Inside This Month

WORKSHOP SPECIAL

Setting Up Your Workshop
BY REV. George Dobbs G6RUV

Build
A Desk Microphone
A NiCad Cell Holder

Reviewed
The Kenwood CO-1305 Oscilloscope

Plus
Novice Natter
For The Newcomer To Amateur Radio
Bits & Bytes
The computer in Your Shack

Win An SG-2000 HF Mobile Transceiver - Final Questions & Entry Form
Plus All Your Favourite Regular Features
The news is out. And it's too exciting to keep under your hat.

Kenwood's new TH-22E (144 MHz) and TH-42E (430 MHz) redefine handheld communications, with a palm-size format and impressive performance.

They're small and light enough to carry anywhere, but offer over 5 watts output (with a 9.6V battery) and long hours between charges. The secret's in the FET power module, a world first in this class for sophisticated power management.

Other features? From the user friendly menu system to the 40 EEPROM memory channels, Kenwood's new handheld FM transceivers offer numerous category-leading features and first-class performance. So it's hats off to Kenwood – the transceivers that cap the rest.
9 Special Prize Competition Corner
The final part of our three part competition to win an SGC SG-2000 h.f. transceiver.

15 Novice Natter
Eaine Richards C4LFM has some interesting news on videos, helping others and free gifts.

20 Review The Kenwood CO-1305 5MHz Oscilloscope
Richard Ayley G6AKG takes a look at a budget priced oscilloscope from Kenwood.

22 Setting Up Your Workshop
The Rev. George Dobbs G3RJV offers some sound advice on setting up your workshop.

27 The £5 Desk Microphone
Ken Fisher GOLKX shows you how to construct a desk or mobile microphone for under a fiver.

28 NiCad Battery Box - Hold Those Batteries In Place When Charging
Edgar Powell GWITDW finds a way of holding NiCad cells for charging.

30 New Transformers From Old
Paul Essery G4XKFE provides some practical advice on rewinding transformers.

34 Tex's Tips
Tex Swann G1TEX takes time off to pass on some practical tips and advice on where and how to find all those necessary bits and pieces for your workshop.

36 Basic QSOs in Spanish Part 3
Gareth Roberts GW4JXN and Ildefonso Sevilla EA7BWX conclude the Basic QSOs in Spanish series.

39 Come Fly With Us To The 1994 Dayton HamVention
Book your seat now ... we don't want you to be disappointed!

40 Clubbing Together For Amateur Radio
Steve Ortmayer G4RAW tells you how to get the best from your local radio club.

55 Focal Point
Andy Emmerson G8PAB brings you his bi-monthly report on the ATV scene with a look into his mailbox.

56 Practical Wireless 1993 Index

59 PW Tool Club
Rob Mannion G3XFD has tried and tested some interesting tools suitable for your workshop.

Other Regular Features

- Advert index
- Antenna Workshop
- Arcade, All PW Services under one roof
- Bargain Basement
- Broadcast Round Up
- Bits & Bytes - The Computer In Your Shack
- Club News
- Editor's Keylines
- HF Bands
- News '93
- Packet Panorama
- Radio Diary
- Receiving You
- Satellite Scene
- Valve & Vintage
- VHF Report

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Front cover photograph shows our guest lead feature writer, the Rev. George Dobbs G3RJV working at his bench in St. Aldan's Vicarage, Rochdale, Lancashire. Kenwood CO-1305 Oscilloscope courtesy of Sale Electronics. Photograph by Derrick Bennett L.M.P.A. 5a Romby Street, Heaton, Lancaster, LA5 1AA.
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The new HOWES CTU150 has been introduced to meet the demand for a higher powered version of our much-liked CTU30 30WATU (kit: £39.90). The CTU150 is designed for use with the popular 100W HF transceivers and covers 1.6 to 30MHz. The "FTmatch" configuration (using 2 high voltage tuning capacitors and 12 switched inductance settings) gives a wide matching range and useful extra RF filtering. It suits coaxied and long-wire antennas. The optional hardware pack is styled to match our other equipment and enables you to achieve a smart finish for your project.

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Practical Wireless, December 1993
Mark's Message.

By the time you read this Leicester will be over but I will still be here waiting for your calls for even more orders. You know how I like to sell so give me a call and let me do you a deal on any make of equipment you see advertised in this magazine. Latest news is our gift tokens. Ideal for presents etc. We can supply them for virtually any amounts and they can be exchanged by post, in our shops or at rallies. We have some particularly nice deals going on if you let me know your needs and of course we are happy to offer part exchange. Take a look at the new Ten-Tec Scout, it really is great value. The MFJ loop looks equally exciting. A complete ht antenna system in a loft which really works. We hope to have the new ALINCO DJ-G1 Boy, what a performer! Come and see it working. In fact why not come and pay us a visit. Free coffee and exciting. A complete hf antenna system in a loft which really works. We hope to have the new ALINCO DJ-G1 Boy, what a performer! Come and see it working. In fact why not come and pay us a visit. Free coffee and exciting.

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With Spectrum Display

- 80 memories, 2 Watts on mic/10 W on 12V
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- Full Duplex
- Time Out Feature

This is the newest mobile rig to come from ALINCO and with 50 Watts output it really does pack a punch. Its simple front panel belies its many features yet making operation safer. You can switch between channel display and channel numbers; nice for “on the move” operation. Frequency control is by rotary control or up/down buttons on the mic. Repeater access is taken care of by the 1700Hz tone with reverse repeater in an instant. And if you get tired of 2 meters you can always listen to the segment 130MHz-174MHz. Everything you need to mount and operate the rig is supplied. Just connect 13.8V.

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- 50 Watts Output
- Time Out Feature
- Channel or Freq. Display
- Compact size

This is the newest mobile rig to come from ALINCO and with 50 Watts output it really does pack a punch. Its simple front panel belies its many features yet making operation safer. You can switch between channel display and channel numbers; nice for “on the move” operation. Frequency control is by rotary control or up/down buttons on the mic. Repeater access is taken care of by the 1700Hz tone with reverse repeater in an instant. And if you get tired of 2 meters you can always listen to the segment 130MHz-174MHz. Everything you need to mount and operate the rig is supplied. Just connect 13.8V.
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10 Modes World Leader £339

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<td><strong>YAESU FT 890</strong></td>
<td>100KHz - 30MHz, l.s.b., u.s.b., c.w., A.M. &amp; F.M., 32 Memory channels, Optional internal a.t.u.</td>
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<td><strong>KENWOOD</strong></td>
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<td>£999.95</td>
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<td><strong>ICOM IC735</strong></td>
<td>144 - 430MHz F.M., A.M., RX, Dual receive V+V, U+U or V+U, Extended receive 118-180, 300-500, 800-950 MHz, 41 Memory channels per band</td>
<td>£399</td>
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<tr>
<td><strong>YAESU TH-78</strong></td>
<td>144-530MHz, 46 Memory channels per band, 50 W, V, 35 W, U, output, Dual receive V+V, U+U, or V+U</td>
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- Scanners, 2 by Peter Rouse £10.95
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Mail Order: SRP Trading, Unit 20, Nash Works, Forge Lane, Belbroughton, Nr. Stourbridge, Worcs. Tel: (0562) 730672. Fax: (0562) 731002
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Practical Wireless, December 1993
NEW PRODUCTS  NEW DISPLAYS  NEW SHOWROOM!!

Firstly, A BIG THANK YOU to everybody who came along to the opening day of the new showroom - the response was overwhelming! I thought North London Radio Clubs could pack the food & drink away, but visitors from all over the country? Sainsbury’s turnover went up 50% that week-end!

ANOTHER DATE FOR YOUR DIARY.
Saturday 11th and Sunday 12th December.
(10 - 6 Sat, 10 - 4 Sun)

My WEEK-END TWO DAY SALE. There’s no Verulum rally this year, so come along to our mini rally!

Kenwood TH22/42
The latest from Kenwood, both 2m or 70cm banders are loaded with features and not loaded on price! Throw £30 at me and pay the balance in SIX MONTHS!!

Yaesu FT-840
The new price conscious HF transceiver from YAESU. Buy one now for only £95 and pay the rest in MAY 1994! Are we mad? NO! are TRICITY FINANCE? Maybe...

Alinco DJ-G1
The only Handie available with “Spectrum Display”, the 2M transceiver is waiting for your order! Special November price.

AOR AR3030
Built to commercial specifications, the NEW AR3030 will set new standards in Shortwave Receivers. Telephone for info sheet, or buy on our Twelve Months FREE FINANCE OFFER!

ICOM IC707
The first delivery were sold to an overseas customer - he completely cleared us out! This no frills HF Transceiver is a real winner, wing us & find out why.

DON’T FORGET WE’VE MOVED!!

286
Northfield Avenue

286
Northfields Station

140-142
Northfield Avenue

ATTENTION RADIO CLUBS!

NEW OPENING HOURS!!
Monday - Saturday 9:30 till 6:00,
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The week ending Friday and Saturday 15 and 16th of October 1993 was a busy time for Tex Swann GITEX and myself. Firstly, we drove from Dorset to Humberside (it’s still really Yorkshire to me!) to visit the North Ferriby Club, and then on to Rochdale in Lancashire for the Mini-QRP Convention. Tex and I were made very welcome by the North Ferriby Club, and we were joined by other guests from other clubs in the area. Between us, we gave a talk on the approach PW has to the hobby, and on how we tackle the production of the magazine in general.

As is usual during my club visits, I rounded the talk off as soon as possible and turned the evening into a question-and-answer session on PW. The topics were varied and interesting, and we ended up with exactly the same comments as we’d heard at the North Ferriby Club the previous evening regarding reviews in the magazine!

The single most important request from readers during our busy weekend related to equipment specifications. In short, it appears that many readers find the different manufacturer’s specifications to be confusing. And in many cases, the readers said that they don’t understand them at all!

In fact, at both meetings I asked for a show of hands, to get a good idea of how many readers found equipment specifications confusing. The result was quite amazing, almost every hand was raised at both the Friday and Saturday meeting after I had posed the question! So, bearing in mind that on both occasions when technical specifications were mentioned there was a high level of technical expertise, it was obvious that something has to be done. I’m pleased to report that something has been done to help our readers, and it will appear very soon.

Ian Poole G3YWX is a very well known author, both in PW and through the books he’s written. Because of his expertise and approach, Ian is the ideal person to dispel the mysteries and confusion where specifications are concerned.

The first of Ian Poole’s articles will appear very soon in PW, so watch this space! And, remembering that the magazine responds to what you the reader requires, please help us to help you by filling in the Questionnaire which can be found in the centre of the November issue of the magazine.

To round off this last ‘Keylines’ of 1993, I am pleased to announce that this column will have two ‘guest’ authors from the editorial team in the January and February issues. The first guest author will be Donna ‘Toad’ Vincent, our News and Production Editor.

Donna is taking her RAE next year, and I understand that she’s intending to explain one or two ‘Editorial’ (?) mysteries to you in her ‘Keylines’! However, (worrying- ly perhaps) I’ve had to promise that there’ll be no Editorial interference.

In the meantime, I’ll wish you all good fortune with a final reminder. Please don’t forget to fill in your Questionnaires!

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**SPECIAL PRIZE COMPETITION CORNER part 3**

**First Prize**

SG-2000 HF Mobile Transceiver Worth Over £1800 Kindly donated by SCC, Inc.

**Second Prize**

Jones Morse Key worth £65 Kindly donated by Peter Jones Engineering.

**Third Prize**

Two Year Subscription To Practical Wireless

The December Questions (Enter Your Answers On The Special Coupon On This Page).

**Question 1:** When operating the SG-2000 which tuning method did G3XFD prefer to use?

**Question 2:** How many remote control heads (controllers) can be operated with the SG-2000?

You could win the dedicated SG-2000 h.f. mobile transceiver by answering the six questions (five two questions published this month) taken directly from the review by G3XFD of the SG-2000 published in the October Practical Wireless. Enter your answers to the six questions on to the competition form on this page, complete the tie-breaker sentence, staple your corner flash coupons to the entry form and send it to: **Practical Wireless, Special Prize Competition Corner, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW, England, to reach us by 13 January 1994.**

 Entries with all six answers must be written on the final entry form, (photocopies accepted only if accompanied by the three original corner flashes) with all three corner flashes attached and tie-breaker sentence completed. Any entry not conforming to the rules will be disqualified. All winners will be notified by post. The Editor’s decision will be final and no correspondence will be entered into.

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Practical Wireless, December 1993
Dear Sir
I was most interested to read the article about Pat Hawker G3VA in the September 1993 issue of PW.
You mentioned on Page 21 that he listened in 1936 to Schenectady and Sydney VK2ME with its Kookaburra signal. Well, so did I as a schoolboy s.w.l. So, I thought you might like to see the enclosed photocopies of QSLs from these stations together with other interesting ones from the same pre-war period. They were great days in wireless construction and my knowledge of early radio stood me in good stead when I joined the RAF as a wireless operator in 1940. My late mother saved all my pre-war QSLs and gave them to me many years later. Note also, the PW All Continents Received Certificate, dated May 1940. I wonder how many of those are still around?
And I had the pleasure of a chat a few years ago at the Rally at HMS Mercury and I also met Ron at Amberley around the same time.
Colin Dawson
G4UZS
Portsmouth

Editor’s reply: Our article on Pat Hawker G3VA seems to have stimulated many memories and interest Colin! I’ve no doubt that many readers will be interested to see the pictures of your certificates, which we’re pleased to publish in ‘Receiving You’.

Dear Sir
I have recently become an avid reader of Practical Wireless and in the October 1993 issue, on page 33, some very interesting details are given regarding Jack Hum G5UM and his three valve EF50 t.r.f. receiver, first published in 1946.
I would very much like if it were at all possible to obtain further details for the component values and coil details of that receiver and the r.f.c.s, etc.
Can you help me in any way at all?
A. J. Hamshere
Norfolk

Editor’s reply: You should have your photocopy of the article from Short Wave Magazine by the time the magazine is in print Mr Hamshere. However, we found that it appeared in the August 1946 issue of SWM, and not as published. Photocopies (at a special price of £1) of the article and follow up notes are available from the PW office on request and NOT from Jack G5UM whose copier can’t cope with the demand!

Dear Sir
I picked up my first copy of Practical Wireless ever last weekend and I was amazed to read that Taunton is an examination ‘blackspot’ for courses leading to the RAE. In fact, I drive to Taunton, some 23 miles away to attend a course run at the Somerset College of Arts and Technology. The course leads to the City and Guilds examination next May. Perhaps you could put the record straight.
As someone who is totally new to the hobby I found that there were very few colleges offering courses. I was also staggered by the bureaucracy involved in getting a licence. Surely it would be reasonably easy for schools, local colleges or even Radio Clubs to offer the test on a regular basis with proper supervision from an examining board.

With the current trend of colleges offering courses that lead to vocational qualifications, an exam for hobbyists such as the RAE is bound to be lowest in their list of priorities. Unless easier access to the hobby becomes the norm, then existing hobbyists are going to have fewer people to talk to.
I hope to join you next May on the air.
Unfortunately if I fail a paper then it will be six months before I can try again!
Steve Townsley
Devon

Dear Sir
I do not know whether any of your readers have noticed that if a book requested through a local library has to be obtained from the British Library, then there is a reservation charge of £4.11 in addition to the local library’s charge.
Specialist physics books (the one I wished to refer to on this occasion was Antennas by Kraus) American publications and old radio/television books, usually seem to come via this route.
You cannot always be certain that a requested book will turn out to contain exactly the material you wish to study. Yet on other occasions you may be efficiently impressed by a book to purchase your own copy. The new charge is a lot of money (two issues of PW!) to pay out each time on a gamble.
I thought that we had a free public library service. Students, or those employed buy large research/development organisations probably have a free access to these books in the university/company library. But for those of us not so privileged - the self taught, it looks as though we must pay unreasonably for our desire to extend our knowledge.
Brian Pethers
Kent

Editor’s comment: It does seem unfortunate Brian, but it seems as if the libraries are only passing on the charges set by the British Library. I use the Dorset libraries a lot, and although you have to pay for book reservations, I find their charges reasonable. I have a Polish ‘Linguaphone’ course on loan at the moment, it’s costing £5 for three months, which is much cheaper than buying a course. I’d be interested to hear other reader’s comments on the Public Library service.

Examination Blackspot

British Library
Rally At Stalybridge

Dear Sir

May I, on behalf of the society that I represent and through the pages of Practical Wireless, pass a few comments and facts, about the rally held at Stalybridge on the 29th of August.

Like a lot of other amateurs who were present at the rally, I was disappointed that no dealers in radio equipment were present at the rally and only one or two had components. Maybe this was due to the fact that a radio rally took place at Bolton the week before.

A few amateurs had chosen to aim their comments and in one case his nasty remarks, at Tameside ARS. Let me point out to these people, that Tameside ARS was in no way responsible for organising this rally, or had any say in the running of it. If these people had taken notice of the large poster outside the hall or the notice board which they paid their entrance fee, or even the logo on the sweat-shirts of the staff and security people, then they would have seen the name of the people responsible for the rally.

Tameside ARS members were at the rally, because as a local society we were invited by the organisers to run the Bring & Buy, which we did. So why the few amateurs who were dissatisfied with the rally should aim their complaints and in one case his nasty remarks over the air, at Tameside ARS is beyond me. Especially when we were only there by invitation of the organisers, the same as everybody else.

One member of the Tameside ARS did put out a bulletin on packet about the rally taking place, but even he put it out that it was a ‘Computer & Radio Rally’. I believe he did his usual practice at the end of his bulletin, he added his name, call-sign and that he was a member of the Tameside ARS. This does not give dissatisfied amateurs the right to blacken the name of Tameside ARS for something over which they had no control.

The Rally was advertised quite clearly in Practical Wireless as ‘Computer, Electronics and Radio’ rally and if people who were travelling any distance, had taken the advice printed in the ‘Radio Diary’ section of Practical Wireless and telephoned the number given, then not only would they have found out the exact nature of the rally, but also who was organising it.

Maybe these amateurs who were so quick to condemn Tameside ARS can now be just as quick to send us their apologies, I doubt if this will happen.

Our committee had looked at the hall in Stalybridge, as a possible venue for a ‘Radio Rally’ to be held at some future date. My recommendation to them however, is to abandon any thoughts in that direction and channel all our energies into our own society’s activities and those of our local community.

It’s just not worth the hassle trying to help some people.

A. N. Laughlan (Secretary)
Tameside A.R.S.

Send your letters to the editorial offices in Broadstone. They must be original, and not duplicated in any other magazine. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of Practical Wireless. The Star Letter will receive a voucher worth £10 to spend on items from our Book or other services offered by Practical Wireless. All other letters will receive a £5 voucher.

Radio Amateurs Examination

Dear Sir

Re: Your editorial ‘Keylines’ column, October 1993 issue of PW reference the RAE Examination by City & Guilds.

As a tutor of the RAE syllabus for some three decades I am deeply concerned at what I consider to be the excessively high technical standard and deliberately misleading nature of some questions in their Operating Procedures, Practices and Theory papers.

For example:

1: A question which asks the candidate to decide when a semiconductor diode is forward-biased, shows a rectangular block PN junction with terminals A and B, rather than the more realistic internationally accepted diode symbol with cathode (k) and anode (a) legends.

2: A question which asks for the magnification factor of a tuned circuit includes as one possible answer “the ratio between inductive and capacitance.”

3: A question which gives a totally unrealistic figure of 0.08 for the velocity factor of a transmission line.

4: A question which states that a millimetre reads 10% high at 100mA and asks what is the actual current, does not include the correct current of 90.9mA in the multiple-choice answers.

5: Radio circuits given with questions use the Earth symbol rather than the more realistic Frame or Chassis symbol.

Whilst I agree in principle with the concept of the overall responsibility for organisation and administration of the Amateur Radio examinations being vested in the RSGB, I have reservations about their ability to provide and manage geographically localised venues on a stable long term basis.

In my considered opinion, the following administration changes relating to the Amateur Radio examination should be introduced as soon as practicable.

A: Responsibility for compilation of examination papers leading to the Amateur Radio Licence should be transferred to the Radio Society of Great Britain.

B: Examination results should be available within six weeks of the examination date.

C: Examination marks assessed should be issued to the candidate as a matter of right.

D: The option to resit within four months one failed part of the two paper examination.

Ed Chicken G3BIK
Northumberland
Send in your news, photographs and product
information to Donna Vincent
at the editorial offices in
Broadstone.

Jim MX-14S Transceiver

Following the review in the July 1993 issue of
Practical Wireless by Clive Hardy G4SLU and the
comments he made regarding the price of the Jim
MX-14S, UK agents Waters & Stanton have nego-
tiated a price reduction.

Waters & Stanton have recently notified PW
that the manufacturer has decided not to trade to
other dealers, making them the sole importers. As
a result of this Waters & Stanton are now able to
offer the Jim MX-14S at £239 inc. VAT instead of
the original price of £289.

Henry’s Catalogue

Henry’s Audio Electronics of 404
Edgware Road, London W2 1ED now
have copies available of their new
1994 colour catalogue. The 300 page
catalogue comes complete with a
retail/mail order price list and four £5
vouchers.

To obtain your copy call in at
Henry’s with £2.00 or post a £4.00
cheque with your name and address
and they will send you a copy.

Don’t forget that Henry’s are the
main distributors for a wide range of
electronics and can quote for UK and
export. For more information contact
Henry’s Sales Office on 071-258
1831.

Classic From AOR

The AOR Company have introduced the new AR3030 general coverage
receiver to their range of products. The AR3030 has a classical appearance
on the outside and comprises of a direct digital synthesiser design on the
inside. The result is the New Classic.

The frequency coverage of the AR3030 is from 30kHz to 30MHz and
features a.m., s.a.m. (synchronous a.m.), n.f.m., u.s.b., i.s.b., c.w. and FAX
as standard. To help provide the ultimate in a.m. selectivity a Collins 8
6kHz mechanical filter is also fitted as standard. In addition to the Collins
filter the 3030 is fitted with two other filters, a 2.4kHz for s.s.b., FAX, c.w.,
a.m., s.a.m., and a 15kHz for n.b.f.m.

Other features include 100 memory channels allowing data to be trans-
ferred in and out of the memory giving greater flexibility, 1.8W audio output,
and standard headphone socket with 3.5mm jack socket for use with an
external speaker. Antenna input is via a 50Ω BNC connector.

Other new models will also be available soon. These include a high
performance all-mode wide coverage hand-held
transceiver and a new base station all-mode
wide coverage receiver.

The price for the
AR3030 has yet to be
confirmed but further
details are available
direct from AOR (UK)
Ltd., Adam Bede Tech
Centre, Derby Road,
Wirksworth, Derbys
DE4 4BG. Tel: (0629)
825926.

Young Amateur Of The Year -
Tim Munn 2E1AMX/G7OTO

The 1993 Young Amateur of the Year award has
been awarded to 15 year old Tim Munn
2E1AMX/G7OTO from Ventnor, Isle of Wight.

The award was presented to Tim along with the
first prize of £250 by Roger Louth, the Radio-communication
Agency’s Director of Mobile Services. The
presentation took place at the Radio Society of Great
Britain’s HF Convention in Windsor on October 10.

In addition to the first prize, Tim, supported by
his family, also received numerous other prizes
including an invitation to visit Baldock, the Agency’s
Radio Monitoring Centre, Hertfordshire, a one week
training course on professional mobile communica-
tions at Wray Castle College in the Lake District
and gifts from Icom (UK) and Siskin Electronics. Tim will
also receive a certificate signed by the President of
the Board Of Trade, Michael Heseltine.

Tim has been interested in amateur radio since
he was 10 years old and is an active Packet user as
well as being involved with his local RAYNET group.
Not only has he achieved the title of Young Amateur
of The Year but is also the youngest Novice
Instructor in Great Britain and has recently heard
that his first three pupils have all
passed their
Novice Radio
Amateur
Examinations
(NRAE). His great
enthusiasm for
radio is also
shown by the
many items of
equipment he has
constructed. These
include an 3.5MHz
receiver and a
50MHz transmis-
ter/receiver.

The close run-
er-up in the 1993
Young Amateur Of
The Year award was, Simon Kahn G0STU/2E1AAB
aged 14 from Salford, Lancashire. Simon was also
present at the ceremony together with his parents
and brother who is also a Novice. He is an active
member of the Bury Radio Society and is Editor of
the club’s magazine, Feedback.

Simon was also invited to visit the
Radiocommunication Agency’s monitoring station at
Baldock.
Hi-Band Loop

Waters & Stanton Electronics of Hockley in Essex have recently introduced the MFJ-1786 Hi-Q 6 Band Loop to their range of products. The 914mm diameter loop has a power handling capacity of 150W, a frequency range of 10 - 30MHz, and covers the 10, 14, 18, 21, 24 and 28MHz bands.

The MFJ-1786 is supplied with a control box and an a.c. adaptor. The control box allows the loop to be remotely tuned without the need for a control cable. The d.c. controls are fed via a 50Ω coaxial cable connection between the loop and the control box.

The loop is constructed from a 25mm diameter welded aluminium tube and tuning is carried out by a special butterfly capacitor which has no rotating contacts. This helps to keep r.f. current losses to a minimum.

The American manufacturer MFJ claim that field tests have shown that the MFJ-1786 is the equivalent of a dipole erected at similar height. The antenna is aimed at those who find outside antennas a problem to install.

Waters & Stanton are selling the MFJ-1786 for £299 inc. VAT and can be contacted at 22 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835.

Try Before You Buy

The Middlesex based company Livingston Hire and Tektronix have recently drawn up an agreement to allow potential buyers of Tektronix products to evaluate equipment before buying it - at no cost. The scheme known as the Tektronix Freeway Evaluation scheme means that the potential buyer can rent equipment from Livingston Hire at a preferential rate.

The scheme works by the rental cost of up to a maximum of 10% of the purchase price of the equipment being reimbursed by Tektronix in the form of vouchers. These vouchers can be redeemed against the purchase price of the equipment.

Livingstone Hire is unique in providing this 'try before you buy' scheme. The aim is to give customers the opportunity to evaluate any new Tektronix equipment before deciding whether or not to buy.

For more information on the 'try before you buy' agreement contact Graham Harris, Livingston Hire Limited, Livingston House, Queens Road, Teddington, Middlesex TW11 0LR. Tel: 081-943 5151.

Packet Survival

Roger Cooke G3LDI author of the PW 'Packet Panorama', column has recently produced a self published booklet entitled Packet BBS Survival For The Beginner. It's produced in loose leaf spiral bound A4 format and contains 73 pages on how to survive on packet as beginner.

Packet BBS Survival For The Beginner takes the user from the first connect to the BBS through to using the full set of servers. It is laid out clearly and concisely and gives the user plenty of examples to work to. There is also a United Kingdom Mailboxes and a DX Clusters list at the back of the booklet.

Anyone interested in obtaining a copy of Packet BBS Survival For The Beginner can get one by sending £4.50 inc. P&P to Roger Cooke G3LDI, QTHR or by packet address to G3LDI GB7LDI.GBR.EU. For each booklet purchased Roger will donate £1 to the AMSAT Phase 3D Satellite Fund.

Speak To Me

The National Museum of Science & Industry, London are currently running an exhibition entitled 'Speak To Me' on communication and disability. 'Speak To Me' is the seventh and final exhibition in the Science Box Series on contemporary science sponsored by Nuclear Electric Plc. and is running until the 30 January 1994.

The exhibition, designed to help those who have difficulty in communication, was opened on 4 October 1993 by Professor Stephen Hawking, author of A Brief History of Time. Professor Hawking, a sufferer from motor neurone disease uses a speech synthesiser which he operates using two fingers of his left hand.

Visitors to the exhibition will have the chance to try out various methods of communication. These include the Liberator speech synthesiser, like the one used by Professor Hawking.

The Liberator works by using a software package called Minspeak. This allows the user to choose individual words on a symbol based keyboard. Using different combinations of pictures, it builds up sentences much faster than using a conventional keyboard. The computer then turns the sentences into synthesised speech giving the user a voice which sounds almost human.

Also on display is the Speaking Hand developed by Robert Klein, a student at University College London. The Speaking Hand is an experimental device that recognises the Deafblind Alphabet and then turns it into artificial speech or text. The device works on the Deafblind Alphabet principal of spelling out one letter at a time by touching the palm and fingers of the left hand. This has enabled Robert to develop a glove containing tiny sensors which detect pressure on each touch point. A control unit then turns the electrical output from the sensors into a signal that can be processed by a BBC microcomputer.

Visitors will also have the chance to use an electronic newspaper designed for the blind and visually impaired as well as the chance to take part in an opinion poll on communication and disability.

'Speak To Me' can be seen at the Science Museum, Exhibition Road, London SW7 2DD. Tel: 071-938 8080/8008.

Old Radio Sets

Old Radio Sets by Jonathan Hill has recently been published by Shire Publications. The A5 sized book describes the development of radio (wireless) from the late Victorian era until the late 1960s. It shows many rare and unusual sets that were once familiar to listeners as well as containing a ‘Further Reading’ and ‘Places To Visit’ section.

The author, Jonathan Hill, is a freelance writer and photographer who has been interested in radio since the early 1970s. He was also a founder member of the Vintage Wireless Society and runs his own communications museum next to his home in Bampton, Devon.

Old Radio Sets is available from booksellers or from Shire Publications Ltd., Cromwell House, Church Street, Princes Risborough, Buckinghamshire HP27 9AJ for £2.25.
Palm Sized Communications

The TH-22E and TH-42E are the latest f.m. hand-helds to be launched by Kenwood.

The TH-22E is designed for 144MHz and the TH-42E for 430MHz. Both of these hand-helds are small, palm sized, light and offer over 5W from a 9.6V battery.

Other features include 40 EEPROM memory channels, easy to use menu system and numerous category leading features.

Kenwood announce that both the TH-22E and 42E will be competitively priced. For more details contact Trio-Kenwood (UK) Ltd., Kenwood House, Dwight Road, Watford, Herts WD1 8EB. Tel: (0923) 816444.

New Warranty

Icom (UK) Ltd. have just announced a new warranty scheme. The new two year warranty came into operation on November 1. This will be available on receivers, transceivers, hand-helds and mobile rigs as well as selected other products purchased after November 1 1993.

For more details contact Icom (UK) Ltd., Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 741741.
Videos on the radio hobby must be few and far between. So when Nevada Communications sent a package of four videos to look at, it came as quite a surprise.

The videos are produced by the American CO Magazine - but don’t let that put you off. The subjects they cover are Getting started in Ham Radio, Getting Started in Packet Radio, Getting Started in Amateur Satellites, and Getting Started in DXing.

I can’t tell you about all of them in detail in one issue, because there’s too much to say. But, at £19.95 each, I think they could be really good additions to the ‘Please can I have...’ list. I started by looking at the video about Packet Radio - an aspect of amateur radio I’ve never bothered with before. The video contains lots of American enthusiasm, but as the equipment is the same both sides of the Atlantic, the information is valid.

The explanations of packet radio are about the simplest and best I’ve ever heard/seen, I could almost be converted. Don’t worry though, it shows you how to use packet and not the theory on why packet works.

Any orders for these videos should be sent to Nevada Communications, 189 London road, North End, Portsmouth, Hants PO2 9AE. If you want your videos for Christmas, don’t wait too long before sending off your order, you know how congested the Post Office gets the closer we get to Christmas, and you wouldn’t want to be disappointed, would you?

Helping Others

Helping others is something the RAIBC do a lot of. The letters in RAIBC stand for Radio Amateur Invalid & Blind Club. The Branch in Northern Ireland have sent some details on how we can help them to help disabled people in Northern Ireland.

The RAIBC project for 1993/94 is to encourage deaf people to take part in the hobby with the use of a computer, linked to their radio with a modem - packet radio. This in itself opens up a new world of communications for the deaf.

If you think this is a worthwhile project to support, then send your vouchers free of charge to MLO, Radio Amateur Invalid & Blind Club (NI Area), FREEPOST, BE 1769, Belfast BT15 3BR.

RAE Courses

I have some young friends who are attending an RAE course. One topic they asked to be clarified was resistors and what happens when you put them in series and parallel.

Before I cover that, let’s just look at the reason for resistors and what they do. Their primary role in life is to pass current, but in a very controlled way.

One way to think of a resistor is to imagine you’re trying to water your beloved greenhouse plants with a powerful hose. If you take the hose to your previous cious seedlings it’s power will probably blast them clear out of the pot!

What you need is some way of restricting the flow. You could do this by putting your finger over the end or perhaps by squashing the hose pipe. The restriction or resistance is precisely what a resistor is required to do in an electrical circuit. In this analogy, the water pressure can be equated to voltage and the water flow to current. You will find this similarity between the flow of water and electrical current holds true for many types of electrical circuit.

Resistors in series are easy to deal with. You just have to be able to add their values together and if you can’t do that in your head you can always resort to a calculator. For example, a 100kΩ resistor in series with a 470kΩ resistor in series with a 550kΩ resistor is equivalent to: 100Ω + 470Ω + 550Ω = 1120Ω (or 1.12kΩ).

When thinking of resistors in parallel, imagine our hose pipe again. This time imagine it’s a hose pipe that splits into three smaller pipes and then joins back into one large pipe. What do you think happens to the flow of water?

If the three pipes are the same size or resistance, each will pass the same amount of water so the total flow will be three times the flow in each individual pipe. Exactly the same principle applies to electrical circuits with identical resistors in parallel, you just need to divide that value by the total number of resistors.

But, what if the pipes or resistors are different sizes? In this case, the current is shared between the resistors. The lowest value of resistor passes the most current and the highest value of resistor passes the least current. If you need to work out the total resistance of a group of parallel resistors, there’s a simple formula you need to learn.

1/Ωt = 1/Ω1 + 1/Ω2 + 1/Ω3, etc.

This is where Ωt is the total resistance you want to end up with and Ω1, Ω2, Ω3 etc., are however many resistors that are sat in your parallel circuit. If you look at Figs. 1a & 1b, you can see what both series and parallel resistors look like in a circuit.

Free Gifts

As we’re approaching the festive season, the Editor’s ‘getting into’ the festive spirit early. I’ve got 20 Maplin catalogues and a couple of free subscriptions to give away.

So, what do you have to do? To get the subscriptions, I need to see a photo and a few details of you and your Novice station. For the catalogues, I want to know what is the total value of resistance when you have a 2.7kΩ, 270Ω and 470Ω resistor in parallel - easy or what?... See you next month with the answers and winners.

Elaine Richards G4LFM, PO Box 1863, Ringwood, Hants BH24 3XD.

Elaine Richards G4LFM brings you some interesting news on videos, helping others and free gifts.

Fig. 1a: Resistors in series.

Fig. 1b: Resistors in parallel.
Antrim
Carrickfergus AG. Tuesdays, 7pm. Downshire Community School, Downshire Road, Carrickfergus. November 20 - Rally/Ring/Bag/.. on 522, 12pm start, December 7 - Packet by Hugh Irvine G3ITL. Gwinn G3MGM on (0220) 836350.

Avon
Thornbury & DARC, Wednesdays, 8pm. United Reform Church, Chapel Street, Thornbury, September 22 - Rig Night. A. Helleen G8TVV on (0454) 413215.

Bedfordshire
Shefford & DARS. Thursdays, 8pm. Church Hall, Amphill Road, Shefford, Bedfordshire, November 11 - Talk by Nic G4TXG, 18th - Members Activity Night, 25th - Quiz Night, December 2 - Members Activity Night, 9th - The QMEO Challenge. Paul G1GSN on (0462) 700168.

Berkshire

Cheshire
Stockport RS. 2nd and 4th Wednesdays, 7.45pm. Room 14, Dialstone Centre, Stockport RS. 2nd & 4th Wednesdays, TR. November 20 - Rally/Bring & Buy/Talk-in Downshire Road, Carrickfergus. Antrim January 16 - Amateur Radio Videos. Tony Rees GW2FPM on (0246) 690563.

Gwynedd
Dragon ARC. 1st and 3rd Mondays, 7.30pm. Four Crosses Hotel, Menai Bridge. November 15 - Amateur Radio Videos. Tony Rees GW2FPM on (0246) 690563.

Hampshire
Basingstoke ARC. 1st Mondays, 7.30pm. Forest Reg Community Centre, Sycamore Way, Winlesham, Basingstoke. November 28 - 144MHz Direction Finding Competition - Fox, December 6 - Xmas Social. (0256) 25517.

Ichen Valley RC. 2nd and 4th Fridays, 7.30pm. Scout Hut, Brickfield Lane, Chandlers-Fox. November 12 - Food Hygiene by John G7ODY, 26th - Home Construction From Kits by Keith G3UXO. Les Kennard G3ABA on (0730) 732297.

Winchester ARC. 3rd Fridays, 7.30pm. Red Cross Centre, Durngate House. November 19 - Construction Project by Gerry Sanderson G2BST. Peter Simkins G3MCL on (0626) 850814.

Hereford & Worcester

Hertfordshire
Decanor AR & TS. 1st (informal) and 3rd (normal) Tuesdays, 8pm. The Heath Park, Cotterells, Hemel Hempstead. November 16 - ATV by G4NUJ. Nicholas Camp, 48 Northfield Road, Harpenden, Herts AL5 9HZ.


Greater Manchester
Rochdale & DARS. Mondays, 8pm. The Cemetery Hotel, 470 Bury Road. Rochdale, Lancs. November 15 - Guest Speaker. Brian on 061-653 8316 or Dave (0760) 323602.

Tameside ARS. 1st and 3rd Tuesdays, 7.30pm. ATC Camp, Moorcroft Street, Droylsden, Tameside. November 15 - Amateur Radio Videos. Tony Rees GW2FPM on (0246) 690563.

Kent
Bromley & DARS. 3rd Tuesdays, 7.30pm. The Victory Social Club, Kchil Gardens, Hayes, Kent. November 16 - RAYNET In Romania visits by Les W1HWHAN G0LW. Alan G7SHB on (07177 8434.)
Norfolk

King’s Lynn ARC. 7.30pm. The King’s Lynn Scout Hut, Queens Lane, North Runton, Nr King’s Lynn. November - 11 - Packet Radio & Basic TCPIP by Paul Overton GM6HOM, 25th - Club Junk & Surprise Sale. Derek Franklin GM6GOL on (0553) 841199.

Norfolk ARC. Wednesdays. 7.30pm. University Arms, South Park Avenue, Norwich. November - 14 - Equipment Sale, 17th - On Air & Workshop, 24th - Archeology And The Metal Detector by Dr. John Davies. December - 1 - Committee Meeting/On The Air Night, 8th - Voice Pitch Control by Ted G6OVC. Dale Simkin on (0603) 37393.

Northants

Nottinghamshire
South Notts ARC. Highbank Community Centre, Farndon Road, Clifton Estate, Nottingham, or Fairham Community College, Farndon Road, Clifton Estate. November - 12 - VHF Linear And Power Supplies by Martin Dale G6ABU, 19th - Open Forum, 26th - HF & VHF On Air Construction. Julie G6VDS. PG Box 4, Nottingham NG11 9OE.

Scotland
Banff & DARC. 1st & 3rd Fridays. Banff Castle, Castle Street, Banff, Aberdeenshire AB91 1DL. November - 19 - Fire Engineering, December - 3 - Club Construction Meeting. Martin Andrew GM6VXG on (0346) 82061.


Lothians RS. 2nd & 4th Wednesdays, 7.30pm. Orwell Lodge Hotel, 29 Polwarth Terrace, Edinburgh EH11 2HR. November - 24 - Air Traffic Control At Edinburgh Airport by Phil Jackson and Kel Kirkland.


Suffolk
Felixstowe & DARS. November - 22 - HF Antennas by Richard Hayward GOOZG, December - 3 - December Fixed & AFS Contest, Paul Whiting G4YQD on (0914) 273507.

Surrey

Horsham ARC. Guide Hall, Denne Road, Horsham, West Sussex, 8pm. December - 2 - AGM. Peter Stevens G6JCS on (0737) 842150.


Sutton & Cheam RS. The Ingrow Cricket Club, Keighley. Tuesdays, 8pm. November - 16 - Guest Speaker. November - 23rd - PSUs by Mike Cox G8HUA, December - 2 - 144MHz AFS/Fixed Contest. John Puttock G3JXK, December - 6 - All I Want For Christmas by David G0DJR, 7th - The Club’s Ten Pin Bowling Competition. (0422) 464292.

Wiltshire

Trowbridge DAR. 1st & 3rd. Wednesdays, 8pm. Southdown Village Hall, 8pm. November - 17 - Natter Night, December - 1 - Christmas Party & Skittles. Ian G6DO on (0306) 77236.

Worcestershire
KENWOOD RADIO

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just arrived. This new "micro" 100 watt HF mobile rig is in short supply because of its popularity. We have purchased large quantities - call for info or port exchange price on your old HF rig...

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RS5000 SX10/90 Rec. 150kHz - 30MHz...

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$2300.00

$369.00

$360.00

$125.00

$250.00

$159.95

$35.95

$49.95

$399.00

$1299.00

$1399.00

$1599.00

$999

$29.95

$59.95

$79.95

$365.00

$399.00

$399.00

$429.00

$499.00

$259.00

$189.00

$299.00

$339.00

$399.00

$399.00

$369.00

$369.00

$139.00

$179.00

$329.00

$369.00

$389.00

$399.00

$999

$939.00

$1499.95

$179.95

$189.95

$299.00

$369.00

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$299.00

$389.00

$399.00

$399.00

$399.00

$399.00

$399.00

$399.00

$399.00

$129.95

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$3.49

$15.99

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**STARTEK**

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SAY GOODBYE TO RANDOM COUNTING AND FALSE READINGS WITH THE ATH™ SERIES

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- **Complete with 40m band module**
- **Legendary QSK and superb electronic keyer**
- **Multi function signal meter**
- **Easy plug-in band module (inc. WARC bands)**
- **Superb sensitivity and dynamic range**
- **Full range of optional accessories available**
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- **Simple, affordable and fun to use**

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**LOW LOSS CABLE**

Super Japanese low loss cable with aluminium foil and braid double each section, tough weather resistant, yet flexible. Fantastic low loss – suitable for high power and frequencies up to 30MHz.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Losses (dB/m)</th>
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<tr>
<td>500kHz</td>
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<tr>
<td>1MHz</td>
<td>0.038</td>
</tr>
<tr>
<td>10MHz</td>
<td>0.031</td>
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</table>

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**EARTALKER**

A completely new concept in microphone technology. The Eartalker is a combination of earphone and microphone which is worn within the ear. It provides outstanding transmitted audio quality and is suitable for all leading brands of hand-held (Call for details on your particular model), Separate volume, PTT switch and control box.

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Simply divide the price into 3 equal payments. Write 3 cheques dated in consecutive months starting with today’s date. Your telephone number and cheque card number/expiry date on the back of each cheque.

Post them to us enclosing your name & address and we will (subject to status) send your goods immediately.

The hardest part is deciding what to buy!
The compact size of the CO-1305 reviewed by G6AKG can be judged by comparison with photographer's (G1TEX) hand.

Looking at the prices charged for surplus test equipment these days, has left me wondering who can possibly afford to buy an oscilloscope. New or used they don't come cheap.

However, if you're thinking of buying new, the Kenwood CO-1305 scope from Saje Electronics is cheap at £185 plus VAT when compared to most other budget instruments currently available.

Looking at its specification and price the CO-1305 is obviously aimed at the educational and Novice end of the market. And from what I hear, it is selling very well.

Light and Neat

The Kenwood CO-1305 is a light and neat instrument with quite a quality look about it. Closer inspection with the covers off, shows a well built design with the cathode ray tube (c.r.t.) running the full depth of the instrument and two p.c.b.s.

The tube used in the CO-1305 gives a bright well defined trace, which seems to hold up well even when the instrument is working at the limits of its specification.

The power consumption of the entire instrument is just 12W, which would indicate that the tube is also nice and efficient.

The first p.c.b. nearest the small mains transformer obviously provides the many power supply rails used to feed a c.r.t.

The second p.c.b. forms a sub-chassis to which all the front panel controls are mounted. The control panel p.c.b. also contains the trace amplifier and sweep circuitry.

The Inputs

Three 4mm sockets are used for inputs, the first two are used as the Y-amplifier input. The third socket along with the second, which is a common grounding point, is used to provide either external synchronisation of the sweep oscillator or by flicking a switch, an input to the X-amplifier.

The X-amplifier in this instrument is d.c. coupled. This allows the application of very slow external sweep waveforms.

For those unsure of what the X and Y amplifier actually do in circuit I'll provide a reminder! Basically speaking, the Y-amplifier output is used to drive the display trace up and down. On the other hand, the X-amplifier is generally fed with a sawtooth waveform (sweep oscillator) which moves the trace across the screen from left to right.

On the back of the instrument are two terminals for Z-modulations, which enable the brightness of the trace to be varied by an external voltage source.

The use of 4mm sockets was obviously chosen to suit the schools environment which does not allow the direct use of the more useful capacitive type 'scope probe.

However, the spacing of the input sockets enables the use of a 4mm to BNC type adaptor and the specification input impedance of the instrument is well suited to high resistance capacitive type probes.

Kenwood provide a coaxial input lead fitted with 4mm plugs and insulated crocodile clips. This is acceptable for basic testing at audio frequencies.

Uncluttered Appearance

The instrument front panel is uncluttered in appearance with the intensity and focus controls designed as presets, adjusted with a trimming tool or small screw driver through a recessed hole in the panel.

I didn't have a problem with this arrangement as these controls are rarely used in most circumstances. The other preset control is the d.c. balance of the Y-amplifier.

Input sensitivity

The input sensitivity of the scope is 10mV/division which can be adjusted with the Y-gain control. Once the Y-gain is altered with this control the scope loses its calibrated figure of 10V/m and then reverts to being a comparative instrument.

However, in order to extend the calibrated range of the instrument a switched attenuator is provided which can be set to either divide by 10 or 100.

To use the scope in this calibrated mode the Y-gain control needs to be set fully clockwise. This point isn't made that clear in the operating notes and I felt that a calibration mark on the front panel along with a pointer type knob would have helped operation.

In order to check the amplitude and duration of a waveform against the graticule screen in front of the c.r.t., X and Y position controls are also provided.
**Review**

The sweep oscillator of the 'scope is similar to the Y-amplifier, in that it is fully adjustable between the switch ranges. But unless the frequency control of the oscillator is set fully clockwise, the timebase calibration of the scope is meaningless.

My earlier comments on control markings still hold. This means the instrument is somewhat limited in its ability to give useful duration measurement.

There are four sweep ranges provided 10 to 100Hz, 100Hz to 1kHz, 1 to 10kHz and 10kHz to 100kHz. The highest frequency which could be measured is limited by your ability to count the number of wave peaks and divide them into the switched sweep rate selected.

The trace synchronisation of the CO-1305 is very good considering its simplicity. The engineer I spoke to at Saje Electronics said that one of his customers had commented at the trace stability, even when being used with complex video waveforms.

I must admit, the oscilloscope handled everything I tried on the review model. It even coped with low amplitude signals. I found one small point unfathomable to Kenwood's design philosophy. And this is although they have provided a Z-mod. input on the oscilloscope, a function I have yet to utilise in my experience, they did not blank the flyback part of the trace!

My reference to the Z-modulation input was because this function could be used with some additional circuitry to enable flyback blanking. A lack of flyback suppression shows a totally spurious, and annoying, section of the trace as it returns to the left hand side of the tube for its next sweep.

To be honest, when I first saw this design flaw I thought it to be a fault condition. However, when I was told it was quite normal my overall feeling towards the instrument changed to disappointment. Still, all things are built to a price these days!

Anyone viewing a sinewave for the first time might be forgiven to think that all such waveforms have this rather odd line drawn through their negative wave peak! Educationally it's a bit misleading and it is one small problem I think Kenwood could do something about.

**Operating Instructions**

The operating instructions, along with the specification of the instrument are given on a fold-out A3 sheet. This I found to be reasonably written.

There are a few oddities in the instructions. Personally I'm sure these were introduced in translation and the shorthand style adopted through lack of space.

The instruction sheet also tells you how to measure Lissajous Figures. These are used for comparing the frequency of a known signal source with that of an unknown waveform being monitored with the 'scope.

**Summing Up**

In summing up my opinions, I think that the bottom line must be that the Kenwood CO-1305 oscilloscope represents good value for money in its class. This is an important factor if you consider that the next step up to a semi-professional oscilloscope could add another £200 to the price tag.

Most people are on a tight budget these days. This particularly applies to schools and colleges and this 'scope will seem very attractive to this sector of the market.

However, if I were buying a scope for my own personal use and I had £200 to spare, I think I would do some shopping around to find a reasonable second-user semi-professional instrument.

The few switch ranges provided by the CO-1305 and the lack of flyback suppression must be taken into account. I think these factors would quickly frustrate most experienced home constructors, myself included.

Thanks to Saje Electronics Ltd. for their helpful and cheerful assistance when technically quizzed on the 'phone. They have a growing list of comparatively priced lines of test equipment. They're so helpful, I suggest you ring them for details of their full range of test equipment.

My thanks go to Saje Electronics Ltd. at 117 Lovell Road, Cambridge CB4 2QW, Tel. (0223) 425440, FAX (0223) 424711, for the loan of the CO-1305 which they can supply for £185 plus £5 carriage.

PW

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**Manufacturer's Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>CO-1305 Details</th>
</tr>
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<tr>
<td>Vertical deflection sensitivity</td>
<td>Approx. 10mV/div</td>
</tr>
<tr>
<td>Frequency response d.c.</td>
<td>To 5MHz or more (-3dB)</td>
</tr>
<tr>
<td>Frequency response a.c.</td>
<td>2Hz to 5MHz or more (-3dB)</td>
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<tr>
<td>Input resistance</td>
<td>1MΩ ±2%</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>50pF or less</td>
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<tr>
<td>Attenuator</td>
<td>1,1/10, 1/100 and ground. (Step by step error 5% or less)</td>
</tr>
<tr>
<td>Gain control</td>
<td>Step-less control over 22dB range</td>
</tr>
<tr>
<td>Max. input</td>
<td>600V peak-to-peak</td>
</tr>
<tr>
<td>Horizontal deflection sensitivity</td>
<td>300mV/div or more</td>
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<tr>
<td>Freq. Response</td>
<td>d.c. to 250kHz (with ext. gain at max)</td>
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<tr>
<td>Input resistance</td>
<td>d.c. to approx. 30kHz (with ext. gain set at halfway point)</td>
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<tr>
<td>Input capacitance</td>
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<tr>
<td>Max. input voltage</td>
<td>Step-less attenuation to 0 (ext. GAIN)</td>
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<tr>
<td></td>
<td>100V peak-to-peak</td>
</tr>
</tbody>
</table>

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[Fig. 1: The neat and uncluttered interior of the CO-1305 oscilloscope.]
Setting Up

As we have a workshop theme to this month's magazine, who else could we ask to write a special article than PW's old friend the Rev. George Dobbs G3RJV? George is probably the UK's most well known 'home-brewer' and he's offering some sound advice on setting up your workshop, starting off with a quote as usual!

The Rev. George Dobbs G3RJV busy in his workshop.

"An art can only be learned in the workshop..." Samuel Butler 1835-1902

We radio amateurs are a perverse lot! What can be more odd that wanting to run a radio station from a private house? The situation is usually never ideal. There's never enough time, money or space and the garden is always too small!

Amateur radio is not a pursuit for the faint-hearted. The happiest radio amateurs are those who achieve results, however meagre, in spite of the situation.

Our hobby is a real 'in spite of' pastime. The true amateur revels in adversity. The achievement is enhanced by the challenge.

The implied challenge is equally true in the amateur radio workshop. Few of us have dedicated workshops and we can manage without one.

Most enthusiasts cannot afford a vast array of tools. But only a few simple tools are required.

Few people are trained in workshop techniques. However, we learn as we go on. Not many enthusiasts have an extensive collection of test equipment, but very simple equipment can be used.

The workshop is where the radio amateur learns his art. I have not received any formal training in radio or electronics in my life. Instead, I've learned my craft while working with a soldering iron and a few pieces of test equipment.

But setting up a workshop can be a very modest enterprise. Some of my most enjoyable radio construction was done when I was a student, living in a cell-like room with a bed, one chair, a small wardrobe and a desk.

So if you really want to be in the 'front line' of the hobby, set up a workshop. Don't be wary. You have nothing to fear, but fear itself... and the odd solder lash on the carpet!

Finding The Space

For the radio amateur, the ideal situation is the dedicated workbench in a room set aside for the purpose. Unfortunately, few of us can enjoy that luxury. A small workshop bench about 600mm by 1.2m or so offers plenty of space for all the jobs a radio amateur is likely to undertake.

In fact, the amount of space I've suggested would be a luxury for me. My equipment (and junk!) has encircled my working area. Nowadays I do all my construction and testing in a space of approximately 600mm by 1m.

I feel fortunate to have dedicated space in St. Aidan's vicarage. Small house or flat dwellers rarely have space for a workshop, but any available table space can be commandeered, temporarily (with appropriate protection against sharp tools and hot soldering irons).

Modest Workbench

My modest 'workbench' during my student days was a large old wooden tea tray. I bought this at a jumble sale and stored it under the bed when not in use.

The radio components were stored in manila envelopes 'filed' in shoe boxes. My tools were all housed in a plastics cutlery tray bought at the same jumble sale.

If a domestic table, or portion of a table, is being used as the work surface, it can be a good idea to make a purpose built workshop. A suitable design was described by Vic Flowers G8QM in his 'A Table Top Project Bench' article in the December 1992 PW.

I made my original from piece or hardboard or plywood. Suitable size makes a good base, but this will be counter-productive if the 'table protector' scratches the table! So, add some felt or rubber feet to the underside of the piece of wood.

Edging the base board, to form a tray, is important. Without a retaining edge, small components always fall off and disappear into the carpet!

The ingenious constructor will perhaps add some compartments to keep tools or other small parts in place. A good sturdy soldering iron stand is also essential and it's not a bad idea to fasten it to the base in a corner away from the 'person side' of the surface.

Soldering is generally a safe process, but it can certainly incur the risk of your spouse or the home owner's wrath. I also suggest the use of a piece of plastics carpet protector underneath the working area of a soldering iron.

The simple, and transportable 'workshops' I've mentioned are suited for construction and testing, but are often not suitable for metal fabrication. With my existing set up, I do all the metal working in a corner of my cellar.

It's very common to do the heavy and dirty work in a garage or garden shed. Sawing, drilling, filing and etching printed circuit boards are best done away from the main living quarters of a house. It may be inconvenient - but safeguarding domestic harmony often is!

Words Of Warning

A few words of warning about restricted space workshops and soldering. The soldering process forms an important part of any radio amateur workshop practice, unfortunately modern solder generates fumes which can be an irritant.
The fumes produced during soldering may be produced by the flux in some rosin cored solders, and some enamels on insulated wires. So, it’s best to work in a well ventilated space or add ventilation.

In an enclosed space, anextractor fan can be useful. I have an old axial fan used for cooling equipment, which I bought cheaply at a radio rally. This is tucked away on the corner of my bench and gently draws air across the working area.

Another safety consideration is that of eye protection. Splashes of solder in the eye can be painful as I know from experience!

Certain metal working procedures, especially when using a soft metal like aluminium, can also endanger the eyes. I’ve already got eye protection, because the ravages of old age force me to wear reading spectacles to perform any close-up work.

But, if you’re one of those lucky people who retain the eagle eyes of your youth, I advise to consider buying a pair of safety glasses. These inexpensive plastic lenses are available from many hardware and DIY shops.

Small Components

Another problem for constructors is that many modern projects use small components with diminutive markings. Even those with keen eyesight have difficulties in reading, or even seeing the diminutive components.

Fortunately, a wide range of magnification aids are sold for inspection of small components or circuit boards. Some of these use large lenses often mounted on stands or part of ‘helping hands’ clamps, or in the form of visors worn over the head.

The only common factor with magnification aids seems to be that they get in the way! My answer, even before I had to resort to spectacles as a matter of course, was to buy a pair of the inexpensive ‘off the shelf’ half-lens reading spectacles.

When you’re buying your half-lens spectacles, it’s best to take a few hard-to-read parts or circuit boards into the shop to help choose a suitable magnification. You only have to add a string to the side-arms (to wear them around the neck) so they can be used when required.

Specialist Tools

Thankfully, very few specialist tools are required for the amateur radio workbench. Many may already be a part of the domestic tool collection, and most of the required tools are readily available in DIY chain stores.

I’m also going to add the usual sensible advice about tool buying! I urge you to get the best quality tools that can be afforded. Good quality tools, when well cared for, should outlive the user.

The minimum tool requirements are very modest. To compile a list of the basic tools required, I took a look at my workbench to see which of my tools were on the bench and which were in the tool tray under the bench.

In theory, all my tools should have been packed neatly in the tool tray. But my personal working habits are another matter!

The items I appear to use frequently, are a small pair of pointed pliers and a small pair of wire cutters. I also use a few small screwdrivers, a small adjustable spanner and a pocket knife.

Also in my collection there’s my soldering, and desoldering equipment. This is hardly surprising, for most of the work on the amateur radio bench involves the cutting, manipulating and soldering of wire.

Just under my bench I keep several small reels of various colours of pvc covered wire. Personally I always use plastic coated, flexible wire.

In the past, I’ve found that the single strand variety of wire has broken too often on my projects. The wire I use is pvC covered (7/0.2) ‘hook-up’ wire as sold by most of the electronics mail order houses.

I keep a small reel of each, in red and black, of (16/0.2) hook-up wire for power connections. There’s also a reel of 22s.w.g. tinned copper wire and a motley collection of screened cable, coaxial cable and mains cable.

Amongst my component and parts storage there are several reels of the more common gauges of enamelled copper wire. I use them for winding inductors.

Pliers And Cutters

When working with wire, most of my work is done with only the pointed pliers and wire cutters (side cutters). And, I must say that a really good pair of pointed pliers is a joy to find.

The pliers I use are sometimes called ‘snipe-nosed pliers’ or even ‘radio pliers’. They only need to be some 110 to 140mm long. But, please inspect them carefully before parting with any money.

The plier’s action should be smooth, ideally with a lap joint, and the jaws should meet correctly at the tip. Remember these tools are for bending and holding the wire and not for tightening up nuts!

Several types of tool are available for wire cutting. My favourites are miniature side cutters. Again look for a tool with a smooth closing action and teeth that align accurately.

There are specialised tools which are designed for wire stripping. I’ve several examples, but in practice I rarely use them.

When stripping wire, my favoured option is the ‘nick and pull’ method of removing the insulation from the end of wires using side cutters. My method requires a little care and practice, but it’s more convenient than most of the sophisticated wire stripping tools.

Impressive Screwdrivers

Most radio amateurs seem to have an impressive array of screwdrivers, and they really do seem to build up as the years progress. Although, in practice only a few are needed.

The starting point for the tool box would be medium and small flat bladed screwdrivers and medium and small cross headed screwdrivers. Look for screwdrivers with sharp blades, and only buy good quality cross-headed screwdrivers. Bad cross-headed types can chew away at the smallest of screws or bolts.

I also keep one or two trimming tools for inductor cores, and I prefer the sort with the plastics handle and thin phosphor bronze blades. Normal screwdrivers often crack inductor cores, so trimmer tools are not a luxury. I buy them in pairs because they are very easy to mislay!

The workshop will also require the use of spanners. These days you’re likely to run into metric and BA sizes in radio equipment and occasionally nuts from the Far East, which appear to be neither.

In my tool collection I have a selection of BA and metric, box and open-ended spanners. But my most commonly used tools for nuts is a 150mm miniature adjustable spanner.

The adjustable spanner has jaws which can open to
The New Classic

AR3030 General Coverage Receiver

*Collins mechanical filter inside

The AR3030 receiver combines a classical appearance on the outside using robust extruded aluminium and metal cases with a high-tech DDS (Direct Digital Synthesizer) design inside. The result is THE NEW CLASSIC from AOR. The AR3030 has been designed by AOR’s R&D team who fully appreciate the demands of today’s serious short wave listener. The aim has been to provide the highest possible receive performance and facilities using the latest technology while retaining a traditional appearance and user friendly operating features. The AR3030 boasts a wide frequency coverage from 30kHz to 30MHz and all mode reception ‘as standard’: AM, SAM (synchronous), NFM, USB, LSB, CW & FAX. The legendary high performance 6kHz *Collins mechanical filter is fitted as standard in order to provide the ultimate in AM selectivity. There are two other filters fitted as standard, these being 2.4kHz for SSB/FAX/CW and narrow AM/SAM and 15kHz for NFM. Additional filter options include a *Collins mechanical 500Hz filter for narrow CW operation and a *Collins mechanical 2.4kHz filter for even better selectivity on SSB. True carrier re-insertion techniques have been employed for SSB/CW plus a separate BFO for greater flexibility on CW. A large tactile keypad, back-lit green LCD with colour-coordinated analogue 5-meter and smooth 5Hz minimum step rotary tuning control make the receiver a pleasure to operate. For the established listener, the ‘band’ button makes changing frequency simple - to call the 49m broadcast band just type 49 and hit the band button. Of course there are too many facilities to list here in full but include: 100 memories carrying all data, RS232 (fitted as standard), tape / remote output, large 66mm internal speaker with front mounted grill, I.F. output, HI-LOW impedance aerial inputs, operation from external 12V DC for greatest versatility. An optional internal VHF converter is also planned.
about 19mm. It can cope with most sizes and is ideal for potentiometer and other control panel fixing nuts. I also have a small adjustable spanner, but these are not so easy to obtain.

Another item which always lives on my bench is a small pocket knife. I use this to scrape wires and terminals, cut around wire sleeving and clean out my pipe! (I hope he runs the ventilation when he's smoking it! Editor)

**Your Soldering Iron**

A parting greeting that I once used to exchange with an old radio amateur friend was "Keep your soldering iron warm!" Soldering is the most common operation in the amateur workshop.

For any kind of success in amateur radio construction or servicing the ability to make a good solder joint is essential. Unfortunately, space does not allow me to go fully into the techniques of soldering.

If you are doubtful about your ability when soldering, then read one of the many texts of instruction on making a good solder connection, and practice. Remember that even very modest electronic construction projects may require more than a hundred solder connections, and one bad joint can ruin the whole thing!

Soldering like most other practical pursuits, requires good equipment for successful results. Buy a decent soldering iron and this means one with a known (branded) name.

The most popular amateur radio soldering irons appear to be made by Antex. The range includes their C240 (15W), CS240 (17W) or XS240 (25W) irons. All the Annex irons are suitable for general workshop use. The CS range is designed with almost zero leakage for soldering static sensitive devices.

My firm favourites are the Weller range of TCP Soldering Irons. These are 45W, 24V temperature controlled irons which require a PS Power Unit. The temperature is controlled by the type of tip used. I normally use the Weller PA-AA7 tip for all general electronic work. They are expensive systems, but the owner can expect years of use with the power unit and the iron.

The Weller soldering iron tips, which are made from pure copper coated with iron, also have a long life. They're especially useful for people like me who leave soldering irons switched on for long periods. I think they're the 'Rolls Royce' of soldering irons!

A good soldering iron also requires a decent soldering iron stand. This is particularly important for workshop safety.

The coil spring stands with a heavy base are the best. If the base is lightweight, fasten it down to the working surface.

To ensure good results, always use a good quality solder. I usually buy a large reel of Multicore Ersin 22s w.g. 60/40 tin/lead solder with a core of resin flux. The large reels are expensive but they last a long time, even in my workshop!

There are other makes of suitable solder but avoid cheap products. Some have a high acid content and help neither the iron tips or the long term life of the solder joints.

Desoldering connections to remove parts from a circuit board is a common workshop process. This is usually done by melting the solder on the joint with a soldering iron and removing the melted solder with a spring loaded solder sucker.

Again, it's worth spending a little more on a reliable solder sucker. This is because it can often be difficult to get replacement tips for the unknown makes.

I also have a rubber bulb type solder sucker for the more delicate desoldering operations. Other constructors like to use absorbent solder wick material. These are in the form of a copper braid strip that acts like blotting paper, but I rarely seem to succeed with this material.

**Chassis Bashing**

In the 'old days', we used to call metal working 'chassis bashing' and my version of it still is! Because I am not a skilled or elegant sheet metal worker, like many other I tend to use ready built cases and boxes and only add holes and cut-outs appropriate to my needs.

I will not deal with materials and tools for making cases, anyone who feels capable of doing this probably has all the equipment now. However, anyone interested in making their own equipment housing will find the two-part article 'Boxing It Up' by Stephen Harding G4JGS (December 1992, January 1993 PW) very helpful.

For the type of metal working that most radio amateurs carry out, only a few basic tools are required. These may be the sort of tools that most car owners would have on their garage workbench.

A large amount of my metal working is carried out on a Black and Decker Workmate, and the 400 and 600 models are both suitable. The Workmate is a combined clamp and bench which also works very well for holding and bending thin aluminium sheets.

When you're drilling metal, it's much easier with a pillar drill or bench press drill, but I've only had one for a relatively short time. Before that I used a normal domestic electric hand drill.

Working with a soft metal like aluminium (the common material for amateur radio boxes and cases) it's important to punch the hole first with a centre punch to locate the drill bit correctly.

Two more important tools I use a lot when metal working are a reamer and a 'nibbler'. Soft metals rarely seem to drill into a nice circular hole. I always drill an undersized hole and then ream it up to full size.

For odd shaped cut-outs or large holes a nibbler is useful. These are tools which fit into a drilled hole and, by squeezing a handle, bite off nibble out pieces of metal.

With a little patience, a steady hand and a tidy up with a file, quite complex cut-out shapes can be made in sheet metal. If large circular holes are needed, these can be cut with a chassis punch set.

Chassis punch sets are relatively expensive. But if you're making round holes in sheet metal, chassis punches are an easy way to make a neat job.

The other metal working tools I use are very common.
items. A standard hack saw, with a good supply of spare blades, is used for cutting metal, printed circuit board material and shortening shafts on controls. I also use a ‘Junior’ hack saw.

A collection of files is also useful but I suspect I could get away with only two. These include a medium cut flat and medium cut round. I also have a wallet of inexpensive needle files.

The rest of my tool collection includes spanners, sockets, Allen keys, hammers, etc. These are all part of the domestic tool kit.

**Test Equipment**

We all like to impress our friends and neighbours with the technical nature of the hobby! But an amateur radio workshop can achieve quite a lot with a minimum of test equipment.

I must admit that my array of test equipment may seem expensive. But very few of the items were bought as new.

Fortunately, amateur radio rallies are wonderful sources of bargain test equipment. Forget about looking around the shelves for bargains in transceivers and station equipment. Start looking for items of useful equipment can be bought instead!

Don’t worry too much when looking for test equipment, if you’re not sure what to buy, or which items represent good value. Take someone with you who does know about test equipment, that’s what friends are for!

In the past, I’ve seen some real bargains in test equipment hanging around on the shelves of rally Bring & Buy stalls until the end. Meanwhile, other people have been fighting to buy over-priced second-hand 144 and 430MHz hand-held transceivers in the first half hour!

The definitive item of test equipment is the multimeter (a volts/ohms/milliamperes instrument). The basic test bench multimeter should be an analogue instrument, that is one with a needle pointer scale (not a digital display instrument).

I recommend the analogue type of multimeter because in our sort of work we rarely need to take finite and accurate measurements. We usually want to know if the voltage, current or resistance is about right.

We often want to measure changes, dips and rises. And an analogue meter is the way to do this. But be aware that the internal resistance of cheaper multimeters can interfere with the accuracy of the readings.

Choose a meter with a reasonably high ‘Ohms Per Volt’ rating. This should be 20kΩ or better and there are many such instruments for sale at reasonable prices.

A digital multimeter looks more exciting, but this should only be bought after an analogue instrument has been obtained. It’s also a good idea to look for extra features in a digital meter.

Many digital display multimeters have built in transistor testers. Some have inductance and capacitance ranges, making them good general purpose instruments.

**Essential Item**

An essential item of test equipment on my bench is a diode probe to use with the multimeter. This is so simple that mine are all home-made from a couple of diodes and a couple of capacitors.

My earlier series in PW, ‘Getting Started the Practical Way’ (page 32, 33 August 1991 and pages 60, 61 of November 1991) PW describe a further development of the idea, describes how to build a simple peak reading diode probe. It’s a useful device, and I use mine for checking r.f. levels around circuit boards.

A similar circuit attached to a load resistor and a calibrated meter makes a useful r.f. wattmeter. A multimeter and diode probe can do most of the jobs for the average amateur radio constructor.

One not-to-be-forget item of test equipment probably already exists in your amateur radio station. It’s actually in a receiver, especially a general coverage receiver.

Your receiver can be used for locating and checking oscillators, transmitters and other signals. I have even tapped off the signal from a receiver’s local oscillator to use as a signal source. If you try this do not forget to add or subtract the receivers i.f. frequency.

However, a more commonly used signal source would be a signal generator. These are often available as cheap rally buys.

Some constructors buy a dip meter first. They use them not only for their intended job of checking the frequency of tuned circuits, but also as a signal source. I described a home-built dip meter in the ‘Getting Started the Practical Way’ series (pages 33 to 37, April 1992 PW).

**Frequency Counter**

Perhaps the next expensive item I would buy would be a digital frequency counter. This can also double up to read the frequency of a simple home-made dip meter, in which case it need not have a calibrated scale.

An oscilloscope always looks good on the test bench. Despite this, a lot of the ‘scopes I see around in amateur radio shacks are audio oscilloscopes which have very limited value in our type of work.

A ‘scope should be capable of ‘seeing’ several tens of MHz for amateur radio work. This sort of range is useful if you can afford one or find a good bargain.

The list of test equipment can go on, and depends upon your need and pocket. Very useful work can be done with the absolute minimum. Begin with the essentials, learn how to use the simple instruments well and then progress as skill and finances allow.

**Components And Parts**

Any good amateur radio workshop ought to keep a stock of basic components and parts. These would include all the common values of resistors and capacitors.

The starter packs sold by a number of mail order houses are ideal for this purpose. The component packs sold by Marco Trading are a useful source for anyone starting a workshop stock.

I also keep a stock of the more common transistors and integrated circuits plus some hardware. What your basic stock should be, is quickly learned by experience.

Whenever I see component bargains I buy them and add them to my stock. This is because when I do need them, they’re bound to be expensive!

**Storage Problem**

Storage can be a problem for anyone with limited space. Although I have some of the small plastics storage drawers, most of my storage is in crude (but cheap) containers.

My resistors and capacitors are sorted according to values and size. The component packs sold by a number of mail order houses are ideal for this purpose. The component packs are then stacked on shelves or in boxes.

The values are written on each envelope. The larger items are stored in square 1 litre ice cream tubs or marigold tubes.

But it’s best to choose square containers, if possible of the same sort or size, as these stack better to save space. I can do most of my construction or servicing out of two shoes boxes and about half a dozen ice-cream tubs of parts.

The tubs in turn fit into a larger plastics box of the stackable tidy box type. Although I don’t have to (I ought to) put them away each time, it would be simple to pack them out of the way if I was working on a kitchen or domestic table.

In summing up, my message is: don’t be daunted. I would be very surprised if anyone reading this could not set up some kind of amateur radio workshop capable of producing reasonable results. Begin planning now - it’s really the only way to learn the art!
Construction

The £5 Desk Microphone

A desk or mobile microphone for under a fiver may seem impossible, but Ken Fisher G0LKX shows you how.

Making a desk, or mobile, microphone for less than £5 can be done, even buying all the bits. Many of you will already have some, or even all, of the bits in the junk box.

So let's begin. Cut the plastics shroud of a DIN plug as shown at Fig. 1. Dip one end of the 6mm plastics sleeving in hot water for a few minutes to soften it.

The sleeving can be pushed over the cable entry of the plug body. You can use about 250mm of sleeving for the desk microphone version, or about 350-400mm for the mobile version.

Stiff copper wire, put onto the sleeving along with the microphone coaxial cable, supplies the necessary stiffness. I used some single strand copper wire, stripped from flat wiring cable, for this purpose. I found that four or five strands held the boom nicely in shape.

For the base microphone version, I used a tobacco tin for the base. Taking the wires through a hole drilled in the lid, I spread the copper wires out, and soldered them in place. If you use a plastics box for the base, then an epoxy glue works just as well.

When soldering the microphone insert to the cable, check that polarity is correct and don't hang about with the iron, they don't like being cooked.

Make up the board as in Fig. 2, and assemble in the box of your choice. Try to avoid buying boxes if possible as they push up the cost of simple projects such as this and tobacco tins are free.

Mobile Version

For the mobile version, use enough coaxial cable to run neatly from the mounted microphone to the gear stick. Then fix the control box in position on the gear lever with two small clips. I clamped the copper wires under one of the sun visor fixing screws and led the boom over the visor then down to a comfortable position.

As these microphone inserts are quite sensitive, there's need to "eat the microphone", so the positioning of the microphone is not that important. All that remains to do is to ascertain the connections to your set, put on a plug and that's it.

So there's no excuse for using a fist microphone now!

PW

Shopping List

Resistor 5% 0.4W
1kΩ 1 R1
Capacitor electrolytic 10V working
4.7μF 1 C1

Miscellaneous

Electret microphone insert (Maplin FS43W), an AA battery holder
a length of 6mm plastics sleeving, audio coaxial cable, one d.p.d.t.
switch, the body moulding from a DIN plug, a small piece of perfboard or Veroboard, and a plug to suit your transceiver.

Fig. 1: This is the layout of the basic microphone stem used in different locations.

Fig. 2: The basic microphone used as a base station microphone.

Fig. 3: Here it is used as a visor-mounted microphone. The control box is shown in Fig. 4.

Fig. 4: One suitable mounting position for the control box is on the gear lever stem.

Fig. 5: The circuit diagram and one possible layout for the control box.

Practical Wireless, December 1993
Finding a way of holding NiCad cells for charging didn't worry Edgar Powell GW1TDW. He just got to work with his handsaw and made a battery box.

Like many people I've purchased some individual NiCad cells, mainly for toys and hand torches, to reduce the overall cost of battery powering items. Having constructed a constant current charger for the 'C' and 'D' type NiCad cells, I reached the stage of wondering how and what to house the cells to charge them.

I wonder how many constructors have come up against the battery housing problem. I suppose most people just connect the cells individually with crocodile clips and bits of wire, or go to the added expense of buying a combined charging unit and cell holder. These methods are a lot more expensive than making a battery holder. There are also many plastics cell holders available, but they are normally suitable for no more than four cells.

With minimum expense in mind, I came up with the idea presented here. I don't think you need to be a carpenter to knock these up. Just some straight (?) gentle work with a saw (almost any fine cut saw will do the job). The only other items you will need, are a keen eye, steady hand (personal attributes), a few panel pins, a small hammer, a rule and a pencil and pieces of sheet metal to make the spring contacts.

Whichever cell unit you have decided to build, the method of construction is to start by cutting the two side members first. Make them somewhat longer than the dimensions given in the drawings to allow for discrepancies in spacer thickness (and the end pieces).

Cut one end piece (spacer), pin and glue this to both side pieces on one end, now cut the required number of spacers and start to space and pin each one from each other as to the dimensions on the drawings, or to suit your NiCad cell diameters and lengths.

Cut the hardboard base to size, and drill the ejector holes then pin this to the bottom of the unit. Finish off the woodwork by cutting off the protruding surplus wood from the end pieces and sand paper if necessary.

From the metal sheet, make and pin the tin contacts to the appropriate positions. The metal should ideally be of a springy nature, to make better contact with the bases of the batteries.

The bolts, or screws, making up the positive contacts, may be of almost any size or type. They need only be long enough to pass through the wooden sides and leave sufficient length to take a nut and solder washer.

Finally, fit on to one end of the end spacers an electrical connecting block and wire it up as to the drawing, run a pair of red and black flexible wires from this to the charger. Place the appropriate cells, all of the same capacity, into the unit (the correct polarity around), and you are now ready to begin charging.

(The wood for the units can be obtained from DIY shops, etc., and is normally called door-stop about two metre lengths).

PW

NiCad Battery Box

Hold Those Batteries In Place When Charging

Further Reading

'NiCad Recycler' May/June 1990 PW.
Peter Lovelock shows you how to build a NiCad cell recharger that can regenerate your rechargeable batteries, by repetitively deep discharging them before a complete recharge.

'Regulated Discharge, the key to improved health' February 1991 PW.
Niel Starkie describes an add-on constant current discharge unit for the PW NiCad Recycler unit.

'Low Cost NiCad Tester' February 1991 PW.
Alistair Downes gives you a circuit for a NiCad cell capacity tester. Now you can find out just how much power is available from NiCads.

Fig. 1: A little work with simple hand tools is all that is needed to produce the NiCad cell holder.
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29
New Transformers From Old

Paul Essery
GW3KFE discusses some ideas and suggestions on how you can rewind transformers for your own purposes.

My aim in this article is to discuss, in as simple terms as possible, the rewinding of transformers. They can be from the junk-box or ones that have 'cooked', in order to make something different. But, please note that I'm not covering the design of the switched-mode type of power supply.

 Obviously, I will be to some extent improvising. But this does not imply that I'll be suggesting you make a transformer to such close limits of size that a slight change in input frequency will be enough to wreck it.

What I mean to do is to create a situation where you can pick up a transformer and visualise whether it can be turned into what you want or not. Assuming you have access to a supply of the chosen wire to rewind it.

For a start, it's necessary to realise that for a given external circuit, a fair estimate of what the transformer can do is given by its weight. Also it's possible to imagine four different basic possibilities for the load.

Toughest Load

The toughest case for a transformer is where the load must be assumed to be continuous. Secondly, it's possible to imagine the transformer in the p.s.u. of a c.w. transmitter, where it can, as it were, rest during key-up and listening times.

Obviously, in the case of the c.w. transmitter, the transformer can be persuaded to give more power during key-down periods. This can be more than would be acceptable for a continuous service rated unit.

Thirdly, it's possible to imagine the transformer in use for a s.s.b. transmitter, where again the transformer is rested. In this case, there's a little more power out of the transformer.

And finally, there's the third case again. But in this application the transformer is pushed to the absolute limit for safety.

Other modes of interest will tend to fall between the areas I've mentioned. Below a weight of about 5 or 6lb (2.7kg approx), this concept fails, because other problems, such as the d.c. resistance of the wire used, begin to enter the argument.

Transformer Power

A transformer weighing around 5lb should manage about 100W of power output. For a rough example, that would be 12V at 8A continuous.

At the top end it's possible to go to an extreme. You can envisage a transformer weighing 45lb (20.4kg) providing 1kW of output working in continuous service.

For c.w. service it's possible to 'ask' a 30lb (13.6kg) transformer to provide 1.5kW. In the case of an s.s.b. transmitter you could aim for 1.9kW from the 30lb unit.

By pushing the s.s.b. 'luck' to the limit it might even be possible to get 2kW from 25lb (9kg) transformer. However, below a 5lb weight, the continuous ratings must be adhered to. This situation is summed up graphically in Fig 1.

When assessing the weight, I'm talking about the transformer proper. If the transformer is in a metal case and has mounting fixtures, deduct an allowance for the weight.

Consideration To Design

Now it's time to give some consideration to the design of the 'new' transformer. There are two possible approaches.

The first approach involves noting how many turns there are on a winding of given voltage. From this, you can derive a figure for the number of turns per volt.

If the transformer has a heater winding, clearly this is the way to go. For example, eight turns per volt and a 5V winding mean forty turns, so you aren't too likely to lose count as you unwind.

Anyway, if you do lose count of the turns don't despair. You can measure the end to end length of the wire taken off. Then measure the length of one turn with a bit of string, and get back to the figure even if you are a bit absent-minded!

The alternative way is to tackle a full-blown design, but making some assumptions since you don't have all the information needed. But, more of this approach later.

Simple Matter

It used to be a simple matter of getting a set of standard wire gauge tables. Unfortunately, they changed the design units from CGS to MKS to metric, and then metricate the wire sizes.

You may only have a set of standard wire gauge tables (s.w.g.) tables from some aged reference book...so what are you to do? Firstly, keep your cool and look in a set of metric and s.w.g. drill size charts for some comparisons of dimensional size. You can even go to the trouble of turning s.w.g. sizes into metric dimensions.

At the same time, check what wire sizes you can lay hands upon in enamelled copper winding wire. For your purposes it doesn't matter if your transformer's windings are a combination of mixed metric and s.w.g. wire, particularly if by this means the wire has come cheaper!

If planning your design around what you've got means you spend an extra evening on the design, but doing so saves you buying any wire at all, you can be even happier! This is the key to the approach.

The Efficiency

Let's now consider the efficiency of the transformer. For example a 100W output transformer will probably be 90% efficient, a 50W only 75%. But once above 500W the efficiency may be expected to rise to 95%.

Now, you can turn your thoughts to the ways and means. The normally accepted figure of current, of 1000
‘circular’ millimetres per ampere for continuous service can be taken as high as 1500 circular millimetres for intermittent service. (Yes, I know they’re really ‘square’ millimetres, but in this context it’s best to think of them as circular.)

The wire tables suggest how many turns you can get into unit winding space. However, on the other hand, professional designers have the advantage of coil-winding lathes to pack the maximum number of turns into the available space. Additionally, there’s also the need to have a thin layer of paper insulation between each layer.

If you assume the need for 50% more winding area, that will cater fairly well for an acceptable degree of hand-winding clumsiness plus the interleaving. But do not go for thicker interleaving, because the thicker paper merely keeps heat in better!

Do not think about using masking tape for interleaving, either, as it seems to harden under heat. Watch out too for Sellotape. This is because the normal household grade, when used in transformers seems to deteriorate with time and to attack wire enamel.

**Stripped Transformer**

Assuming you have already stripped your transformer, and established the turns per volt, you can lay the wire aside. Coil it up carefully on a drum to avoid chipping the enamel.

Next, lay the E and I shaped laminations carefully to one side. Notice as you do so, that one side of each lamination is coated and one is not. This is to insulate each lamination from its neighbour, to reduce eddy currents and the resulting losses.

Investigate the former on which the wire was wound. Is it fit for re-use?

Repairing the former is practical if you remember what it does. It holds the wire in place, so if the sides of the former bulge while winding, you’ll not be able to get the transformer back together. It’s also long odds that somewhere the end turn in a layer has slipped sideways and dropped one or more layers down.

A turn that has moved or dropped means either the wire vibrating and breaking. It could also short to another turn when the vibration rubs the insulation away.

A shorted turn means a rapid build-up of heat due to the current circulating in the shorted turn, even if the transformer is off load. The moral is: have a decent bobbin whether by repair, manufacture or purchase!

Actually, before now I’ve used new cheek pieces of s.r.b.f. or s.r.b.p. These were stuck into place with Araldite epoxy resin adhesive to make completely new cheeks or thinning them down?

When professional transformer rewinding companies do the job, they may elect to have no sides at all to the bobbin. If so, they would measure the winding area defined by the space available when the laminations are correctly assembled.

Of course, the mandrel used for the winding would be provided with sides so it would not slip during the actual winding process. If the bobbin your winding has sides, the winding area will be enclosed by the bobbin. Either way, you must measure and record.

**Turns Per Volt**

Now it’s maths time. Given the turns per volt it’s possible to define the number of turns for each secondary winding.

If the current drawn by the winding is known, it’s possible to define, using the wire tables, the desired wire gauge to carry that current, using the figure of 1000 ‘circular’ millimetres per ampere or 1500 circular millimetres/ampere as appropriate.

Warning! Do not use the current figures used by electricians. This is because they are based on some assumptions about cooling which don’t apply in the applications I’m covering.

Don’t forget also, that if there are long wiring runs and/or heavy current, you may need a suitably higher voltage at the transformer terminals. Now your calculator comes into play.

If you know how many turns of wire of a certain size you require, you know how much area your winding takes. Repeat this process for each other secondary, and then for the primary. Don’t forget to allow some extra turns for tapping, say 220, 230, 240 and 250V.

When you’ve finished, add up the various areas so found. Make the allowance for hand winding and paper interleaving mentioned above, and you have the winding area you require. Then compare it with the winding area you have already measured.

As always, Sod’s Law can now step in. If you are lucky, the winding will fit. If on the other hand the calculator says you can’t quite get your windings into the space you have available, there are numerous possible ways of tackling the problem.

1: Have you made too much allowance for hand winding and paper interleaving - paper - after all you might be a dab hand at it!

2: Can you compromise a bit on wire gauges? Maybe a particular winding is only drawn upon intermittently?

3: Could you win a bit of extra space by scraping the side checks or thinning them down?

4: Finally, the worst case, it won’t fit, and you need a bigger winding area.

Think carefully on everything I’ve mentioned. There are all sorts of possibilities. For example, if you have one continuously loaded winding could you move that to a separate transformer? Perhaps you could then reduce wire sizes for the other windings which are intermittently used?

Normally it’s possible to assume the primary is running continuously. But what happens if the transformer secondaries all tend to draw at different moments of time, perhaps the primary wire gauge could be reduced?

Nine times out of ten or even more, there are ways and means of solving the problem. So sit down and have another think!

**Transformer Design Formula**

Back in the days of CGS units, the transformer design for a continuous rating started from a formula:

\[
E = (4 \times F \times f \times T \times Z)/1000000,\]

This is where \(F\) is the form factor (1.11 for sine-wave), \(f\) is the frequency in Hz, \(T\) is the number of turns in the winding being considered, and \(Z\) is the total magnetic flux.


“It’s when you start to aim at minimum size transformers that skill in juggling is needed”

through the core.
All you modern technicians won’t have too much difficulty in relating this to current ISO units. (good mental exercise!). Incidentally, Z is used instead of the Greek letter because it doesn’t appear on my wordprocessor!

Still considering continuously rated transformers, as I go into things a bit more, it’s possible to simplify matters. This is because the cross-sectional area of the core (where it goes through the centre of the bobbin) in square inches, times the turns-per-volt equals right. This figure applies to every winding on the transformer.

You can also observe how the cross-sectional area of the core required varies as the watts input to the transformer, as in Fig. 2. This figure shows some scattering of data, which arises because I tried some existing transformers, to generate the data for the graph.

Summing Up

Now I can begin summing up. Let’s start by picking up an old transformer, and guess from its weight how many watts it’s possible to pull out of it by reference to Fig. 1.

From further inspection/measurement of the sample transformer and comparison with Fig. 2, you’ll be able to see the cross-sectional area. This should give a broadly similar answer to your guess of the weight if you compare the continuous service figure in both cases.

Further still, by noting whether you can get the cross-section area of the turns turns required on every winding, by allowing 50% for hand-winding and interleaving as already mentioned...

If the transformer weighs more than 5lb, you can then turn back to Fig. 1. You’ll then see whether or not you can pull more out of it in c.w. or s.s.b. service.

Another problem can occur with a case where the laminations to hand are from a transformer that is too big. This is where you end up with a lot of unused space in the window after all windings are complete. So, what do you do?

Provided you did the maths correctly, for the core cross-section as you measured it, and used the wire sizes appropriate to the task in hand, there’s no problem. Except that you have made a transformer which wastes space.

However, it’s when you start to aim at minimum size transformers that skill in juggling is needed! So, let’s take a practical case.

Firstly, let’s consider a transformer providing 12V r.m.s. out at 10A. At 90% efficiency, the transformer will have about 135W in and 120W out.

Let’s now assume there’s an existing transformer you can strip down. The cross-sectional area of core is about 2.5 square inches. Using Fig. 2, you’ll find you need 3.5 turns per volt.

So, you need 240 x 3.5 = 840 turns on the primary winding, and 12 x 3.5 = 42 turns on the secondary. Now it’s time to consider the wire gauge for the primary.

With the transformer under consideration, at 135W into the 240V winding, you’ll have an r.m.s. current of, say 60A flowing in the primary. Turning now to your s.w.g. wire tables you may have some 22s.w.g, enamelled copper wire for the primary to hand.

Using the other tables you’ll find that a metric wire close enough would be 0.75mm diameter. For the secondary, a wire that can carry 10A is required.

You’ll need a wire of 12s.w.g, the equivalent metric size is around 2.7 mm. Therefore, you’ll need a primary of 840 turns of 22s.w.g, and a secondary of 42 turns of 2.7mm copper wire, enamelled in each case.

The wire table tells you that it’s possible to get 1089 turns into a square inch. So your 840 turns will take up 0.771 square inch, and allowing for the 50% for handwinding and interleaving, that’s about 1.2 square inches for the primary.

Taking the 12s.w.g. figures from the table, this tells you it’s 56 turns per square inch. So you need, allowing the 50% factor again, about 1.3 square inches.

Looking at the bobbin and laminations, you’ll find there’s a ‘window’ space of 3 square inches, into which the windings will slip quite comfortably. You now have a viable design for continuous service!

Now consider the same transformer, but in a different service. This time it’s going to be used to supply power through a bridge rectifier to feed a transistor a.p.a. stage for c.w. operation, refer to Fig. 1.

With the operation I’m suggesting, it should be possible to get away with as much as 150W output, key-down. But since the transformer is actually operating down near the bottom left-hand corner of the graph, you’ll have to be careful!

Practical Construction

Now it’s time to look at practical construction. And firstly, you’ll have to strip the transformer.

I’m going to be honest from the start. I don’t bother with trying to totally strip one which has been ‘potted’ (encapsulated in a resin or other suitable compound).

When you’ve got a transformer that’s fairly obviously heavily impregnated with varnish, you may well be able to recover the laminations. In this case there’s also a chance that the ‘impregnation’ is all on the surface, so at least try to remove the windings.

The advice I recommend removing the windings is basic. In order to persuade the impregnant to enter the windings fully, the manufacturer needs to ‘pull a vacuum’ on the transformer.

The ‘pulling’ is done by putting the transformer in the impregnant bucket, then putting the bucket and its contents into an autoclave. As the air bubbles come out, so the impregnant goes in.

However, pulling process is often reduced to a mere dip by ‘the shop’, who seem to think that the impregnant itself drives the air out. So do have a try.

If the transformer is of the more or less standard undosed variety, take it apart. Take note and record with a sketch, how the laminations fit together and strip off the windings, checking the number of turns per volt.

If you’re dealing with a burned-up transformer, observe as the windings come off, where the burned-up winding is, and hence the state of the other windings. If the shortest turn is near the surface, you might find the primary is undamaged. Your nose and eyes will indicate clearly between them.

Word Of Caution

A word of caution about transformers which were interleaved with material that looks like drawing-office masking tape. With time and heat, this sets hard. The result is that instead of a winding, you have a lump having the strength and consistency of reinforced concrete.

Almost invariably, an attempt at breaking-in to a transformer with the masking tape ‘look alike’ is started with a craft knife. The next thing you know is that the blade has broken and flown across the room - so do be careful.

When working on a transformer insulated with the tape, I suggest you remove the laminations and set them aside. Then be prepared to write off the bobbin if you can’t get the windings off.

Once you have the transformer apart, inspect the bits. Check the laminations and lay them out so that as you reassemble them, each bit will be the same way up. This maintains the orientation of the windings.

Insulation, by whatever means, is only on one side of each lamination. Check again that you have a note of how the laminations fit together and interleave.

Check the state of the bobbin, repair as necessary. If you must, make a new one from materials at hand. Bits of scrap p.c.b. (less the copper, obviously) can be pressed into service along with an epoxy resin adhesive, such as Araldite.

I’ve even made a bobbin from sheets of writing-paper. It was formed round a greased wooden mandrel of
appropriate size and each ‘buttered’ on one side with Araldite. It was then wound tightly round the mandrel, adhesive-side out.

Arrange things so your starts and finishes are staggered. Then remove all surplus adhesive while it’s still plastic, and then you can then put the papery mandrel to one side to set while you make the sides.

Leave the assembly to set thoroughly (several days). Then bring the side pieces and the ‘centre’ together. Then fix with Araldite, and again leave to set. If you forgot to grease the mandrel, hard luck!

The Winding

Now to the business of winding. If you have used a lathe, you won’t need me to tell you how to adapt it to coil winding duty.

All you need to add to a lathe is a ‘turns counter’. This is easily done by modifying a cheap calculator. You arrange it so that one revolution of the lathe completes +1 on the calculator.

If you don’t have a lathe, you can use a hand-drill to grip the mandrel on which the bobbin is to rotate. Grip the end of the drill (a ‘Workmate’ bench is ideal) in a bench vice, and allow the wire to feed from the reel.

Since one turn of the handle will be several turns of the mandrel, find out how many, and remember the relationship. You then only have to remember how many turns of the handle you need to have made.

Tension is applied to the wire by your thumb (watch out for splinters) or a simple brake. At the bottom limit, wind purely by hand.

You’ll need an interleaving sheet and a tiny section of masking tape. And, since you know how wide the bobbin is, you can cut the paper to width precisely.

You can pre-cut the length to be one complete turn plus a bit, measured round the outside of the bobbin. Don’t forget to lay out enough pre-cut pieces nice and handy.

When your first layer is complete, put on a turn of interleaving paper. Then trim the surplus length so there’s minimal overlap between start and finish of the sheet, and stick down with the narrowest piece of tape possible.

Wind another layer over the interleaving, then add a sheet of paper as before and so on to the end of the winding. Keep the wire tension as even as possible while winding.

Enough tension on the wire holds the inner layers nice and fast. Too much tension can snap the wire, and not enough lets the wire flap about in service.

When a winding is complete, use two sheets of interleaving, then start the next winding. This process is continued to the end.

Finishing Off

Finishing off is completed with an outer layer of paper. If you can give each winding a coloured sleeve, you can make a note, so you don’t have to mess about identifying them later!

Now it’s time for the laminations. Most transformers of interest to radio amateurs have cores made up of lots of E, or E and I-shaped metal stampings.

Take care and be quite sure how the laminations go together before you start the assembly. With E and I shaped laminations for example, you start with an E and close the E with an I-shaped stamping.

Next, you should lay and E over the I, and close the E’s gap with another I and so on. They should fit snugly, with no air gaps. And, don’t be afraid if towards the end you have to tap the transformer on the bench to make the laminations all snug and tight.

Finally, fit a clamp round the outside of the laminations to pull them up really close. This precaution will prevent that annoying buzzing.

Time To Test

Now it’s time to test your transformer. Before you begin, take note of your test meter’s accuracy at full scale.

Note also that it is less accurate at less than full scale deflection (f.s.d.). So for testing, you should choose a range which will provide as near full-scale as possible.

If you are going to re-use an existing primary winding, you should have checked it with full mains voltage before you think of winding over it, just in case of a shorted turn.

For an all-new transformer apply the correct voltage to the primary. Then measure the voltages at the secondaries. Play safe.

Always switch off the primary volts while changing test leads, etc., around. Now try running the transformer with primary volts but no secondary loads for an hour or more. It should remain cool.

Finally, load up the secondaries to the working conditions and give it an hour on test. At the end of the test the transformer should not be over-hot. (This may be defined as, in normal room temperatures, hot to the touch but not hot enough to burn a bare hand).

If you have built a transformer for c.w. or s.s.b. service, refer back to Fig. 1. You can extract the relevant continuous service ratings when applying the loads for this test, or simulate the working loads some other way.

Essence Of Radio

In my opinion, to turn a junk-box transformer into a purpose-built ‘special’ is the essence of amateur radio.

Furthermore, it is cheaper!

Because you don’t know precisely what you’ve got in the way of iron, the relationships given are pretty conservative. So core saturation shouldn’t occur

Some of the transformers I’ve rehashed have lasted for two decades of satisfactory service or more. Some have been transformed from burnt-out wrecks into useful transformers.

At least two transformers I’ve made are keeping alive test gear which otherwise would have been thrown away.

And the one I couldn’t dismantle has been an excellent test gear which otherwise would have been thrown away.

“To turn a junk-box transformer into a purpose built ‘special’ is the essence of amateur radio. Furthermore - it’s cheaper!”

GW3KFE

Radio Diary

If you’re travelling long distances to rallies, it could be worth ‘phoning the contact number to check all is well, before setting off.

November 13: AMS 7 The All Micro Show

Electronics Fair & Radio Rally will be held at Bridgland Recreation Centre. Doors open at 11am, 10.30am for wheelchair operators. 

Bring & Buy, canteen and large bar/rest room. The swimming pool and the rest of the recreation centre will be available.

Mike Smith on (9656) 722159.

December 5: Leeds & District Amateur Radio Society will be holding its rally at Allerton High School, King Lane, Leeds.

Four large main halls, talk-in on S22, catering facilities. Richard Tillotton on (9825) 525344 or FAX (9825) 385816.

“PW& SWM in attendance.

December 6: Centrew Of England

Christmas Radio, Satellite, Computer

Electronics Rally is being held at the Sports Connexion Centre, Leamington Road, Ryton on Dunsmore, Coventry 045/4423/223. Doors open at 11am, 10.30am for disabled visitors, admission £1. Over 80 traders, Bring & Buy, talk-in on S22. Bar

and hot food all day, ample free parking.

Christmas special ‘Spot The Cracker’ on many of the stands to win a prize.

Frank Martin on (9825) 598172.

1994

January 22: Oldham ARC are holding their annual radio rally at the Queen Elizabeth Hall, Civic Centre, West Street, Oldham, Lancashire. Large trade presence, free parking, doors open at 11am, 10.30am for disabled visitors. Morse test and talk-in on S22. Dave Gray on (9825) 827863.

*PW & SWM in attendance.

Practical Wireless, December 1993
Tex Swann G1TEX, takes time off from his busy schedule as the PW Technical Projects sub-editor to pass on some practical tips and advice on where and how to find all those necessary bits and pieces for your workshop.

The idea behind my article is not to tell you how to set up your workshop. George Dobbs G3RJV has already told you that in his 'Setting Up Your Workshop' article. I'm actually aiming to provide you with an idea of who can supply what in the way of bits and pieces. My ideas and tips are aimed at everyone.

However, if you're taking your first steps into the fascinating world of radio construction I have an excellent piece of advice for you. I think that to make best use of my notes, you should read George's article first!

No article of this type can possibly guarantee to be fully comprehensive. There are just too many suppliers for that to be the case.

Whatever group of constructor you fall into, whether it be beginner, intermediate or advanced, this section should prove to be helpful. I've put all the addresses together at the end and it will be obvious which supplier I'm referring to when I mention names. So, without any more ado, let's make a start.

Space To Spare

How much space you have to spare when you're preparing your work area will tend to decide how many and what type of tools you might need. For example, it's unlikely you'll have space to set up a mains powered pillar drill if you're working with the 'Table Top Bench' described by Vic Flowers G8QM in the January 1993 issue of PW.

If your working area is limited, then most likely the projects you tackle, will be of a lightweight nature. They may be biased more towards kit building rather than 'chassis bashing'.

I don't think that much metal working seems to go on these days. It's much more convenient to solder p.c.b. material into a chassis shape than work on metal chassis.

When it comes to tools, I think they can be broken down into two main types: hand tools and powered types. Powered tools may also be broken down into battery and mains powered types.

The choice is very wide. Hand, mains or battery powered drills, saws, screwdrivers, the list becomes longer every day.

At one time only two names were found on power tools bought in the UK. Now there are many to be found. The most prominent include Black and Decker, Bosch, Wolfcraft and Makita.

The choice of power tools is so wide, it's best made at a specialist tools supplier such as the many DIY superstores. The larger DIY chainstores are difficult to beat for price, so I won't dwell on this point.

Small Powered Drills

There are several small 12 volt powered drills around. One example, is available with a suitable stand is sold by Cirkit Distribution Ltd.

The 'Expo' Mini Drill was reviewed by Rob Mannion G3XFD, the Editor of PW in the Dec 1992 issue. The various bits, attachments and the stand make this drill very versatile in use.

In the way of handtools, all the suppliers mentioned, can supply a great variety, in both price and quality. However, in my mind there's no way out of the truism that 'you don't get owt for nowt'!

In general the more you spend on each item in your tool kit, the better quality it will be. This statement doesn't always hold true, but its a pretty fair bet that the 50p set of side cutters will not remain sharp for long!

It also pays to remember that side cutters can't handle aluminium sheet. So, when working with this material, use a saw, tin snips or a nibbling tool. The once popular nibbling tool is not often seen these days, but they can cut shaped holes easier than by using a file and hacksaw.

I cannot stress enough that it is worth getting catalogues from the various suppliers, and spending some time looking them over before buying any tools. Time spent doing this will, without doubt, save both frustration and expense later.

Remember, before you order, that most of the suppliers have a minimum charge. And, don't forget also to add in the post and packing charges before you make a decision.

Some items may be cheaper from other suppliers. However, overall you may save by purchasing from one firm rather, sending off to the cheapest for each item.

Test Equipment

Having set out your work area and tools, the next area of the workshop to look into, has to be test equipment. This section of the working environment will also depend on the space available for the items.

I've no doubt that most of us would all like to own a workshop full of expensive test equipment, to do every conceivable job we might like to tackle. Unfortunately, most of us have to make do with a rather smaller area that this.
My last military posting was in an electronics inspection laboratory. I must have had almost a £million worth of equipment under my control at that time.

I was like a child let loose in a toy shop for over two years! Nowadays though, my home workshops is not only very much smaller, but also a lot less exotic, not to mention cheaper!

If you are buying second-hand then remember 'Caveat Emptor', let the buyer beware. Try to take someone else with you, ask to see the piece of equipment working. Does it look as though it is was revered? Or was it just thrown in the bottom of a pile of junk?

If you decide to buy new, buy only what you think you need, try and borrow items you won't use very often, to start with at least. Again most if not all the suppliers have various items of test equipment at a variety of prices.

To help choose a suitable supplier when looking for test equipment, it's a good idea to look in the 'Test Equipment' special issues of PW. The most recent was in the September 1993 issue of the magazine.

Build Your Own

Perhaps you intend to build your own items of test equipment. Many radio enthusiasts do make their own equipment, and operate very well with these items.

We have had many test equipment projects in past issues of PW. These included items such as power meters, gate (or grid) dip meters, r.f voltmeters, s.w.r. meters, signal tracers, signal generators, digital counters and pre-scalers.

The number of projects published in PW is too long to list them all. However, a s.a.e. to the editorial offices will get you a complete list of projects. But please make sure your envelope is large enough to take several A4 sheets of paper, and mark it Test Equipment Projects.

Ready To Start

Now that you're ready to start making things, is there anything else to consider? How about electrical safety?

What about electrostatic precautions for handling sensitive modern components? Again, I'm pleased to say we've had previous articles on both these important issues.

Personal electrical safety was covered in the August, September and November 1986 issues of PW. An article covering the safety of static sensitive devices appeared in the January 1991 issue of the magazine.

Finally, after building your superb item of radio or test equipment, what do you put it in? This problem can be solved by looking in the catalogues from the suppliers I've already mentioned. Most, if not all, have an extensive range of boxes and enclosures to proudly grace your workshop.

Something Unusual

But how about something unusual? Yes you've guessed it, we've even had two articles published on how to make boxes!

Unfortunately (the similarity in names could cause confusion) both articles were called 'Boxing It Up'. The earlier was published in October 1986, with the other article appearing in December 1992/January 1993.

If after setting up your own workshops you don't know what to build, look out for our kit building special in a future issue of PW. We'll have some more ideas to help the long dark evenings pass by.

Until then, good reading...and keep busy!

Tips...Tex's Tips...

Practical Wireless, December 1993
<table>
<thead>
<tr>
<th>English</th>
<th>Spanish</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>From the shack I can see mountains/sea/moors.</td>
<td></td>
</tr>
<tr>
<td>I have a friend/wife/children in the shack with me.</td>
<td>Tengo un amigo/mi esposa/mis hijos en el cuarto de radio conmigo.</td>
<td></td>
</tr>
<tr>
<td>He is a visitor/a shortwave listener.</td>
<td>Es un visitante/un radio escucha.</td>
<td></td>
</tr>
<tr>
<td>He intends to sit his radio exam.</td>
<td>Espera visitar su pais.</td>
<td></td>
</tr>
<tr>
<td>I am at home/at work/at a friend's house.</td>
<td>No podemos continuar en Ingles?</td>
<td></td>
</tr>
<tr>
<td>This is a demonstration/special station.</td>
<td>Puede decirlo en Ingles?</td>
<td></td>
</tr>
<tr>
<td>I have visited your country.</td>
<td>¿Podemos explicarselo en Ingles?</td>
<td></td>
</tr>
<tr>
<td>I hope to visit your country.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have a nice time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excuse my Spanish.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can we continue in English?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May I say it in English?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May I explain it in English?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QSL</td>
<td>Could you please send me your QSL card.</td>
<td></td>
</tr>
<tr>
<td>I would be very pleased to get a QSL card from you.</td>
<td>Por favor podria mandarme su QSL.</td>
<td></td>
</tr>
<tr>
<td>I shall send you my QSL card via the bureau/direct.</td>
<td>Me gustaria mucho recibir su tarjeta de QSL.</td>
<td></td>
</tr>
<tr>
<td>My name is in the American/British Call Book.</td>
<td>Le enviare mi QSL via bureau/directa.</td>
<td></td>
</tr>
<tr>
<td>Is your name and address in the Call Book?</td>
<td>Mi nombre esta en el Call Book Americano/Ingles.</td>
<td></td>
</tr>
<tr>
<td>Can you give me your address and telephone number over the air?</td>
<td>¿Deme su direcci6n y telefono ahora?</td>
<td></td>
</tr>
<tr>
<td>What is your postal code/telephone code?</td>
<td>¿Cuál es su codigo postal/precio telefonico?</td>
<td></td>
</tr>
<tr>
<td>This is my address and my telephone number.</td>
<td>Esta es mi direcci6n y mi numero de telefono.</td>
<td></td>
</tr>
<tr>
<td>Concluding Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May I thank you once more for this and I wish you a very</td>
<td>Una vez mas gracias por la llamada, y le deseo buen dia/buenes tardes/buenas noches/buen fin de semana.</td>
<td></td>
</tr>
<tr>
<td>good morning/afternoon/evening/good weekend.</td>
<td>¡Felices Pascuas y prspero ano nuevo!</td>
<td></td>
</tr>
<tr>
<td>I send you my best regards.</td>
<td>Le envio mis mejores recuerdos.</td>
<td></td>
</tr>
<tr>
<td>All the best to you and yours.</td>
<td>Todo lo mejor para usted y su familia.</td>
<td></td>
</tr>
<tr>
<td>I look forward to working you again.</td>
<td>Espero que podamos copiarlos otra vez.</td>
<td></td>
</tr>
<tr>
<td>May I wish you 73, 55, 88 and make this my final.</td>
<td>Muchos 73, 55, 88 y me despido.</td>
<td></td>
</tr>
<tr>
<td>Goodbye until next time/until the pleasure of seeing you</td>
<td>El ver para ... de ... que espera cualquier otra cosa.</td>
<td></td>
</tr>
<tr>
<td>This is ... signing off and clear with ... and now standing by for a call on this frequency.</td>
<td>Mis mejores deseos y muchos DX.</td>
<td></td>
</tr>
<tr>
<td>... now monitoring this frequency and waiting for any call.</td>
<td>Adios hasta la proxima vez que nos encontremos.</td>
<td></td>
</tr>
<tr>
<td>... now changing frequency to.</td>
<td>Aqui ... terminando con ... y quedando atento a la frecuencia para cualquier llamada.</td>
<td></td>
</tr>
<tr>
<td>... now returning to the calling channel.</td>
<td>... ahora espero cualquier llamada en esta frecuencia.</td>
<td></td>
</tr>
<tr>
<td>... now going GRT.</td>
<td>... ahora voy a cambiar a ...</td>
<td></td>
</tr>
<tr>
<td>CONCLUDED ON PAGE 38</td>
<td>... ahora vuelvo al canal de llamada.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>... ahora quedo GRT.</td>
<td></td>
</tr>
</tbody>
</table>

**Pronunciation**

- **Desde mi cuarto de radio puedo ver montanas/el mar/paramos, mar/paaramos.**
- **Tengo un amigo/mi esposa/mis hijos en el cuarto de radio conmigo.**
- **Es un visitante/un radio escucha.**
- **Es una visita.**
- **El ve a examinarse de radioaficionado.**
- **Estoy en casa/trabajando/en casa de amigo.**
- **He visitado su pais.**
- **Espero visitar su pais.**
- **Lo pasamos muy bien.**
- **Perdone, no hablo bien Español.**
- **Desearia hablar su idioma tan bien como usted habla el mio.**
- **¿Podemos continuar en Ingles?**
- **¿Puedo decirlo en Ingles?**
- **¿Puede explicarselo en Ingles?**
- **Desde me kwarto day radio poopy ver montanas/el mar/paaramos, mar/paaramos.**
- **Tengo on amego/mee esposa/mees eechos en el kwarto day radio conmeego.**
- **Es oone bissentay/on on radio eskoootsha.**
- **El es oone bisseta.**
- **El ve a eexaminersay day rad firmaionado.**
- **Estoy en casa/trewhando/en casa day amego.**
- **Es oone demonstration/estation espeshial.**
- **Ay visitahdo sooo pays.**
- **Espayo visitor sooo pays.**
- **Lo pasamos mooe be-en.**
- **Payrdenay, no ablo be-en espanol.**
- **Desayarea ablar soo eedionia tan be-en como oosteth ebla el meeo.**
- **Podhaymos continuooar en inglays?**
- **Poochydo dethhirlo en inglays?**
- **Poochydo explainayso yo en inglays?**
- **Una vez mas gracias por la llamada, ee le deysayo booenen da/booenees tardoeh/booenees nooches/booen fin de semana.**
- **Faylithes Paskwes ee prospayro ano nooayyo.**
- **Ley enviary mee meehchorees reekordhos.**
- **Todhoo lo meychor para oostaylhe ee soo feemielie.**
- **Ayepayro kay podhamos kopemams otre veth.**
- **Muchos sehentaneesrthes, seekonointheesanchoh, osshentahoeoshhoh eee mey despiho.**
- **El veth para ... day ... kay ... espayra kwakwee ear.**
- **Mees maychorees deysyoos ee moochtahos Day Eks.**
- **Adhios hasta le proxiama veth kay nos enkentraymos.**
- **Akee ... terminando con ... ee koodaendo atento a la frockoontshie para kwakwee ear llamadha.**
- **... aora espero kwakwee llamadha en esta frockoenthia.**
- **... aora voy a kambiar a ...**
- **... aora vvelvoo el canal day llamadha.**
- **... aora kwwoydo en cuerty.**

**OSOs in Spanish**

*Garth Roberts GW4JXN and Hidalgo Sevilla EA9BWX bring you the third and final part of Basic OSOs*
Telford Electronics Distributors

Suppliers of R.F. Connectors – Microwave – A.C.O.'s – Waveguide also high-voltage switches and transformers

VHF Log-Periodic Antenna
Type MA752 30–88MHz
Ex-army pro-quality. Construction by Rocal Antennas. This antenna is transportable and comes in a convenient carrying holdall. The antenna can be assembled by one person in less than 15 min. Mounting can be either vertical or horizontal. Polarisation on a ground mounted 9m mast (as above).

General spec:
Input impedance: 50 Ω
Power: 400 watts
VSWR: 2.6:1
Gain: 7dbi.

Brand new £225.00

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Telephone 0952 605451 – Fax: 0952 677978

Lightweight Telescopic Mast
Type MA798
Ex-army pro-quality. Construction by Rocal Antennas. Height extended – 9m height closed – 2.17m. Weight of mast 10 kg, weight of accessories kit 25kg. Mast can be extended by hand, foot-pump or 12 volt Holfords car type compressor. Telescopic mast 9m comes with installation kit – (guy ropes, hammer, stakes etc).

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We stock a full range of VHF, UHF and HF transceivers from all the well known manufacturers together with accessories like linear, antennas, rotators, dummy loads, wave meters, etc. At Bredhurst you will have time to compare similar rigs, side by side and discuss your particular requirements with our qualified sales engineers.

We have also organised a fast efficient nationwide Mail Order service. The system is simple, just write to us stating clearly the items required, or telephone us to discuss your requirements, we’ll be pleased to help. Give us your credit card number and normally the goods will leave that same day.

PART EXCHANGE WELCOMED
QSOs In Spanish
CONTINUED FROM PAGE 36

<table>
<thead>
<tr>
<th>Numbers together with their pronunciation</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>uno</td>
</tr>
<tr>
<td>2</td>
<td>dos</td>
</tr>
<tr>
<td>3</td>
<td>tres</td>
</tr>
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<td>4</td>
<td>cuatro</td>
</tr>
<tr>
<td>5</td>
<td>cinco</td>
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<tr>
<td>6</td>
<td>seis</td>
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<tr>
<td>7</td>
<td>siete</td>
</tr>
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<td>8</td>
<td>ocho</td>
</tr>
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<td>9</td>
<td>nueve</td>
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<td>10</td>
<td>diez</td>
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<tr>
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<td>once</td>
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<tr>
<td>12</td>
<td>doce</td>
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<td>veinte</td>
</tr>
<tr>
<td>21</td>
<td>veinte y uno</td>
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<tr>
<td>22</td>
<td>veinte y dos</td>
</tr>
<tr>
<td>30</td>
<td>treinta</td>
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<tr>
<td>31</td>
<td>treinta y uno</td>
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<tr>
<td>40</td>
<td>cuarenta</td>
</tr>
<tr>
<td>41</td>
<td>cuarenta y uno</td>
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<tr>
<td>50</td>
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<td>60</td>
<td>sesenta</td>
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</tr>
<tr>
<td>1000</td>
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</tr>
<tr>
<td>2000</td>
<td>dos mil</td>
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<table>
<thead>
<tr>
<th>Days Of The Week</th>
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<tbody>
<tr>
<td>Sunday</td>
<td>Domingo</td>
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<tr>
<td>Monday</td>
<td>Lunes</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Martes</td>
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<tr>
<td>Wednesday</td>
<td>Miércoles</td>
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<tr>
<td>Thursday</td>
<td>Jueves</td>
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<tr>
<td>Friday</td>
<td>Viernes</td>
</tr>
<tr>
<td>Saturday</td>
<td>Sábado</td>
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<table>
<thead>
<tr>
<th>The Spanish Alphabet - this is used to give the Q code and also for callsigns (distintivo de llamada).</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
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<td>C</td>
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<tr>
<td>D</td>
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<td>I</td>
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<td>W</td>
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<td>Y</td>
</tr>
<tr>
<td>Z</td>
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<table>
<thead>
<tr>
<th>Common Spanish Christian Names - it is easier to recognise them in the QRM if you have seen them before.</th>
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<tbody>
<tr>
<td>Angel</td>
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<tr>
<td>Alfonso</td>
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<td>Antonio</td>
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<td>Alberto</td>
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<td>Benito</td>
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<td>Carlos</td>
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<tr>
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<td>Cristobal</td>
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<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>1 o'clock</td>
<td>son la una</td>
</tr>
<tr>
<td>2 o'clock</td>
<td>son las dos</td>
</tr>
<tr>
<td>2.05</td>
<td>son las dos y cinco</td>
</tr>
<tr>
<td>2.10</td>
<td>son las dos y diez</td>
</tr>
<tr>
<td>2.15</td>
<td>son las dos y cuarto</td>
</tr>
<tr>
<td>2.20</td>
<td>son las dos y veinte</td>
</tr>
<tr>
<td>2.25</td>
<td>son las dos y veinticinco</td>
</tr>
<tr>
<td>2.30</td>
<td>son las dos y media</td>
</tr>
<tr>
<td>2.35</td>
<td>son las tres menos veinticinco</td>
</tr>
<tr>
<td>2.40</td>
<td>son las tres menos veinte</td>
</tr>
<tr>
<td>2.45</td>
<td>son las tres menos cuarto</td>
</tr>
<tr>
<td>2.50</td>
<td>son las tres menos diez</td>
</tr>
<tr>
<td>2.55</td>
<td>son las tres menos cinco</td>
</tr>
</tbody>
</table>
Come Fly With Us To The 1994 Dayton HamVention

Book Your Seat Now.....We Don’t Want You To Be Disappointed!

With so many radio enthusiasts attending the event - around 40,000 visited the 1993 HamVention - there will probably be enough hot air to send the Kenwood balloon soaring in 1994! So, come and join in the fun, meet and make new friends and see the biggest and best amateur radio show in the world!

Join the PW party, led by the Editor Rob Mannion G3XFD, when we fly out on a scheduled Delta Airlines flight from Gatwick on Monday April 25 1994. We’ll be flying direct to Cincinnati and our private coach will take us to the Holiday Inn in Dayton for our seven night stay. There’ll be several day trips in our private coach and we’ll spend a day at the United States Air Force Museum. There’s plenty of shopping and many other attractions for the family too!

You can book your seat on the PW 1994 HamVention Holiday for only £630 per person, sharing a twin-bedded room. Single rooms are available for an extra £205. The price includes the return flight and meals on the aircraft, coach transfers, seven nights’ accommodation, two day excursions by coach and admission ticket to the HamVention. We return home on Monday May 2, arriving at Gatwick on Tuesday morning. Although Rob Mannion G3XFD is leading the PW party, the entire holiday is being organised by the Bristol based professional group tour operator RCT International. Annette Oxley at RCT is awaiting for your enquiry and she’ll be delighted to send you a full itinerary and booking form. Don’t delay, send away today and fly with PW to the great amateur radio adventure of 1994!

We don’t want you to miss the flight! We’re looking forward to your company on the 1994 trip!

To Annette Oxley
Practical Wireless 1994 HamVention Holiday
RCT International
44 College Green
Bristol BS1 5SH
Tel. (0272) 230933, FAX (0272) 226912

I am interested in joining the Practical Wireless 1994 Dayton HamVention Holiday, please send me further details.

Name:
Address:
How many seats required
His worship the Mayor of Calderdale Bill G4KQJ operating GX2UG closely watched by Ben, a student Novice and Roy G3NBI. (photograph courtesy of the Halifax Evening Courier)

The welcome a newcomer receives at a club is very important. The first time visitor must be made to feel that they can become more deeply involved and eventually get on the air themselves. Established radio club members can too easily slip into jargon which will often be incomprehensible to the newcomer.

Clubs do not exist just to attract new people into the hobby, important though it is to do so. The club should be able to offer a wide range of activities which can be undertaken as a group, but would be difficult for an individual on their own.

Later on I will go on to describe a whole range of activities that can be undertaken by the club. But first a little about my own club, The Halifax and District Amateur Radio Society.

Great Radio Pioneer

The Halifax and District Amateur Radio Society club was formed in 1922 and is one of the oldest in the land. Halifax was fortunate in having one of the great early radio pioneers, Percy Dennison.

Percy had experimented with radio for some years before helping to form a club called The Scientific Wireless Society. What a grand name, I think we should have stuck with it!

The club's first meeting place was Clare Hall which has long been demolished and an inaugural message was sent from the Marconi works in Chelmsford. The club also contacted the Eiffel Tower and a 'peace message' was exchanged, the club still has the original letter from the Director at the Tower confirming the contact. Is this perhaps the first QSL card?

Halifax & DARS has met on and off since this date and was re-formed in 1982 after a short lapse.

The club presently meets at the 'Running Man' public house, Pellon Lane, Halifax.

One meeting place in the 1950s was a pub on the moors above Halifax. Ron G3OTE was a member then, has told me the following amusing story.

One of the members gave a talk on simple repairs to radios. Because the moorland pub had no mains electricity, only oil lamps, he powered his radio from a car battery with an inverter for the h.t. “You will all know the simple wet finger on the grid test for the a.f. amplifier” he said. But when he put his finger on the first a.f. valve grid, nothing happened! There were no mains for miles and the 50Hz hum which normally surrounds our bodies was not present!

Wealth Of Advice

The discussions that take place at clubs can provide a wealth of advice to old and new radio amateurs alike. Perhaps one of the most talked about subject is antennas.

I can remember going to a club for the first time and asking “What is a G5RV antenna”? this brought wry smiles from the members.

Nowadays, antennas are still of interest. I have recently been to the G-QRP club mini convention at Rochdale and heard a talk by Peter Dodd G3LDO. I also bought his book on antennas and I am looking forward to passing on some of the new ideas I have learned at a future club meeting.

Club Shack

The club in Halifax is lucky to have its own shack in a Community Centre. However, you do not need...
Together For Radio

anything very grand, just a small secure room where gear can be set up and permission to erect antennas. The local council youth and community service will be keen to help with this kind of venture. They'll be particularly keen if you can demonstrate a youth interest, such as tuition for the Novice Licence.

The Halifax club call is G2UG and this can be modified to GX2UG to allow non licensed people to pass messages. How this is done is covered by DTI regulations and clubs who wish to use this facility should carefully study them.

The Halifax club’s use of GX2UG is a wonderful step forward in bringing new, particularly young persons into the hobby. Instead of having just to watch, knowing that it can be many months before a newcomer gains his licence, they can now join in and practice on the air procedure.

Special Events

Many clubs take part in Special Event demonstrations. This is where the club is on show to the public and a good image of amateur radio can be promoted. The event needs careful planning with members agreeing a roster for manning the station and providing and erecting the equipment.

The Halifax Club has put on a number of special event stations using a special call or G2UG or more recently GX2UG. The venue for such events is important, as there is often too much already for the public to see at a Gala and not much interest is shown to the radio amateurs.

As well as the operator, it’s a good idea to have an experienced member standing by to welcome visitors. They can explain what is going on with possibly a map to show where the contact is being made.

Our club callsign GX2UG still causes some interest on the air. Amateurs not familiar with it think they have worked some rare DX or a rare offshore island!

Perhaps the most successful demonstration station held by the Halifax Club was at Wainhouse Tower which is a famous local landmark and Victorian folly. The tower was used by Percy Dennison in the early days of radio and the club has a plan of his shack located near the base of the tower which is almost 300 feet high (90m).

I was persuaded to climb up the steps inside the tower carrying the antenna wire. Chairman Jim G4MH said my upwards progress was marked by the pigeons escaping from the tower!

There were not too many distractions for the visitors at Wainhouse Tower. Once they had climbed the tower so many showed an interest in the station and several had a ‘go’ with GX2UG.

When running a special event such as our Wainhouse Tower, to obviate the need to sign/P a temporary change of location of the station can be advised to the DTI. Perhaps the most memorable thing heard on the air from Wainhouse Tower was from a ‘W’ in Ohio who said “Gee, your own 300ft stone antenna support” much more impressive than a simple lattice tower!

We also had support from the Town Hall. For the event the council provided nice coloured postcards of the tower which we used as QSL cards.

Construction Projects

Many local radio clubs can embark on a wide range of construction projects. This is when the more experienced can help the less able member.

The White Rose Club in Leeds has constructed a fantastic project. This was originally a receiver for all bands from 1.8 - 144MHz which the club then developed into a transceiver.

I am very keen on home-brew and made my first QSO with a simple crystal transmitter and direct conversion receiver. Both designs were by my hero the Rev. George Dobbs G3RJV.

Both G3RJV projects seemed too simple to work. But when they were completed I called CQ on 3.5MHz and back came GM3MXN, Tom in Glasgow with a 559 report for my first QSO!

Club Opportunities

Clubs also have opportunities to enter all the major contests as a group. There are plenty of hills around Halifax and my club used one for v.h.f. contests.

The larger clubs can organise rallies which can be very hard work to put on. However, they can be a good source of income for club funds and can also help to bring new members to the club.

Talks on radio subjects are the mainstay of the club activity. The Halifax & DARS has had some very interesting and informative talks on a wide range of subjects. These talks are arranged almost a year in advance by the club secretary David GODLM.

“You only get out what you put in” this is often said about many forms of human endeavour and it is true of radio clubs. So, get down to your local club with a bright new idea. I am sure that the response will be “Good idea, why don’t you organise it”!

Fig. 2: The Wainhouse Tower perched above Halifax.

Practical Wireless, December 1993
The Leeds & District A.R.S.
Christmas Rally 1993
Sunday 5th December 1993

New Venue
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King Lane, Leeds 17

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** Disabled 10.30am **
** Usual well known traders **
** Massive Car Park ** Free Prize Draw **

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THE HUSTER
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Above prices are inclusive of VAT. Send two first class stamps for list 52.

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CASE AND ALL HARDWARE INCLUDED
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LAKE ELECTRONICS
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(Called by appointment only)
Electronics Workbench (v3) is produced by Interactive Image Technologies Ltd., of Toronto, Canada. And it's aptly described as 'The electronic lab in a computer'.

The Electronics Workbench program is the most complete, versatile, complex, easy to use, electronics design software package I have ever seen. To call the program a p.c.b. design program would be an understatement.

Look at the picture in Fig. 1 (a 'grabbed' screen display), and I'll explain what I mean. This is an MS-DOS program but the built-in GUI (Graphics User Interface) gives the feeling that you're in Windows. Although this DOS version will run from within Microsoft Windows, a full blown Windows version is available, as is a version for the Apple Macintosh.

**Main Workbench**

The main part of the screen is your workbench, along the right hand side you have a Parts Bin (with an 'unlimited supply' of components), along the top are all your test instruments. The instruments can be moved onto the workbench and connected to the circuit. At the top right hand corner of the picture is an ON/OFF switch, flick this to ON to supply power and the circuit is tested. At any time you can change the value of any component, you can also add, delete, move and rotate these components as you please. The circuit can also be retested as often as you wish.

You can 'blow' components without any damage to your pocket or stock. When all the faults have been corrected, and your design functions satisfactorily, you can go ahead and build the project, on the kitchen table, knowing that it'll work. With Electronics Workbench you get two 'MODULES'. One is for Analogue, the other for Digital (see Figs 2 and 3). The use, feel and function of each module is identical, and each has its own array of test instruments and unlimited supply of components.

**Easy To Read**

The manual is well laid out, informative, and easy to read. Its 300 plus pages contain thorough, easy to follow tutorials for both analog and digital. The disk contains a full DEMO for each module. Appendix D in the manual has listings of Abbreviations, SI Prefixes, Units of Measurement, and Equations (Ohm's law etc.). This makes it ideal for the RAE candidate. You can learn by doing, without burning yourself.

**Build And Test**

With Electronics Workbench you can build and test your circuit in modular form. Each individual circuit can, when tested and proven, be saved. All 'modules' can then be connected together and tested (and improved if necessary) as a complete project. Each individual circuit can be used over and over again as often as you wish. This makes Electronic Workbench an ideal package for both hobby and professional experimenters alike.

Unfortunately I haven't had the program long enough to give it a thorough testing, nor sufficient space to do it justice, in fact I haven't even scratched the surface. I therefore hope to give a 'long term' user report at a later date.

The minimum hardware needed to run the DOS version of the program is an IBM AT (or 100% compatible) with an 80286 or higher CPU. It needs 640Kb RAM with at least 350Kb free, MS-DOS 3.1 or higher, one floppy drive and a hard disk with at least 2 megabytes available space. A Microsoft compatible mouse and VGA colour monitor are preferable, though not essential. For really 'serious' work I would suggest somewhat higher specifications than this.

With an asking price of £233.83 inc. VAT plus £4.99 P&P this is certainly value for money.

My thanks (and congratulations) go to Interactive Image Technologies Ltd who sent me this review copy. For more information, or to place an order, contact: Robinson Marshall (Europe), 17 Middle Entry, Tamworth, Staffordshire B79 7NJ. Tel: (0827) 66212.

End
In the last Antenna Workshop I looked at the advantages of measuring impedance and briefly discussed the noise bridge. For antenna measurements, the noise bridge is one of the most useful pieces of test equipment available to radio amateurs. In addition to measuring antenna impedance the noise bridge can be used to measure coaxial cable losses and characteristic impedances.

In this Antenna Workshop I will give a few additional details of the bridge. How to calibrate it and a method for using it for measuring antenna impedance.

My thanks go to Jandek, for permission to publish the noise bridge circuit shown in Fig. 1. The instrument comprises an r.f. bridge energised by a wide band source of amplified noise.

I will refer to the components as they appear in Fig. 1. Most noise bridges have the similar components so the following description can apply to all noise bridges.

Two arms of the bridge are energised equally via a broadband ferrite transformer. The third (reference) leg of the bridge contains the calibrated resistive and reactive components.

Completing the bridge, in the fourth leg, is the circuit whose components.

resistive and reactive bridge contains the calibrated components.

The unknown impedance (in most cases an antenna) is measured by connecting it to the unknown impedance socket. A null detector (receiver) is connected to the detector socket, and is used to detect the bridge balance.

The receiver used for null detection, should be switched to a.m. if that mode is available. Otherwise use the s.s.b. mode. Do not use f.m. or a narrow band mode such as c.w.

Look now at the redrawn bridge Fig. 2. The bridge is balanced when the impedance of the bridge’s reference arm (R1 and CV1) equals that in the unknown arm. (C5 and unknown impedance).

Bridge balance is achieved by adjusting the variable resistor RV1 and capacitor CV1. This is done until a null in the noise level is detected in the receiver.

A reactance offset capacitor, C5, is connected in series with the unknown impedance side of the bridge. This offset capacitor enables the variable capacitor, RV1, to be used to measure inductive (positive) or capacitive (negative) impedances.

The units of impedance are measured in ohms. The reference variable resistance RV1 can be calibrated directly, but the capacitor measurement units are, of course, picofarads. These capacitance values must be converted to impedances by calculation.

Before the bridge can be calibrated, its performance should be checked to ensure that the bridge’s measurements do not vary with frequency. This can happen because of capacitive coupling between the bridge and the noise amplifier through the toroidal transformer T1.

To check possible frequency dependence, connect a 50Ω resistor (the nearest preferred value is 51Ω) to the unknown socket. The resistor can be soldered directly across the socket inside the instrument or soldered into a coax plug and connected to the socket.

Connect a receiver to the detector socket. Set the receiver to 2MHz. Switch on the receiver and the noise bridge and adjust the resistance and reactance controls for the deepest null in the noise output from the receiver.

If the bridge has been calibrated, the resistance scale should read 50Ω and the reactance scale should read zero. Now retune the receiver to 21 or 28MHz.

Repeat the measurement. If both the resistance and reactance readings remain the same then the design of the bridge is good.

The Jandek noise bridge provides a method of bridge balance frequency compensation and uses a small capacitance connected between points A or B and earth. This is shown in Fig. 3. The capacitance comprises a pair of wires twisted together near to the ‘Unknown Impedance’ socket. The frequency balance compensation details are described in the instructions that come with the kit.

**Resistance Calibration**

Calibration of the resistance scale is straightforward. Begin by tuning the receiver to around 3.5MHz. Now connect a 50Ω resistor to the unknown port. Then vary RV1 and CV1 to null the bridge, adjusting both controls until a null occurs in the noise output from the receiver.

This calibration point (50Ω) can be then marked on the front panel scale for RV1. The calibration scale for CV1 should also be marked and labelled ‘0’.

Using fixed resistors, the rest of the resistance range is calibrated in a similar manner. For greatest accuracy the resistors should be individually calibrated using an accurate ohm-meter. The calibration resistors can be wired into a coaxial plug, or soldered directly across the socket inside the instrument. Which ever method is used, keep the leads as short as possible.

**Reactance Calibration**

When the resistance scale was calibrated, the zero point on the reactance scale was also fixed. If you are only going to use your

---

**Fig. 1: The circuit of the Jandek Noise bridge kit JDO31, courtesy of Jandek.**
noise bridge for setting up (matching) antennas, where you are aiming for 50Ω (0Ω reactance) then there's no real need to calibrate the reactance scale. However, if you wish to make impedance measurements then the reactance scale must be calibrated.

The reactance scale should read ohms; positive for inductive reactance and negative for capacitive reactance. This range would enable you to plot impedance values and enter it in the impedance chart described in 'Antenna Workshop' in the November 1993 issue of PW.

The offset capacitor's value determines the zero reactance point on the dial. In the Jandek noise bridge this capacitor, C5, and 250pF is used for CV1.

However, before the impedance can be quoted in ohms, you must read the equivalent capacitance value in picofarads. This is because the circuit uses a capacitor as the reactance (inductive) side of the reactance scale, you should repeat the procedure described above, with the calibration capacitors connected in turn across CV1.

To find the reactive impedance, the calibration values (pF) must be converted to reactance. This need only be done at one frequency such as 3.5MHz. You can use the formula:

\[ x = \frac{10^8}{2\pi f} \frac{S}{C_5 + (S + C_5)} \]

If you have a computer, you might like to use the small program (Listing 1), from Jandek. This program ran on every flavour of BASIC I could find, and it produces a table of reactance values for given capacitance calibration marks for any one frequency.

**Using The Bridge**

I only have enough space this time to cover one aspect of using the noise bridge; adjusting antenna matching devices such as the Gamma Match.

When you are making impedance measurements at the antenna, the audio output of the receiver has to be close at hand so that you can hear the noise levels. This may be a trifle inconvenient if you are up a mast or on the roof of a house.

The inconvenience of having to listen to the receiver, may be overcome by using an extension speaker. But you'll need a rather long extension lead to reach to the antenna location. You could use a couple of wires from the antenna rotator if you have one. The other alternative is to use the arrangement shown in Fig. 4.

The method shown in Fig. 4 allows the station receiver to be used as the noise detector when adjusting an antenna matching using a noise bridge, but with a loudspeaker at the antenna site. I find that using headphones gives a much better ability to sense the null point.

In the next 'Antenna Workshop' I'll be describing a new low band antenna - watch this space.

I'll also describe how to use an impedance measuring instrument, to measure coaxial cable losses and characteristic impedance. I will also describe a more accurate method of calibrating the reactance scale.

**Listing 1**

```
10 REM HF Noise Bridge Program
20 REM to convert capacitor scale reading to reactance
40 REM
50 REM Capacitance in pF, Frequency in MHz
60 REM X is Reactance in Ohms
70 REM S = Scale reading (in pF difference from zero)
80 REM C5 is fixed capacitance in unknown arm
100 CLS
110 INPUT "CS in pF.."; C5
120 INPUT "frequency in MHz."; f
130 PRINT "S", "X"
140 FOR S = -180 TO 180 STEP 20
150 IF S < -05 + 20 THEN 180: REM to prevent division by zero
160 X = 159155 * (S / (C5 * (S + C5))) / f
170 PRINT STR$(INT(S)), STR$(INT(X))
180 NEXT
190 END
```

Fig. 2: The bridge components re-arranged a little. Winding labels are as in Fig. 1.

Fig. 3: Inside The Jandek noise bridge. The pair of twisted wires near the left hand coaxial socket are the compensating components.

Fig. 4: One method of extending the receiver's audio up to the antenna location without extra wires.

Further details on Jandek kits are available from:
6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0384) 288900.

Practical Wireless, December 1993
Ron Ham is ready for 'business' once again in the PW vintage wireless 'shop'. You're welcome to enter and savour the softly illuminated dials and warm cabinets.

Wireless developed through the years from the bread-board receivers built on the kitchen table, in the 1920s and early 1930s. We've passed through the era of the factory made sets of 1930s, 40s, 50s and 60s with their sophisticated style and polished cabinets, to the smaller, mainly portable, domestic sets in use today.

Throughout the past 70 years, there have been many advances in technology. But nothing, in my view, can equal the complete change in wireless design and techniques that which came when the thermionic valve was replaced by the semiconductor.

When transistors arrived, out went the metal chassis, valve holders, large components with high working voltages, heavy mains and speaker transformers. Also redundant were big smoothing capacitors and chokes and, most important, all that unwanted heat generated inside the cabinets.

Get America on this One-Valver

Fig. 1: The boy radio enthusiast pictured on the cover of Every Boy's Hobby Manual (published 1937) brought back memories for both Ron Ham and Dave Riddick.

Read And Wallow

At least for the time it takes you to read 'Valve & Vintage', you can forget about transistors and microchips and wallow in nostalgia. You can join the wireless-collectors and restorers, in the age that was dominated by the thermionic valve. However, first readers, I suggest that you take a good look at Fig. 1. You'll see the character and enthusiasm in that boy's face in the illustration. Does it remind you of yourself? It certainly did wish me! My thanks for the illustration in Fig. 1, and the memories that came with it are due to Dave Riddick (St. Albans, Hertfordshire). Dave sent me a copy of Every Boy's Hobby Annual of 1937 which contained a four-page constructional article entitled, 'Get America on this One-Valver'.

The article had a sub-heading: "Short wave reception is the latest thing in radio! Here is a simple set which will give you the thrill of exploring the world through the ether!"" Circuit In Psalter

A circuit, similar to the one in the Every Boy's Hobby Annual article was drawn in the back of my choir boy's Psalter! How could an 11 year-old boy concentrate on his singing, etc., when at home he had a one valved bread-board receiver with a 2V glass accumulator, 120V "Winner" h.t. battery and a pair of S.G. Brown headphones? I was given the bits to make my set at the age of ten and it became my life. I'm now 62 Dave and can honestly say, that this little receiver gave me more pleasure and a greater thrill than any of the hundreds of complex sets that I have owned and serviced since!

I remember winding another coil and hearing some different stations! I often think of the excitement produced by a few more or less turns of wire on that coil former, when I casually flip through a wave-change switch or 'punch' in a frequency on a modern receiver today.

World At War

Soon after the 1937 hobby annual was published the world was at war. Untold numbers of transmitters and receivers of numerous shapes, sizes and designs were built for the armed forces of all countries.

When the Second World War ended in 1945 a large amount of military equipment was sold as government surplus. Much of it was came from a 75Ah accumulator and the high-tension was provided by either two 60V dry batteries, wired in series, or one single battery of 120V.

Service Valve Numbering.

In the past, we've often talked about service valve numbering. And, recently I have been reminded by Keith Seddon (Stockport, Cheshire) about the confusion that can be caused by the prefix "VT" on a valve's identification.

The VT marking represents Valve Transmitting to the RAF, but in the USA in means vacuum tube. To the dear old GPO (General Post Office) Keith thinks it represents 'Valve Thermionic'. He points to three type VT104s, 1, (RAF) = CV1104 = PT15; 2. VT104 (USA) = CV546 = 12SQ7 and 3. VT104 (GPO) = CV1040 = PX25.

British Army Receiver

One of the lesser known British army receivers is the R109, in Fig. 2. The receiver illustrated, is currently on display in the Vintage Wireless Building at the Amberley Chalk Pits Museum.

The battery operated R109 receiver, uses mainly ARP12 valves and covers 1.8 to 8.5MHz in two
ranges. It’s fed from a 6V accumulator via a socket on the bottom left of the grey front panel (behind the webbing).

The h.t. for the valves is produced by an internal 6V vibrator operated power-pack. Because of this, a gentle buzzing is heard while the set is running. The vibrator itself, like the valves, is a plug-in replaceable component.

The R109 is simple to operate. The on/off switch is under the ‘pocket’ watch holder which has the red (power-on) warming light above it.

The front half of the holder unscrews and a standard pocket-watch is laid inside. This becomes the station clock when the front is screwed back on. Watch-holders were first fitted to military wireless sets during The First World War.

Three on/off toggle switches are used to bring in the b.f.o. for c.w. reception. The ‘crash’ limiter (noise filter) and, if required, the loudspeaker are fitted below the speaker toggle.

The wave-change switch (upper) and volume (lower) controls are situated vertically between two of the toggles to the left of the main tuning control-knob. The dial (top right) has a small round knob on the left of the escutcheon to lock the scale.

Next to this is a low voltage power-point for an operator’s desk light. Two headphone jack-sockets are fitted below the speaker toggle.

The metal grid which originally protected the front panel is missing from the set in Fig. 2. And, although interesting in its own right, the tiny Morse key, (displayed lower centre) is not part of the R109 equipment.

Books For Collectors

One of the books that I would thoroughly recommend for military wireless enthusiasts is Echoes From Arnhem (ISBN 0-7183-05213). It’s by Lewis Golden, who took part in operation ‘Market Garden’.

The book is fascinating and has informative text about the development of airborne signals and the parachute landings at Arnhem. Additionally there are photographs of the communications equipment used during the battle.

Large pictures are devoted to the 68P set. This is almost identical to the WS-18 and the ‘22’ set (similar to the WS-19) packed in its parachute dropping container.

There’s another photograph of a WS-22 mounted in an airborne jeep. Also shown is a ‘76’ set transmitter with an R109 receiver and the short-range American, SCR-536 (‘handy-talky’).

The ‘handy-talky’ looks like a large telephone handset with a hefty send-receive switch on one side. In the book, Chapter 8, ‘Signals at Arnhem’ provides the reader an account of how all these sets were used in action.

More nostalgia now as H. E. Chamberlain (Newark-On-Trent, Nottinghamshire) tells me about a small booklet entitled When The Ovation’s Sang, by Ron Montague. The booklet gives details of such 1930s radio-stations as Radios Normandy and Luxembourg who broadcast sponsored programmes. It costs £1.20 (post free) and is available direct from the author at 39 Orchill Drive, Benfleet, Essex SS7 2LS.

Fig. 2: The Story Of Radio, by W. M. Dalton, one of an interesting series of books for radio collectors (see text).

Well, that’s it for another month. It’s time to close the vintage wireless shop, but don’t forget I’m ‘open’ at any time for your letters.

Write to me at ‘Faraday’, Greyfriars, Storrington, West Sussex RH20 2HE. Cheerio for now.

Can You Help?

Rob Filby requires a manual for a ‘Samwell and Hutton’, type 7Bm wobbulator. If you can help, drop him a line, at 11 West Street, Timberland, Lincolnshire LN4 3RX.

“I started reading Practical Wireless in 1934”, so writes P. G. Ascough, who is currently overhauling a Philips 206A which was made in 1940. He recently obtained a signal generator, type SGML, serial number 658 made by Weymouth Radio Manufacturing Ltd., of Weymouth in Dorset.

If anyone can help with a manual and/or instruction book, please contact Mr Ascough at: 22 Misty’s Field, Walton-on-Thames, Surrey KT12 2BG.

From Malta GC, C. A. Fenech is looking for a 1L5 valve, for a set that he’s restoring. Offers please to: 35 Main Street, Attard, Malta GC Europe.

Well, that’s it for another month. It’s time to close the vintage wireless shop, but don’t forget I’m ‘open’ at any time for your letters.

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Practical Wireless, December 1993
Paul Essery GW3KFE takes his monthly look at the h.f. bands and at the successful use of loop antennas.

As the minimum of the solar cycle approaches, the spots tend to the solar equator, and the first hint of a new cycle is observance of a sunspot much nearer a solar pole.

Angie's Pirate

Angie GHIGA, in Stevenage, seems to have a pirate! The unwelcome station was noted on 3.5, 7 and 14MHz. Anyone who can take a line of direction and pass it on to Angie please do so.

Still with GHIGA, Angie has some antenna changes in mind but meantime found T36GC on 3.5MHz. Believe it or not, some joker called her on 7MHz at 1300Z signing 'W2AR'. On 14MHz, there were lots of East Coast Ws plus W5 and W6.

On 16MHz I noted WHHD, but better antennas are needed. As for 21, 24 and 28MHz - Zilch!

On the QRP front, Eric Masters GOKRT in Worcester Park says the 'Boss' made him have a tidy-up. The result being much improved operating conditions and the retrieval of some items thought lost for ever. All this and UA3CM on 7MHz with the Lake District the best. USORR was found ZA1E, and 180/W7SW in the Ligurian Islands.

On 7MHz Leighton has a modified WD3RT into the upper half of a W3EDP antenna and a quarter-wave counterpoiser! Talking still of low power, Leighton Smart in Trelewis has wielded GW0LIB to the tune of 100+ DXCC countries in all continents. A recent foray on 7MHz surprised him somewhat.

On 17MHz Leighton worked five continents in a few minutes around supper-time on what he had always thought of as a chaser band! On 14MHz c.w. HZ1AB and N8AR on 300Mv seemed the pick of the crop.

Using s.s.b. on 21MHz yielded a few Europeans. And on 28MHz there was one c.w. plus one s.s.b. contact.

Leighton has a modified Yaesu FT-747 at 5W out His antennas include a 'A Masters GOKRT' plus one s.s.b. contact. On 28MHz there was one c.w. yielding a few Europeans. And on 18MHz 1 noted ZS8MI as top, a country last raised in the 1950s.

The 14MHz band wasn't so popular with John, though DU1CDG TG3GI and ET3YU were all good. His operation on 18MHz resulted in 2B8X, and on 7MHz UA9XX and CY9R. Sideband on 3.5MHz yielded VK3AJJ and various Europeans were raised on 1.8MHz.

The loop antenna used on 1.8MHz by Ted G2HBU is the Isle of Sheppey is a great help in keeping the skeds with ON7EW and GW4RPU despite heavy QRM. John G3BDQ also uses a loop, and reckons that using it he gets perfect copy of North American cards who are only R3 on the transmit antenna.

To return to G2HBU, QRP with the IC-711 and GP3/2 on 10MHz gave IS/0ER and small fry. And a blast with the Omni found ZA1E, and IB7/WSV in the Ligurian Islands. Turning to 14MHz, Ted's IC-721 found another ZA, and SV5TH in Rhodes. USORR was a joint effort in the CIS. On 18MHz using the HP8 antenna, he worked B8AQ and 9X5DF, and on 28MHz a solitary IK0TXF.

Contest Dates

The 1993 CW WW DX Contest dates are October 30-31 for 'phone, and November 27-28 for the c.w. leg. It's interesting to note that the 'disqualification' clause now includes disqualification from eligibility for an award for a year, referring either to the station or the operator. The disqualification clause adds: "the use of non-amateur means such as telephones, telegrams, to elicit contacts or multipliers is unsportsmanlike and the entry is subject to disqualification". All that's needed now is for some brave soul to actually disqualify someone!

Personalities And Notes

On to personalities and notes now. To start off I've heard that Martti Lain OH2BH was working in the Far East for several years and that he now holds VR2BH.

The 3V8W exercise was not a "Slim," despite the packet radio network. Isn't it about time that licences covering packet radio, wherever in the world, have a clause added covering deliberate misinformation?

Karl made some 6500 contacts, mostly on the key. However, it's true that a "3V8W" and "3V8WX" were cluttering the bands at the same time and they were not genuine.

The proposed BV, Pristas, exercise is gradually coming together and OH2BH is among the chosen operators, so says DXNS. However, the date has been slipping fairly consistently, and all I can advise on this is to keep an ear to the ground for BVAR/BV9S.

Thanks To Contributors

Thanks go as always to our various contributors, The DX Bulletin, The DX Magazine, The Canadian Amateur, DX News Sheet, and all your letters. Keep it all coming!

Finally, a reminder on deadlines. Your input please, by the middle of each month, addressed as always to me at: 287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA. Cheerio for now and good DX!
Welcome to the world of amateur radio in orbit! It may surprise you, but the OSCAR-11 satellite was launched almost ten years ago and it's still going strong.

Thanks to phased efforts by the University of Surrey Command team and AMSAT-UK's Richard Limebear G3RWR, the OSCAR-11 is now carrying the ASCII bulletin once more. Read on to learn what's been going on.

Launched in June 1983, OSCAR-11 is still giving good service. However, due to radiation it has lost its onboard computer, telemetry and the ability to change antennas or bands.

Fortunately, OSCAR-10's mode B capability on its antenna permits regular DX activity. It will then be on Mode 'B' with 'S' transponder on but 'B' off from MA 201 to MA 205. Followed by Mode 'S' with 'S' beacon only from MA 205 to MA 250. The omni-directional antennas will be used between MA 220 and MA 40. The Alon/Alat attitude will be 180/0.

The satellite will be moved to attitude 210/0 on October 25. From then until November 15 the intended schedule will be Mode 'B' from MA 0 to MA 130, Mode 'B's from MA 130 to 180. It will then be on Mode 'S' with 'S' transponder on but 'B' off from MA 201 to MA 205. Followed by Mode 'S' with 'S' beacon only from MA 205 to MA 210.

Mode 'BS' returns from MA 210 to MA 226. The omni-directional antennas will be in use from MA 240 to MA 80, and an attitude change to 240/0 will be set for November 15. Users are requested not to attempt to uplink on 'B' mode between MA 180 and 205, as this interferes with mode 'S'.

Lots Of DX

There's lots of DX on OSCAR-13. This fact is shown by log listings from Bernhard DJ5MN and Mike DQ5MV. This is also supported by reports from G01MC, G0ZSM, G3CLW and G8KEM. There's activity from Africa, and this is represented by C91AJ, F05K, S24JU, ZS6NH, CG8BO, E49BM. Active from Asia are 4X10M, 4X1MK, A41KB, VU5B, 4X4JW, HS5QD, TASC, VS5HJ, UL5CY, UL7PL, UV2KEA, UAG6V and many Japanese operators.

From North and South America come PY1DGG, XE1KK, XE1EMM, KX2DB, KP4SO, L44UC, ZP5KD, LH7JP, WL6KY, WL7LA, PT9HF, and VP9RUP. Active from Oceania are YB1CS, 3D3RG, ZL2QJ, ZL4KU, A06RL, KOBUI and lots of all area Ws.

From Europe the reported loggings show CI1ANC, 1AVP and 1CCU, L2ZD, 1UH and 1KWT, DK16, 1ADQ, 1A0CD, 1FVQ, 1UFZ, 1UOZP, ZAGK, ZMVU, ZT7SB, G3Q60G, LAF3P, ON3AQ, SV3BEE, YO3AD, U196E, EJ5UD, SSTTLI, ZL3CIF and YL8BDX.

Stations from DL, EA, F, G, GW, HB9, I, JA, K, OE, OH, DN, DZ, PA, SM, SP, VE are not given. This is because of the high level of activity from these countries.

Further Awards

In September's 'Satellite Scene' I promised to tell you of further awards available for satellite operators. So, to keep my promise here are some more than you may wish to see.

Canadian Award: The North Alberta UHF Society of Canada sponsors the VE Satellite Award. To win this very handsome certificate, you'll need to submit QSL cards confirming satellite contacts with eight different Canadian call areas. The call areas for the Canadian award are: VE1, 2, 3, 4, 5, 6, 7, and 8 plus VE01 and VE11. That's if you are in North America. If you are in any other continent, then you need only four of the call areas listed.

Magazine Awards

The American CD Magazine sponsors the CD Award OSCAR endorsed for 100 confirmed countries. These can be QSLs specifically via c.w. or s.s.b. by satellite, but not mixed mode. The magazine also provides endorsements for each additional 50 countries confirmed. For the required forms and the fee schedule write to CD Magazine, 76 North Broadway, Hicksville, NY 11801, USA.

Another American publication, 73 Magazine, offers the DX Dynasty Award. This is for 100 countries worked by satellite after 1981. The steps for the DX Dynasty Award then go by 50 up to 350, then to 375, then to 400. You don't need to send your QSL cards, but you do need to apply by the official DXDA form and the country list is available from 73 Magazine for the DXDA form and country list just send your request, a SAE plus $1 or 2 IRCs to: DXDA, WGE Center, Peterborough, ON K9M 5A8, USA.

Once you've got it, you have to submit QSL cards confirming satellite contacts with eight different Canadian call areas. The call areas for the Canadian award are: VE1, 2, 3, 4, 5, 6, 7, and 8 plus VE01 and VE11. That's if you are in North America. If you are in any other continent, then you need only four of the call areas listed.
Roger Cooke G3LDI remembers the day he played at being a ‘paparazzi’ photographer, and says ‘caught at last!’ to Ian Wade, and brings you news ‘from down-under’.

Despite his extreme efforts to avoid my camera, I have at last obtained a photograph of Ian Wade, G3NRW, the author of *Nosintro*, and the editor of the TCP/IP section of *Datadom* magazine.

Obviously I shall refrain from revealing the source of the photograph, but suffice it to say that I did have help! Ian is pictured in Fig. 1 trying to hide behind a copy of his book, which I understand is rapidly becoming a best-seller. Ian is on the BARTG committee and works hard to promote TCP/IP. His book is still available from the PV Book Service or from Dowermain Ltd., 7 Daubeney Close, Harlington, Beds LU5 6NF.

By the time you read this column, the 1993 AGM of BARTG, should have been held on November 13, will probably be history. However, I shall report any major changes the group makes as soon as I have any information.

**Information From Australia**

Ian VK6CR has kindly sent me the following information from Australia. I was particularly keen to obtain the correct Hierarchical addressing for VK, so Ian made some enquiries for me.

Following this overview by Ian, I shall give some addressing information. This may well take us into next month’s column.

“For those unaware of Australian geography, I’ll start with a few facts and figures. The continent has an area of almost 7.7 million square kilometres. To put this in perspective, it’s approximately the area of mainland USA. Australia has a total population of about 15 million people.

Western Australia has around a third of the total land area, but little more than a tenth of the population. The incredible scale of the State can be astonishing. In UK terms, Western Australia is almost ten times the total size of the British Isles!

What bearing have these Australian facts and figures on amateur radio you may ask. The answer is that the huge distances make linking packet networks a major hurdle.

The low population density means a similarly sparse amateur population and resource base. In spite of these hurdles, an efficient BBS and forwarding system has developed.

Perth and its suburbs contain most of Western Australia’s amateur population. Others spread out over six towns and the regional rural districts. The metropolitan area is served by three full function BBSs. These are supported by file server systems on three v.h.f. channels, although u.h.f. activity has limited support.

Four other BBS systems are located around the State near the main regional centres. The majority of BBS or forwarding systems are now running on FBB software. I gather that the compressed forwarding function proved most attractive. With the adoption of FBB the complimentary TPX software is receiving attention.

Until such time as more complex networks develop, I believe that some of the more feature packed systems available these days will find limited support. The TCP/IP has made some advances, but there is a sparsity of interest, due mainly to the greater complication of the package. However, after an extended ‘honeymoon’, I am definitely taken by this versatile system.

Interstate and international forwarding traffic relies heavily on h.f. In the past, there was the benefit of a free ride on a commercial link to New South Wales, now sadly defunct. This gave a gateway to Trans-Pacific forwarding, courtesy of the Internet system.

The wisdom of reliance on non amateur-controlled system links must be considered as short term only. Present links employ 14 and 21 MHz. Within the State, digipeaters carry forwarding to the south-west (with 7MHz back-up). Forwarding to the north of the State is carried out on h.f.

The northern link also provides forwarding, to and from the international networks via Indonesia and Taiwan. Some use has been made of the Fidonet system to reach areas where path or lack of facilities prohibit normal amateur channels.

Should anyone be in need of information on this ‘sun-blessed’ State, I will be happy to oblige, but please note that my knowledge of the States ‘over-East’ (thousands of kilometres away) is almost non-existent”.

**Packet Survival**

In order to help users to obtain the most from the packet BBS system, I’ve produced a book *Packet BBS Survival For The Beginner*. This book takes the beginner from absolute basics, to explanations of the complete command set. These commands include those from FBB-DOS, the Library, and most of the commonly installed servers.

The book is written to enable the newcomer to packet, to use the system with complete confidence. At present it has 70 A4 format, spiral bound pages, quite handy for the desk.

The price of £15 is inclusive of post and packing. This is basically non-profit making, for every one sold I shall be donating £1 to the Amsat Phase 3D fund.

I shall have more from ‘down under’ in next month’s column. Readers in VK, or any other land, please don’t be shy, send me some news of what is happening in your part of the world. Perhaps with a few pictures to show everyone else.

However, space has just run out again, so that’s it for this month. Even though you may be reading this in November, I’d like to wish you all a very Happy Christmas and a peaceful 1994. Remember, there are lots of good things in small packets!

As usual, news to G3LDI @ GB7LDI, OTHR or Tel: (0508) 70278.

73 and happy packeting de Roger, G3LDI.

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**Fig. 1:** Ian Wade G3NRW, caught with a copy of his book *Nosintro*.
BRITISH TRANSVERTERS
RN6/2/25 2.6 metre 25W output £229
RN16/2/25 2.6 metre 25W output £229
RN18/2/25 2.6 metre 25W output £238
Transverter prices include VAT and post & packing
R. N. Electronics
Arnolds Court
Arnolds Farm Lane, Mountnessing, Essex CM13 1UT.
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Practical Wireless, December 1993
Recent months have seen a marginal improvement in auroral activity on the v.h.f. bands. Levels in June and July, as expected, were very low with only four openings being recorded during the period.

In the following month, three events were observed on August 4, 18 and 27. The opening on August 16 which commenced around 1500UTC was probably the best of these.

Contacts on the 50MHz band were generally between G and GM. The stations of GMX091 (JO99) and GM6464/UP (IP90) both located on the Shetland Islands were much in demand.

It was a similar situation on the 144MHz band. But Andy Cook G4P11 (J002) did find ZS6EPF/J078 at 2200UTC operating in the c.w. end of the band.

Jim Williamson GM0FET (I087) literally saw the aurora. Jim observed it at 2200UTC, before going into the shack and firing up the 144MHz gear. On that band he runs a Yaesu FT-221 with a MuTek front-end board, a single 4CX250B amplifier and 17-element 9FT Yagi at 20m above ground.

Andy worked a total of seven countries including OH2BH and OH2T1 (both in KP20) and QY3JD (IP62). Most stations were worked on a beam-heading of 30°.

But at 0000UTC the aurora had moved to the west. Then Andy found that the Swedish beacon SK4MP1 (J022) has sent me the logs which I described in the February issue (also comes in very handy).

For example using the auroral calendar, one solar rotation (28 days) after the event on August 16 the recurrent solar coronal hole was facing the earth again. It therefore came as no surprise that an aurora might happen on September 13. Other indicators were also present to give forewarning of the event. On September 12 the h.f. bands were very disturbed as a minor Dellingen fade-out had occurred earlier in the day.

The aurora on September 13 started around 1900UTC. Although not very intense it waxed and waned through to 2200UTC.

During the September 13 event, contacts could be made on the 144MHz band with a number of stations in northern Europe. The pick of the bunch was UZ2FWA (K040FT) who was putting in a really strong c.w. signal around 1630UTC.

It's just a pity that more people don't read Morse. I can't emphasise enough that the real DX is always on c.w. Good DX can be encountered between November 15-19 peaking on Wednesday November 17 theoretically at 1030UTC. It rises in the sky at 2230UTC and sets at 1430UTC. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or west, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west.

The Geminids shower lasts from December 8-15 with the predicted maximum activity occurring at 1900UTC on Monday December 13. It rises at 0100UTC and sets at 1400UTC. Between 2200 to 0100UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0500UTC beam south-east or north-west.

The Bavarian Contest Club (BCC) have organised a contest to be held during the Geminid meteor shower. It commences at 0000UTC on December 10 and continues through to 2400UTC on December 14.

The Bavarian contest is a c.w. only event, with the aim of generating more activity on the random working frequencies. Full contest details may be obtained from me via packet radio @ GB7MAD or even via the postal system!

The 50MHz Band

Activity on the 50MHz band was very low, which is a real shame. It's almost like operators on this band don't recognise DX unless it's S9!

At least on the 144MHz band some people are prepared to dig down into the noise to find the DX. The use of the auroral calendar (which I described in the February issue) also comes in very handy.

Unlike sporadic meteors, the orbits of established meteor showers have paths which can be accurately calculated. The following information concerns the Leonid and Geminid showers which the earth will encounter in the next few weeks. It determines the best direction to beam at specific times and when the shower is below the horizon.

The Leonids meteor shower will be encountered between November 14-19 peaking on Monday November 16 theoretically at 0100UTC. It rises in the sky at 1930UTC and sets at 0130UTC. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or west, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west.

The Geminid shower lasts from December 8-15 with the predicted maximum activity occurring at 1900UTC on Monday December 13. It rises at 0100UTC and sets at 1400UTC. Between 0100 to 0300UTC on 2.200UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0500UTC beam south-east or north-west.

Fig. 1: A proposed transverter combination (see text).
was a small 2-element HB9CV beam.
The station of M Richardson G1YUN (L001) runs a Yaesu FT-736R into a 2-element Yagi. He has also been successful in recent months making many s.s.b. contacts throughout Europe including HB9CKZ, ISOS4Y, OY3JE and T7QDA.

Dave Akrill G0DJA (I093) was pleased to come back from his summer holiday to find the 50MHz band still in good shape. He can run up to 10W output, but prefers to run at a GRP level of 3W or so.

Some of the DX worked included G6LFL/TF/P and G4ODA/TF/P, both in locator IP8. The FT-221 transceiver (at 144MHz) and a muTek replacement front-end was agreed that in the usage of the amateur bands.

During September I was one of the RSGB delegation that attended the IARU Region 1 Conference in De Haan, Belgium. Many items were discussed concerning the protection of the amateur radio and amateur satellite service. In addition papers were put forward by national societies making various proposals regarding the usage of the amateur bands. I'll now deal with these changes in band order.

The conference agreed to an RSGB paper that the 144MHz sub-band should be discontinued and that the 144.000-144.035MHz be adopted. This is in fact a 10kHz increase to the existing usage part of the band plan. Another proposal that has not gained in popularity is the use of the 'letter' system for random s.s.b. meteor scatter operation. It was agreed that this procedure will be abandoned, but it will be retained for random c.w. operation.

As many operators still use the old m.s. calling frequency, therefore two segments for s.s.b. random m.s. operation have been introduced. They are 144.195-144.205MHz and 144.395-144.405MHz.

A request from the RSGB Repeater Management Group (RMG) regarding low power repeaters on the 430MHz band was agreed. A footnote will be added to the band plan acknowledging the use of channels R61 to R67 at a power of 10W e.r.p. on a non-interference basis.

Modifications were also made to the IARU Region 1 band plans regarding the 1.3, 2.3, 3.4, 5.0 and 10GHz bands. These and the changes just described can be found in the 1994 edition of the RSGB Amateur Radio Call Book.

That's the lot for this time. Keep writing to me, not forgetting the deadlines! Please send your letters to reach me by the end of the month.

Don't forget that I can also receive messages via packet radio @ GB7MAD or at my DX cluster GB7DXC. Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as QSL cards, awards, certificates etc. are also useful.
Peter Shore brings you some new winter broadcasting schedules as well as details of a new short wave receiver from Sangean.

Short wave radio did not have quite the same impact in the political upheaval in Russia a few weeks ago as it did during the coup attempt in the summer of 1991.

In 1991 President Gorbachev listened to the Voice of America and BBC World Service on short wave in the Crimea to try to establish what was going on back in Moscow. However, in 1993 President Yeltsin was the one in control in Moscow and it was the dissolved Parliament that was installed in the White House. The Deputies did, however, try to put over their point of view to the outside world using a very low powered amateur radio transmitter.

It seems that few heard the signals. And since most of the people on the streets seemed to have little interest in the whole affair, it was not terribly successful.

On Sunday 3 October, when fighting broke out between the Army units loyal to Yeltsin and the armed supporters of self-proclaimed President Khasbulatov, Radio Moscow World Service broadcast its normal range of programmes and the news contained only brief reports about the trouble flaring in Moscow city centre. How times have changed!

Boston Site To Close

The World Service of the Christian Science Monitor in Boston's transmitting site in Scotts Corner, Maine, the site used to launch the international station, is to be closed down.

An additional transmitter and antenna have been ordered for the transmitting complex at Cypress Creek, South Carolina. This will enable European and African audiences to continue to be reached from mainland US sites. The Scotts Corner facility will be put up for sale, I wonder who will buy it?

The beginning of October marked the end of an era when the Voice of Peace beamng programmes into the Middle East, closed. Run by Israeli Abie Nathan, the Voice of Peace has been on the air for more than a quarter of a century.

Many DJs on board were recruited in Britain. But now with a peace accord signed between the Israeli government and the Palestinian Liberation Organisation (PLO), and increasing costs in maintaining a ship that is over 50 years old, Nathan has decided to call it a day.

The fate of the ship is uncertain. It may be sunk in the Mediterranean, or perhaps turned into a peace monument somewhere in the region.

Winter Schedules And Reports

The Voice of Israel's winter schedule arrived with me at the time of the signing ceremony in Washington. English to Europe can be heard on 0500-0515 on 17.545, 9.435, 7.465MHz; 1100-1130 on 17.575, 15.65, 15.64MHz; 1400-1430 on 15.65, 15.64MHz (Sun-Thu); 1800-1815 on 11.675, 11.587, 7.465MHz; 2000-2030 on 17.575, 11.675, 11.603, 11.585, 9.435, 7.465MHz; 2230-2300 on 17.575, 11.675, 11.603, 11.585, 9.435, 7.465MHz.

The broadcasts at 0500, 1100 and 1800 are relays of the domestic Network A.

There have been reports in the press recently of increasing unrest in Cuba as the population finds it more difficult to make ends meet, with severe rationing of basic foodstuffs.

The Caribbean island state no longer has help from the former Communist countries of eastern Europe, and is struggling by itself, with sanctions in place in the United States preventing trade between the countries.

Cuba seems a perfect place for an uprising by the people and for that reason it could be worthwhile keeping an ear on Radio Havana Cuba. The station has English on the air at; 0000-0200 on 6.01 and 9.815 u.s.b.; 0200-0500 on 6.06, 6.18 and 13.66MHz; 0500-0700 on 9.51MHz; 2100-2200 on 17.60MHz; 2200-2300 on 6.18MHz.

Spanish can be heard at 2000 to Europe for two hours on 13.715 u.s.b., 17.765 and 17.655MHz.

Regular readers will recall that BBC World Service rents time on an Albanian medium wave transmitter to reach the Balkans. Now the Voice of America is doing the same.

Serbian programmes are transmitted at 1600 for half-an-hour on 1295kHz. In addition, a Romanian medium wave transmitter on 755kHz is used to reach the former Yugoslavia, according to Media Network on Radio Netherlands.

Croatian Radio is now heard on the new short wave channel of 13.64MHz. This is in addition to the existing frequencies of 5.92, 9.83 and 13.83MHz, all of which are 24 hour-a-day services.

The Lithuanian station, Radiocentras, is now on the air using 9.40MHz lower sideband, with a 5KW transmitter. The owners are offering to hire time on the transmitter to everyone from broadcasters to churches to DX clubs. To contact the station, you can write to PO Box 1752, Vilnius, Lithuania, or fax the station on +370 2 612800. Perhaps we should have PW on short wave from Lithuania?

If you tune your satellite receiver to transponder 22 on Astra 1-B (that is one of the MTV channels) and the audio subcarrier at 7.74MHz you can listen to National Public Radio's current affairs output, together with Radios Netherlands, Australyka, Finland, France International, Korea, Moscow and Canada.

World Radio Network is now on the air, relaying all radio stations from Astra 1-B, and one or two others, twenty-four hours a day. All programmes are in English, but the station has plans to introduce other language streams in the future. It means that you might never have to switch to a short wave receiver at home again!

New Sangean Receiver

Finally this month, I have details of a new short wave receiver from the Taiwanese Sangean company, badged for the German manufacturer, Siemens.

The Sangean ATS606 (Siemens call it the RK 759), has comprehensive short wave coverage as the a.m. band runs from 150kHz to 30MHz.

The ATS606 has been designed as a compact travel portable. It measures a little under 150mm wide by 90mm high and 30mm deep and weighs around 330g.

Frequencies can be keyed in directly on the numeric keypad and manual tuning is provided by UP and DOWN buttons. Additionally there are 18 frequencies of nine European broadcasters have been programmed into the total of 45 memories.

A novel device on the ATS606 is the Automatic Tuning System. This works on f.m. to store the strongest signals in a separate memory table, so that if you take the radio to a new area, you do not have to search laboriously for the local stations (which does take the fun out of it if you like DXing the f.m. band on your travels).

Overall, the ATS606 is a well-built receiver, and it seems to work well on short wave and it costs around £90 in Germany.

That's all for this month, don't forget to send your news and reports to me via the PW office.
Andy Emmerson G8PTH brings you his bi-monthly report on the ATV scene with a look into his mailbag.

The World of ATV

FOCAL POINT

Andy Emmerson G8PTH

I start this month with a welcome letter from Mike Edwards G8CPF. He signs himself Technical Dogsboddy for GB3UT.

Mike says “In response to your plea for updated info on the ‘secret’ repeaters, I am pleased to inform you that GB3UT (Bath) is also alive and well (!), having undergone major surgery and much tender loving care for many months, nay years!”

“It seems we are not quite alone in having to wrestle with the problems of an a.m. allocation (RMT 1276 MHz in, 1311 MHz out) with its ridiculous 35MHz split (lovely for an i.f., isn’t it?) and all the attendant problems of keeping TX out of RX. Please extend our sympathies to Keith G8HMG and company (GB3VI).

“We too are running about 6W, in a phased co-linear array from our 700ft a.s.l. site at Bath University (co-located with GB3UB and GB3UX), most contributors using GB3UB for talkback so as to avoid cluttering 144.750 MHz (in view of our proximity to the ‘Z’ country). GB3UT has two receivers, one for a.m. and one for f.m. – the a.m. one has gone a bit blind lately. Hoping that will be fixed soon.

Mike continues “The transmitter uses a Mitsubishi M57182 brick, amplified and modulated on its bias pin, with envelope negative feedback to improve linearity. In beacon mode it emits a sequence of eight test patterns from an EPROM-type card generator.

“Current work in hand is to implement multi-source switching, using a MAX456 eight-by-eight crosspoint switch (courtesy of Maxim Integrated Products), a frame store and to improve the intercarrier sound.

“Don’t forget if you are looking for either ‘UT or ‘VI we are amplitude modulated, which means your normal satellite receiver will probably clip the syncs unless you can fiddle the limiter. All you really need is a downconverter into the back of your domestic a.m. television, plus a good antenna. 72 from GB3UT.”

Good stuff, nice to hear from you, Mike!

News

Now for some news. I received a telephone call from William G8CMK, who has been working on the Mk III version of GB3VL, the Hastings repeater. William says it is an a.m. transmitter producing 10W peak sync power into a G3VLI Alford Slot antenna.

“This signal reaches Eastbourne very satisfactorily in colour. Apparently many users transmit into the repeater using f.m. for convenience, the repeater having twin a.m. and f.m. receivers. William’s current tour-de-force is a filter having just 1.6dBi insertion loss and 20MHz passband. The stopband is 80 or 90dB at 35MHz off and the filter is made of 15mm diameter copper pipe enclosed in printed circuit board material. The whole affair is two feet long.

Paul Godfrey G8JBD in Lowestoft, Suffolk, has also written to me to say “Just a few lines to update you and your readers with the progress of GB3LO, the Lowestoft 24cm ATV repeater. Paul writes “Our repeater builder Ray G4RKP has been busy improving the box in stages, it now runs the full output power of 26W ERP (courtesy of a Mitsubishi brick p.a.) from an Alford Slot. This has greatly improved the coverage in the North and South directions over the original set-up of bow tie aerials that only favoured the westward direction.

“Lowestoft is the most easterly town in the UK and therefore to see the repeater’s potential to the east needed a lift in conditions to get signals across the North Sea.

“On the 30th June 1993 a local GSO between Dick G4RPR in Norwich, Mike G4PG in Harleston and Tony G4AXN near Norwich had a breaker on frequency. Walt ON5NY in Passendale who was P5 into the box. Between breaks in transmission the PE1LRS call sign appeared and Walt tried to call him via LO but did not make contact.

“After working our local trio Walt then worked via LO Tony G4JAM at Lingwood near Norwich. Later that evening Ray G4RKP in Lowestoft did work PE1LRS who reported that he could see Ray’s signals via the box and direct.

Paul says “I have taken some photos of a video tape made by G4RKP of some of the events of that evening with the hope that these may be of interest. Thanks for all your columns that appear in the various mags, I feel this really helps to keep interest in ATV alive.” Thanks for that Paul and for your comments on my columns.

More Thanks

Thanks also to the Severnside, Kent and Birmingham ATV Repeater Groups for their newsletters. We’ll probably dip into these next time if there’s room. Also by then I hope to hear that

Here’s an off-screen shot of PE1LRS working through GB3LO, the amateur television repeater in Lowestoft. It looks as if he is using a light pen for the main caption or more likely he wrote it on card with a felt pen and used his camcorder’s frametore to key the saved image into the main picture.

Photograph by Paul Godfrey G8JBD in Lowestoft.

the Birmingham group have been successful in their

Well Developed Repeaters

Britain is not the only country with a well-developed TV repeater system. Jonathan Gudgeon G4JMU was a keen ATVer until he left these shores to work in Vienna.

John kindly sent me a map and frequency allocation sheet of repeaters in Austria, which shows no less than nine AN repeaters there. Kris Partridge G8AUU (he used to publish the European VHF/UHF Repeater Guide with Julian Baldwin) has extracted nine pages showing frequencies and locations of ATV repeaters in Denmark, France, Germany, Luxembourg, the Netherlands and Switzerland. If anyone wants photocopies, I’ll be happy to oblige (11 pages at 10p = £1.10 plus 24p postage).

Again space as caught up with me so until next time we’ll keep sending your news and views to 71 Falcutt Way, Northampton NN2 8PH.

END
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To accompany our ‘Workshop Special’ issue we’ve come up with some interesting and very useful tools for your workbench. All items have been selected and tried by Rob Mannion G3XFD, Editor of PW.

The SL-1000 Portable Gas Powered Soldering Iron. To start with, have you ever been stuck when needing to solder away from a mains electricity or 12V battery source? I have, and I have found the portable Pencil Gas Soldering Iron ideal for those emergency jobs, or even when you’re near a mains supply but don’t have the larger iron. This neat little soldering iron measures 20 x 145mm with its soldering tip in place, and a little less with the supplied blow-torch head. Working as a soldering iron, once it’s lit, the catalytic burner takes over and the flame disappears. You can then adjust the iron up to a maximum equivalent heat rating of approximately 60W. It’s ideal for outdoor antenna jobs, and you can see just how much gas is left. Refilling, from an easily obtained lighter fuel dispenser takes only a few seconds. I was most impressed, and needless to say, there’s one in my toolbox now! Tool Club price £14.45 inc. P&P and VAT.

Five Piece Mini Pliers And Cutter Set. This neat set of 105mm long tools is of good quality, well finished steel with the essential (for small hand tools) sprung-loaded action. All items are extremely useful, but I found the angled pliers and end cutters particularly good. The set is well made and fitted with a comfortable, good quality handle insulation made from resilient plastics. Tool Club price £10 inc. P&P and VAT.

The Helping Hand. Everyone can do with an extra ‘helping hand’ in the workshop. The type we’ve come up with has a built-in magnifying glass. It can save you many wasted minutes trying to solder and hold awkward small components and will be useful on any workbench. Tool Club price £10.75 inc. P&P and VAT.

Adjustable Automatic Centre Punch. The automatic one-hand operated ‘centre popper’ can save you much frustration and time. By placing, and then gently pushing the barrel you can use this handy 120mm long punch to make a good centre point for drilling metal and I also use mine when I’m marking out metalwork and p.c.b. material. Tool Club price £7.45 inc. P&P and VAT.

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5: Only one problem per letter please.

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Limited stocks of many issues of PW for past years are available at £2.00 each including post and packing. If the issue you want is not available, we can photocopy a specific article at a cost of 85p per article or part of article. Over the years, PW has reviewed many items of radio related equipment. A list of all the available reviews and their cost can be obtained from the Editorial Offices at Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW for a stamped self-addressed envelope.

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Components for PW projects are usually readily available from component suppliers. For unusual or specialised components, a source or sources will be quoted.
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Bargain Basement December 1993

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**ADVERTISERS INDEX**

<table>
<thead>
<tr>
<th>Advertiser</th>
<th>Issue</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3TH</td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>AH Supplies</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>AKD</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>AOR</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Breddhurst Electronics</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>British Wireless for the Blind</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>C M Howes</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Castle Electronics</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Characteristics</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Chevet Books</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Cirkit</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Colomor</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Datong</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Eastern Comms</td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>Electrovalue</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>G3RCP</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Haydon Comms</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Hesing Technology</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Icom</td>
<td></td>
<td>Cover iii</td>
</tr>
<tr>
<td>J Birckett</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Jaytee Electronics</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Kenwood</td>
<td></td>
<td>Cover ii</td>
</tr>
<tr>
<td>Lake Electronics</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Langrex Supplies</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Leeds ARS</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Link Electronics</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Maplin</td>
<td></td>
<td>Cover iv</td>
</tr>
<tr>
<td>Martyn Lynch</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Nevada Comms</td>
<td></td>
<td>18, 19</td>
</tr>
<tr>
<td>Northwest Radio</td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>RAS Nottingham</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Reg Ward</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>RN Electronics</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>RSGB</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>SRP Trading</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Suredata</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Telford Electronics</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>Tennamast</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>The Shortwave Centre</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>Waters &amp; Stanton</td>
<td></td>
<td>4, 5</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Board</th>
<th>Article (Project) Title</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR315</td>
<td>PW Bourbon 3.5MHz TX</td>
<td>Aug 93</td>
</tr>
<tr>
<td>WR314</td>
<td>UHF Pre-Ampifier</td>
<td>Feb 92</td>
</tr>
<tr>
<td>WR313</td>
<td>10MHz Transmitter</td>
<td>Feb 92</td>
</tr>
<tr>
<td>WR312</td>
<td>Receive/ Mixer (Getting Started)</td>
<td>Feb 92</td>
</tr>
<tr>
<td>WR311</td>
<td>Oscillator BD (Getting Started)</td>
<td>Jan 91</td>
</tr>
<tr>
<td>WR310</td>
<td>1.2GHz Pre-scaler</td>
<td>Apr 92</td>
</tr>
<tr>
<td>WR309</td>
<td>Volt Reg/Divide by 100</td>
<td>Apr 92</td>
</tr>
<tr>
<td>WR308</td>
<td>TTL 1MHz Oscillator (Getting Started)</td>
<td>Jul 92</td>
</tr>
<tr>
<td>WR307</td>
<td>Crystal Checkcr (Getting Started)</td>
<td>June 92</td>
</tr>
<tr>
<td>SET</td>
<td>WR303/304/305/306</td>
<td>Jun 91</td>
</tr>
<tr>
<td>W302</td>
<td>G00 (Getting Started)</td>
<td>Aug 92</td>
</tr>
<tr>
<td>W301</td>
<td>Challenger Receiver</td>
<td>Feb 92</td>
</tr>
<tr>
<td>W300a</td>
<td>OSCAMP Oscillator</td>
<td>Mar 92</td>
</tr>
<tr>
<td>W300</td>
<td>OSCAMP Amplifier</td>
<td>Feb 92</td>
</tr>
<tr>
<td>W399</td>
<td>Multivibrator (Getting Started)</td>
<td>Jan 91</td>
</tr>
<tr>
<td>W272/278</td>
<td>Additional Beaver boards</td>
<td>Oct 91</td>
</tr>
<tr>
<td>SET</td>
<td>WR260/261/262/263 Chatterbox</td>
<td>Aug 91</td>
</tr>
<tr>
<td>SET</td>
<td>WR260/261/262/263 Chatterbox</td>
<td>Aug 91</td>
</tr>
<tr>
<td>W289</td>
<td>WR276/277/278/279 Chatterbox</td>
<td>Jul 91</td>
</tr>
<tr>
<td>W288</td>
<td>Morse Master</td>
<td>Jun 91</td>
</tr>
</tbody>
</table>

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86 Practical Wireless, December 1993
The picture below shows the IC-P2E 144MHz FM transceiver, typical of ICOM's new wave of handhelds, the IC-P2ET has extended functions and is keypad operated. Both of these compact radios have Al (Artificial Intelligence) a unique feature that allows instant access to previous functions. The IC-P2E and P2ET will evaluate your operating capability and memorize the order of functions used. Other features include; 100 memory channels, programmable call channel, ergonomic design, system clock with timer and lots more.

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The IC-W21 ET has the same dual-band performance characteristics as the IC-W21E but sports a command keypad and relocated back-lit display (manual operation is also available). Features are as the IC-W21E and include; battery capacity indicator, remote control via an optional HM-75 speaker mic, 70 channels, dial select steps, monitor function, high-speed scan functions, frequency-lock function, external DC power jack for mobile use, auto power-down to allow last minute operation before battery fades, giving you the most from your IC-W21ET.

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Cover photograph shows the final alignment of MVT8000 scanners in Yupiteru’s factory in Okazaki City, Japan

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WELCOME

Once again it's the time of year for another issue of What Scanner. This issue is being given away, free, with both Short Wave Magazine and Practical Wireless, so reaching an even wider audience than in previous years.

Scanning has grown in popularity over the last year or so, probably as a result of the 'scandals' that have been widely covered by the press - tabloid or otherwise. However, the widely predicted clampdown by the authorities has not happened - in fact it now seems to have receded somewhat.

I hope that you enjoy reading this issue of What Scanner. If you received your copy with Short Wave Magazine you do not need me to tell you that SWM is essential reading for scanning enthusiasts. If, however, you are a Practical Wireless reader and this is your introduction to the world of listening, may I be so bold as to suggest that you might find Short Wave Magazine worth looking at.

Dick Ganderton

CONTENTS

1 VHF Utility Listening
   Tim Anderson

7 Netset Pro-46 Review
   Mike Richards

8 AOR 1500EX Review
   Donna Vincent

12 Visiting Yupiteru On Their Own Ground
   Mike Devereaux

13 Have Scanner, Will Travel
   Andrew Linney

15 What Scanner
   Compiled by Elaine Richards

WHAT SCANNER

VHF UTILITY LISTENING

Perhaps the most succinct definition of utility listening would be to say that it is listening to signals other than broadcast and amateur stations. Often listeners will specialise in a particular mode or type of station for their utility listening, some will use only RTTY and decode News Agency broadcasts, others prefer FAX and receiving weather data, some will just listen to the various military/aviation bands spread across h.f. following movements of planes right across the Atlantic. In short, there are hundreds of different types of signals out there to be copied.

Most utility listeners, except perhaps for aviation enthusiasts and satellite fans, would be using frequencies between 30kHz and 30MHz for their signal chasing, but as I have found, utility listening need not stop there.

Throughout much of the world, low v.h.f. (30-50MHz approximately) is used for many interesting services such as power utilities, military, telephones, fire services, police, forestry services, railways and many others. Given that v.h.f. propagation is generally line of sight, you may be forgiven for thinking that there is not much chance of receiving any of these services from overseas and whilst it is true that you won't hear things everyday in this part of the spectrum, there are many days when European and even world-wide reception is possible. Equipment to receive all of these signals is not hard to find, any scanner that covers low v.h.f. will do.

IT ALL STARTED WITH 50MHz

I have owned a scanner of one sort or another for nine years now and I used them mostly for TVDX as an 'early warning' monitor to keep track of how many TV channels were active during openings. I didn't really become aware of all the world-wide DX that could be heard on v.h.f. until I became interested in the 50MHz amateur band.

Many amateurs who use the 50MHz band monitor the 'World-wide 6m Information and Talk Back Net' on 28.885MHz to keep abreast of the openings and the DX. I heard several amateurs on this net swapping frequencies of STLs (Studio to Transmitter Links) in various exotic locations. These STLs are used in the same way as the amateur beacons to indicate the direction of any possible openings and also to monitor the rise of the m.u.f. (maximum usable frequency). Many amateurs also had lists of the exact offsets of many world-wide E2 and R1 TV transmitters,
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What Scanner 1993
What Scanner 1993

RC-135V 64-14844 of the 55th Wing at RAF Mildenhall during late April '93. It flew as 'Bama 15' on 3rd May to Bosnia to oversee that nights food-drops. The 'OF' tail-code signifies Offutt AFB in Nebraska, USA where the 55th Wing is based.

48.25 & 49.75MHz nominal vision frequencies, for the same reason.

I took note of a few of the frequencies that were mentioned and entered them into the scanner memories. The first STL I heard was in Columbia, South America. Very pleased with this DX, I started to scan between 30 and 50MHz and was surprised how many signals I could hear from the USA and Central America.

How could I hear all this DX at these frequencies? Quite simply because of the sun spot cycle being near its peak. There have been many other articles in many radio magazines explaining the vagaries of our sun and its eleven-year sun spot cycle, so I don't intend to go into a full explanation here. Suffice it is to say that for two to three years either side of the sun spot cycle peak the F2 layer of the ionosphere becomes more highly ionised and generally speaking the higher the ionisation, the higher the Maximum Useable Frequency or m.u.f.

Over the past four winters, m.u.f.s have climbed to 51MHz or more, often for a week or more at a time, allowing reception of many world-wide utility signals on v.h.f. Depending on how quickly this cycle declines we may still have one or two winters of F2 propagation on v.h.f. Of course, all the other more familiar v.h.f. propagation modes will produce DX reception of some sort on the low v.h.f. bands.

Summertime Sporadic E, or Es, often brings in signal from much of Europe and occasionally North Africa and the Middle East. Tropospheric reception does occur on low v.h.f. but generally it is not as intense as high v.h.f., 144MHz for example, although I have received trop signals from France and Germany on low v.h.f.

**MYSTERY SIGNALS**

Some of the signal received are a real mystery due to the language problem, but with a little patience and detective work you can often locate the source of the signals. Radio procedure seems to be much the same the world over, listening to a radio net one morning in a totally incomprehensible (at least to me) language, I noted that all the stations were called by a name, rather than a number. Some of these names seemed vaguely familiar and given the time of day, the signals were more than likely coming from the Near of Middle East, so I made some notes, phonetically, of all the names and looked them up in the atlas. Many of these names correspond to town names like Turkey. For most listeners in the UK, signals from the USA and Canada will be the most interesting as they use English, or at least a form of it!

Many police services in the USA have channels on low v.h.f. and plenty of these channels are simplex. Once the m.u.f. is high enough and the propagation in the right direction, sections of the low v.h.f. spectrum can be crammed with police communications. Not just the base stations either, I have often heard the mobiles and on one occasion a policeman in New York involved in a chase could be heard, panting, into his hand-held! Knowing the locations of these police signals makes listening even more exciting. It takes a little bit of patience as obviously no one is going to announce their location on every communication, but the controllers often direct cars to addresses that indicate the area of a city, like the Bronx, in New York. As controllers or dispatchers as they are known over the water, often direct cars in 'hot pursuit' by road or highway numbers, it is useful to have an American atlas handy. Mine is the Bartholomew Road Atlas America, which includes Canada, the USA and Mexico along with major city maps that I bought from WH Smith. Using this I have twice followed car chases in New York state and Washington DC on the map.

Other signals from the Americans, heard by me or other UK scanning enthusiasts, include power utility controllers sending linemen, 'To an overhead cable break that had been made by squirrels chewing through the cable, again', port workers involved in docking ships, ambulance dispatchers, railway track repairmen and outside broadcast links for TV news. Yet more signals from around the world include a police net in Pakistan, American workers in the Gulf who sounded as though they were involved in the operations to cap all the burning oil wells in Kuwait, military communictions from the USSR (as it were then), STLs from many countries and once, US forces somewhere in the Pacific.

**DIFFERENT SIGNALS**

Another type of signal often heard on low v.h.f. when conditions are right is harmonics from h.f. broadcast and utility. Many h.f. broadcasters use very high power transmitters, often hundreds or even thousand kilowatts, and while most h.f. broadcasters take great care to keep harmonic radiation from their transmitters to a minimum, some power is still radiated as harmonics. These harmonics could be in tens or hundreds of watts range and easily propagated around the world when conditions are right.

Tracing the source of these signals is easy with a short wave receiver and a book such as the World Radio TV Handbook. Take note of the frequency of the monitored harmonic and start dividing - divide by two and check the resulting possible, fundamental frequency on the h.f. receiver, no luck? Divide by three and check again and so on until you find the real fundamental, check what service it is and refer to your WRTH and you will have the source of your signal. Many of the harmonics heard will be of broadcast stations but some will be from utility stations such as the Egyptian SUK16 c.w. station I heard on 34.38MHz, see Table 1. It would be interesting to see whom could hear the highest multiple, 5th, 6th, 7th?

Equipment and antennas for this sort of reception need not be sophisticated. My present scanner is the Realistic PRO-2005. Multi-element beams for low v.h.f. are nice if you have the room for them and a deep pocket! All reception on the scanner,
WHAT SCANNER

including Australian TV video carriers, has been with loft mounted dipoles cut for 40 and 50 MHz. To help you on your low v.h.f. in the USA.

Table 1 - a selection of frequencies from my own database and Table 2 - band plan for low v.h.f. in the USA.

<table>
<thead>
<tr>
<th>Freq (MHz)</th>
<th>Mode</th>
<th>Service</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.000</td>
<td>FM</td>
<td>US Military Link</td>
<td>Europe</td>
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<td>30.040</td>
<td>FM</td>
<td>Travellers</td>
<td>Canada</td>
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<td>30.055</td>
<td>FM</td>
<td>Radiophones</td>
<td>Barbados</td>
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<td>30.125</td>
<td>FM</td>
<td>Power plant</td>
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<td>30.160</td>
<td>FM</td>
<td>Mobile phone</td>
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<td>30.475</td>
<td>FM</td>
<td>Security Service</td>
<td>El Salvador</td>
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<td>30.700</td>
<td>FM</td>
<td>Ocean drilling</td>
<td>Gulf of Mexico</td>
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<td>31.090</td>
<td>FM</td>
<td>Jamaic bus depot</td>
<td>New York, USA</td>
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<td>31.250</td>
<td>FM</td>
<td>Radio pager CHV</td>
<td>Uruguay</td>
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<td>31.400</td>
<td>FM</td>
<td>?</td>
<td>Scandnavia</td>
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<td>31.600</td>
<td>FM</td>
<td>OB link</td>
<td>Ontario, USA</td>
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<td>32.200</td>
<td>FM</td>
<td>Military</td>
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<td>32.200</td>
<td>FM</td>
<td>Repeater</td>
<td>Iraq</td>
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<td>32.670</td>
<td>FM</td>
<td>VIP Taxi service, call WARD15</td>
<td>Washington DC, USA</td>
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<td>33.160</td>
<td>FM</td>
<td>Guam cable TV Repeater</td>
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<td>33.350</td>
<td>FM</td>
<td>Collective farms</td>
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<td>33.400</td>
<td>FM</td>
<td>UN Forces</td>
<td>Cyprus</td>
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<td>33.500</td>
<td>FM</td>
<td>Trouble Fire dept.</td>
<td>New England, USA</td>
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<td>33.570</td>
<td>SSB</td>
<td>Scrambled</td>
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<td>34.380</td>
<td>CW</td>
<td>Harmonic of SUK16 on 17.199 MHz</td>
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<td>34.790</td>
<td>FM</td>
<td>Autohahn assistance</td>
<td>Germany</td>
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<td>FM</td>
<td>Statue of Liberty, call KID703</td>
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<td>Radio Llamada paging, call 2T2292</td>
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<td>35.840</td>
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<td>US Forces</td>
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<td>37.180</td>
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<td>37.860</td>
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<td>38.650</td>
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<td>38.750</td>
<td>FM</td>
<td>Power plant</td>
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<td>38.460</td>
<td>FM</td>
<td>Highway Patrol</td>
<td>Kansas, USA</td>
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<td>FM</td>
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<td>FM</td>
<td>WNBC TV OB Link</td>
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<td>S. Carolina, USA</td>
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<td>FM</td>
<td>Fire dept.</td>
<td>Colon, Panama</td>
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<td>43.920</td>
<td>FM</td>
<td>Meteor scatter system for Transatlant</td>
<td>Manon, USA</td>
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<tr>
<td>44.040</td>
<td>FM</td>
<td>Telephones</td>
<td>Italy</td>
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<tr>
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<td>FM</td>
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<td>Japan</td>
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<td>Baltimore, USA</td>
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<td>Japan</td>
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</tbody>
</table>

RCMA Journal, the magazine of the Radio Communications Monitoring Association. Address RCMA Inc., PO Box 542, Silverado, CA 92676, USA. Subscriptions for Europe are £28 surface mail and £54 airmail. Another excellent magazine with many columns including one on v.h.f. DXing.

Betty Bearcat Frequency Directory. This was published in two volumes covering the Western & Eastern half of the USA. The series has now been expanded to cover the USA in 12-16 volumes. These directories list thousands of USA frequencies in geographical and frequency order and cost $14.95 each in the USA. The only address I have is Uniden Parts Dept., 9340 Castlegate Drive, Indianapolis, IN 46256, USA (although it might be worth trying Uniden UK as a source).

Of course, don’t forget our own Short Wave Magazine!

USEFUL PUBLICATIONS

Monitoring Times (ISSN 0889 5341) published in the USA by Grove Enterprises, PO Box 98, 140 Dog Branch Road, Brassontown, NC 28902-0098, USA. Subscription rate $28.50 US Funds outside the USA. Covers everything from v.l.f. to Satellite TV including a comprehensive scanning column.

Table 2 - band plan for 40 and 50 MHz.

<table>
<thead>
<tr>
<th>Freq To Freq (MHz)</th>
<th>Services</th>
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<tbody>
<tr>
<td>30.580-30.640</td>
<td>Industrial</td>
</tr>
<tr>
<td>30.680-30.640</td>
<td>Forestry &amp; business</td>
</tr>
<tr>
<td>30.700-33.380</td>
<td>Petroleum utilities</td>
</tr>
<tr>
<td>31.260-31.980</td>
<td>Industrial &amp; forestry conservation</td>
</tr>
<tr>
<td>33.440-33.980</td>
<td>Fire departments</td>
</tr>
<tr>
<td>35.040-35.980</td>
<td>Industrial, business &amp; telephone maintenance</td>
</tr>
<tr>
<td>37.040-37.400</td>
<td>Local police</td>
</tr>
<tr>
<td>37.100</td>
<td>Fire departments</td>
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<tr>
<td>37.160-37.250</td>
<td>Local government &amp; police</td>
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<tr>
<td>37.460-37.860</td>
<td>Power utilities</td>
</tr>
<tr>
<td>37.920-37.960</td>
<td>Highway maintenance</td>
</tr>
<tr>
<td>39.020-39.960</td>
<td>Local police</td>
</tr>
<tr>
<td>39.100-39.980</td>
<td>Local government &amp; police</td>
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<td>42.280</td>
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<td>42.960-43.180</td>
<td>Industrial &amp; business</td>
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<tr>
<td>43.700-44.600</td>
<td>Trucking</td>
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<tr>
<td>44.620-45.060</td>
<td>State police &amp; forestry conservation</td>
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<td>45.640-45.040</td>
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<td>45.100-45.660</td>
<td>Local police</td>
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<tr>
<td>45.680-45.840</td>
<td>Highway maintenance</td>
</tr>
<tr>
<td>45.700-46.020</td>
<td>Local police, highway maint &amp; special emergency</td>
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<td>45.880-46.500</td>
<td>Fire departments</td>
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<tr>
<td>46.520-46.580</td>
<td>Local government</td>
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<td>46.800-47.000</td>
<td>Government</td>
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<tr>
<td>47.020-47.400</td>
<td>Highway maintenance</td>
</tr>
<tr>
<td>47.440-47.680</td>
<td>Industrial</td>
</tr>
<tr>
<td>47.700-48.540</td>
<td>Power utilities</td>
</tr>
<tr>
<td>49.520-49.580</td>
<td>Industrial</td>
</tr>
</tbody>
</table>

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What Scanner 1993
AR1500EX - The very compact AR1500EX hand-held wide range receiver offers all mode reception including SSB as standard. Newly designed printed circuit boards have been incorporated to ensure this new version offers the very best performance. Frequency range is 500 kHz - 1300 MHz without gaps (reduced sensitivity below approx 2MHz - all modes), all mode reception AM, FM(N), FM(CW) & SSB (USB, LSB & CW - with BFO). The AR1500EX offers full coverage of the VHF, UHF and Shortwave Airbands plus Broadcast, Amateur band, Utility services etc. Many accessories included: Nicad pack, Charger, Dry battery pack, DC lead, Soft case, Belt hook, DA900 VHF-UHF aerial, SW-wire aerial, Earphone, Comprehensive Operating manual... Suggested Retail Price of £349.00 inc VAT. (UK Carriage free)

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AORSC is a powerful program for the IBM PC (and 100% compatible) computer, which allows you to control an AOR scanning receiver using a serial port (RS-232 interface) of the computer. Many facilities are offered to provide you with a high performance radio monitoring system. The software is priced at £75.00 plus £2.00 P&P. AORSC is supplied on both 3.5 & 5.25 inch media for installation onto a hard drive. A DEMO disk (without RS232 support) is available on a 3.5 inch disk for installation onto a hard drive. Price is £3.00 "Nearly New" software soon to be released **

ACEPAC3A For those with a larger budget, ACEPAC3A is also available for the AR3000A & AR3000 receivers. Installation is recommended on a hard drive but can be run from 3.5 or 5.25 inch floppy's depending on machine compatibility. Features are similar to AORSC but ACEPAC3A has a more versatile spectrum graph type display. A descriptive leaflet is available to request. Suggested Retail Price £139.00 plus £2.00 P&P

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**MODEL DESCRIPTION**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
<th>Suggested Retail Price</th>
<th>&quot;Nearly New&quot; Saving Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR800A</td>
<td>The ultimate! Unique all modes extremely wide band ham-mail receiver. Coverage is from 100 kHz - 2036 MHz with no gaps.</td>
<td>£949.00</td>
<td>£799.00</td>
</tr>
<tr>
<td>AR800B</td>
<td>Compact all mode hand-held receiver. Receiver coverage 500 kHz - 1300 MHz. AM/NFM/WFM &amp; SSB using BFO. Enhanced model.</td>
<td>£349.00</td>
<td>£299.00</td>
</tr>
<tr>
<td>AR2000</td>
<td>Compact all mode hand-held receiver. Receiver coverage 500 kHz - 1300 MHz. AM/NFM/WFM &amp; SSB using BFO. Latest model.</td>
<td>£309.00</td>
<td>£270.00</td>
</tr>
<tr>
<td>AR2100</td>
<td>Hand-held receiver 500 kHz - 1300 MHz without gaps. AM/NFM/WFM.</td>
<td>£309.00</td>
<td>£270.00</td>
</tr>
<tr>
<td>AR2800</td>
<td>Compact all mode hand-held receiver. Receiver coverage 500 kHz - 1300 MHz. AM/NFM/WFM &amp; SSB using BFO. Coverage is 200 kHz - 600 MHz &amp; BFO - 1300 MHz. Includes internal NiCad battery.</td>
<td>£349.00</td>
<td>£375.00</td>
</tr>
</tbody>
</table>

"Nearly New" equipment is truly supplied as -new and is not the result of worn out used equipment through trade-in deals etc. Offer only available directly from AOR UK and is subject to availability. Please phone or send a large S.A.E. for full details of New and "Nearly New" equipment. There are many models in the range.

Many other receivers and products are available from the AOR range. Please phone or send a large S.A.E. (34p) for full details. Dealers throughout Europe.... fast mail order available for direct orders.

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73 from Dave G4KQH, Technical Manager.
The PRO-46 is a very smart, wide range, portable a.m.f.m. scanner that’s ideally suited to a host of different monitoring requirements. From basic airband through to ‘DianaGate’ fans, the PRO-46’s coverage is well planned. Powered by internal batteries and supplied with a neat 'rubber duck' antenna, it easily slips into a coat pocket. In addition to selective coverage from 66MHz through to 956MHz, the PRO-46 features automatic a.m. and f.m. switching. All this combined with the one hundred memory channels makes the PRO-46 an attractive receiver.

STARTING OUT

To help the operator get the best from the receiver it was supplied with a 27 page operating manual. This was well laid-out with good use of calculator style charts to lead the operator through the various key sequences. There was the usual trouble shooting section for when the thing just lies there beeping at you! The manual also listed the known 'birdies' or spurious signals. Knowing these can save a lot of frustration trying to identify bogus signals. It was interesting to note that there were just seven such 'birdies' quoted for the PRO-46.

General handling of the PRO-46 was very straightforward and required minimal use of the manual. The liquid crystal display featured all the important information and could be back-lit at the press of a button. This backlight remained on for around fifteen seconds before automatically turning off, which saves unnecessary battery drain. For those that want to use the PRO-46 as a base station, or maybe even mobile, there was provision to use an external power supply. The requirements were a very modest 9V d.c. at around 200mA, which could be supplied from a mains unit or a car battery adaptor. The only odd point about this was that it used a smaller than normal coaxial power socket.

The antenna connection was also well thought out with a good quality BNC socket on the top panel. This could be used either for the supplied 'rubber duck' or for an external antenna. If you use a good external antenna, it’s as well to have some form of attenuation available. This is because the wide open front end of the PRO-46 can be prone to overload from strong local signals. However, in my experience, a little attenuation goes a long way to minimising the problem.

SCANNING AROUND

The main operating mode for this receiver is scanning, where it sequentially checks each memory channel for activity. The check, in this case, being for any signal that exceeds the manually set squelch threshold. The scanning rate appeared to be very rapid and was quoted at fourteen channels per second. Although the PRO-46 has a hundred memories, these were conveniently divided into ten banks of ten memories. This makes recall of the memory channels somewhat easier for the operator. You can use this system to group the memories according to the type of signal. As an example, an airband enthusiast could put all the local airport frequencies into one bank, whilst company frequencies may kept in another.

Selection of the appropriate banks to be included in the scan is done during scanning. Each of the numbered keys on the keypad has a memory range printed above it. All you do is press the appropriate memory band key to toggle it in or out of the scan, as appropriate. There is no limit to the number of banks that can be excluded or included. For further refinement of the scan, you could also lock-out individual memories.

When the PRO-46 detects a signal, the scan will pause for as long as the signal exceeds the squelch threshold. When the signals end, the scan immediately re-starts. In order to cope with the gap between ‘overs’ in a simplex radio link, you can add a two second delay to any memory. This, fairly obviously, causes the scan to pause for two seconds after the signals disappears and is adequate to cope with most radio links. If you want to hold a memory for longer you just have to press MANUAL or turn the squelch control to minimum.

If you have a particularly important frequency you want to keep an eye on, you can use the PRIORITY feature. This provides automatic monitoring of memory one every two seconds. This happens regardless of the main mode selected. Needless to say, programming the PRO-46’s memories was very simple.

COMPREHENSIVE SEARCH

Of course, having lots of scanner memories is all very well if you know all the local interesting frequencies. For us lesser mortals, the 'hot' frequencies first have to be found. Although you can use a scanning guide or Alan Gardner’s ‘Scanning’ column to get started, you will need to do some of your own searching. The PRO-46 is well set-up in this area and has a couple of interesting features to help find those elusive frequencies. The first is the LIMIT search mode. This enables the operator to start an intensive search between any two frequencies. The receiver automatically selects the appropriate mode and frequency steps. Once started, the PRO-46 continually sweeps between the upper and lower limits of the search, stopping only on signals that exceed the squelch threshold. The search speed of this mode was very fast with a claimed speed of nineteen steps per second.

As with the scanning mode, you can introduce a two second delay once a signal has been detected. To save you having to write down each useful frequency, the PRO-46 features a set of ten MONITOR memories. When the search stops on a signal, the number of the next available MONITOR memory will flash in the display. A single press of the MONITOR button then transfers the current frequency into that MONITOR memory. Once this search has finished, you can then review the MONITOR memories and transfer any interesting frequencies into the main memory system.

In addition to this LIMIT search, you could start a search from any of the main memory channels. This is done by pressing the UP or DOWN buttons whilst the required memory is selected. As this...

CONTINUED ON PAGE 9
As a relative newcomer to the world of short wave listening and scanning and someone who has just started, Radio Amateurs Course, Donna Vincent was a little apprehensive when asked to review the AOR-1500EX. But here's how she got on.

The AOR-1500EX is a hand-held, wide-range, monitor, featuring s.s.b. as standard, together with a.m., n.f.m. and w.f.m. modes. The 1500EX has a total of 1000 memories arranged in ten banks of 100 memories as well as an automatic memory feature to enable automatic storage of busy channels.

It comes complete with a single wide-band whip antenna, for v.h.f.u.h.f., an a.c. charger, internal NiCad rechargeable battery pack, dry battery case, 12V d.c. lead and a short wave wire antenna for use when receiving short wave broadcasts. There's also a soft carry case, belt hook, earphone and operating manual. You do have to supply your own plug for the charger.

FIRST IMPRESSIONS

My first impression of the AOR-1500EX (incidentally the EX stands for enhanced model for the UK market), was its solid, robust but reasonably compact size.

The controls and functions are divided between the top and front panels: the top panel houses the VOL & PWR (volume and power) combined switch, SQL & BFO (squetch and b.f.o.), DIAL, rotary tuning control, LOCAL/DX attenuator switch, KEY LOCK and BFO switches, together with the EAR (earphone) and ANT (antenna input socket).

The b.f.o. only functions when the receiver is in a.m. mode when the BFO switch is depressed and is used in conjunction with s.s.b. transmissions.

The front panel consists of a grid of 0-9 push-buttons as well as an ENTER and a dual purpose ° and CLEAR button. The other thirteen buttons are used for things such as changing modes, locking out certain frequencies, determining STEP size in multiples of 5kHz and programming. Also on the front panel are the SEARCH and SCAN buttons along with a rather useful LIGHT button which, when pressed, activates a light behind the i.c.d.

I found this function especially useful when operating in bad light conditions.

The 1500EX has nine pre-programmed search banks covering all modes, upper and lower frequency limits. These are factory defaults, although it is possible to re-program these banks anywhere within the coverage range of 500kHz - 1300MHz.

The searching facility I found that, as a newcomer, the ability of being able to search through each of the banks very useful, although it does take rather a long time! When the receiver reaches a frequency that is active it automatically stops there until the channel becomes clear, unless the HOLD key has been activated.

It is also possible to manually tune the received frequency up and down using the rotary DIAL control by whatever tuning step has been previously programmed in.

If you only want to search specific banks this can be done by carrying out the following: SEARCH, BANK, PROG (No.), LIMIT (No.), ENTER (this is explained in the manual). This facility is particularly useful if you only want to listen to certain frequencies such as airband or marine.

You can store any interesting frequencies into the memory as you come across them when using the receiver in search mode.

SCANNING & MANUAL TUNING

If you want to use the receiver to listen to short bursts of communication, the 1500EX when in SCAN mode is capable of scanning a maximum of 20 channels per second. You can scan all 1000 memory channels apart from those that you have stored.

<table>
<thead>
<tr>
<th>MANUFACTURER’S SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiver Coverage: 500kHz - 1300MHz</td>
</tr>
<tr>
<td>Receiving Modes: a.m., f.m. (narrow) and s.b. with the b.f.o. switched on (u.s.b., l.s.b. &amp; c.w.)</td>
</tr>
<tr>
<td>Number of memory channels: 900 plus 100 reserved for 'auto-memory' in bank 9</td>
</tr>
<tr>
<td>1000 total x (10 x 100)</td>
</tr>
<tr>
<td>Scan rate: 20 channels per second (approx)</td>
</tr>
<tr>
<td>Number of scan banks: 10 total. Bank 9 reserved for 'auto memory'</td>
</tr>
<tr>
<td>Scan delay time: 2 seconds (approx)</td>
</tr>
<tr>
<td>Search banks: 9 standard search banks plus one search bank for the automatic search pair of bank 9</td>
</tr>
<tr>
<td>Search rate: Programmable in 5 &amp; 12.5kHz steps to a maximum of 995kHz Search step size: (i.e. 5, 10, 12.5, 15, 20, 25, 50, etc.)</td>
</tr>
<tr>
<td>Priority channel (AUX): Any one of the 1000 memories may be used as priority. Sampling is every 2 seconds (approx)</td>
</tr>
<tr>
<td>Receiver sensitivity: f.m. (narrow) 0.5µV or better for 12dB across most of the range</td>
</tr>
<tr>
<td>a.m. 3.0µV or better for 10dB S/N across most of the range</td>
</tr>
<tr>
<td>s.s.b. 1.5µV or better across most of the range</td>
</tr>
<tr>
<td>BFO range: Continuous -4 +6kHz (approx)</td>
</tr>
<tr>
<td>Antenna connection: One 50ΩBNC socket on top case</td>
</tr>
<tr>
<td>Audio output: &gt;100mW @ 10% distortion</td>
</tr>
<tr>
<td>Power requirement: 6V from built-in NiCad battery pack or 11-18v d.c. from CHG jack or 4 x AAA dry cells (dry case provided)</td>
</tr>
<tr>
<td>Power consumption: 100mA approx</td>
</tr>
<tr>
<td>Size: 55(w) x 152(h) x 400mm(d) approx excluding projections</td>
</tr>
<tr>
<td>Weight: 360g approx including NiCad pack</td>
</tr>
<tr>
<td>Display: Liquid Crystal (I.c.d.) with switchable light for areas of low level lighting</td>
</tr>
</tbody>
</table>
locked-out. Specific banks can also be scanned using the program facility. One thing that I found very helpful as newcomer was the fact that the 1500EX comes ready programmed. This meant that I was able to get stuck into listening straight away without having to program in any frequencies. This meant that I could discover if there were any frequencies that were of more interest to me that others. Even though the 1500EX is supplied ready programmed you can manually tune the receiver via the keypad. Using this feature you can enter any frequency, in any mode and alter the step tuning size as required.

OPERATING
Once I had finally got to grips with the operating procedure of the 1500EX, I felt confident enough to put it to the test. With the receiver in a.m. mode and by using the b.f.o. control I managed to listen to quite a few short wave stations including broadcasts from RFI and VOA Europe. These signals were vastly improved when I attached the short wave wire antenna instead of the standard whip antenna.

The SEARCH and SCAN buttons are printed in blue against the grey plastics casing which makes them difficult to see clearly especially in artificial light.

SUMMARY
I think the AOR-1500EX is an excellent little receiver and I thoroughly enjoyed being given the chance to use it. In fact I’m trying to persuade the Editor of SWM to let me hang onto it a bit longer! With a retail price of £349 it may be a little too expensive for the enthusiast who’s just starting out. However, with the wide range of facilities it offers, together with the sensitivity and versatility I think it’s well worth every penny.

Improved when I attached the short wave wire antenna instead of the standard whip antenna.

I also managed to receive signals closer to home. For example, I heard a couple of radio amateurs in Yeovil when I was using the receiver in n.f.m. mode. I was fascinated by the number of frequencies it was possible to receive and found listening to the airband and marine frequencies particularly interesting.

CRITICISMS
The only critiscms I have of the AOR-1500EX are of the instruction manual and the SEARCH and SCAN buttons. Even though the manual works through the operating procedures in stages I found it a little difficult to understand. This meant that I had to read through the manual twice very carefully before I felt ready to begin using the receiver. However, I do not necessarily think that this a fault in the way the manual is written, it might just have been because I was a newcomer.

Don’t really like the lower voltage provided by NiCads - the PRO-46 breaks that trend. The PRO-46 also featured a recessed KEYLOCK button. As its name suggests, pressing this disabled the keypad and was a boon for true portable operation. There was also the commonly found WX key which initiated a search of the American weather report channels. The frequency range covered was 162.4 to 162.55MHz in 25kHz steps. Needless to say, this is of little value outside the USA.

PERFORMANCE
Throughout the review the PRO-46 showed itself to be a good performer. The audio quality was always very clean, especially on a.m. I was pleased to hear this, as many scanners seem to have particularly poor a.m. detectors. Whilst on review, I took the opportunity to make a few measurements. The low distortion was confirmed with measured results of 1.5% max. on f.m. and a very good 1% for a.m. The sensitivity was also well up to standard giving the following results for 12dB SINAD:

- 70MHz 0.18µV
- 137MHz 0.6µV
- 450kHz 0.5µV.

As mentioned earlier, if these high sensitivities are combined with a good external antenna you may hit overload problems. The solution is normally achieved with the introduction of some attenuation in the antenna lead.

SUMMING-UP
The PRO-46> showed itself to be one of the better performers in the competitive portable scanner market. Its facilities were well organised and you don’t have to keep referring to the manual to use it to the full. Overall then, a good receiver that is likely to appeal to a wide range of listeners. The current price is £199.99 from all Tandy outlets. My thanks to Link Electronics, 216 Lincoln Road, Peterborough PE1 2NE. Tel: (0733) 345731 for the loan of the AOR-1500EX.

ESSENTIAL FEATURES
- The power connections of the PRO-46 were very versatile and gave the operator a number of options. As mentioned earlier you could use internal batteries or an external d.c. source. A particularly good point was its ability to handle both NiCads and dry cells. When NiCads are being used, you can plug an external power source into the charge socket and so trickle charge the NiCads. All too often, you find that battery powered receivers don’t really like the lower voltage provided by NiCads - the PRO-46 breaks that trend.

The AOR-1500EX also features an unusual feature. It is a little too expensive for the enthusiast who’s just starting out. However, with the wide range of facilities it offers, together with the sensitivity and versatility I think it’s well worth every penny.

My thanks to Link Electronics, 216 Lincoln Road, Peterborough PE1 2NE. Tel: (0733) 345731 for the loan of the AOR-1500EX.

SPECIFICATION
- Frequency Range: 66-88MHz
- 108-174MHz
- 406-512MHz
- 806-937.5MHz
- 851-868.9375MHz
- 896.1125-956MHz
- Sensitivity: 66-88MHz 0.5µV
- 108-136.975kHz 1.6µV
- 137-174MHz 0.7µV
- 406-512MHz 0.7µV
- 806-966MHz 0.8µV
- Search Speed: 19 steps/channel
- Scan Speed: 14 channels/second
- Built-in Speaker: 220mW max.
- Audio Power: 220mW max.
- Priority Sampling: 2 seconds
- Delay Time: 2 seconds
- IF Frequencies: 10.8MHz and 450kHz
- Audio Power: 220mW max.
- Power Requirements: 4 AA batteries
- Dimensions: 151(H) x 66(W) x 37mm(D)
- Weight: 220g
Alright we admit it! It was us!

Guilty!

for offering outstanding service

ICOM ICR7100
Perhaps the ultimate scanner. Full VHF and UHF coverage and more scanning facilities than you can shake a discone at!

£1395.00

Guilty!

for offering spectacular trade-ins

AOR AR3000A
Still our best selling scanner. Full coverage from 100kHz to over 2GHz make this popular with both hobbyist and professional clients.

£939.00

Guilty!

for being people you can trust

MVT8000
Great choice for a compact, wide band mobile or base scanner. 200 memories, 10 search bands and easy operation.

£449.00

Guilty!

for giving 2 year warranties*

SIGNAL R535
Still the finest mobile, desktop AND transportable scanner dedicated to airband reception. Covers both civil and military frequencies and computer controllable.

£329.00

Guilty!

for offering flexible credit terms
VT125
Probably the finest civil Airband monitor we sell.
Very sensitive and with a complete range of accessories.
£189.00

VT225
All the versatility of its little brother but with the Military Airband range as well as marine band.
Excellent performance
£269.00

MVT7000
Easy to use, full range scanner. 10 search bands, 200 memories - everything you really need in a scanner
Special price!! £319.00

MVT7100
Top of our range in handhelds. Super wide coverage, it's got 1000 memories, SSB mode and oozes quality!
Special price!! £399.00

WIN108
A great, value for money Airband scanner - especially at our new low price. Full coverage and with 20 memories
Now only £139.00

JIM M75
An ideal introduction to the world of Airband that doesn't cost the Earth.
Fully tuneable over the civil Airband
Only £79.95

R537S
A super set top pre-amp for scanners. Has variable gain to help pull in weak or distant stations.
Only £84.95

THERE'S STILL TIME TO GET YOURSELF A COPY OF POOLEY'S FLIGHT GUIDE '92
IT'S PACKED FULL OF VERY USEFUL INFORMATION ON JUST ABOUT EVERY AIRFIELD IN THE COUNTRY - AN IDEAL DATA GUIDE FOR THE SERIOUS AIRBAND LISTENER. YOURS FOR ONLY...
£4.00
FROM OUR BRANCHES, OR £6.00 INCLUDING POSTAGE

AND......
Our Airband Listeners Guide is still available. Four first class stamps will secure your own copy - and our bumber airband info pack!

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CHESTERFIELD ROAD, MATLOCK, DERBYSHIRE, DE4 5LE
TEL 0629 580800 FAX 0629 580020 FAXINFO 0629 580008
or try our nation-wide network of branches.......
Yupiteru are best known in the UK for high quality scanning receivers. However, on a recent visit to their headquarters in Tokyo, Mike Devereaux, MD of Nevada Communications, learnt that beside scanners, they manufacture telephones, radar detectors and audio visual equipment, all of which provided them with a staggering £146 million turnover in 1992/3.

Yupiteru employ more than 500 people and recently completed the expansion of their plant and engineering centre in Okazaki City where the scanners are manufactured in almost laboratory conditions. The Production Plant resembles an operating theatre - they even wear white gloves! The company operates two other plants, one in Shenzhen, China with 1300 workers making telephones, the other in Penang, Malaysia where 350 workers make telephones and TVs, mainly for the Japanese and US markets.

Yupiteru sell their products in Japan and throughout the world, but it was interesting to note that the UK is their largest market in Europe for scanning receivers.

They first started producing scanners in 1984, shortly after Mr Kitamura, the current President, was appointed. He explained, “We put great emphasis on research and development to provide innovative products that we hope will shape the communications of tomorrow.” He went on to add, “Technology is advancing so rapidly and being upgraded faster than ever, but we at Yupiteru never forget that however sophisticated we make our products they must be reliable and easy to use.”

Certainly, it has been the reliability and ease of use that has made Yupiteru products so popular here in the UK.

On my two day visit, I was impressed with how hard the Japanese work. They are often still in the office at 8 or 9 o’clock in the evening.

From an early age, Japanese children are encouraged to study hard and most are expected to attend university. I was in Tokyo during the summer holidays, when many children would usually be at play. Not for the Japanese, however - this is an ideal time to send the children to summer school where they will cram for their school exams later in the year.

The staff at Yupiteru headquarters were no exception - most of them had been to university prior to joining the company.

Just before I concluded my visit, I asked Mr Aoyagi, Export Manager of the International Division, if the rumours of an MVT-8100 base version of the popular MVT-7100 scanner were true. He replied quite firmly, “We have no plans for any further scanner products at the moment”, but then added, with a glint in his eye, “However, as a manufacturer of radio and telecommunications equipment, we have plans for new products in the near future”.

Yupiteru are continually looking to the future and are certainly well informed of events in the UK market - as I left the headquarters I noticed several copies of Short Wave Magazine in the Export Office!
In a recent edition of Short Wave Magazine, the Editor asked for people with experience of taking scanners abroad and for any hints, tips or problems that they'd experienced. Andrew Linney relates some of his experiences.

I've been heavily into scanners for several years and travel a fair bit whenever I get the opportunity. I've taken a Fairmate HP 200F hand-held scanner on several excursions by various methods, i.e., plane and ferry. Up to now, I haven't had any trouble at all in getting the radio through customs in any of the places I've visited. Mainly I think, because to most people it looks like a mobile phone or posh radio. In fact, a trick that I generally employ is to set the scanner to Radio One or some other radio station in the normal v.h.f. broadcast band and lock the radio so that it can't be altered accidentally. Then, I turn the volume down as I get to the check-in gate. I usually trigger the metal detectors as I always carry a Swiss Army Knife in a pouch on my belt.

As a result of the Lockerbie Bombing, airport security now want to see radios working, so they must have batteries fitted - otherwise they can get really interested. If you put Radio One in or whatever, and as I say, lock it and turn the volume down, when you go through the gate, present them with the scanner and turn it up. Once they hear Steve Wright or whatever, they pop it through the X-ray machine and that's it.

You're through.

I went to the USA in January 1991 and the Gulf war had just started going flat out, so security at Heathrow was stricter than usual, with the Army tanks patrolling the surrounding approach roads and troops running around in the terminals as well as the normal Hunter/Delta armed patrols. I was sat for a good couple of hours listening merrily to various suspect packages and general activity until we checked in.

They paid particular interest to us as well, seeing as we had Arabic stamps on the passport from a Tunisian holiday a few years before, but the scanner went through, no problem.

If you take a scanner to the States then call into a Radio Shack (Tandy) over there and ask for a local listing. We were there on a fly-drive holiday in Florida and called in several as we toured and asked them for any information. They gave us a photocopy of the local action from the Highway patrols to Coast Guard, Fire Department to the Secret Service! Also a good book to obtain from this shop is called Police Call. This covers the state you're in and neighbouring states and gives you the spot frequencies for every service you'll ever want to know. It also comes in useful in high sun spot activity when you're back home, as I've heard Police and Fire Departments from the States on 33 to 40MHz during these times. If the 28MHz band (10m) is open with American stations, then it's worth listening a bit higher up.

I've also taken the rig with me to Amsterdam on a couple of occasions, once by boat and once by plane. In fact, in Schipol airport in the arrival lounge they sell them and sweepers for bug detection. The only thing to listen to once you're in a non-English speaking country is the air band (unless you speak the local lingo of course).

The most unnerving experience I've come across was at Tegel Airport in Berlin on the way out. On the way in was no problem, but coming out I was beginning to think it was a bad idea. When I was there it was just a year to the day, near enough after the wall had come down, so things were a bit more relaxed then in previous years, I think. The guard was showing more than a passing interest in it, but again, I'd got it tuned to the local radio station of the v.h.f. American Forces Radio Berlin, or something along those lines, and so got away with it. AFN Berlin was about the only thing worth listening to as such. I do speak a little German but unless your fluent in the host language than it's really a waste of time as they don't use tourist lingo in their normal comms. As in, they don't need a double room with a shower or a steak well done so to speak. Only the air bands use English in general.

In Berlin, I was there wandering around the old Russian section of the city with a high tech radio receiver capable of monitoring their traffic. Had it have been a couple of years earlier, I'd have left it at home. Otherwise, I'd probably be somewhere in Moscow or thereabouts as a special guest of the KGB. But that's the closest I've come to regretting taking it. So, basically, if your scanner has got w.b.f.m., tune it into a domestic station and lock it until you've got through customs. Just use your common sense and don't have their armed security or whatever blasting out of the radio as you go through.

I've taken mine through East Midlands, Manchester, Heathrow, John F. Kennedy, Orlando International, Schipol Amsterdam, Tegel Berlin airports and Dover, Calais, Hollyhead and Dun Loaghaire Ferry Ports.

Use your common sense in the use of the rig and you should have no trouble. Go up to the nearest Cöp and tell him to turn his radio up as their comms are shouting at him and you'll get what you deserve!

Happy travels.
ENGLISH INSTRUCTIONS!!
If you are finding the instructions supplied with your scanner a little difficult to make head or tail of then you might like to try one of our own, re-written Instruction Books. They are available for all the Yupiteru & AOR/Fairmate handheld range.

Secondhand Equipment
As part exchanges are welcome we usually have a wide selection of good condition secondhand or ex-demo equipment available and all sets come with a 6 month warranty.

Part Exchanges
If you have been thinking about a new scanner but find it is a little out of range of your pocket why not consider a p/x. Just give us a call and we will gladly give you a price over the phone.

Leather Carry Cases
For the MVT-7100 are now available together with cases for the MVT5000, VT225, AR1000/HP100 family. All £14.99 each (and smelly!)

As specialists in airband listening we are better placed than most in trying to guide you through the vast range of equipment available suitable for this fascinating hobby. We have always tried to give friendly, un-biased advice on all the models we stock and together with a receivers “good points” are as keen to point out the disadvantages of certain models not always brought to your attention. Please feel free to call and have a chat - it would be nice to speak with you. If you would like a catalogue please send a large (A5+) SAE - Thanks.

FREQUENCY LISTS
Our New VHF/UHF guide is dated the 17th September and has been updated over the July edition with new squawk codes and callsigns. If you are not familiar with our guides we are sure you will find them both informative and interesting. We include a considerable amount of information not found in any other publication, complete listing of all civil and military airfields together with stud/channel numbers, en-route ATCC frequencies, transmitter sites, range frequencies and much, much more.

Combined VHF/UHF AIRBAND Guide £7.50 inc. P&P.

Carlton Works, Carlton Street, BRADFORD, BD7 1DA
Telephone: 0274-732146. FAX: 0274 722627
Scanners are available from a wide range of sources, many advertisers in Short Wave Magazine will be able to give you advice as well as technical help whilst you choose which radio is the one for you. I’ve drawn up a list of all the dealers who stock scanners that I could find, my apologies if I’ve left anyone out. It’s often worth talking to your local radio dealer to see if he can supply the scanner you’ve been looking for, most are always pleased to help a customer.

The following pages contain many of the most popular scanners, some now are only available on the second-hand market, but that doesn’t mean that they are second best. I’ve tried to include as many scanners as possible, but as new models and makes seem to appear on the market monthly, there are bound to be some that have slipped the net. If you know of a good scanner that hasn’t been included, please drop me a line so that it can be included in any future scanner studies.

Prices were correct when the article was written, although those scanners only available on the second-hand market, but that doesn’t mean that they are second best.

Compiled by Elaine Richards

**DEALERS**

**Avon**
AMOAT, 4 Northville Road, Northville, Bristol BS7
ORIG. Tel: (0272) 690352.
GSL Communications, Unit 6, Worle Industrial Centre, Coker Road, Worle, Weston-super-Mare BS22 0BX. Tel: (0373) 512757.

**Bedfordshire**
Welldon Communications, 33 High Street, Bedford MK40 1RJ. Tel: (0560) 364004.

**Buckinghamshire**
Communications Centre (Photo Acoustics Ltd.), 58 High Street, Newport Pagnell, Bucks MK16 8AQ. Tel: (0908) 610625.

**Cambridgeshire**
Link Electronics, 216 Lincoln Road, Peterborough PE1 2NE. Tel: (0733) 345731.

**Cheshire**
CB37, 15 Middlewich Street, Crewe CV1 4BS. Tel: (0270) 508440.

**Cornwall**
Skywave, Slades Road, St. Austell, Cornwall PL25 4HG. Tel: (0726) 702250.

**Derbyshire**
AGR (UK) Ltd., Adam Bede High Tech Centre, Derby Road, Wirksworth, Derbyshire DE4 5LE. Tel: (0603) 759269.

**Essex**
Jaycee Electronics Ltd., 20 Woodside Way, Glennrothes, Fife, Scotland KY7 5DF. Tel: (09392) 759062.

**Hampshire**
Nestor Communications, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 692145.

**South Midlands Communications Ltd.,** SM House, School Close, Chandlers Ford Ind Est., Eastleigh, Hants SO5 3BY. Tel: (0703) 251549.

**Hereford & Worcester**
SRP Trading, Unit 20, Nash Works, Forge Lane, Nr Steurbridge, Worcs. Tel: (0562) 730872.

**Ireland**
Redcom Electronics, Midleton Enterprise Park, Midleton, County Cork. Tel: 021/832725.

**Kent**
Icom (UK) Ltd., Unit 8, Herne Bay West Industrial Estate, Sea Street, Herne Bay, Kent CT6 9LD. Tel: (0227) 741555.

**Lancashire**
The Flying Shop, Biggin Hill Airport, Westerham, Kent TN16 3BN. Tel: (0959) 576370.

**Leicestershire**
Microgate Services Ltd., Metcom House, Bradley Lane, Standish, Wigan WN6 1XCL Tel: (0257) 472866.

**London**
ARE Communications '92, 6 Royal Parade, Hanger Lane, Ealing, London W5A 1ET. Tel: 091-997 4147.

**Norfolk**
The Short Wave Centre Norwich, 95 Colindelme Lane, Sprowston, Norwich, Norfolk NR7 6EQ. Tel: (0603) 788281.

**Nottinghamshire**
Radio Amateur Supplies, 3 Ferndon Green, Wollaton Park, Nottingham NG8 1DU. Tel: (0602) 280287.

**Staffordshire**
J.W. Stanton & Sons Ltd., 15 Brunswick Street, Newcastle, Staffs. Tel: (0978) 618702.

**Tyne & Wear**
Supertech, 32 Russell Way, Gateshead Metro Centre NE11 9YZ. Tel: 091-493 2316.

**West Midlands**
Amateur Radio Communications, 38 Bridge Street, Earlston, Newton-le-Willows, Merseyside WA12 9BA. Tel: (0252) 229881.

**Aviation Hobby Centre, 1st Floor, Main Terminal Building, Birmingham International Airport, Birmingham B26 3QJ. Tel: 021-782 2112.**

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**Haydon Communications, 132 High Street, Edgware, London HA8 7EL. Tel: 081-951 5782.**

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**South Essex Communications Ltd., 191 Francis Road, Leyton, London E10 BNG. Tel: 081-558 0854.**

What Scanner 1993
**HAND-HELD SCANNERS**

**UP TO £50**

**STEEPLETONE SAB-11 PORTABLE RADIO**

- Frequency Range: 108-135MHz
- Modes: a.m., f.m.
- Memories: n/a
- Scan Speed: n/a
- Search Speed: n/a
- Features: Budget priced airband radio, receiver airband frequencies and normal f.m. and m.w. radio programmes, rotary controls, no I.c.d. readout.
- Reviewed: None
- Price: £14.95

**YUPITERU VT-150**

- Frequency Range: 142-170MHz
- Modes: f.m.
- Memories: 30
- Scan Speed: 20 channels per second
- Search Speed: 20 steps per second
- Comments: Reviewer said, "For the enthusiast who combines an interest in aviation with both amateur and marine band listening...is an ideal compliment to the other receivers in this range. In styling, sensitivity and audio quality this receiver is well worth every penny."
- Reviewed: Short Wave Magazine March 1993*
- Price: £189.00

**REALISTIC PRO-41**

- Modes: f.m.
- Memories: 20
- Scan Speed: 20 channels per second
- Search Speed: 20 steps per second
- Comments: Reviewer said, "Fiddly buttons for those with larger hands. the set shows the selectivity to have a pleasing value"
- Reviewed: Short Wave Magazine December 1988**
- Price: £175.00

**RCV WIN-10B**

- Frequency Range: 108-142.975MHz
- Modes: f.m.
- Memories: 20 (two banks of 10 channels)
- Scan Speed: 20 channels per second
- Search Speed: n/a
- Features: Keyboard access to frequencies, memory back-up circuit, hyperscan search and scan.
- Reviewed: None
- Price: £249.99

**UP TO £150**

**NETSET PRO-44**

- Modes: f.m.
- Memories: 50
- Features: Keyboard access to frequencies, keyboard lockout and low battery indicator.
- Price: £149.90

**REALISTIC PRO-43**

- Frequency Range: 88-88, 118-174, 220-512, 806-960MHz
- Modes: a.m., f.m.
- Memories: 200
- Scan Speed: 25 channels per second
- Search Speed: 25 steps per second
- Features: Comes complete with a full range of accessories, including an UK charger
- Price: £199.00

**NETSET PRO-46**

- Modes: f.m.
- Memories: 100 (5 banks of 20 channels)
- Features: 30 minute memory back-up retaining all stored frequencies in the event of battery exhaustion, automatic selection of both step size and mode is accomplished by the microprocessor.
- Price: £199.95

**REALISTIC PRO-39**

- Frequency Range: 88-88, 118-174, 220-512, 806-960MHz
- Modes: a.m., f.m.
- Memories: 200
- Scan Speed: 20 channels per second
- Search Speed: 20 steps per second
- Features: Keyboard access to frequencies, memory back-up circuit, hyperscan search and scan.
- Price: £219.99

**REALISTIC PRO-38**

- Modes: f.m.
- Memories: 20
- Scan Speed: 20 channels per second
- Search Speed: 20 steps per second
- Features: Direct keyboard access to frequencies, keyboard lock and audible low battery indicator.
- Price: £199.95
BLACK JAGUAR BJ290
Frequency Range: 26-29.995, 50-88, 115-178, 200-280, 360-520MHz
Modes: a.m., f.m. selectable
Memories: 16
Comments: Reviewer said, "The receiver is so easy to use that my initial reservations about its few facilities, e.g. only 16 memories and an inability to store band limits (unlike my base receiver) melted away when I realised just how easy it is to operate. It takes me longer to remember which number band I want to search on my base receiver than it does to program the Black Jaguar fresh each time!"
Reviewed: Short Wave Magazine November 1993* Price: £239.00

COMMTEL COM203
Frequency Range: 68-88, 118-174, 380-450, 470-512, 806-960MHz
Modes: f.m.
Memories: 200
Scan Speed: 25 channels per second
Search Speed: up to 50 steps per second
Features: Built-in power save circuit, key lock switch to avoid accidental operation, easy-to-read l.c.d. with back lighting, direct frequency entry.
Reviewed: Price: £213.00

COMMTEL COM204
Frequency Range: 68-88, 118-174, 220-512, 806-999.999MHz
Modes: a.m., f.m.
Memories: 200
Scan Speed: 25 channels per second
Search Speed: 50 steps per second
Comments: Reviewer said, "It's a very compact portable scanner...and sophisticated scanning modes. Its neat lines conceal a lot of features".
Reviewed: Price: £249.00

REALISTIC PRD 32A
Frequency Range: 68-88, 108-174, 380-512MHz
Modes: a.m., f.m.
Memories: 200 (10 banks or 20 channels)
Scan Speed: up to 8 channels per second
Search Speed: up to 8 steps per second
Comments: Reviewer said, "It's a very compact portable scanner...and sophisticated scanning modes. Its neat lines conceal a lot of features".
Reviewed: Price: £249.00

FAIRMATE HP-101E MKIII
Frequency Range: 25-550MHz, 830MHz-1.3GHz
Modes: a.m., f.m., w.b.f.m.
Memories: 1000 (10 banks of 100 channels)
Scan Speed: 20 channels per second
Comments: Reviewer said, "proved itself to be a very competent and easy-to-use little scanner. Its technical performance was well up to the standard one would expect from this type of receiver but the layout and features put it one step ahead of a lot of the competition...highlight the provision of the rotary tuning control".
Reviewed: Price: £79

UNIDEN BEARCAT 110FB
Frequency Range: 66-88, 138-174, 405-512MHz
Modes: f.m.
Memories: 16
Comments: Reviewer said, "The receiver is so easy to use that my initial reservations about its few facilities, e.g. only 16 memories and an inability to store band limits (unlike my base receiver) melted away when I realised just how easy it is to operate. It takes me longer to remember which number band I want to search on my base receiver than it does to program the Black Jaguar fresh each time!"
Reviewed: Short Wave Magazine November 1993* Price: £239.00

ALINCO DJ-X1D
Frequency Range: 108-174, 380-450, 470-512, 806-960MHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 100 (2 x banks of 50 plus 20 holding)
Scan Speed: up to 50 steps per second
Comments: Reviewer said, "is packed with useful features designed to make easy for the listener. Although its high sensitivity can be a boon when operating, you could have problems with external antennas if you don't use an attenuator".
Reviewed: Price: £399.95

YUPITERU MVT-7100
Frequency Range: 530kHz-1.65GHz
Modes: a.m., i.s.b., u.s.b., n.b.f.m., w.b.f.m.
Memories: 1000 (in 10 banks of 100)
Scan Speed: 30 channels per second
Search Speed: 30 steps per second
Comments: Reviewer said, "is a superb receiver. It's very sensitive, has extremely wide-band coverage and is just the right size for a hand-held receiver." Reviewed: Price: £399.95

SONY AIR-7
Frequency Range: 150kHz-2.19MHz, 76-136, 144-174MHz
Modes: a.m., w.b.f.m., n.b.f.m.
Memories: 10
Comments: Reviewer said, "It's a superb receiver. It's very sensitive, has extremely wide-band coverage and is just the right size for a hand-held receiver. Its conversion receiver is the standard one would expect from this type of receiver but the layout and features put it one step ahead of a lot of the competition...highlight the provision of the rotary tuning control".
Reviewed: Price: £29

SONY ICF-PROBO
Frequency Range: 150kHz-1.8MHz, 115.15-222MHz
Modes: a.m., i.s.b., u.s.b., n.b.f.m.
Memories: 40
Comments: Reviewer said, "is a novel set, limited by its design and perhaps only moderate overall performance. It is aimed, perhaps, at the listener who wants more than either just short wave or v.h.f. scanning, but a combination of the two".
Reviewed: Price: £350

YUPITERU VT-225
Frequency Range: 108-142, 149.5-160, 222-391MHz
Modes: a.m., f.m., w.b.f.m., w.b.f.m.
Memories: 100 (10 banks of 10)
Scan Speed: 15 steps per second
Search Speed: 15 steps per second
Comments: Reviewer said, "One thing that I found very helpful as newcomer was the fact that the 1500EX comes ready programmed. This meant that I was able to get stuck into listening straight away without having to program in many frequencies. This meant that I could discover if there were any frequencies that were of more interest to me that others".
Reviewed: Price: £349

YUPITERU MVT-7000
Frequency Range: 8MHz-1.3GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 200
Scan Speed: 16 channels per second
Search Speed: 20 steps per second
Comments: Reviewer said, "is a very attractive portable scanner with a fine overall performance. The attenuator was very effective, reducing spurious to a minimum. The audio quality was well adjusted for speech communications and there was plenty of output power for portable use".
Reviewed: Price: £369.00
WHAT SCANNER

UNIDEN BEARCAT

UBC-142XL
Frequency Range: 68-88, 136-174, 406-512 MHz
Modes: air, f.m.
Memories: 16
Scan Speed: up to 15 channels per second
Search Speed: up to 15 steps per second
Features: Selectable 100dB attenuator, keypad or rotary tune controls

Price: £171.00

UNIDEN BEARCAT

UBC55XL
Frequency Range: 68-88, 108-174, 406-512 MHz
Modes: air, f.m.
Memories: 50
Features: Programmable in either scan or search modes

Price: £195.00

MOBILE/BASE SCANNERS
 UP TO £150

FAIRMATE HP-200
Frequency Range: 500kHz-1.3GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 100 (10 banks of 10 channels)
Scan Speed: up to 200 channels per second
Search Speed: less than 40 steps per second
Features: Selectable 100dB attenuator, keypad or rotary tune controls

Price: £325

MOBILE/BASE SCANNERS
 UP TO £200

REVCO RS-3000
Frequency Range: 26-30, 68-88, 118-176, 380-512 MHz
Modes: a.m., f.m.
Memories: 50
Features: Reviewer said, "satisfactory performance compared with the quoted figures and these are quite high. I would expect on a mobile of the road scanner. The strong point is the simple mode. Its has plenty of memory channels and some features that are only found on more expensive machines.

Price: £193

WHAT SCANNER

UNIDEN BEARCAT UBC-760XLT
Modes: a.m., n.b.f.m.
Memories: 100 (5 banks of 20 channels)
Scan Speed: up to 15 channels per second
Search Speed: up to 15 steps per second
Features: Keyboard has been divided into two parts, PROGRAMME that allows you to command any frequency within its range on all 100 memory channels and OPERATION that controls scan lockout, priority, delay and process searches as well as the programmable search functions.

Price: £191.00

UNIDEN BEARCAT UBC175XL
Frequency Range: 68-88, 108-174, 406-512 MHz
Modes: a.m., f.m.
Memories: 16
Scan Speed: up to 15 channels per second
Search Speed: up to 15 steps per second
Features: ing in each scan or search mode is made very easy with a simple-to-use keypad and large LCD.

Price: £180

NEVADA MS-1000
Frequency Range: 50kHz-600MHz, 800MHz-1.3GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 1000 (in 10 banks of 100 channels)
Scan Speed: 20 channels per second
Search Speed: 20 steps per second
Features: Reviewer said, "a very compact easy-to-use scanner with a very respectable performance. It's equally at home both in the shack and in the car. The comprehensive range of memory storage options are worthy of note and should prove more than adequate for most operators."

Price: £279.00

REALISTIC PRO-200
Modes: f.m.
Memories: 200 (10 banks of 20 channels)
Features: Direct keyboard access to frequencies, easy-to-read LCD, memory back-up

Price: £219.99

UNIDEN BEARCAT BC-950XLT
Frequency Range: 25-520 MHz, 760 MHz-1.3 GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 400 (in 10 banks of 40 channels)
Scan Speed: up to 26 channels per second
Search Speed: 20 channels per second
Features: Reviewer said, "was a very smart and capable modern scanner. The facilities covered all the basic requirements with one or two useful extras. These facilities were also easy-to-use, makes it particularly attractive to the newcomer."

Price: £219.95

SIGNAL R-535
Frequency Range: 108-142, 285-385 MHz
Modes: f.m.
Memories: 50
Features: An airband set that covers both v.h.f. and u.h.f. signals that can be computer controlled.

Price: £65.00

UNIDEN BEARCAT 980XLT
Frequency Range: 25-54, 118-174, 406-512, 806-970 MHz
Modes: f.m.
Memories: 40
Scan Speed: up to 15 channels per second
Search Speed: up to 15 channels per second
Features: Reviewer said, "although featuring fairly basic scanner facilities, was actually a pleasure to use as everything worked so well. The very wide frequency coverage was also very welcome, but I will remember it for its excellent audio quality particularly on the air band."

Price: £223

Cobra SR-29
Frequency Range: 29-54, 118-174, 406-512 MHz
Modes: f.m.
Memories: 16
Comments: Reviewer said, "I found the scanner very easy to use... it doesn't have some of the more complex options available, but that didn't make it any less of a useful piece of equipment."

Price: Approx £110

MOBILE/BASE SCANNERS
 UP TO £300

REALISTIC PRO-2021
Modes: f.m.
Memories: 200 (10 banks of 20 channels)
Features: Direct keyboard access to frequencies, easy-to-read LCD, memory back-up

Price: £219.99

UNIDEN BEARCAT BC-950XLT
Frequency Range: 25-520 MHz, 760 MHz-1.3 GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 400 (in 10 banks of 40 channels)
Scan Speed: up to 26 channels per second
Search Speed: 20 channels per second
Comments: Reviewer said, "was a very smart and capable modern scanner. The facilities covered all the basic requirements with one or two useful extras. These facilities were also easy-to-use, makes it particularly attractive to the newcomer."

Price: £219.95

FAIRMATE HP-200
Frequency Range: 500kHz-1.3GHz
Modes: a.m., n.b.f.m., w.b.f.m.
Memories: 1000 (10 banks of 100 channels)
Scan Speed: 20 channels per second
Search Speed: less than 40 steps per second
Features: Selectable 100dB attenuator, keypad or rotary tune controls

Price: £325

MOBILE/BASE SCANNERS
 UP TO £200

REVCO RS-3000
Frequency Range: 26-30, 68-88, 118-176, 380-512 MHz
Modes: a.m., f.m.
Memories: 50
Features: Reviewer said, "satisfactory performance compared with the quoted figures and these are quite high. I would expect on a mobile of the road scanner. The strong point is the simple mode. Its has plenty of memory channels and some features that are only found on more expensive machines.

Price: £193

NETSET PRO-2032
Modes: f.m.
Memories: 200 (10 banks of 20 channels)
Features: Direct keyboard access to frequencies, easy-to-read LCD, memory back-up

Price: £219.99

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**WHAT SCANNER**

### MOBILE/BASE SCANNERS UP TO £500

**REALISTIC PRO-2004**
- Frequency Range: 25-520MHz, 750MHz-1.3GHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 100 (10 banks of 10 channels)
- Scan Speed: up to 16 channels per second
- Search Speed: up to 16 steps per second
- Comments: Reviewer said, "Neatly designed and built in a matt black plastics case, the sloping front panel carries the controls and display panel. The l.c.d. is clear and easily read and shows which channel and frequencies are being scanned, monitored or programmed, as well as the status of the channel and the operational mode of the receiver."
- Review: Practical Wireless May 1984**
- Price: £325

**AOR AR-2001**
- Frequency Range: 25-550MHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 100
- Scan Speed: 5 channels per second
- Search Speed: 1MHz in 6 seconds
- Comments: Reviewer said, "Receiver sensitivity is good and even with its own telescopic antenna it compared well with dedicated portable rigs on the 144MHz band."
- Review: Practical Wireless October 1981**
- Price: £325

**REALISTIC PRO-2005**
- Frequency Range: 25-520MHz, 750MHz-1.3GHz
- Modes: n.b.f.m., w.b.f.m.
- Memories: 400
- Scan Speed: up to 16 channels per second
- Search Speed: up to 16 channels per second
- Comments: Reviewer said, "Improvement over the previous model and its overall performance was very good for a scanner of this type... the sound squelch was particularly useful."
- Review: Short Wave Magazine September 1999**
- Price: £399.95

**AOR AR-2002**
- Frequency Range: 25-500MHz, 800MHz-1.3GHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 20
- Scan Speed: 5 channels per second
- Search Speed: 1MHz in 6 seconds
- Comments: No new scanners of this type are being made, so keep an eye open for some good bargains. Reviewer said, "There is a useful I.e.d. S-meter and tuning knob for those who prefer this to UP and DOWN buttons."
- Review: Practical Wireless December 1989**
- Price: £499.99

**JIL SX-200N**
- Frequency Range: 26-68, 108-180, 380-514MHz
- Modes: a.m., f.m.
- Memories: 20
- Scan Speed: up to 10 channels per second
- Scan Speed: up to 8 channels per second
- Comments: Reviewer said, "I.c.d. is clear and easily read and shows which channel and frequencies are being scanned, monitored or programmed, as well as the status of the channel and the operational mode of the receiver."
- Review: Practical Wireless May 1984**
- Price: £325

**YUPITERU MVT-5000**
- Frequency Range: 100kHz-1.3GHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 200
- Scan Speed: up to 20 steps per second
- Features: Frequency entry via a simple front panel keypad, metal case and liquid crystal display with backlight, keypad illumination for easy use.
- Review: Price: £399.00

**YAESU FRG-100**
- Frequency Range: 50kHz-30MHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 900 (6 banks of 150 channels)
- Features: rotary and direct keyboard entry are available for fine tuning, built-in clock, multiple scan functions, high sensitivity and reliable frequency stability.
- Review: Price: £1395.00

### MOBILE/BASE SCANNERS OVER £500

**ICOM IC-R7000HF**
- Frequency Range: 25-999.999MHz, 1.025-1.99999GHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 400 (4 banks of 100 memories)
- Scan Speed: 50 channels per second
- Search Speed: 50 channels per second
- Comments: Reviewer said, "Can be very deceptive in that its wealth of unusual features are not obvious from a simple scan of the front panel... the more I used the receiver the more I grew to like it. I was particularly impressed with the main I.c.d. which proved extremely clear in all lighting conditions."
- Review: Short Wave Magazine April 1993**
- Price: Approx £945

**AOR AR9000A**
- Frequency Range: 100kHz-2.036GHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 400 (4 banks of 100 channels)
- Scan Speed: 60 channels per second
- Search Speed: 60 channels per second
- Comments: Reviewer said, "Its incredible how AOR have managed to fit so much into such a small case. A quick check in the lab showed the sensitivity of the set to be very good up to 16GHz."
- Review: Short Wave Magazine January 1987**
- Price: Approx £945

#### MOBILE/BASE SCANNERS OVER £500

**YUPITERU MVT-5000**
- Frequency Range: 100kHz-1.3GHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 200
- Scan Speed: up to 20 steps per second
- Features: Frequency entry via a simple front panel keypad, metal case and liquid crystal display with backlight, keypad illumination for easy use.
- Review: Price: £399.00

**ICOM IC-R100**
- Frequency Range: 50kHz-1.6GHz
- Modes: a.m., n.b.f.m., w.b.f.m.
- Memories: 100
- Features: 15dB pre-amp enhances weak signals in the 50-60MHz range, 20dB r.f. attenuator reduces excessively strong signals
- Review: Price: £629.90

**ICOM IC-R7010**
- Frequency Range: 25MHz-2GHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 3000 (6 banks of 500 channels)
- Features: rotary and direct keyboard entry are available for fine tuning, built-in clock, multiple scan functions, high sensitivity and reliable frequency stability.
- Review: Price: £1395.00

**YAESU FRG-100**
- Frequency Range: 50kHz-30MHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 900 (6 banks of 150 channels)
- Features: rotary and direct keyboard entry are available for fine tuning, built-in clock, multiple scan functions, high sensitivity and reliable frequency stability.
- Review: Price: £1395.00

### WHAT SCANNER

**ICOM IC-R9000**
- Frequency Range: 100kHz-2GHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m., c.w., f.s.k.
- Memories: 1000
- Scan Speed: 5 channels per second
- Search Speed: 5 channels per second
- Comments: Reviewer said, "The large 5in c.r.t. display shows, apart from the frequency readout, memory lists, a dual clock, weekly and daily timers and an external video input. It can also be used as a spectrum 'scope, displaying signals up to 100kHz from the receive frequency, with a sensitivity of approximately 10uV and a dynamic range of 50dB, or as a terminal monitor."
- Review: Short Wave Magazine April 1989**
- Price: £4950.00

**ICOM IC-R900**
- Frequency Range: 25kHz-2.036GHz
- Modes: a.m., l.s.b., u.s.b., n.b.f.m., w.b.f.m.
- Memories: 3000 (4 banks of 750 channels)
- Features: rotary and direct keyboard entry are available for fine tuning, built-in clock, multiple scan functions, high sensitivity and reliable frequency stability.
- Review: Price: £399.99

**YAESU FRG-9000**
- Frequency Range: 50-950MHz (up to 460MHz for a.s.b.)
- Modes: a.m., (wideband), n.b.f.m., w.b.f.m.
- Memories: 100
- Features: An all-mode scanning receiver with computer control capabilities allowing operators to add virtually unlimited customised control functions in software. It has seven tuning/sampling rates.
- Review: Price: £625

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