Build
A Simple Inductance
Bridge

Reviewed
The Kenwood TS-450S
HF Transceiver

FREE INSIDE THIS
MONTH'S ISSUE

Presented Free With Practical Wireless
Computing in Radio
The complete guide to help you start using computers in radio communications, with advice and information from radio-computing specialist
Richard Wilmot
GW3RRI

PLUS...Getting Started - The Practical Way
CB High & Low, Bargain Basement,
Club News, Maths For The RAE... And Much More!
The FT-26/76 hand-helds make your life simple with all the features you will ever need. They're easy to use and designed to fit comfortably in your hand, and weighing in at just one pound each, the FT-26/76 lets you travel light.

For complete details on these handhelds call your nearest Yaesu dealer now!

FT-26/FT-76 Hand-helds that make your life simple

- FT-26: 144-146MHz, FT-76: 430-440MHz.
- Supplied as standard with FNB25 and NC28C.
- 53 Memory Channels.
- 5 Watt Output, 12V DC NiCad Batteries Available.
- Four User-Programmable Power Levels (with FNB-27).
- Built-In Vox.
- Built-In DTMF calling For Selective Or Group Calling.
- Backlit Display and Front Buttons.
- Direct 12-Volt Operation With E-DC-5 Adaptor.
- Key, PTT and Dial Locking.
- Automatic Repeater Shift (ARS) Built-In For 2 Meters.
- Automatic Power Off.
- Selectable Channel Steps.
- Automatic Battery Saver.
- User Selectable Channel-Only

Display, Simple Operation For New Hams.

Accessories Options:
A selection of batteries and leather cases. Desktop quick charger (NC-42 1 hour), CTCSS encode/decode unit (FTS-17A), DC adaptor with noise filter (E-DC-5), Mobile mounting bracket (MMB-49).
APRIL 1992

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Cover Acknowledgements: Thanks to CirkIt for the use of dozens-upon-dozens of Toko inductors for the background photograph.

Sorry to Waters & Stanton for not crediting them for last month’s cover. They kindly provided the range of power meters used to help illustrate our graph.

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Prices are those current as we go to press.

Don’t miss the next issue: May 1992
ON SALE APRIL 9

NEXT ISSUE (MAY) ON SALE APRIL 9
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NEW HARDWARE PACKAGES

Now your home brew gear can look as good as factory equipment! With our interlinking range of kits it has always been possible to expand one of our simple receivers into a transceiver by adding the relevant transmitting kits. Now we can also offer custom made metal work to give the project a really high standard of finish.

Receiver kits start at £15.90 for single band SSB/CW. Transmitters start at £14.80 for single band CW. A transceiver “hardware pack” costs £29.90.

If you are just starting shortwave listening, studying for a Novice Licence, or an experienced operator needing a QRP rig for home or holiday use, we have a good selection of high quality, easy to build kits for you to choose from. The beauty of HOWES KITS is that you can start with a beginner’s receiver and upgrade to a transceiver in easy stages. A full range of matching accessories is also available. Please send an SAE for further information. We have too many kits to even just list them here!

ANTENNAS AND PRE-AMPS

AA2 ACTIVE ANTENNA for 150kHz to 30MHz

The HOWES AA2 is the active antenna to use for general coverage HF reception. Broad-band performance that does not tail off at the higher frequencies. The neat, compact answer for those with limited space, holiday use, mobile operation etc. Two selectable gain settings, local or coax powering (12 to 14V) IP3 +38dBm. Easy to build and much liked by customers!

AA2 Kit: £3.50
Assembled PCB module: £12.90

SPA4 BROADBAND PRE-AMP

The HOWES SPA4 is a low noise IC pre-amp covering 4 to 1300MHz for use with wideband passive antennas (discone etc.). If signals tend to be rather weak in your area, then the SPA4 could be just what you need!

SPA4 Kit: £14.90
Assembled PCB modules: £20.90

NEW! ADD-ON DIGITAL READ OUT

The new HOWES DFD4 Digital Frequency Display adds “Digital Readout” to analogue type receivers and transceivers. If you own an FRG7, FT101, TS520, etc., we had you in mind when we designed this kit. You can even add digital readout to a surplus WW2 receiver, or domestic broadcast set.

The DFD4 can accommodate any IF frequency offset, VFOs that tune normally or "backwards" - all with a resolution of 100Hz. Versatile indeed! A small buffer module for easy connection to the radio is included in the kit. Why not give me a ring to discuss its use with your rig, or send an SAE for more details?

DFD4 Kit: £29.90
Assembled PCB modules: £59.90

PLEASE ADD £1.20 P&P to your total kit order (£3.00 for hardware).

HOWES KITS are produced by a professional RF design and manufacturing company. They contain a good quality printed circuit board with screen printed parts locations, full clear instructions and all board mounted components. Sales and technical advice are available by phone during office hours. Please send an SAE for our free catalogue or specific product data sheets. Normally all kits are in stock and delivery is within 7 days.

72 & 73 from Dave G4KOH, Technical Manager

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Howes KITS are produced by a professional RF design and manufacturing company. They contain a good quality printed circuit board with screen printed parts locations, full clear instructions and all board mounted components. Sales and technical advice are available by phone during office hours. Please send an SAE for our free catalogue or specific product data sheets. Normally all kits are in stock and delivery is within 7 days.
in the fast-moving world of mobile communications, Kenwood's new TM-732E FM dual-band transceiver is a winner. Despite its compact design, the TM-732E packs a host of advanced features such as dual receive (including VHF+VHF and UHF+UHF), built-in DTSS and pager functions. The detachable front panel has a high-visibility LCD display to provide instant intelligence on operational status. And on-the-move operation is facilitated by a multi-function microphone. TM-732E offers true pole-position performance.

Enjoy all advantages of these superior features: ■Detachable front panel for maximum freedom of choice during installation (requires optional PG-4K/PG-4L kit) ■Dual receive on same band (VHF+VHF or UHF+UHF) with one antenna ■Audible frequency identification ■Multi-function microphone ■Built-in DTSS with pager function ■Tone alert system ■Separate speaker terminals for each band (switchable) ■Automatic band change (ABC) ■Multi-scan functions ■50 split memory channels or 64 simplex memory channels plus 1 call channel (switchable)
Don't miss our OPEN DAY! Sunday 10th May

Discounts! DJ-560E
2m/70cm
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We've got a batch of current dual band DJ-560E's to offer at a discount price. Dual watch 2m/70cms. All factory fresh and guaranteed with extended receive coverage, DTMF, tone squelch etc. Guaranteed with extended receive coverage, DTMF, tone squelch etc.

STOP PRESS: New MFJ QRP rig with 500Hz CW filter £179.95

Why Buy From Us?
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MODEL MFJ-407B is a budget price electronic keyer that is remarkable value. Operating from internal or external source it provides conventional or isometric keying at speeds from approx 5-50 WPM. Controls include tone, speed, weight and volume. (Needs paddle key).

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The DJ-S1E for 2 metres provides the ideal answer for those who need a low cost, compact, yet comprehensive handheld. Requiring 6 AA cells, this transceiver features LCD readout, 40 memories, scanning, battery save, programmable steps, 3 power levels, cell channel, illuminated dial, rotary tuning and 5 Watts maximum power output (12V DC).

£179.00

Both models provide reception of Marine FM & Aeronautical AM bands.

DJ-F1E
The DJ-F1E for 2 metres has all the features of the DJ-S1E but includes full keypad control, 700mAh ni-cad pack and universal AC hod charger. Acknowledged as the fastest selling handheld, its additional features include DTMF, Pager and Code Squelch, Priority, Reverse repeater, illuminated keypad, auto power off, electronic tuning etc.

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WOOD
Practical Wireless, April 1992

YAESU

STANDARD
The FT890 is an exciting new all band multimode HF mobile/base transceiver from Yaesu. Designed to replace the very popular FT757GX and FT757GXII, the FT890 is a worthy successor. Direct digital synthesis combined with a magnetic encoder provides silky smooth tuning, pure signals and as the digital synthesizers are driven from a single master oscillator both frequency accuracy and stability are guaranteed.

Optional accessories include:
- FP800 Power supply.
- ATU2 Internal automatic ATU
- FC800 External automatic ATU
- DVS2 Digital voice storage system
- SP6 External speaker (base).
- SP7 External speaker (mobile).
- TCX03 Temperature compensated oscillator unit.
- MMB20 Mobile mounting bracket.
- XF455K 250Hz CW filter.
- YF100 500Hz CW filter
- YF101 2kHz SSB filter.

The FT415 is the latest in a long line of highly acclaimed hand portable transceivers from Yaesu. Very similar to the FT26, the FT415 is a compact deluxe hand-held with a number of novel features and of course a full numeric keypad. A whole new range of battery saving features are included to prolong the duration of operation of the transceiver. Amongst these features are the A.B.S. (Automatic Battery Saver) which monitors operating history and optimizes the save duration accordingly. A selectable automatic power off system turns the transceiver off after a period of inactivity.

Supplied with an FNB28 and NC28C charger the FT415 produces 2.5W RF output, this can be increased to 5W by using the optional FNB27 12V ni-cad pack or the EDC5 DC adaptor. Others options include: CTCSS unit, desk charger, mobile bracket, external speaker, microphones, vinyl cases and headsets to operate with the internal VOX circuit.

Why not drop in to your nearest shop and see one in action!

FT415
2m Hand Portable
The FT415 is the latest in a long line of highly acclaimed hand portable transceivers from Yaesu. Very similar to the FT26, the FT415 is a compact deluxe hand-held with a number of novel features and of course a full numeric keypad.

FT2400H
2m FM Mobile – Rugged & Reliable
Possibly the roughest, toughest 2m FM mobile transceiver on the market today, the FT2400H has been designed to cope with the rigours of constant day to day operation. It is probably the only amateur transceiver to be based on a PMR mobile that has passed US military standards for shock and vibration.

The FT2400H is based on a one piece diecast alloy chassis which allows a full 50W RF output without the need for forced air cooling. Some of the features of the FT2400H include automatic display dim controls with 8 different levels to suit almost all ambient light conditions, a flip-down front panel hides a number of the minor controls allowing trouble free mobile operation – no unexpected channel changes or scanning! Probably the most useful feature is the ability to programme the memory channels with an alpha-numeric code up to 4 characters long to easily identify certain memories i.e. S20, R1 or repeater calls signs, 3SN etc. etc. All these features are packed into an aesthetically pleasing din size package.

Try one today we think you’ll like it!
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**KENWOOD**

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**ICOM**

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<td>IC-R7000</td>
<td>950.00</td>
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We have available simply too many accessories to list inc Antennas, Linear, PSU’s, Cases, Manuals, Spares, Software, TNC’s, etc. We also stock C M Howes Kits. Why not give us a ring with your requirements. REMEMBER we have a huge selection of NAMED BRANDS for supply.

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Radio Shopper is a trading name of Network Systems (EC) Ltd

Some 2m & 70cm equipment may have minor band variations.
All Trade Marks Acknowledged. E & OE.

Practical Wireless, April 1992
Why not pay a visit to your nearest ICOM Hamstore. In addition to the full range of ICOM equipment, you will discover an excellent source for all your Amateur Radio requirements.

Fully equipped operating stations are available enabling you to compare the current range of ICOM equipment with the latest offerings from Kenwood and Yaesu.

You will find a wide selection of tested second-hand equipment plus plenty of special offers, please telephone or write for latest price lists.

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Watch this space for more news, 73's Chris G8GKC, Gordon G3LE61 and John G8V161. The source for all your Amateur Radio requirements.

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Autoranging. Large display plus 32-segment bargraph. Data hold, range control, diode and continuity check. Measures to 1000 VDC, 700 VAC, 10A AC/DC, resistance to 30 megohms. With moulded rubber holster. Requires 2 ‘AA’ batteries. 22-167 ............ £49.95

COMPACT AUTORANGE

£29.95

Autoranging. Features diode-check, auto polarity. Easy-to-read LCD display, low-battery indicator. Measures AC/DC volts, DC current and resistance. Fuse protected. Requires 2 ‘AA’ batteries. 22-166 ............ £29.95

MINI DMM

£22.95

Mini DMM. With built-in test leads. Measures 1000 VDC, 750V AC, 200mA DC current. Resistance to 2 megohms. Built-in transistor checker NPN/PNP hFE, 1.5 and 9v battery checker. Requires 9v battery. 22-9022 ............ £22.95
Amateur radio provides opportunities to extend other hobbies. As many of my friends already know, I’m a very keen railway enthusiast. I never miss the chance of talking about trains when I’m working someone over the air, who shares the same interests.

Another hobby of mine, which seems to be an ideal companion to amateur radio, is learning foreign languages. Although I’m not a natural linguist, I thoroughly enjoy the learning process and being able to talk to friends abroad while getting some practice at the same time.

I’ve set myself a personal goal this year, in that I will be able to converse with the many French visitors who come to the Hamfest at Friedrichshafen. This excellent show is a truly international event, and there’s a fascinating variety of languages to be heard, and English is not (as yet) as commonly heard as the other tongues…until the English speaker is overheard!

**English Barrier**

Unfortunately, for the English speaker, there’s a ‘barrier’ which seems to appear automatically whenever your language is spoken. This barrier hasn’t anything to do with racist attitudes, but is usually brought about by someone else who is very anxious to practice their acquired English.

Perhaps you’ve noticed it when you have been abroad? Whenever you try your best to converse in their language (whether it be French, German, Italian, etc.) invariably the other person replies automatically in excellent English!

Although it’s not quite so bad on the air (because you can’t see the ‘onlookers’), it takes some determination to plough on in the other language. It’s particularly embarrassing when the other side of the conversation insists on speaking English, and you are trying your best in their language and not managing very well.

**Internationally Spoken**

In many ways, it’s a pity that our language is in many ways an internationally spoken tongue. Maybe it’s because our neighbours have got fed up with us shouting at them, and decided it was best to learn what we were shouting at them for in the first place. (Basil Fawlty has got a lot to answer for!)

Joking apart though, nowadays when we do try our hand at other languages, unless we really go off the beaten track, we’re unlikely to be very far from an English speaker who can help you out. Mind you, there are times when you can’t choose your interpreter, or their age for that matter.

In the mid 1960s, I’d travelled down to Austria, and found myself in a remote village where it appeared no one understood English. I only had a few words of German in those days, and the local stationmaster promptly brought his eight-year-old daughter out to interpret for us! I felt very ashamed, that two reasonably intelligent adults had to rely on such a young child to interpret for them. She did an excellent job too, and from that day onwards I was determined to learn as many languages as I could. And of course I started off with German.

**Evening Classes**

I would be most interested to hear from other radio enthusiasts who are also keen on learning other languages. Learning a language can be fun, and perhaps the best way is to join evening classes because you can become immersed in the language.

However, for many of us, free evenings are at a premium and we have to use some of the excellent audio-visual systems to help learn the new language. For many years I’ve favoured the Linguaphone system, and although the recordings have often been quite old, they have been of tremendous benefit.

My family and I invested in a brand new French Linguaphone record course several years ago, and I intend to get a Spanish course soon. However, (and I am speaking from experience) I recommend the records, because tapes can so easily be chewed up by a bored tape-recorder!

**The Best Way?**

So, if you’re keen on learning other languages, how do you start the process? What’s the best way?

I’ve mentioned my basic method, which is backed up by lots of listening as I drive around in the car. In fact I’m convinced my laboratory, who travels in the car every where with me, understands the various languages better than I do!

I would be interested to hear from readers on this subject, who are interested in this extension of the hobby. It would be helpful in the preparation of our next feature on holding QSOs in foreign languages.

When I’m working in the shack, or for that matter in my office, I rarely listen to the amateur frequencies! As I’m working, I usually listening to the many foreign broadcasting stations that can be heard on the short wave broadcasting bands. It’s on these frequencies that you can hear ‘Dutch by Radio’ from Radio Netherlands, along with the many other language-by-language courses offered by other foreign broadcasters.

**Free Dutch Course**

Several years ago, Radio Netherlands offered a free Dutch language course to listeners of their (excellent) English service. As I’m a keen tram enthusiast I watch the Dutch detective series ‘Van der Valk’, based in Amsterdam for the trams, not the police action! and enjoy visiting Amsterdam itself, I got one of the courses. It has proved useful, so keep an ear open for marvellous offers like this!

It also pays to read Peter Shore’s ‘Broadcast Round-Up’ in P W’s ‘Backscatter’ section, because that’s where you’ll find the latest news on the short wave broadcast scene. There are many languages to be learnt, and you can even find details on where you can hear Latin broadcasts on short wave.

And finally, I must not forget those readers who want to learn English. For these readers, there is of course the widely acclaimed English By Radio series. This is provided by BBC English Service and they can be contacted at: Bush House, PO Box 76, Strand, London WC2B 4PH.

If there isn’t one at the moment…you never know we might even get an inter-G European language practice net! It could be good fun, instructive and worthwhile, especially if we could lay Tony Hancock’s Japanese QSO “It are not raining here in Tokyo” to rest at last, especially as the Japanese amateur had at least tried to learn our language, whereas Hancock had but one word of Japanese!

**First Novice**

As I write this edition of ‘Keylines’ in February, I’ve just worked my first Novice on h.f., using c.w. on 3.5MHz. I had been listening to the young chap working away, slowly but surely with his careful Morse. However, all was not well, and the fault was not his!

The young Novice carefully called several G3 and G4 stations, but despite repeated (polite and correctly sent) calls, he wasn’t answered. Eventually, I called him and we had a brief but interesting QSO.

This young man must have wondered why he hadn’t been answered by the various stations he’d called. At my QTH he was a good 5-9, albeit affected by QSB. However, and despite the QSB, I’m sure that the Novice station was being ignored by the other stations!

**Novice Ignored?**

I don’t have any proof of course, and there’s no way I can prove my theory. All I can say is that if the Novice station was being ignored, I feel very ashamed that I am a radio amateur.

Surely, if I am correct and the Novice was being ignored, the offending operators are showing contempt for their own hobby. In my mind, there’s no difference whatever between ignoring an obvious newcomer to the bands, and turning an interested person away from a club or radio shack.

That’s not the spirit of amateur radio is it?

There are very few radio amateurs who would deliberately say to a young person that they’re not welcome in the shack. The vast majority of enthusiasts positively encourage enquiries from people of all ages, when they’ve shown an interest.

Unless you’re an amateur who would slam the door in the face of a keen, potential enthusiast, why do it on the air? So, please, if you value your hobby and want to see it enter its second century, take the time and trouble to work these Novice stations. They are, after all, radio amateurs, and they will play an important part in our hobby’s future.!
Dear Sir

August 1983, you ran A number of years costing £1.50. being published 'Mathematics for the young and am sure that 14 Practical Wireless, April 1992 E. Fielding Lancashire your suggestion Mr Fielding, Editor's reply: Thank you for the suggestion So, what about the current series too! We particularly need reader's letters with reprints of Ray particularly pleased that readers are asking for reprints of Ray Feautley G3ASG, 'Mathematics for the RAE' by Ray Fautley G3ASG, being published later in a small book form, as you did with the Roger Lancaster articles? I am sure this could be a viable proposition. I have followed these articles throughout and am sure that something similar collected together would be useful as a reference guide to both young and old. What do you think?

E. Fielding G4IHF Lytham St. Annes Lancashire

Editor's reply: Thank you for the suggestion Mr Fielding, and you'll doubt realise that your suggestion will join the pile! I'm particularly pleased that readers are asking for reprints of Ray Feautley G3ASG's series, and the Rev. George Dobbs G3RJV's, 'Getting Started The Practical Way'. Unfortunately, we can't really reprint them until they've finished. However, we hope to provide a 'natural break' with both series. This will enable the authors to restart the series, perhaps in a more advanced form, or with a slightly different approach. It will also enable us to offer the reprints and continue to publish both author's popular work. You never know, we could end up with both series appearing in reprint form as editions one and two!

Dear Sir

How's this for service? I recently returned my mobile microphone to Heatherlite of North Humberside for repair after three years service between car, caravan and home. I sent my parcel off late on Friday afternoon, and my microphone was repaired and returned to me on Tuesday morning. This was despite the fact that I had sent it to the wrong address. The cost was less than my local shop charge for supplying a four pin mic plug!

Tony Harris G7DGL Stoke-on-Trent Staffordshire

Editor's comment: Long live good service Tony!

Dear Sir

Having read your review of the Global GDO MkII Dip meter in February PW, I felt I must write to put forward a suggestion that came to mind. It's because I consider that the construction and operation of a GDO, is the most instructional and rewarding of all projects available to the novice or experienced amateur. Like you, I used a mains operated GDO with a triode valve for many years until it was replaced by the excellent PW f.e.t. dip oscillator by John Thornton Lawrence GW3JGA in PW October 1985. My suggestion is, why not arrange an up-date to his design with (a) additional I.f. coverage and (b) a switchable modulating facility. I am sure this would be very popular with readers. It could be followed up as before, by an article describing the many uses of this versatile piece of test equipment.

Vic Flowers GB8OM Sunniside, Newcastle-upon-Tyne

Editors's reply: We hope you find the Dip-meter project in 'Getting Started The Practical Way' useful Vic.

Dear Sir

I have been a PW reader for many years, and I thoroughly enjoy your various columns and articles. I have been interested in radio all my life and am now a keen s.w. listener. Since 1986, I have had a Sangean ATS803 which covers 150kHz to 29.999MHz continuously. I chose this set because it has a b.f.o. I also have a National Panasonic RF1350B which also covers 530kHz to 30MHz, but has no b.f.o.

My other interest is CB radio, and I operate two 4W/12W p.e.p. output a.m./s.s.b.transceivers, a Uniden and a Grant AX144. These are legal in New Zealand where we use 28.330 to 26.770MHz. I read Quaynotes' column, and I suggest he does a series on the legal CB activity of other countries. I've enclosed a booklet put out by the New Zealand Radio Frequency Service. I like Fred Judd G2BCX's homebrew antenna articles and was impressed with his 50MHz design (Sept 1991) and the 144MHz 'Ringbase' (Sept 1982) with the A./2 wave radiator loaded to 3X4 wavelength. I wonder which is best?

Best wishes for the future.

Ian Wishart, Queenstown New Zealand

Editor's reply: Nice to hear from you Ian. Thanks for the booklet, 'Quaynotes' will see it.

Dear Sir

Your correspondent John Bidgood, writes in the February issue of PW... "Who is F. C. Judd G2BCX?" I have also read G2BCX's numerous articles in both Practical Wireless and Short Wave Magazine. I presume this must be the one and same F. C. Judd that wrote articles for magazine called Tape Recorder (or something similar), back in the early 60s.

I seem to recall his items about constructive recording, involving sound mixing, splicing tape, microphone technique, and how to get the best out of your equipment. I put his advice to good use, and very quickly became a news reader/presenter on a pirate radio ship.

I remember buying some sound effects records, which I still have, recorded by F. C. Judd on the Castle label. They were produced by Recorded Tuition Ltd., of Woodford, East London.

I too would like to hear about Fred's long involvement in the radio and electronics field. Let's hope his retirement from antenna rigging will give him more time in a sitting position in front of his word processor keyboard.

Andy Cadier, Folkestone, Kent.

Editor's reply: Thank you Andy, we'll pass on your letter to Fred and I've no doubt you will get a personal reply as he appreciates readers' interest. We hope to bring the 'Radio Personality' feature, starring G2BCX, very soon.
Dear Sir

Congratulations on your new look magazine, full of interest without getting too 'high tech', which is I'm sure what most amateurs need. Colour coding of your pages makes it very easy to quickly find the article of interest. Being recently retired I have in the last two years refunded PW and it re-kinders my interest.

Just one small criticism! Can you settle for printing the issue month in the bar code block as in the August 1991 issue?

Good luck.

R. Fattinson GW3KVX
Powys, Wales

We are delighted to receive your letters, but do try to keep them short. It helps us, and makes it easier to get more letters in!

Editor's reply: Thanks for your comments Mr Fattinson. However, our Art Editor Steve Hunt says that any apparent 'colour coding' of articles was purely coincidental and not deliberate! However, Steve was interested to hear your comment. The month of issue by the way, is not normally placed in the bar code box, because it can be hidden from view on the newsagents' shelf and the issue you mention was exceptional.

Report from ORMat your end, you are just rubbishin the English language. Any intelligent person would say something like 'Did you get all that?' particularly since QSL has changed its use in amateur parlance to mean written (printed) confirmation of a two-way radio communication.

Likewise, to say 'I wish you 73 and 88' is pdecatic and ungrammatical when you mean 'best wishes' and 'love and kisses'. If you must use these terms, at least make them grammatically correct, by saying 'seventy threes and eighty eights'.

Geoff Leonard GOGSS London

Gupies
We will always try to help readers having difficulties with a Practical Wireless project, but please note the following simple rules:
1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4. Make sure you describe the query adequately.
5. Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of PW for past years are available at £1.80 each including post and packing. Binders, each holding one volume of PW are available price £5.50 (overseas orders must be drawn on a London Clearing Bank). Access, 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. The printed circuit boards are available, mail order, from the Post Sales Department.

Subscriptions
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Are computers really taking over amateur radio? Have we reached the stage where the operator is redundant? Is packet operation amateur radio without the amateur? Now's your chance to comment and win a prize!

Write your caption below.

Name...........................................
Address...........................................
...........................................

☐ Subscription ☐ Voucher

Send your entry (photocopies acceptable with coupon) to: April Caption Competition, PW Publishing Ltd, Enefco House, The Quay, Poole, Dorset BH15 1PP. Editor's decision on the winner is final and no correspondence will be entered into.

Entries to reach us by April 24.

First Prize: One year subscription or £20 book voucher.

Two runners-up: Six months subscription or £10 book voucher.
The Late Allan Barracough GW3UDO
Of Allweld Engineering

On Thursday 13 February, Allan Barracough GW3UDO, suffered a heart attack and died at his home in Wales.

Born in India 52 years ago, he came to England when he was 16 years old and joined the RAF where he served in Yorkshire, Norfolk and Libya, working as an airframe engineer. When he left there he retrained as a designer draughtsman with a special interest in welding. He went on to work for a firm on the edge of Croydon Airport, Phillips Welding, where he designed a remote control window mechanism that is still used in factories and offices today.

In 1969, he left Philips to set up his own company manufacturing towers and telescopic masts, and many readers of PW are now the proud owners of an Altron tower from Allweld Engineering.

After his wife and family, Allan's three great passions were radio, flying and shooting. He was 10 years old when he built his first crystal set, and he gained his amateur radio licence while in the RAF. He was an active amateur, always willing to share his enthusiasm for the hobby and for many years he was an instructor in the Air Training Corps, where he was given a commission.

He recently became a qualified pilot, and after his cremation in Swansea on Thursday 20 February, his local flying club held a flypast in his honour. He was also a skilful shot with both pistol and rifle and was a member of the local gun club as well as shooting at Bisley.

Allan leaves behind his wife Gillian and son Erol, to whom we extend our deepest sympathies. He will be missed.

Roger Hall G4NTY

Tennamast

Over the past five to six years, Tennamast (Scotland) have increased their range of masts, and now galvanise all of their static mast products.

Tennamast are always pleased to quote for any special mast requirements you may have, and custom build many masts to suit individual locations.

A new facet was added to their business recently, when they entered into the boating industry with a new, patented boat storage cradle. This won the prestigious Silk Cut Nautical Design Award for 1990/91, which is probably the highest accolade in the British marine industry.

Details on any of the above can be obtained by writing to Tennamast (Scotland) at 81 Maina Road, Beith, Ayrshire KA15 2HT, or by telephoning or Faxing (0505) 53824 (24 hours).

Amateur Radio On The STS-45 Shuttle Mission

The eight day duration STS-45 Atlantis Space Shuttle Mission, currently planned for lift-off at 1301UTC on March 23, will be the fifth NASA mission to carry the SAREX Shuttle Amateur Radio Experiment.

Onboard with mission commander Charles Bolden and mission specialist C. Michael Foale, will be four amateur radio operators. Mission specialist David Leestma is N5WQC, pilot Brian Duffy is N5WOW, mission specialist Dirk Frimont is ON1AFD, and with payload specialist Byron Lichtenburg is Kathy Sullivan, who is now awaiting her call sign allocation. All will operate under Dave's call N5WQC.

The high 57º inclination of Atlantis will bring it well above the v.h.f. radio communication horizon for all of the world's major countries, including the UK, and the crew between them can speak numerous European languages.

As in the past, the operators will be communicating with students at various schools world-wide, one of those selected being the station at Harrogate Ladies College, who were successful with their contacts with MIR and Helen Sharman's GB1MIR operation. Most SAREX transmissions will be spontaneous open contacts, the operating times being dictated by launch time, geographical constraints, and when the astronauts work activities allow time to operate.

The SAREX mission will employ a battery-powered voice-operated 2m f.m. transceiver, with 3kHz deviation. The primary frequencies intended for use during the mission are 145.550MHz for the Atlantis downlink and 144.910, 144.950, 144.970MHz, plus other specially selected frequencies for the uplink from earth stations. There will be no SSTV or packet radio operations on this flight, due to power need limitations.

Orbital and pass information will be supplied by W1AW bulletins and on the AMSAT nets. These meet on Sundays at 1015 on 3.780MHz and on the AMSAT nets. These meet on Sundays at 1015 on 3.780MHz and at 1800 on 14.282MHz, Mondays and Wednesdays at 1900 on 3.780MHz and Saturdays at 1000 on 14.280MHz. Additionally WA3NAN, the amateur radio club station of the Goddard Spaceflight Centre at Greenbelt, Maryland, will be active from one hour before lift-off and throughout the mission on 14.295 and 21.350MHz. It will be rebroadcasting the SHUTTLE audio and providing tracking and pass information.

Over the same period as the STS-45 Shuttle mission the current U4MIR and USMIR amateur radio operators on the Soviet MIR space station will be being replaced by the new crew, who will continue their amateur radio activities.

If overhead passes occur between one hour before or up to two hours after dusk, Atlantic will be clearly visible. Further information from Pat Owen G3IOR QTHR.

ARC No Link With ARE!

Amateur Radio Communications Ltd. (ARC), of 38 Bridge Street, Earlestown, Newton-le-Willows, Merseyside WA12 9BA, would like to make it clear that they have no link with ARE Communications Ltd. Hangar Lane, Ealing, and this has been the case since 1 May 1988.

Eddystone Users Group

Eddystone Users Group is for users and collectors of Eddystone and Stratton receivers and related products. The Newsletter carries receiver reviews, servicing information, readers' hints, free members' ads, and much more. It is out six times a year and membership is already worldwide. With members in Alaska, Papua New Guinea, UAE, Norway, as well as the more prosaic places. We have in two years grown from a seven page to a 24-page newsletter, much of the content coming from members.

Thanks to the kindness of Chris Pettitt, the Managing Director of Eddystone, we are able to use the Company logo on our EUG badge, and we can now provide members with copies of a number of period Eddystone publications. UK membership is £8 inclusive, cheques to EUG, 112 Edgeside Lane, Waterfoot, Rossendale, Lancashire BB4 9TR.
Nevada To The Rescue Of GORSC

Members of Clayesmore School radio society were delighted when Mike Devereaux G3SED of Nevada Communication in Portsmouth, came to their rescue. Mike had heard that the society’s KW2000B h.f. transceiver had developed several faults, and arranged for it to be repaired at Nevada’s own workshops.

The newly repaired transceiver was handed over in a ceremony at the school, which is located deep in the Dorset countryside between Blandford Forum and Shaftesbury. The KW2000B was gratefully accepted by members of the society, in the presence of the Headmaster Mr. David Beeby, his wife and members of the teaching staff.

The ceremony took place during a talk and demonstration evening on amateur radio, presented by Rob Mannion G3XFD and Tex Swann G1TEX. Mike Devereaux G3SED joined in with the talk, and during the following ‘on air’ demonstration, conditions on v.h.f. and h.f. were such that good contacts were made, including a QSO with a German station, much to the fascination of the audience.

Keen Society Members
Clayesmore Radio Society has some very keen members, some of whom are already building Howes kits for 7MHz receivers. Several members, including one of the teaching staff, have now decided to aim for their own licence.

The society has reserved a callsign, and soon as G0RSC (G0 Radio Society Clayesmore) is issued by the DT, the station will be on the air during Tuesday evenings. The society members will be looking for contacts with other schools, to arrange further schedules and possible visits.

If you are interested in working G0RSC, please write or call George Scott, Head of Science Department, Clayesmore School, Iwerne Minster, Blandford Forum, Dorset DT11 8LL. Tel: (0747) 811217.

‘Operation Euro-Baby 1992’
On Wednesday 22 April 1992, a team of four, including Richard Hook G8LVB, will depart from St. Mary’s Hospital, Portsmouth, on a 7200 mile record-breaking, European, ‘Drive For Life’.

The team will be visiting all 12 European Community capital’s, a total of over 7200 miles, where they will be met by various Mayors, Presidents and Prime Ministers, and whilst in Rome, have a private audience with Pope John Paul II.

The aim of this record-breaking drive, is to raise £250,000 for vital life-saving equipment, needed to monitor prematurely born babies in the new Neo-natal Unit being built at St. Mary’s Hospital, Portsmouth. Each year, over 700 babies are born prematurely in the Portsmouth area. With the money raised, they hope to ensure that their chance of a normal life can be further enhanced.

Richard and his three colleagues, Alan Hartill (Police Officer), Tony Sinclair (Police Officer) and Kevin Taylor (Travel Consultant), will be waved off from St. Mary’s Hospital at 0500hrs on April 22, by the Lord Mayor of Portsmouth. The team will head north to London, where they will be met by the Lord Mayor of Westminster at the House of Commons.

From London, they will drive to Dublin, Brussels, The Hague, Copenhagen, Bonn, Luxembourg, Rome, Athens, Madrid, Lisbon and Paris, before returning to Portsmouth, 16 days later.

During the drive, and using the special callsign GB8OEB, Richard will be busy making contact with amateurs via the various repeaters located throughout Europe, using the latest Alinco DJ-F1E 144MHz hand-held, kindly donated by Waters & Stanton of Hockley, Essex, which they have named their ‘Little Baby’. This particular transceiver is capable of receiving the airband frequencies between 108-138MHz and will be ideal for the team to obtain the latest ‘Volmet’ weather conditions as they travel through Europe.

Clement Clarke International, who are well know for the manufacturing of aircraft headset’s, are assisting Richard’s charity drive by donating two of their latest Delta 100 headsets, these headsets will be used in conjunction with the Alinco DJ-F1E transceiver.

During the ‘Drive For Life’, the team will also be using a new Mercedes 300TD estate, kindly loaned by their local Mercedes dealer, David J. Sparshatts Ltd., of Portsmouth.

Radio amateurs and short wave listeners might like to know that Richard has produced an award which is known as the ‘Operation Euro-Baby Gold Diploma’. For a copy of the ‘Operation Euro-Baby Gold Diploma Rules’, send a stamped addressed envelope to the below address, but HURRY!

If you would like to assist the ‘Operation Euro-Baby’ team in any way, please contact Richard on (0705) 379328. The address for the donations is ‘Operation Euro-Baby’, 8 Chalkpit Road, Paulsgrove, Portsmouth, Hampshire PO6 4EX.
Acea Veia ARC meet 1st Fridays, 7.30pm in the Forem., Commercial, Trinity Square, Amersham. Further details from Pat Cross GM4HGH on (01296) 472472.

Agelby Tels meet 1st & 3rd Mondays, 8pm in the Village Hall at Harrogate. March 19 is 1st AGM and April 1st Roger Pieri G6UMH on the Aspects of VHF and How to Join the Club from Martin G6DZU on (091-370) 6622.

Barnsley & District ARC meet Mondays in the Townshend, 9pm in the rear of the Bexley Hotel, Station Road, Barnsley. March 19th is a Members' night to discuss Construction and GRP, the 23rd is their AGM, the 30th as 10 The Air Night and April 1st is a talk by the Radio Communications Agency. For further details, ring Emmie G4ULU on (0297) 33756.

Basingstoke ARC meets Mondays at the Gamba Club, 8pm in the Allen Club, Hurst Road, Basingstoke. More details from John Randall GD2GZ, 243 Pedwell Road, Basingstoke, Hants RG22 6GP.

Braintree & District ARC meet Thursdays, 8pm in the Polish Ex-Service Club, Sidney Road, Braintree. March 16 is an RF Test Equipment evening, 23rd is a Chairman's discussion night and 30th is a talk on 'When the Sun goes down' by John Joiner G8CAF.

Braintree & District ARC is a monthly meeting, which they can do in the workshop. The club equipment, training on the safe use of tools, and more details, contact Len GORDY (but arm as G4LYK) on (0773) 852475.

Breadalbane & District ARC meet Fridays, 7.30pm in Holy Trinity Club Hall at the rear of Holy Trinity Church, Granville Road, London NW. Further details from Rod GL2K and Perch K4CK. April 9 is a night on 'Amateur Television' by John Lawrence G3HUG.

Brighton & Hove Men's Society ARC meet Mondays, 8pm at the Polish Ex-Service Club, Church Road, Brighton, East Sussex BN1 5EG. Tel: (0273) 426222.

Bromsgrove & District ARC meets at Friends at Avoncliff Arts Centre, South Bromsgrove, WR11 4QR. Tuesdays, 7.30pm in the Memorial Hall, 11th May in the Park, 25th May in the Town Hall, 2nd June in the Bowling Green, Olveston. Further details from Joe Poole G3GMM on (0562) 710706.

Bromsgrove ARC meets at Lickety End Social Club, Alcester Road, Burscough, Burscough, March 24 is Mike Wilkes, the Redditch Heath Foundation. Mr R E Edwards G2HLY, 2 maize Cress, Headless Cross, Redditch, Worcs B97 3EJ. Tel: (0344) 450070.

Bromsgrove & District ARC meet Fridays at Anchor Lambs Arts Centre, South Bromsgrove, WR11 4QR. Mondays, 7.30pm at the Refectory, Church Road. For further details, contact Joe Poole G3GMM on (0562) 710706.

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Radio Diary

March 15: Wylam RC will be holding their Annual Rally at Wylam Park, Silver Street, Wylam (near Newcastle). Doors open at 11am to 5pm. Usual traders, bar and refreshment facilities. Bring & Buy Talk-in. Details from Chris GE0GYD on 0202-430 7267.

March 15: Tiverton West Country Radio Club Mid-Devon Rally will be held at the Pannier Market, Tiverton. Easy access, only minutes from junction 27 on the M5. Free parking. Two halls of trade stands, Bring & Buy stall and mobile snack bar. Further displays and full refreshment facilities in the club room bar, which is open throughout the day. Doors open at 10.30am. Talk-in on 222. More details from G4TW, Mid-Devon Rally, PO Box 3, Tiverton, Devon.

March 22: Pontefract & DARS have their Annual Components Fair & Spring Rally at Carleton Community Centre, Carleton, nr Pontefract. Doors open at 11am to 4.30pm. Admission by programme. Bring & Buy, traders, licensed bar, bookstall, etc. Talk-in on 144MHz. Car boot spaces available. Extra car parking. Details from G0JGE on (0977) 640049.

March 29: Bournemouth Radio Society’s 57th Annual Amateur Radio, Electronics and Computing Exhibition is to be held at the Spring Gardens, Millpool, at Bournemouth. Doors open at 11am. Admission is 50p, including prize draw ticket. Light refreshments available. Talk-in on 222. For further details of table bookings, etc., contact Vic GC4PT on (0202) 515953 evenings after 6pm.

April 8: The Leuchten 6th Amateur Radio Rally will be held at Leuchten Castle. Doors open 10.30am. Maggie. Tel: (0490) 21219.

April 12: Cambridgeshire Repeater Group will be holding their Amateur Radio Rally at Philips Communications System - Catering Centre, St. Andrews Road, Chesterton, Cambridge.refreshments and bar. There will be a junksale, Bring & Buy, Auction. Further details from Mike G0GDG on (0232) 440273.

April 19: Centre of England Easter Sunday Radio & Electronics Rally will be held at the National Motorcycle Museum, Bicknall, near the NEC Ltd. 6 M4. Doors open 10.30am, 10am for disabled visitors. Admission £1 (concession for RAIBC members and senior citizens). Over 60 traders, ample free parking, bar & restaurant facilities. Talk-in S22. Easter special 'Spot The Egg' on many of the trade stands to win an Easter egg. Details from Frank Martin G4ULMF on (0962) 586113.

April 26: The Bury Radio Society are holding their Annual Rally/Massive at ‘The Castle Hotel’, Bolton Street, Bury, Lancashire. More details from Laurence JOONES G4KLY on 061-762 9300.

April 26: Lough Erne ARC have their 11th Annual Mobile Rally in The Killyhevlin Hotel, Enniskillen. Talk-in on S21. Contact Alwyn G4OJD, 15 Glenwood Gardens, Sligo Road, Enniskillen, County Fermanagh, Northern Ireland BT94 7LT. Tel: (0365) 323902.

May 6: Dartmoor Radio Club Rally is to be held at St. Pauls Church Hall, Yelverton. Doors open at 10.30am. Free parking, usual traders, refreshments, Bring & Buy, Details from George Spray on (0622) 853885.

May 17: The 35th Northern Mobile Rally will take place in the Flower Show Hall at the Great Yorkshire Showground, Harrogate, north Yorkshire. Showground opens at 10am, doors open at 10.45am. Talk-in on S22. Bring & Buy, bar and cafeteria. Free parking and disabled facilities. Entry fee £1. Details for disabled visitors off Stockwood Hall House. Details from Mike G0MKX on (0423) 564535/567635 or FAX (0423) 520992 or @GB1CYM.

May 17: The ‘Parkersley’ Rally will be held at the Silverwood Hotel, Lurgan, Co. Armagh. Doors open from 12 noon. There will be usual traders stand, Bring & Buy, bookstall, GBL, bureau etc. Talk-in on S22 (145.550). The proceeds of this rally will go to the Stanley Enfield Retirement Fund, at Parkersley. The venue is near Donaghmore. This is a very worthy cause and they hope to see a really good turn out of everyone interested in all aspects of radio and electronics. Details from Jim Leppin on (0706) 515171.

May 26: The Plymouth Radio & Electronics Fair by the Plymouth Radio Club will be held at Plymouth Comprehensive School, Church Road, Plymouth. Over 25 stalls selling electronics, computer and radio components. Second-hand bargains for the enthusiast. Free parking. Bring & Buy, club stand on the air, bookstall, hot & cold buffet and grand raffle. Doors open 11am, admission is £1 at door. Further information, phone Plymouth 787181.
Kenwood

TS-450SAT

HF Transceiver

As he's a keen 'mobileer' and wants to encourage h.f. mobile working, Rob Mannion G3XFD was pleased to get to grips with the compact Kenwood TS-450SAT transceiver. Here's what he thought of this fairly new rig.

It all began when I was searching for a rig to use as a basis for an article, with the sole intention of getting more people active on h.f. mobile operating. So, I rang Lowes in Matlock, Derbyshire.

"Have you got a rig that will work mobile, with the minimum of fuss" I asked? And that's how I came to have the Kenwood TS-450SAT in my shack, with the job of reviewing it, and trying it out mobile.

Reputation For Quality

Kenwood have a reputation for producing high quality equipment, and neat designs. However, I was quite unaware of quite how compact the rig was! To say this transceiver is compact, is an understatement.

Despite clever photography, the advertising people rarely seem to be able to convey size effectively. So, after a conference with Tex Swann G1TEX, and Steve Hunt our Art Editor, we thought that Tex's driving glasses would provide a good perspective to judge the size of this 100W rig by. Small isn't it?

Read The Book

With a modern and complex rig, the golden rule has got to be to read the book, and by that I mean read the manual! The Kenwood TS-450SAT comes with a lot of documentation, and it looks overwhelming at first, although I quickly realised it's because different languages are catered for in one book.

Despite the occasional 'Japanese' English, the manual is excellent. It's clear, concise and very helpful. There are pages of diagrams showing the operator everything they need to know. Occasionally, (and surprisingly) the English captions don't flow quite as smoothly as the diagrams do, but despite this, the manuals are excellent.

I was soon confident enough to go on the air, and that was when I became concerned, because I thought the transceiver was 'deaf'. But, I was soon to find out just how wrong I was!

Circuit Description

Before I get carried away with my on the air experiences, let's have a brief look at the specification of the transceiver itself. But, before I start, I should say that at first glance, although the receiver specification is excellent, it doesn't really give you a firm idea of what to expect on the air.

The receiver is a triple -conversion superhet, and it's tuning range (on the TS-450SAT) is continuous from 30kHz (not 500kHz as the manual says in one place) to 30MHz. The first i.f. is 73.05, and the second is 8.83MHz, while the third is 45.5kHz.

As supplied, the receiver works on s.s.b., c.w., f.s.k., a.m. and f.m. The transceiver I had on loan came fitted with all filters, except the 500Hz version. The receiver is fitted with a tuneable notch filter and an i.f. shift facility.

The transmitter works on a.m., c.w., f.s.k., f.m., and s.s.b., with a maximum output power of 100W. However, I'm not going to bore you with just a list of statistics, because I feel that if you're going to buy a rig like this, you'll know it's going to be good. What you do want to know is how it performs on the air!

On The Air

The on air performance was superb. I did a lot of s.s.b. operation and a great deal more c.w. working with the transceiver, and much of the time I was able to run at reduced power. However, when I had first switched the rig on, I thought the receiver side was 'deaf', although I soon found it was just an exceptionally quiet receiver.

I always regard the 7MHz band as the ultimate test, especially on c.w. at weekends! So, I spent a Saturday afternoon on 7MHz, thoroughly enjoying myself on the key.

Conditions on 7MHz had been excellent. The band had provided some very good inter-European working, and I had been very pleased at the very low noise level in the rig.

At first, I found the receiver's extremely low noise level, to be misleading. There were times when I thought the antenna had gone open circuit!

The afternoon drew on, and I started a very enjoyable c.w. QSO with Eric G0KHR up in Stockport, near Manchester. When Eric and I started, the band (and our frequency) had been exceptionally quiet, but we were in for a surprise.

Switched On QRM

Eric G0KHR and I were enjoying the un-clustered frequency, until suddenly (as I said to Eric, it was just as though someone had 'switched on' the QRM) I passed the QSO back to him, and the noise, QRM and general clutter was there, at S-9++.

Now it was time for the transceiver to show its paces, and it coped very well, despite not being fitted with the 500Hz filter. Although Eric was a good signal, the continental signals were incredibly strong. I had never come across such a rapid change in conditions on the band before, and I'm a keen and regular 7MHz operator.

I had to use the built-in notch filter facility, and it was good. However, the most impressive and effective aid was the i.f. off-set tuning facility.

This extremely effective and very useful facility (in action, it provides the same effect as the variable selectivity found on the Eddystone 750 and 888A receivers, although I do realise it works in a different way) made c.w. operation particularly easy on the busy 7 and 14MHz bands. It was so easy to use too, and can provide
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Practical Wireless, April 1992 21
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Peter GACKN

We don't pay it any wages!... Elaine, Frank and Richard
up to 90dB attenuation of the unwanted signal! Although I would have liked the opportunity to try the 500Hz filter, I now realise that it can only make a superb little receiver better!

**Mobile Fashion**

The next stage was to try the Kenwood out mobile fashion. But to be honest, as small as it is, you do need a large parcel shelf for safe mobile mounting.

All I did, was to place the rig in an old p.m.r. cradle (it fitted nicely, but didn't have the depth of the original occupant, before driving to my favourite hilltop lay-by. I used my set of trusty G-Whip antennas for the tests. The rig, of course, worked superbly. The reports on the audio and general signal quality were very pleasing. The automatic antenna tuning unit also worked quickly and efficiently, a definite advantage when using a mobile antenna.

I did find that the receiver's audio output was a little low for my liking, which could be a problem with high background noise levels in a moving vehicle. Having said that, I've no doubt many operators would be using a headset boom-microphone in any case. I was pleased to see how well the control panel coped with bright sunlight in the car. I found no problem in reading it at all.

The final matter of interest (forgive the pun) was how the rig would react to the extremes of heat in cars (you know how hot they can get, even on a mild day). Well, the whisper-quiet cooling fan did its job very well, so much so that I enquired how Kenwood had achieved such a silent-whisper-quiet cooling fan did its job very well, so much so...

Despite looking through the manual, I couldn't find any information. However, the Lowe workshop staff in Matlock, confirmed there are two fans, not one! These brushless d.c. units are electrically noiseless and very efficient. I can confirm that, because for a time (helped by the manual) I wasn't sure there were any fitted!

**Control Panel**

Although I do have one or two little reservations regarding the layout on the control panel and other items, I would strongly recommend this rig to anyone. However, the Kenwood TS-450SAT is likely to prove extremely useful to those wanting to work mobile (whether it be in a car, on an inland waterway holiday or maritime) or just portable. It's also a delightfully neat rig to have perched on a desk or workbench. I found that I used the rig a great deal to listen to the short wave broadcasting bands when I was working, it's really a versatile little transceiver.

My only reservations are to the size of the 'important' controls, r.f. gain, a.i.t., i.f. shift, and a.f. gain, which are of the concentric or coaxial type (as well as being rather small). I would have liked them to be larger.

The only other comment is regarding the VOX. I found that I consistently left the microphone plugged in when I was working c.w. This meant that the transceiver 'keyed' itself on loud c.w. signals when the VOX activated. An indicator on the front panel, or perhaps an auxiliary switch (operated when c.w. was selected) would help.

---

**Specifications**

<table>
<thead>
<tr>
<th>General</th>
<th>s.s.b., c.w., a.m., f.m., f.s.k.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes</td>
<td>100</td>
</tr>
<tr>
<td>Memory channels</td>
<td>(with automatic a.t.u.) 20-150kHz</td>
</tr>
<tr>
<td>Antenna impedance</td>
<td>12 to 16V d.c. (13.7V reference)</td>
</tr>
<tr>
<td>Power requirements</td>
<td>Negative</td>
</tr>
<tr>
<td>Grounding</td>
<td>Current consumption 2A (receive, no signal) 20.5A (transmission)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10°C to 50°C</td>
</tr>
<tr>
<td>Frequency stability</td>
<td>Less than ±10ppm</td>
</tr>
<tr>
<td>Frequency accuracy</td>
<td>Less than ±2.10ppm</td>
</tr>
<tr>
<td>Dimension (w x h x d)</td>
<td>280 x 107 x 340mm</td>
</tr>
<tr>
<td>Weight</td>
<td>7.5kg (with automatic a.t.u.)</td>
</tr>
<tr>
<td>Frequency range (transmit and receive)</td>
<td>1.8 to 29.7MHz including WARC bands</td>
</tr>
<tr>
<td>Frequency range (receive only)</td>
<td>30kHz to 29.999MHz</td>
</tr>
<tr>
<td>Transmitter</td>
<td>Output power (without AT-450 tuner)</td>
</tr>
<tr>
<td>Modulation</td>
<td>Balanced (s.s.b.) Reactance (f.m.) low level (a.m.)</td>
</tr>
<tr>
<td>Spurious radiation</td>
<td>Less than ±50dB</td>
</tr>
<tr>
<td>Carrier suppression (with 1.5kHz reference)</td>
<td>More than 40dB</td>
</tr>
<tr>
<td>Unwanted sideband suppression (with 1.5kHz reference)</td>
<td>More than 40dB</td>
</tr>
<tr>
<td>Max. freq. deviation (f.m.)</td>
<td>Less than ±5kHz</td>
</tr>
<tr>
<td>Audio freq. response</td>
<td>40Hz to 2.6kHz</td>
</tr>
</tbody>
</table>

**Receiver** (although the general coverage receiver tunes from 30kHz to 29.999MHz, specifications only cover 500kHz to 25.999MHz in the Kenwood manual)

<table>
<thead>
<tr>
<th>Receiver circuitry</th>
<th>Triple conversion superhetodynamy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency range</td>
<td>500kHz to 29.999MHz (30kHz to 29.999MHz model reviewed)</td>
</tr>
<tr>
<td>Intermediate frequencies</td>
<td>1st: 73.05MHz, 2nd: 8.81MHz, 3rd: 455kHz</td>
</tr>
<tr>
<td>Sensitivity: 500kHz to 1.2MHz</td>
<td>Less than 4µV (s.s.b., c.w., f.s.k.) at 10dB</td>
</tr>
<tr>
<td>Sensitivity: 1.62 to 21.5MHz</td>
<td>Less than 0.2µV (s.s.b., c.w., f.s.k.) less than 2µV (a.m.)</td>
</tr>
<tr>
<td>Sensitivity: 21.5 to 30MHz</td>
<td>Less than 0.15µV (s.s.b., c.w., f.s.k.) less than 1.3µV (a.m.)</td>
</tr>
<tr>
<td>Sensitivity: 1.25 to 300MHz</td>
<td>Less than 0.25µV at 10dB SINAD</td>
</tr>
<tr>
<td>Selectivity s.s.b., c.w., f.s.k.</td>
<td>-6dB, more than 2.2kHz, -40dB, less than 4.4kHz</td>
</tr>
<tr>
<td>Selectivity a.m.</td>
<td>-6dB, more than 5kHz, -50dB, less than 18kHz</td>
</tr>
<tr>
<td>Selectivity f.m.</td>
<td>-6dB, more than 12kHz, -50dB, less than 25kHz</td>
</tr>
<tr>
<td>Image rejection</td>
<td>More than 70dB</td>
</tr>
<tr>
<td>1st f. rejection</td>
<td>More than 70dB</td>
</tr>
<tr>
<td>Notch filter attenuation</td>
<td>Less than 20dB</td>
</tr>
<tr>
<td>Squelch sensitivity</td>
<td>Less than 200µV 500Hz to 1.62MHz</td>
</tr>
<tr>
<td>Audio output</td>
<td>1.5W into 6Ω (1% distortion)</td>
</tr>
</tbody>
</table>

As we go to press, Lowe Electronics have announced they are to offer a free matching PS-33 power supply for a limited period with the TS-450 range. Further details from Lowe Electronics.
Construction

Don't discard those surplus meter movements. Even if they're only capable of reading a few microamps at full scale, Arthur Rumbelow G3KKC says that you can extend their current range, using standard value resistors and save money at the same time!

Extending The Range of Current Meters

How often have you discovered a need to measure a particular value of circuit current, and then found you don't have a suitable meter? It's on occasions like this we have to resort to using a meter with a full scale reading, or deflection (f.s.d.), far smaller than the current to be measured.

When using a meter to measure a current greater than it's designed to carry on its own, we have to bypass some of the total current, away from the instrument. This bypassed, or shunted current, flows through a shunt resistor, Rshunt, as shown in Fig. 1.

From Ohm's Law, we can find that the ratio of the resistance Rshunt to Rmeter equals the ratio of the current Imeter to Ishunt (please note the inversion).

$$\frac{R_{shunt}}{R_{meter}} = \frac{I_{meter}}{I_{shunt}} \quad (equation \ 1)$$

From this formula we can make a general formula for calculating the value of Rshunt, or Rs as I will now call it.

Where $R_s = \frac{R_{meter}}{n-1} \quad (equation \ 2)$.

In this formula, Ra is the internal resistance of meter Rmeter in Fig. 1 and n is the factor by which original meter scale is to be multiplied. In general terms, if the 'n' factor is greater than about 500, then using 'n-1' is the same as using 'n' itself.

Typical Meter

Let's look at this process in more detail, by taking a typical µA reading meter. This meter may have a f.s.d. of 100µA, and an internal resistance of 375Ω.

For the purpose of the exercise, we'll assume that we want to use it to read 300mA f.s.d. We can calculate two values of Rs using the general term 'n' or, the mathematically more correct, 'n-1' term. These values are 1.2504168060 (when using 'n-1'), and 1.250 if we use 'n' instead. Whichever value we choose to use, we could make it up from resistance wire.

Unfortunately, some trial and error work might be necessary to get an accurate value. Alternatively, if we were to use a 1.2Ω resistor there would be a known reading inaccuracy of about 4%.

Moreover, when coupled with resistor value variation, and a possible movement inaccuracy of 2-5%, the resulting reading accuracy might be inadequate.

Another Look

If you take another look at the diagram of Fig. 1, you'll see that this is a variant of the method given in many amateur radio handbooks. Although I've not seen it mentioned in any of the better known textbooks, there is a method of making the situation easier.

This easier method is derived from basic physics, which by using Ohm's law, states that the ratio of the resistances Rs/Rn is the ratio of the currents I1/I2. My method allows readily available wirewound resistors and preferred standard values of 0.25W resistors to be used. This can save a great deal of trouble!

My idea is based on making the apparent meter resistance greater. This has the effect of increasing the value of Rs. If we make Rs equal to the next available preferred value above the value calculated, then we don't have to play around with resistance wire any more. So, let's have a look at how it can be done.

Preferred Values

In our example (as the shunt current is almost 3000 times greater than the meter current, I'm going to use 'n') the ratio of Rs/Rn is 1:3000 (3.33 x 10^-3).

With Rn set at 375Ω, Rs is 1.25Ω (using the 'n'...
value). If I wanted to use a wirewound resistor of 1.5 Ω, then R_m(new) would have to be 1.5 * 3000 or 4500 Ω. For all practical purposes this value may be assumed to be exact as the error is well under 1%.

These new values of Total resistance R_m(new), would mean adding one, or more, resistors in series with the meter, as shown in Fig. 2. The difference between the values R_m(old) and R_m(new) is 750 Ω. This value could be made up from three resistors, 3300Ω + 390Ω + 30Ω. All of these figures are preferred values, available as close tolerance high stability resistors.

Another Example

Here’s another example, and a variation on the theme. Let’s assume that we have a resistor of 2.212 Ω instead. So, let’s use this value of 2.212 Ω and do a little more arithmetic. If 2.212•R_m = 1.3000, then R_m(new) = 2.212 * 3000 = 6636 Ω.

Using standard values resistors, to bring the 3750Ω (internal resistance) of the meter up to 6600Ω, means adding more resistance (2850Ω) in series with the meter. This value can be made up with two resistors, R_a and R_b, as shown in Fig. 2. One combination to make up the value, 2850Ω, is one 2700Ω, and one 150Ω in series (0.25W).

Some Examples

I’ve worked out some examples using preferred values of wirewound resistors for R_m. In working these values out I’ve also assumed the R_m value (3750Ω) used as above. These values are shown in the table of Fig. 4.

The shunt resistance must be capable of dissipating the power necessary. Up to approximately 1A, a 3W wirewound type could be used.

Above this level of current, resistors capable of dissipating greater power should be used. It’s important to remember that if this resistor went open circuit, it would be disastrous for the meter!

PW

Further Reading:
Mathematics For The Rae on page 39 of this issue discusses the power dissipated in resistors.
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The Pigtail

A Reliable 144MHz Antenna for Mobile Working In A Reliant Car

Some while ago in a previous job, I had to commute daily to get to work. This involved a round trip of about 150km, which due to starting at 7.30am, meant being on the road at the unearthly time of 6.15am! The local repeater was a source of companionship at that time of the day, and also on the return trip in the evening, but for reliable communication, I needed a good antenna.

One problem presented itself almost immediately! It’s a difficulty that faces drivers of all glass fibre-bodied Reliant three wheelers, who want to transmit. How do you fit an antenna for 144MHz mobile working?

Let’s face it, the ‘Plastic Pig’ was never designed with radio communications in mind. Leaving aside the many jokes about the machine, which I tend to join in with, (So do we Tex, so do we!‘ Ed.) as I’m a happy and contented Reliant owner. So, let’s have a look at the radio problems associated with this long-established three-wheeler or the “aeroplane minus wings” as G3XFD calls it!

Ground Plane

In normal 144MHz mobile systems, the roof of the vehicle forms a more than adequate ground plane, against which a λ/4 or 5λ/8 antenna does remarkably well. The body length of the average car body is such that, even though it’s not an ideal surface, it’s vastly better than the same length of glass fibre reinforced plastics material (g.r.p.).

I’m fond of my little car, and I didn’t fancy the idea of radial elements on the roof. The prospect of taking out the lining, and putting a large mass of aluminium foil on the inside of the roof didn’t appeal to me either!

Suitable Antenna

How could I end up with a suitable antenna on such an apparently unsuitable vehicle? After a little thought, I realised that the ideal antenna for this job, wouldn’t require an earth plane.

So, it was a simple problem, with a simple solution. All I needed was an end fed antenna, which has no need for an earth plane.

But the problem I was left with, was just how do you produce an end-fed antenna on 144MHz? Such an antenna would be one or more complete electrical half waves long, and have a feed impedance of around 1000Ω. Not an easy match to 50Ω coaxial cable!

Feed Impedance

After I had looked in the various manuals, I confirmed that a half-wave, end fed antenna seems to have a feed impedance of around 1-1.5kΩ. If some method could be found to match the 50Ω coaxial cable to this impedance, it would perhaps provide a suitable antenna with reasonable performance.

At first, I tried the tuned auto-transformer circuit, demonstrated in Fred Judd G2BCX’s article on a 50MHz mobile antenna (PW, September 1991 page 33). This circuit provided a fair match, when it was very close to the centre frequency, but the matching rapidly deteriorated away from this point.

A further problem, was in choosing the correct tapping point on the coil. If I chose a tapping low on the coil, sensitivity was good but bandwidth was poor. If I went too high on the coil, sensitivity was poor, but the antenna bandwidth was much better!

Unusual Ideas

So, I had to go back to my collection of reference manuals. In these 1950s vintage books, there are many unusual and useful ideas to be found. I wasn’t to be disappointed, as I rediscovered the π-match, which is a more than adequate method for coupling very different impedances.

I won’t bore you with all the maths involved, but it’s fairly easy once a few assumptions have been made. The impedance step-up is about 25:1, or (to be exact) it would have been if the antenna was exactly λ/2 long.

Had this been the case the matching might have been a little more difficult. What I actually opted for was an antenna slightly longer than λ/2. This makes the impedance slightly reactive, which allows more normal values for the π-match components. It could also equally apply to an antenna slightly shorter than λ/2. The theoretical circuit of the matching unit is shown in Fig. 1.

Making The Antenna

It’s time to start the job, and get down to making the antenna. The photograph shows the Mark II version, and it uses the top portion of an old hollow, glass fibre fishing rod (well what else for a vehicle with a glass fibre body?). You should choose a length about a metre long. I found that at this length, the larger end of the tapering fishing-rod would still fit into a PL259 plug.

Next, you should take a length of multi-strand flex (a little longer than the length of fishing-rod) and thread it through the hollow rod. If you find the flex is too thick, all you have to do, is solder a length of thinner flex to it, so it will pass through the end of the rod.

After this stage is completed, find a PL259 plug of the type that has a large diameter cable entry hole. Solder the flex into the plug, then push the rod into the hole, pulling the flex tightly from the narrow end. Then you
How Much? £8 (depending on your junk box!)

How Difficult? Beginner

Shopping List

- Die-cast aluminium or other suitable box for base (see text)
- Length of hollow glass fibre fishing rod (your local fishing tackle shop will probably be quite pleased to sell you a broken rod quite cheaply)
- Wire for coil winding (see text)
- Nuts, bolts and washers as required (alternative to rivets used by author)
- PL259 plugs and sockets
- Two variable trimmer capacitors (22-30pF film type or Oxley will do, but see note in text reference power levels)
- Rubber suction-pad type feet (from hardware stores)
- Suitable plastics material for mounting plate
- Waterproofing sealant
- Self-amalgamating tape (for cable and plug sealing)
- Length of 50Ω cable
- Epoxy resin adhesive ('Araldite Rapid' is suitable)

The antenna should fix the rod into place with some epoxy resin adhesive. When that's completed, you can start on the next part of the project, building the base unit.

Aluminium Base Box

I used a small, die-cast aluminium box for the base. Almost any box will do, but if it's made from metal, it should be as small as it is possible.

You should drill suitable holes for an SO239 socket in the 'bottom', before fitting the socket, with earthing tags under one of the fastenings. I used blind rivets for this job.

To keep the weather out, all holes should be liberally smeared with a waterproofing sealant. I used a rubber glue, and it seems to work very well. Although not strictly necessary, I also fitted a BNC socket for the feed point, as it makes adjustments easier.

Then you should take a length of copper wire of about 0.7 to 1.2mm diameter, and wind the coil, which should be of approximately six turns. If you have silvered copper wire then so much the better, although this only provides marginally better performance.

If you do fit a second socket for the coaxial feed, then the coil may be soldered in place between the two centre connectors. The photograph, Fig. 2, shows how it's done and the photos in Fig. 3 and 4 show more general details of the antenna.

To mount the antenna on my 'Plastic Pig', I cemented the assembly onto a sheet of clear plastics material. You can use virtually any plastics for this purpose, and I fixed some rubber suction-pad 'feet' underneath, to do the same job as a 'mag-mount'.

Setting Up

Setting up and adjusting the antenna for a good v.s.w.r., is an easy task. Begin the process by setting the transmitter frequency to the middle of the area of interest (145.3MHz for the f.m. frequencies).

Then, by adjusting C1 and C2, you can reduce the s.w.r. measurement to its lowest reading on transmit. It should also be possible to achieve a figure of less than 1.5:1 over most, if not all of the 144MHz band.

The 'Pigtail' can also be employed as a useful, portable indoor antenna. I've used it for this purpose, and if you look at the front cover of the June 1990 PW, you'll see the antenna in use on the table, during my annual summer 'portable expedition! Finally, it's important to remember that the components shown, are suitable for a maximum power of no more than about 5W, especially if the antenna is to be used outside in all the conditions the British climate has to offer!

Tail End

With just 2.5W maximum output from my 144MHz rig, I could use our local repeater from a distance of 60km 'up country' on a regular basis. I could also hear other stations up to 150km distance. Not bad for a little 'Pigtail'!
A Simple Inductance And Capacitance Bridge

Of the three fundamental quantities in electronics, resistance, capacitance and inductance, it’s inductance which is the most difficult to measure. The value of inductance is also the most difficult to obtain, with any degree of accuracy relative to that of resistance and capacitance.

Constructors can buy ready-wound inductors, with values ranging from a micro-Henry (µH), to a few hundred milli-Henries (mH) with an accuracy of about 5%. For the purposes which these components are sold, such as r.f. chokes and possibly filter elements, such accuracies are, for most purposes, perfectly adequate.

However, this is not universally so. There are only a limited number of values obtainable, and for values which are not included in this range, we find ourselves at a disadvantage. For while inductors can be wound at the work bench cheaply and easily, unless we can measure what we have wound, those advantages disappear.

Small Inductors

I’m not going to consider large, iron-core inductors, where the inductance may run into hundreds of Henries. I shall however, concentrate on smaller inductors (which may have dust-iron core adjustment) having values up to, say, one Henry.

These values of inductance are in the province of most experimenters, especially those with an interest in radio receiving and transmitting equipment.

Wheatstone Bridge

The project is based on the classic Wheatstone bridge and its adaptations. Bridge methods tend to be neglected nowadays, this is because for measurement of resistance and capacitance, there are now better, cheaper and easily operated alternatives.

However, in the case of inductance measurements, the bridge method offers a convenient and uncomplicated method. It’s particularly convenient for the range of inductors I’ve mentioned.

The usual difficulty with bridge methods, arises from the fact that the bridge balance is affected by the ‘loss angle’. This is much greater in inductive components than in capacitive elements.

This involves the successive adjustment of two controls on the bridge. There’s one to balance magnitude (as in a purely resistive bridge) and the other to balance the phase angle differences.

For this project, I have assumed that the phase angles of the inductors we’re likely to measure, are close to the ideal. This means we can avoid worrying too much about balancing out phase angles, and compare only the value of the inductive reactance, with that of an internal standard.

Simple Modification

The bridge used is a simple modification of Maxwell’s circuit shown in Fig. 1.1. Two arms of the bridge are purely resistive, \( R_a \) and \( R_b \). The adjustable arm consists of a standard variable inductor \( L_1 \) in series with the variable \( R_c \).

The unknown arm contains the coil, whose inductance \( L_x \) is required (The resistance \( R_v \) is the effective a.c. resistance of the inductor at the frequency of measurement). The problem here is the need for a standard variable inductor, which is not something we’re likely to find in the average workshop.

As we are not concerned with phase angles, we can leave out \( R_c \), making the resistive arms have a continuously variable ratio. This is done by using a potentiometer as shown in the modified bridge, Fig. 1.2.

The variable inductor can be replaced with a range of fixed inductors (of known values), with the unknown inductor, \( L_x \) placed into the fourth arm. With the equation of balance as given in the figure, we will know the ratio \( R_v/R_a \) (from a calibrated scale) and \( L \) (one of a standard range); hence \( L_x \) will be found as a simple product. The diagram, Fig. 1.3, shows the basic method of measurement and how the various components of the bridge fit together.

Circuit Details

The main circuit diagram (excluding the power supply), is shown in Fig. 1.4. It consists of three sections,
Fig. 1.4: Circuit diagram of the final bridge excluding the power supply.

**How Difficult?**

**Intermediate**

**How Much?**

£30 (plus p.c.b.s)

**Shopping List**

**Resistors**

- 5% metal film, 0.25W (Unless stated otherwise)
- 3.3Ω 2 R6, 7
- 100Ω 2 R6, 10 (1%)
- 4.7kΩ 2 R1, 2
- 8.2kΩ 2 R4, 5
- 10kΩ 2 R15, 17
- 22kΩ 1 R16
- 47kΩ 1 R13
- 470kΩ 3 R11, 12, 14

Resistors variable

- 10Ω 1 R3 (miniature pre-set)
- 1kΩ 1 R9 1W linear, type CLR (Colvern)

**Capacitors**

Type and tolerance as stated

- 100pF 1 C7 polystyrene 1%
- 1nF 3 C1, 2, 8 (C8 1%)
- 10nF 1 C9 (1% tolerance)
- 100nF 1 C10 (5% tolerance)
- 0.47µF 3 C13, 18, 19
- 1µF 1 C11/5% tolerance
- 4.7µF 2 C15, 16 25V tantalum
- 22µF 1 25V tantalum
- 470µF 2 25V radial electrolytic

**Semiconductors**

Integrated circuits

- NE5534 1 IC1 Opamp, (see text)
- 78L05 1 IC2 100mA regulator

Transistors

- BC338 1 Tr2 (p.n.p.)
- BC338 3 Tr1, 3, 4

Diodes

- 1N4148 2 D1, 2
- CA50/91 2 D3, 4

Zener Diodes

- D5, 6 2 9V 1.3W

**Inductors**

- See note below regarding suitable sources of inductors.
- L1 1µH
- L2 10µH
- L3 100µH
- L4 1mH
- L5 10mH
- L6 100mH
- L7 1H
- T4 (see text)

All inductors are available from the CirKit Toko range or (up to 100mH) from Electrovalue, R.S. Components or Electromall.

**Miscellaneous**

Meter 50µA type MU (or T-series may be used), switches single-pole, 12-way Lortin miniature, Two-pole on-off miniature. T1 is a RM6 pot core with bobbin and clamp (AL=250). T2 12-0-12V (power supply transformer) 2VA p.c.b. mounting mains transformer, 250V neon indicator, miniature type, 6V 0.36W LES bulb, wire terminations. Terminal points (preferably spring loaded) (3 off). Case: Maplin Blue Case (see text). Knobs, SBA 1/2in screws and nuts, 1/4in spacers, 11/4in spacers, 8-pin DIL socket for IC1 (if needed), connecting wire, 3-core mains lead solder.

Each being built on small separate p.c.b.s representing the block assembly in Fig. 1.3.

The a.c. source is a conventional Wien oscillator using an NE5554 op amp with filament bulb stabilisation. The actual frequency of this source is not critical, but other practical considerations appear.

The source has to ‘look’ into the bridge at balance, and might not be too happy at seeing an impedance not far removed from zero! Because of this, it has to be capable of delivering sufficient power into a very low impedance.

With the values used, the frequency of oscillation is about 35kHz. This is fed to a pair of complementary transistors, Tr1 and Tr2, into a step-down transformer feeding the bridge proper. This transformer has an impedance ratio of about 72:1, so the bridge loading doesn’t at worst fall below a few ohms.

**Capacitance Ranges**

By using a 12-way switch in the bridge circuit, five capacitance ranges can be included. In this arrangement, the ratio arms are reversed in the changeover from inductance to capacitance measurement.

This method does away with the necessity of two distinct scales for the ratio, since this will increase as inductive reactance increases, and decreases as the value of a capacitor increases and capacitive reactance decreases.

Thanks to these effects, a single scale calibration showing the arm ratio on both sides of one-to-one, will be practical for both measurements.

The output from the bridge is fed to a simple null detector comprising transistors Tr3 and Tr4. Negative feedback is applied over both stages. A 50µA meter, itself in a diode bridge arrangement, indicates the minimum (or balanced) condition at the input.

The feedback operation protects the meter from severe overloading, even with a far out-of-balance state, and a sensitivity shunt is unnecessary.

The power unit (to be described next month) is entirely conventional and provides a dual 9V output stabilised by Zener diodes.

**Board Assembly**

The two main circuit boards are shown in Figs. 1.5 and 1.6. The oscillator and null detector boards need little comment.

On both boards, the only points to watch are the polarities of the diodes and electrolytics, together with care in fitting the
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transistors (of the complementary pair) in their right places.

Transformer T1 is a type RM6 pot core, with an inductance factor $A_L$ of 250. They have a bobbin which has integral pins on 0.1-inch grid.

The pins are grouped in threes on each side of the bobbin, and the outermost pin of each group must be snipped off to allow the unit to be fitted to the print pads on the board. The bobbin is wound with 105 turns of 36s.w.g. enamelled wire for the primary, and 12 turns of 26s.w.g. for the secondary. There's no need for tape insulation between the windings.

Each coil is brought out to a pair of the pins, and neatly soldered. Which end goes to which of the pins doesn't matter.

It is however, important to get it the right way round when it is assembled with its two half-cores. The 'spiky' ends of the retaining clips go to the single pads. The core adjuster should be screwed well in.

The Final Stage

Next time, I'll describe the power supply, the bridge board, and the final assembly stages, testing and calibration of the simple capacitance and inductance bridge. The good news is that, if you use the recommended components, all the hard work in calibration has already been done for you.
"De nihilo nihilum, in nihilum nil posse reverti" (Nothing can come out of nothing, nothing can go back to nothing) Persius AD 34-62
...or (G3RJV interpretation) "you can't get owt from nowt" as they used to say to me in my Lincolnshire youth! Take it from me, this is worth remembering when dealing with oscillator circuits.

So far in this series, we have built audio oscillators. These are oscillators that produce an output that we can hear.

Radio frequency oscillators (r.f. oscillators) are more usual in our hobby. Oscillators of this type appear in most receivers, and in all transmitters and, as the name implies, they produce a signal at radio frequencies.

The principle of operation is the same as the audio oscillator. The basic circuit is that of an amplifier, where some of the output is fed back to the input (feedback) to set up a cycle of oscillation.

Within the circuit there will be elements to set the frequency of that oscillation, usually in an r.f. oscillator this will be a tuned circuit.

Resonant Frequency

Just as in music, strings or tubes can have a resonant frequency which produces a particular note. It’s the same in electronics, where a circuit can resonate at a chosen frequency.

The circuit, Fig. 1(a), shows a parallel tuned circuit. There’s nothing to it really, only a capacitor and an inductor. The term inductor is the usual name for a coil, although many of us ‘old hands’ still call them coils!

Without going into a lot of theory, a tuned circuit relies on a property called reactance. The reactance resists the flow of alternating current (a.c.) in a circuit.

Capacitive reactance and inductive reactance work the opposite way round. This means that the reactance of an inductor increases as the frequency gets higher, whereas the reactance of a capacitor increases as the frequency gets lower.

So, for any given values of capacitance and inductance, there will be a frequency when both are the same and cancel out. This is the resonant frequency of that tuned circuit.

Since the reactance impedes the flow of a.c. current in the circuit, the resonant frequency is that at which the circuit will allow a high current to flow.

At frequencies above and below resonance, the a.c. current flow is resisted or reduced. So, a tuned circuit accepts or tunes a particular frequency.

Variable Capacitor

The diagram, Fig. 1(b), shows the use of a variable capacitor to vary that frequency. Interesting, isn’t it? But that’s all the theory you are going to get here!

This is ‘Getting Started the Practical Way’ and there are plenty of books dealing with the theory of the subject, and we are simply going to build a circuit to see it working and get some practical use out of it.

Hartley Oscillator

The diagram, Fig. 2, shows the circuit of an r.f. oscillator of the type known as a Hartley oscillator. I assume it’s named after a Mr Hartley, for although my radio archives have references to the circuit back at least to the 1930s, they say nothing of the man behind the circuit.

The circuit shows our first example of another active device, the field effect transistor (f.e.t.). This is a type of transistor with a higher input impedance than the bipolar transistors that we’ve used so far.

The terminations also have different designations, and they are referred to as: the source, gate and drain.

There are two questions that can be asked of an oscillator circuit, and they are: where is the feedback loop to maintain oscillation, and what determines the frequency of the oscillation?

In this circuit, the tuned circuit can be seen clearly in L1 and the variable capacitor. The feedback is applied through the inductor in the tuned circuit. This is tapped, to allow signal to be fed back from the source to the gate.

Feedback Controlled

The amount of feedback is controlled by the placement of the tap in the coil. The higher the tap is up on L1, the greater the feedback.

The ideal amount of feedback is just that required to maintain oscillation, over the whole tuned range of frequencies. Too little and the oscillations will not begin. If there’s too much feedback, there can be problems of instability or even over-heating of the transistor.

In the circuit, Fig. 2, R1 provides a suitable...
A view of the completed dip-meter.

Fig. 1: Parallel resonant circuits. (a) is of fixed frequency. (b) is frequency variable.

The Dip Meter

The dip meter, which was known as the 'grid-dip meter' in the days of valves, is one of the most useful items on the radio constructor's bench. The earliest reference to these instruments, seems to have been a practical circuit by W6WB in CQ Magazine in 1947.

The basic task of the dip meter is to measure the frequency of a tuned circuit. It can also be used to measure the resonant frequency of antennas. Other jobs the dip meter can do include measuring unknown inductances and capacitances, and detecting unwanted harmonic resonances in circuits. However, its main use is probably finding the resonant frequency of tuned circuits that use home-wound coils.

In a practical form, the dip meter is a calibrated variable frequency r.f. oscillator with an inductor mounted outside the instrument’s case. The externally mounted inductor is arranged so it can be brought close to another tuned circuit.

When the tuned circuit being measured is at the same frequency as the dip meter oscillator, it will absorb some of the energy from that oscillator. When this happens the current drawn by the oscillator will decrease, and this can then be measured on a meter.

The frequency of the dip meter is already known and is shown on the instrument’s dial (in other words, it’s been calibrated). All the operator has to do, is to read the frequency from the dial where the maximum ‘dip’ occurs.

The early valve versions used a meter to measure the current in the valve grid, hence the name ‘grid dip’ oscillator, which is still used by many radio amateurs. Nowadays, since transistors don’t have a grid, the term dip meter is more correct.

The Circuit

The diagram, Fig. 3, shows the circuit of a dip meter using the Hartley oscillator. The transistor, Tr1, is exactly the same circuit as the oscillator circuit shown in Fig. 2.

For the dip meter to be effective, it’s essential to have a meter on the instrument, which can clearly show what (if any) oscillatory energy is being absorbed by the circuit being tested. For this purpose, many dip meters have a sensitive current meter monitoring the current flowing in the gate circuit of the oscillator. This circuit uses another method.

The circuit around DI and Tr2 is very similar to that which we used in the field strength meter earlier in this series. Rather than measuring the current flowing in any part of Tr1, this circuit monitors the strength of the oscillation produced by Tr1.

The diode, D1, acts as a detector (just as it would in a crystal set). The transistor, Tr2, amplifies the voltage produced by D1 to drive the meter M1. A variable resistance, R4, in the emitter of Tr2 allows you to adjust the reading of the meter.
How It Works

Now let's see how it works, and you'll soon see how simple it is! When TR1 is oscillating, a radio frequency signal, the frequency being controlled by L1 and C1, appears at the source (S). The diode, D1, detects this signal, converts it to a d.c. voltage and TR1 acts as a d.c. amplifier to drive the meter.

The variable resistor, R4, allows the meter reading to be set on, or near, full scale for normal oscillations. When a tuned circuit, which is on the same frequency as L1 and C1, is brought close to L1, it will absorb some of the energy from the oscillator. The amplitude (strength) of the signal at the source will be reduced, and this will produce a dip in the meter reading.

Frequency Measuring Scale

A signal output point is also provided at the gate of the f.e.t., via a capacitor, C3. This is to drive a frequency counter.

As I've already mentioned, dip meters require a frequency measuring scale (the calibration) to be provided. This can be added underneath the knob which controls C1, so that the frequency at which the dip occurs is known.

Calibrating and adding the oscillator frequency scale to the instrument, is probably the most difficult part of building the dip meter. However, if you're fortunate enough to have a frequency counter (digital frequency meter), there's no need to have a scale on the knob of C1 because the frequency of the oscillations can be measured by the frequency counter.

(Editorial note: Many constructors owning a modern communications receiver, with a digital frequency read-out type of tuning scale, can take advantage of their good fortune, to calibrate the dip meter).

The choice of this circuit means that a lmA meter can be used. This is useful because it suits my own style of 'radio meanness'!

Good quality moving coil meters are expensive. Fortunately, meters with a full scale deflection of lmA are perhaps the most common type to be found on the surplus market.

It doesn't matter what's marked on the meter scale, as all we require is to see the needle swing downwards as the oscillator 'dips'. My meter was culled from an old project, but if new constructors can't find a surplus movement, I have named a suitable new meter in the parts list.
Exciting Winding

This project introduces another exciting new pursuit to this series, and that's the winding of homemade coils, or inductors. Although I've already said that calibrating the instrument could be the most difficult part of this project, others might say that winding the coils is the worst job!

So that the dip meter can cover the whole of the amateur radio hf. bands, four plug-in coils are required for L1. In the past, when I have written articles on projects using home-wound coils, more problems seem to have come from these components than from anything else. But you aren't going to let me down - are you?

The required coils are not difficult to make. They're wound on short lengths of flexible plastics electrical conduit tubing, which has an outer diameter of 15mm.

This tubing is available from DIY stores, although any plastics tubing of the same diameter could do the job. The recommended tubing fits well onto the coil base which is a 3-pin DIN plug. The 3-pin DIN plug will allow the coils to be plugged into a corresponding DIN socket mounted on the dip meter casing.

Four lengths of the tubing are required, and you should begin with lengths of about 60mm long, as the coils can be trimmed to size after the windings have been made.

The coils are all close wound. This means that the windings are placed side-by-side (each turn touching its neighbour) and the direction of the windings is the same throughout the coil.

The wire used, is enamelled copper wire. This is copper wire with a coating of varnish, which provides a flexible insulating layer around the wire. Although some modern enamelling melts as you apply the soldering iron, it's a good idea to scrape the coating off the wire, before tinning it where a solder joint is made.

The Coil Tap

The tap in the coil winding is the most difficult part, so I suggest you begin with this job. A simple way is to drill a 1mm hole near one end of the tube and push a length (about 80mm) of PVC insulated wire through the hole.

Next, you should pull the end of the wire out of the tubing nearest the hole until just about 5mm from the PVC covering from this end of the wire, and form the end into a hook.

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Table Of Turns

To save a lot of work, I've prepared a chart, Table 1, showing the numbers of turns required for the four coils, and how these windings relate to the circuit diagram and the completed coils.

Don't forget to remove excess tubing from the coils, to make the top of the tube about 2 - 3mm from the end of the winding marked '1'. The coils are then completed by adding the 3-pin DIN plug.

Adding the plug to the coils, requires the three wires to be shortened until they just emerge from the tube. The wires are bared, tinned and carefully soldered to the pins of the DIN plug.

The tapping point goes to the centre pin on each of the coils. Looking at the DIN socket from the pin end, with the centre pin at the bottom, wire 1 goes to the left pin and wire 3 to the right pin. The DIN socket can be glued to the tube or simply held in place with a binding layer of PVC tape.

Building The Dipper

The diagram, Fig. 5, shows a layout for the dip meter built on a printed circuit board (p.c.b.). This is viewed from the underneath (copper track side) of the board.

The diagram, Fig. 6, shows a view looking down on the component side, through to the copper track side of the p.c.b. In other words, we are looking down on the components, and through to the copper track.

As with previous projects, it would be possible to build this circuit using 0.1ln matrix 'perfboard'. The layout could follow the p.c.b. design, when transferred to the 'perfboard'.

If the p.c.b. technique is used, the construction is simply a 'push the components in the holes and solder' job. The orientation of Tr1, Tr2 and D1 must be correct as shown on the drawing.

The capacitor C3, provides coupling from the oscillator to a counter. The value, 4.7pF, is enough to drive my frequency counter on all ranges.

Should the 4.7pF value fail to drive an available counter, it can be increased, as the higher the value of C3, the more signal reaches the counter. Don't be tempted to use a very high value for C3, as this could overload the counter and cause false readings.

Metal Case

The prototype dip meter is built in a case measuring 133 x 760 x 520mm. Although the dipper requires a metal box, the size chosen depends upon the dimensions of the available meter, the control knob and calibration scale used for the instrument.

On my prototype, an accurate scale was not important because I can use a counter to check the frequency of the oscillator. I used a large knob for ease of operating the tuning capacitor on the dipper, in conjunction with a pointer on either side with two simple hand-drawn scales.

Table 1:

<table>
<thead>
<tr>
<th>Frequency MHz</th>
<th>Winding Between 1-2</th>
<th>Winding Between 2-3</th>
<th>Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6 to 2.6</td>
<td>60 turns</td>
<td>12 turns</td>
<td>26s.w.g.</td>
</tr>
<tr>
<td>2.6 to 6.6</td>
<td>40 turns</td>
<td>10 turns</td>
<td>26s.w.g.</td>
</tr>
<tr>
<td>6.1 to 15.2</td>
<td>16 turns</td>
<td>4 turns</td>
<td>22s.w.g.</td>
</tr>
<tr>
<td>13.8 to 34.7</td>
<td>4 turns</td>
<td>2 turns</td>
<td>22s.w.g.</td>
</tr>
</tbody>
</table>
In fact, I have no real need for any frequency scale for the dipper, as I simply read the frequency from the counter. If the scale is essential, it's a good idea to have a larger box to allow for a bigger and easier to read scale.

The Controls

The tuning knob control for C1 and the meter fill the 'face' of the dip meter, the DIN socket is at one end and the sensitivity control, R4, is at the other, with S1 and the counter output socket.

On my design, the p.c.b. has no mounting holes and is fixed to the DIN socket by means of stiff wires from point 1, 2 and 3 on the board. The dip meter tuning capacitor, C1, is a polyvaricon variable capacitor. These sometimes have short control shafts and are difficult to mount with a large knob.

The variable capacitor I've suggested in the parts list, has an shaft size, which is adequate for most large control knobs. There are two fixing screw mounting points on the front of the polyvaricon. Using these can be a fiddley job, and I cheated by fixing the control on the inside of the metal box with an instant adhesive.

The PP3 battery is fixed to the inside of the box between the meter and the variable capacitor using double-sided tape. Alternatively, if there's enough room in the box you've chosen, suitable moulded plastics battery holders are available.

Testing And Calibration

The completed dip meter board should be mounted on the DIN socket and the interconnections made between the board and the meter, controls, switch and battery. Your 'dipper' is now ready to be tested.

To test the dip meter, push in one of the coils and switch on. The meter needle should show an indication on the scale. Rotating R4 will move the needle up and down the scale. Check that this movement is smooth as R4 is rotated. You'll find that as the ranges are tuned, there will be some variation in the reading which can then be compensated by adjustment of R4.

Standard Test

Now it's time for the dip meter test. This is the standard test I do to check if a dip meter is any good. It's a good one to try on any commercial dip meter, if you're contemplating buying one. But why bother after building this project?

To start the test, set the tuning control anywhere between the meter and the variable capacitor using double-sided tape. Alternatively, if there's enough room in the box you've chosen, suitable moulded plastics battery holders are available.

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Calibration

If a counter is not available, the dip meter will require a frequency calibration scale for C1 on all four ranges. One way to do this is to use a counter, but if you have one, what's the point of the scale!

Although it might be possible to borrow a frequency meter for calibrating the dip meter. The simplest way is to use a general coverage short wave receiver.

Placing the coil near the antenna of a receiver, will allow the oscillator signal from the dip meter to be heard. The receiver must be set for c.w. or s.s.b. reception. You should hear the signal (with the receiver b.f.o. on, or the receiver set to s.s.b. or c.w. as suggested) as a strong whistling note.

The ideal knob for the tuning capacitor, C1, is a large one. It should have either a double pointer marking (if it only has one, add another) or a cursor made from perspex.

Having a pointer at opposite ends of the knob, means that a scale can be added above and below the knob, since C1 has only 180° of movement. In fact, two scales are added above and below the knob for the four ranges. The job of calibration is carried out by selecting convenient calibration points around the scale, after locating the frequencies on the monitoring receiver.

The careful constructor will no doubt add the figures using rub-down lettering, but I (saving money again!) wrote them on my scale with a ultra-thin felt tipped pen. Without a frequency counter, the accuracy of the dip meter depends upon the amount of time and effort expended in calibrating the tuning scale.
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Mathematics For The RAE

Before we start, I'm sure that you'd like to have the answers to last session's questions I left you with. So, here they are. I have given the answers correct to six decimal places, and then in brackets, you'll find the 'normal' answer correct to two decimal places.

i) \(11.111111\Omega \) (11.1Ω)

ii) 1001mA, precisely (1A or 1000mA 'normal')

iii) 99.99000μA (100μA)

iv) a) 11.111111Ω (11.1Ω)

b) 1.010101Ω (1.0Ω)

c) 0.200401Ω (0.2Ω)

d) 0.100100Ω (0.1Ω)

They were fairly simple, weren't they? If any one of those problems caused you difficulties, you can send a large s.s.a.e. to 'Maths Help March' c/o Tex Swann GETEX at the Poole editorial offices, and he'll send you the full working of the problems.

Now it's time to get down to this month's business. It's related to last session's work in that we will deal with power dissipation in resistors. Power is dissipated in resistors when a current flows through them.

Power Handling

When designing a circuit, we need to know what power is going to be produced in the circuit, or resistor, to allow us to put the correct size resistor in the circuit. If a resistor has too much power fed into it, it will overheat. At best, it will only change its resistance value. At worst it might burn out, or even explode.

Remember, a fuse is just a special resistor design to 'blow' when the current is too great. The power handling of resistors (normally known as their 'dissipation' rating, and quoted in watts or fraction of a watt) must be at least as great as the power produced in them.

Power Dissipated

For this reason, we need to calculate the power dissipated in a resistor (or circuit). When we know what power is produced, we can arrange to put in resistors that can dissipate (or get rid of) the power. It's quite simple to calculate the power in a resistive circuit. All you have to do, is just multiply the voltage across the circuit, by the current flowing in the circuit. Mathematically we say (we'll call this formula one):

\[ \text{power (P)} = \text{volts (V)} \times \text{current (I)} \]

Note that at this point, we don't need to know what value resistance the resistor is. All we need to do, is measure both values and multiply them together. With this in mind let's have a look at some examples:

1) The station rig is on a 12V power supply unit (p.s.u.) with an actual output voltage of 13.2V. On receive it takes 0.7A current, and on transmit 2.5A. What power is being taken in both conditions?

Firstly, on receive at 13.2V, the current taken is 0.7A.

From formula one, we know \( P=V \times I \). This gives a power drain of 13.2 * 0.7 = 9.24W on receive. On transmit the power taken is 13.2 * 2.5 = 33W.

As a little bit of extra fun let's try this problem: what would be the efficiency, if on transmit the set were producing 20W of r.f. energy? The answer is of course, the useful power (r.f.) divided by the total power taken 33W (20/33=0.606, or about 61%).

Let's take another example. In this problem we have a 10Ω resistor connected across 12V. The current flowing is 1.2A (12/10). From formula one the power dissipated is (12V * 1.2A) 14.4W.

Other Methods

Sometimes we don't know, or we're unable to measure either the voltage or the current in a circuit. There are two other methods of calculating the power within a circuit. Both of these methods use the resistance value of the resistor in the calculation.

If the current is known then use:

\[ P=I^2R \] (Formula two)

If the voltage only is known then use:

\[ P=V^2/R \] (Formula three)

Now let's check if they work! To start off, we'll use our example from above, the 10Ω resistor on a 12V p.s.u. From formula two, \( P=I^2R \), we find that the power is 1.2*1.2 *10, or 14.4W. So that formula works, now lets try the other one.

Using formula three, \( P=V^2/R \), and putting figures in, we find the power to be once again 14.4W (12*12/10).

From this example, you see we can use whichever formula is the most convenient to use.

Examples To Try

Here once again, I've provided a few examples to let you try out your new found skills. This time, I'm going back to the multiple-choice method of setting the questions.

1) A resistor of 5Ω is fed from a p.s.u. of 10V, what power is dissipated in the resistor?
   a) 20W  
   b) 2W  
   c) 50W 
   d) 0.5W

2) A p.s.u. of 13.5V is powering a circuit that is taking 2.8A. What is the power being supplied to the circuit?
   a) 4.82W  
   b) 533W 
   c) 37.8W 
   d) 105.84W

3) A resistor of 100Ω has a current of 10mA flowing through it. What is the power dissipation in the resistor?
   a) 1W  
   b) 1mW  
   c) 15W  
   d) 10mW

4) A 50Ω resistor has a voltage of 22.36V across it. Calculate the power being produced.
   a) 2.236W  
   b) 1118W 
   c) 10W  
   d) 236W

5) In a circuit a 5W resistor of 4.7Ω is to act a long-term load. What would be the maximum voltage across it if the 5W is not to be exceeded? (The answer is correct to two decimal places).
   a) 3.786V  
   b) 23.542V 
   c) 5.003V  
   d) 4.847V

As usual, I'll give you the answers next session. See you then!
I suppose that I could start this month's column off with the sub-title 'When 27MHz went to war'! Did you know that during the Second World War, virtually the whole of the present 27MHz band (a wavelength of 11 metres) was used for the UK coastal radiolocation (radar) stations known as the Chain Home Low system? (see note*).

A CH transmitter provided a normal operational power of around 500kW (half a million watts). This was fed to an enormous curtain antenna array (with reflector) suspended between four 350ft high towers. See Fig. 1, and as the Editor insists on metric, that's about 107 metres!

Development In Earnest

Development of radio -location began in earnest during 1935 at Bawdsey Manor, near Felixstowe in Suffolk. By 1939, there were enough operational CH stations to cover the whole of the south and eastern UK coastline. The stations were used for tracking and locating the approach of German aircraft from bases in Germany, and later from German occupied European countries.

The Bawdsey station was also used for development and experimental work on other radar systems. One particular experiment, involved modifying a 27MHz CH transmitter to provide a power output of 1.7MW (1.7 million watts!). However, this power level had to be reduced to 1MW to prevent the transmission lines and antenna elements from melting!

Radio Controlled Models

When the war ended, a frequency band based on 27MHz was allocated for radio controlled models. There was another frequency allocated based on 465MHz and the maximum power permitted for either was 5W.

*Note: The method of converting frequency in MHz to wavelength in metres, in case you are wondering, is 300/f MHz = 300/27 = 11.1 (recurring).

The power level allowed for CB radio on 27MHz, as per the present Department of Trade and Industry schedule, is 4W. The permitted power level is hardly likely to set your antenna on fire! Despite this, there are other aspects concerned with safety where antennas for both mobile and base station operation are concerned, which I'll deal with later.

This month, 'Quaynotes' looks back on the previous users of 27MHz, chats about antennas and suitable mounting systems.

Speaking Of Antennas

Speaking of antennas, reminds me of one particular useful design. You may remember seeing a photo of the Ring -base antenna for 27MHz in 'CB High & Low' (PW January 1992).

If you want to make yourself an antenna that will provide the same performance, you'll find the details for constructing the RB10 (ring-base) antenna featured in PW issues July and August 1990. The RB10, originally designed for portable, or fixed station operation, on the amateur 28MHz band, will operate just as efficiently on 27MHz. The two part article contains information for the minor adjustments necessary for use on this band.

Summer Is Coming!

Now that summer is coming, how about having a go at direction finding or 'Fox-hunts' on 27MHz during the summer months. If you have any back numbers of PW, take a look at January 1991, page 24, in Part 2 of 'Circular and Square Loop Antennas'.

If you want to have a go, there's a photo and details for a fairly compact circular loop direction finding antenna, which is tuneable between 20 to 30MHz. Moreover, it's deadly accurate on receiving (don't forget that directional antennas are illegal for transmitting purposes on 27MHz), if you know how to use d.f. loops that is!

Want to know more on this fascinating subject? I could share a great deal with you, but I can also tell you, the Editor might need some gentle persuasion to provide the space!

Mobile Antennas

The secure mounting of mobile antennas is very important. A long 'whippy' 27MHz mobile antenna on a very small mag-mount, can be swept from a car roof by strong cross-winds or low tree branches. The often very strong cross-winds created by heavy goods vehicles, when they're either overtaking you or passing in the opposite direction, can also dislodge a mag-mount.

A mag-mount for a mobile antenna more than lm in length, should have a base and strong magnet at least 150mm (6in) in diameter. A combination of this nature was loaned to me recently by Nevada Communications Ltd., at 189 London Road, North End, Practical Wireless, April 1992
Portsmouth, Hants PO2 9AE.
Tel: (0705) 698113.

The antenna on loan was a 27MHz mobile whip, model T445 (Boston) 1.7m long, including base coil. The mag-mount was 160mm in diameter (Model 140PL).

On the side of the box, Italian wording described that the antenna and mounting was okay for maximum vehicle speeds of 130-180km/h. Both were quite secure in a situation as described above, and I also know that both the antenna and mounting have been tested in the UK at just over 145km/h (90mph) on a windy day. All in the interest of safety!

**The Gutter Mount**

A gutter-mount is safer for 27MHz mobile antennas. Although the antenna will be at the side of the car roof, this will make no measurable difference to the transmission or reception. This is because the average car roof is ineffective as a ground-plane for this frequency band.

A gutter-mount, similar to that shown in Fig. 2 (a), must be correctly fitted as in (b) or (c), depending on the rain gutter width. Make sure there is a small amount of slack cable as in Fig. 3 (a) and (b) to prevent pulling on the socket.

**Special Mounts**

Special mounts for fixing antennas on the side of the car, are available for vehicles not provided with rain gutters. You can also buy magnetic and gutter-mounts with swivelling bases. The swivel action is useful, as the antenna may be pushed down parallel with the car roof, when entering a garage, car-port or low-roofed multi-storey parking facility.

Finally, I must apologise for the non-appearance of the article on s.w.r., but I will be looking at that very soon, in time for the better weather and easier antenna adjustments.

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**Quagnotes**

That’s the lot for now, but don’t forget to let me know if you want to know more about d.f. or ‘Fox-hunting’ on 27MHz.

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**New from AOR**

The NEW AR3000A is an evolutionary step forward from the highly acclaimed AR3000 and many major improvements have been implemented at the request of enthusiasts. The AR3000A still covers an extraordinarily wide range from 100 kHz - 2036 MHz without gaps and offers ALL MODES: AM, NFM, WFM, USB, LSB & CW. The LCD is larger and the viewing angle has been changed to further improve visibility. SCAN and SEARCH speed has been greatly increased and new programmable DELAY, PAUSE and PRIORITY facilities have been added. The rotary tuning control is ‘free running’ to increase user friendliness for SSB/CW listening. Memory clear and microprocessor refresh are now available from the front panel. RRP £765.

The WAS000 is a new ultra-wide range receiving aerial designed for areas where space is a problem and provides coverage from VLF to SHF. A MOS power FET amplifier is utilised to provide superior performance in the HF 30 kHz - 30 MHz range. The useful coverage of the aerial is 30 kHz - 2 GHz. The total length of the WAS000 is 1.5m and fed via a SO239 connector located in the aerial base. Approximately 15m of terminated coaxial cable is provided ready to plug in and start using. The aerial is powered by 12V DC @ 100 mA (mains power supply provided), this being fed up the coaxial cable. A small interface box is included for connection to the power supply and receiver, this is fitted with a BNC patch lead. RRP £150.

For full details please send a S.A.S.E. – thank you.

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**RST**

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**Practical Wireless, April 1992**
Firstly, a big thank you to each of you who have told me in such detail about your experiences during thunder-storms. Therefore readers, without apology, I lead again with the fascinating subject of lightning.

John Weatherley (Florida, USA) suggests that "For the hobbyist the only safe procedure for operator and equipment is to disconnect power, antennas AND earth connection when storms threaten." John, who has studied this problem world-wide on a professional basis, told me of an amateur in Botswana who had most of his radio equipment destroyed, although he had disconnected his antennas and his gear from the mains, but his earth was still connected.

"Not even buried cables are immune," said John, having investigated severe damage to a communications station in Africa which was caused by a strike several hundred yards away. It literally exploded every power f.e.t. in a large switching power supply due to induced currents in the underground cable.

John believes, as I do, that "nothing protects against a direct strike." He also said that "the enormous current of a lightning stroke has a correspondingly huge magnetic field associated with it and will induce a current, in any conductor, within a wide radius proportional to the distance from the source."

**Church Bells**

During her local history research, Joan found the following piece about lightning in a parish magazine dated November 1923. Under the heading, "Church Bell-ringing during a Thunder-storm", it said, "A recent allusion to the ringing of bells at a church on the occasion of a thunder-storm calls to my mind the old belief in Switzerland that the undulation of air, caused by the sound of the bell, breaks the electric fluid under a thunder-cloud."

These words are inscribed on the great bell of the Minster of Shaffhausen: "Vivis voco, Mortuos plango, Fulgura frango" - "I call the living, I mourn the dead, I break the lightning". The writer continues about the ceremonial allusion of church bells and includes a poem from which I quote the first verse, "Mens deaths I tell, My doleful knell:"

"All this energy floating around and entering the soft front end of our rigs has the potential to do some mischief," wrote David Turtle (Erith) in a long and interesting letter on the subject. He said, "At least with Hertzian antennas (beams and suchlike), in cases other than close or direct strikes, both sides of the antenna will have similar potentials so the front end may not be under too much stress."

The main danger here will be from the rig antenna/chassis becoming part of the path to ground. Marconi antennas relying as they do on a ground connection as a counterpoise, can be presented with a high potential across the antenna connections, as well as being a pathway to ground. You cannot rely on the d.c. continuity of a.t.u. or shunt loading coils to remove the sharp step pulses of a close strike.

**Equipment Damage**

At one time, Paul Drinkwater (Wolverhampton), worked on a marine-based commercial broadcast station in the Middle-East. During a thunder-storm there was a spectacular lightning strike at sea which sent all the needles on the meters of their 20kW transmitter over their end stops, triggering all the overload protection devices simultaneously. "Being a fully valved unit, the transmitter survived the event," said Paul.

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**Lightning Conductors**

David Turtle admires the skill with which lightning conductors are dressed into the nooks and crannies of a building during its decent to ground and tells us that, "there are two good reasons for it being a tape rather than a wire other than for aesthetic purpose. One is so it will have a much larger surface area for cooling purpose, the other is that high frequencies tend to travel on or close below the surface of a conductor rather than deep within its body."

John Weatherley points out that "most lightning rods on buildings, are to reduce the likelihood of a strike by bleeding off the electrostatic charge between the ground and ionised air above the building."

While visiting Saville Gardens toward the end of last year, Joan and I spotted a monument, Fig. 1, near Windsor Great Park, with a very handsome lighting conductor. The copper tape descends just to the left of the centre corner.

**Caution And The Unexpected**

One of John Dudeney's grandmothers "not only removed all mirrors from dressing tables and walls during thunder-storms, but laid them face down on the beds and covered them with sheets." On a summers day way back in 1939 John

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**Fig. 1: Monument near Saville Gardens, Windsor Great Park.**

**Fig. 2: Sunspots, 1330 on 23 December 1991.**

**Fig. 3: Sunspots, 1005 on 27 December 1991.**

**Fig. 4: Bangkok TV received via an 'F2' opening, on Ch. E2.**

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Practical Wireless, April 1992
was sitting in the car with his grandmother at Devil’s Dyke, a beauty spot on the South-Downs near Brighton. They could see considerable lightning in the black sky toward the north and his grandmother exclaimed that "a house had jumped." Next day they heard that a house had been struck by lightning.

In 1977, he was driving south, in thunder and torrential rain, through Norwood. “The road ahead was straight for a few hundred yards and then curved round to the right,” explained John. However, in the brilliance of a flash to ground immediately ahead, he got the impression of a criss-cross frame which could not be accounted for by anything visible after the flash.

Less than a minute later he rounded the bend and a building on his left was covered with scaffolding in the same pattern that he had just seen. Due to refraction? Several years ago John heard a BBC science programme report that ball lightning had passed through the cabin of a Russian airliner. Fortunately, apart from alarming the passengers no one was hurt. However, the aircraft was soon landed and in addition to the damage caused by the storm to the radar and other instruments, small holes were found in the nose and tail of the aircraft.

**Observations**

Patrick Moore’s routine solar observation at his observatory in Selsey continued through the Christmas holidays, as seen by the drawings he made of the progress of those sunspots and groups at 1330 on December 23, Fig. 2 and 1005 on the 27th, Fig. 3.

Around that time Cmdr Harry Haffield (Sevenoaks), using his spectrophotocleob, observed two sunspot groups, 16 filaments, six very small quiescent prominences and two active areas at 1154 on the 24th. Henry observed three groups (“one very long chain”), 15 filaments, 10 quiescent prominences and the remains of a flare at 1214 on the 27th. Henry’s radio telescopes recorded individual bursts of solar noise, at 136MHz, on the 23rd, 25th, 26th and 27th and at 1297MHz on the 23rd, 25th and 26th.

Ron Livesey (Edinburgh) using a 2.5in refractor and a 4in projection screen, located four active areas on the sun’s disc on December 8, 24 and 26, five on days 9, 23, 27 and 29 and six on the 4th, 10th, 11th and 13th.

**Northern Lights (Aurora Borealis)**

“All it cost to view Heaven’s lightshow was a little time,” wrote Roger Phillips (Kendal) about the Practical Wireless, April 1992

auroral events that he witnessed late on October 31 and November 8. During the former he saw “a vast coronet of pale white stretched across the north”, later “maroons had developed overhead and well to the North-East while pale white search-lights explored the zenith from the north.”

Roger told a colleague, who was seeing aurora for the first time, that it was the best display that he had seen in over ten years. However, it was nothing compared to the event he saw between 2130 and 2205 on November 8. Despite the sodium lighting from a Kendal estate, Roger saw faint search-lights passing across the sky between 1820 and 1915.

At 2010 he drove to Scream Point, off the Windermere road, where he remained until 2245 and was rewarded with a display of natural beauty. The event continued as a pale clear light, variously pulsating as a battery of search-lights occasionally turning to crimson at the extreme north-west and north-east. Aircraft passing into Scotland were seen to strobe all the way to the horizon, the Shap Fells.

The climax of the display, which Roger describes as a “crescendo of light” came about 2200 when the search-lights, turning to maroon, expanded into a coronet. The halo, which he had seen earlier, reappeared like “a giant ribbon tied across the heavens with its knot of reds and greens splashed about the south of the zenith.”

Roger’s vivid description, for which we are all grateful, continued, “to its extremes in the West and East tall curtains of yellowish-white fell to the horizons over Windermere and Tebay like hail-showers.” By 2330, only a faint white glow remained.

**Auroral Reports**

Ron Livesey is the auroral co-ordinator for the British Astronomical Association. He received reports of ‘glows’ for the overnight period on December 1, 10, 12, 16, 26 and 28, “are of band” on the 1st and 10th. There were reports of ‘rayed arc’ on the 27th, ‘rayed bundles’ on the 27th and 29th, ‘active, moving and pulsating’ on the 9th, 27th and 28th. There were ‘coronal’ or ‘half sky’ on the 29th from observers ranging from Southern England, through Scotland to Goose Bay in Canada. It is interesting to learn that the ‘ray bundles’ on the 27th were seen as far South as Hampshire and Sussex.

**Sporadic-E**

Sporadic-E activity throughout Band J.

**Tony Hopwood** (Worcester) reported hearing auroral reflected signals on the 144MHz band on December 27 and (Wissha) heard them weakly on the 2nd, 17th and 28th. For the benefit of newcomers, auroral reflected c.w. signals sound like a low pitched ‘hurt’ and s.s.b. transmissions are best described as a ghostly whisper. The pitch of the former is often so poor that in radio terms it is just known as Tone-A.

Do remember that when aurora manifests, v.h.f. antennas must be directed toward the north to receive these reflected signals. Doug compared his radio-aurora reception for 1990 and 1991, and found far more activity in the latter year with peaks of 12 days in June and over 10 in October and November. Gordon Foote (Didcot) reports that the German beacon DX/OC7EY on 10.144MHz gave strong auroral warnings at 0040 and 0920 on December 8.

**Band I**

During December, Simon Hamner (New Radnor) had an interesting haul of DX. This was via several modes of propagation, in a part of the spectrum which is generally unused and quiet in the UK.

He checked this band at 0800 on the 13th and identified pictures coming from Australia on Ch. A0 (46.172MHz) and New Zealand on Ch. NZI (45.250MHz) and Malaysia and Thailand on Ch. E2 (48.250MHz) via an opening in the upper ‘F2’ region of the ionosphere.

Next day, at 1830, he received ‘pings’ of picture from Norway via meteor trail reflection during the Geminids shower.

Then in January came a rare coincidence, especially for the winter months. On the 3rd he saw unidentified ‘pings’ of pictures at 1920 on Chs. R1 (49.75MHz) and R2 (59.25MHz) via meteor trails of the Quadrantids shower, but on the 4th, the predicted peak, Simon’s meteor watch was blotted out by a Sporadic-E opening because of which he logged pictures during the early evening from Austria on Ch. E2a (49.75MHz). Czechoslovakia was received on Chs. R1 (49.75MHz) and R2 (59.25MHz), France on Ch. L3 (54.0MHz), Germany on Chs. E2 (48.25MHz), E3 (55.25MHz) and E4 (62.25MHz), Hungary and Romania on Chs R1 and R2 and Switzerland on Chs E2 and E3. However, he said that there was unidentified meteor ‘pings’ interfering with the Sporadic-E activity throughout Band I.

From India, L.t. Col. Rana Roy (Meerut) sent a photograph, Fig. 4, of Bangkok TV that he received via an ‘F2' opening, on Ch. E2, at 2100 on November 24. Rana’s picture shows the typical smeary and distorted television-signals that arrive via this mode of propagation.

**Slow Scan TV**

Nothing to do with it, but I think the look of amazement on the face of Simon in Fig. 5, would have summed up my feelings had I been in Simon’s shoes and witnessed that combined meteor and Sporadic-E event. Fig. 5, is one of the many slow-scan television pictures received by John Scott in Glasgow around 14.230MHz during December.

There are several spots on the h.f. and v.h.f. amateur bands where slow-scan television pulses can be copied. Briefly, these sound like ‘twittering’ and can be decoded through certain computers, like the Sinclair 48k Spectrum, with a suitable program. However, before undertaking such a project I suggest that you seek advice from one of the software suppliers who advertise in PW and/or our sister journal Short Wave Magazine.

**Editorial Note:** Readers will find our ‘Computing In Radio’ special of interest this month.
OSCAR-13's Mode Polled

James G3RUH, in collaboration with share commanders Peter DB2OS and Graham VK5AGR, has been weighing up the opinions submitted by 85 concerned world-wide users and listeners as to whether expressed opinions that "... too much time devotion to L mode ..." was the majority feeling. The vast majority of returns were unreservedly in favour of maintaining Mode L, even though many of them neither had, nor ever would, have Mode L mode capability for themselves. The common denominators were 'use or lose' and 'incentive and opportunities for experimentation'.

Very few wanted Mode L off altogether, but many respondents regretted that 'B' mode was not on at best squint angles around apogee. But they recognised the fact that 'L' mode does need the best part of the orbit if it is to work properly, and agreed with the suggestion that Mode L and Mode B take alternate apogees or days.

Balancing these views against the technical options imposed by flight software and solar power production, the command team will invoke the following experimental schedule for OSCAR-13, on a trial basis for the period from March 16 to 8 June 1992.

Mode J transponders will be on for four days per week, Monday, Wednesday, Friday and Saturdays UTC from MA 100 to MA 150. Mode J will go off from MA 120 to MA 135. The Mode B transponder will be on at all other times. The 'S' mode will be on every orbit from MA 120 to MA 135, the beacon on 'L' days and the transponder on 'B' days.

The aggregate amount of time allocated is 200 mean anomaly counts per week, compared with the earlier average of 227. However, the actual useable time is considerably increased, because for northern hemisphere stations the squint angle is never worse than 15%. This corresponds to an off-pointing loss of no more than 1.8dB. Thus a minimum e.i.r.p. of only 1.5kW RHCP will always realise modest s.s.b. communications. This translates to 25W to an 18dB gain antenna, 50W to a 15dB, or 100W to a 12dB, a modest required maximum power.

James says, "The fact is that transponder mode schedules are divisive, and nothing can please everyone. So let's give this experiment a try. If it works, then good. If it doesn't we can easily go back to the old arrangements".

Here follows the experimental tabled schedule for AO-13 from March 16 to 8 June 1992, by when a new schedule from the last date will be announced.

- Mode B 000 to 100: Mode JL
- Mode B 100 to 120
- Mode SL 120 to 135: 'S'
- Beacon on 'L' days
- Mode JL 135 to 150: 'S'
- Transponder on 'B' days
- Mode B 150 to 256
- Omni Antennas from MA 240 to 030: Alou/Aalat 1800

OSCAR-13 Activity

Stefano IW2DBL, writes that he was delighted to work Noel P43FM in Aruba (QSL PA0FM) and another Noel 457AVR in Sri Lanka (QSL via Bureau) on OSCAR 13 Mode B s.s.b. Several new stations have appeared on this mode from USA, Japan and Europe, plus a few more from the UK.

Decoding SARA Telemetry

Belgian friend ON1KPS sends the full technical and general information you will need to decode SARA’s digital telemetry, which is coming down as 300 bauds digital telemetry on 145.955MHz in f.m., ±5kHz deviation. It has a 0 level and start bit: 2200Hz, one level: 1200Hz. It gives out 171 seconds of measurements and a blank of one second. This data is prefixed before the measurements with the following message sent in ASCII code:

SARA
ESIEEPSPACE
93162 NOISY LE GRAND
CEDEX FRANCE
SATELLITE AMATEUR DE
RADIOASTRONOMIE
ECOUTE DE L'ACTIVITE
DECAMETRIQUE DE JUPITER
FX0SAT FX0SAT FX0SAT

Header Meanings

Let's look at the header meanings! "SARA" is the satellite's name, ESIEEPSPACE is the name of the "Ecole Superieure d'Ingenieurs en Electrotechnique et Electronique", This is followed by the address, where 'BP' is 'Boite Postale' e.g. the Post Box, where your reports and QSLs may be sent. The five digit number is the postcode, and Noisy le Grand, the City in France.

After this SARA's status is given, the fact that it is an 'Amateur Radio Astronomy' Satellite, and then it tells what it is doing, i.e. listening to the activity of radio emissions on decametric wavelengths from the planet Jupiter. The last line gives SARA's assigned callsign FX0SAT three times.

Reading The Lines

For the telemetry itself, each line ends with a CR($13) and LF($10). The number of the measurement is given with three characters: CYCLE N XXX, XXX represents this number in binary.
A 500Hz subcarrier contains the information on the spacecraft’s battery voltage, and is defined by the equation: $U = 0.0148 \times F - 0.613$ where $U$ is the battery voltage in volts, and $F$ is the received frequency in Hertz.

A 220Hz subcarrier contains information about the spacecraft’s inside structure temperature, and is defined by the equation: $T = 0.714 \times F - 164.2$ where $T$ is the temperature in Celsius, and $F$ is the received frequency in Hertz.

The information may be read by connecting a frequency meter to the filtered output of a receiver. A 50Hz wide band-pass filter centred on 220Hz, or 500Hz, should suffice. The circuit given in Fig. 1 from Hilburn & Johnson, Manual of Active Filter Design, McGraw Hill, 1973 will perform this task adequately. With $R_2$ set at 21kΩ the filter should have a centre frequency of near 210Hz, and when set at 350kΩ it should be approximately 500Hz. The bandwidth will be approximately 50Hz.

**Sampling**

Jupiter’s radio flux information is extracted from the onboard receiver by sampling the eight channels between 2 and 15MHz. These elementary measures are represented by eight bytes, and are performed in 172 seconds, or one transmission cycle.

The measures are then transmitted within 256 frames, and each frame is composed of two elementary measures as: $T_0 C_0 C_1 C_2 C_3 C_4 C_5 C_6 C_7$, where $T$ is the frame number (0 to 255), and $C_X$ represents the amplitude of the receiver channel number, the m.s.b. is the parity bit (even). The 256 frames are followed by 48 control bytes.

**Storage and Error Correction**

The 512 measurements are stored in RAM (random access memory). The first measurement to be transmitted, frame 0 (172 seconds old), is the most recent. This is followed by frame one, and so on, until the last frame, 255, which is 24 hours 27 minutes old.

To give error correction, the 512 bytes are stored in 4096 words (12 bits wide) of protected memory. They are divided into four pages numbered one to four. The twelfth bit is added to each word to obtain an even number of “1’s”. There are 48 control bytes/words, which are initially set to zero. Twelve control bytes/words are associated with each page of memory. Every bit from a measure byte/word is exclusive OR’ed with its associated control byte/word.

**The Shape of Things to Come**

The news is that AMSAT are progressing with work on the Phase III-D spacecraft, due for launch on ARIANE-5 in October 1995. A full-size model has already been made, the shape and impressive size of which may be seen in Fig. 2, the photograph from AMSAT-DL. Comparison with the upper left OSCAR-13 and the upper right AMSAT microsat shows the relative dimensions of Phase-III-D in Fig. 3.

The manufacture of the conical adapter by Konrad Muller and Boris Lang from 32 separate segments is shown by Fig. 4. The planned internal layout and the positioning of the propellant fuel tanks drawn up by Dick Jansson WD4FAB is shown by Fig. 5.

The scaled to earth planned orbit, is shown by Fig. 6. Initially, ARIANE will place the spacecraft into a 35000km apogee, 200km perigee ellipse at an inclination of 10° to earth’s equator. At this low perigee height, atmospheric friction would produce some drag, lowering the required apogee. So the first task is to fire the built-in thrust motor when the spacecraft is at apogee to raise the perigee to 500km. After orientation, the next burn would take place at perigee, raising the apogee to 47 000km. After further positioning, the following burn would be to both change the inclination to 60° and raise the perigee to 4000km.

The final carefully planned thrust negotiations would take the spacecraft to its final stable orbit of 4000km perigee and 47 000km apogee to 63.4° inclination, at which it would see sustained passes over earth’s main areas, at regular maximum user opportunity times, twice daily.

**Fast Direct QSL**

Those of you who have worked the various Robots on the RS series.
of satellites, will know that eventually a QSL card arrives for the contact. Up to now this has been done by digitally downloading the ROBOT memory of stations recorded, then they are hand written by Andy Mirinov. This means the QSL has taken up to two years to arrive via the bureau.

As a means of speeding up this hitherto protracted process, the new Russian Group headed by Ura Ollirapoff URI1EC, will be experimenting with a newly devised fully automatic system. This should result in you having a QSL card delivered directly to your QTH, within a few minutes, or at the longest within a day.

The experiment, to celebrate the centenary of Marti Tridva, who developed the first printer delivery robot, is to have the RS-12 satellite direct QSL'ing for a full earth coverage 12-hour period, commencing from 2359UTC on March 31 this year. All that you need to do is to contact the ROBOT in the usual manner. After it has sent your serial number and wished you '73', i.e before it calls CQ, again, is to add at the same sending speed, your ten figure International QTH Locator, your local wind velocity in km/h and direction in degrees true.

For myself for example, I would add J002PPBLAQ nnn nnn, the 'BL' being the 0.1km divisions and the 'AQ' the 10m locator, added to my usual Maidenhead locator square. If the wind were 5.2km per hour coming from the North East, I would add 052 045 in the nnn nnn section. If there is no breeze whatsoever, send nothing after your precise 10m locator square.

**Are You A Good Catch?**

The ROBOT and RS-12's navigational computer will then calculate the exact time and position when a precision weight QSL card, with known drag factor may be released from the printer paper ejector port, so as to land within 10m of your QTH. Those with greenhouses need no fear, as the aerodynamic design and mass of the re-entry friction resistant QSL material, will mean that the final descent velocity is reduced to less than 2.75km/hour. With the latest Keplerian elements and a known a.s.l., it should be possible for you to calculate a precise overhead pass and a QTH and time, where you will be able to catch your QSL card as it falls those last few metres to earth.

**Beware Burned Fingers!**

It's not recommended that you make more than one QSO. Many others also wish to have the opportunity in the 12-hour limited period. There is the added danger that dual QSL cards, having twice the mass but similar drag frictional co-efficients, could incinerate as they first enter earth's atmosphere, resulting in only a few ashes scattering over a wide area. Some cards may have slightly burned corners if it is not raining.

**Don't Get Caught Out!**

Those participating, must be sure to accurately calculate their QTHs from a large scale Ordnance Survey Map, and to define their stratospheric wind velocity to within 0.010492% of true. Otherwise the new UK anti-litter laws, with their very high fines, will be applied to those who initiated the paper drop into public areas. The satellite or ROBOT itself, is protected by immunity from prosecution by international diplomatic immunity.

**Satellite Modes & Frequencies**

Finally, many readers have asked for the frequencies and modes used by the many amateur radio satellites. An s.a.e. with a request for 'SATFREQS' to PW will provide this comprehensive information to you.

Remember also, that an s.a.e. sent to PW marked 'KEPSETS', will provide you with the latest fully titled sets of all satellites.

### Book Reviews...these are new editions to the PW Book Service, see page 64.

Editor Andrew G. Sennit
Billboard A.G. (Publishers)
590 pages, price £18.95
Available from PW book service, £1 post and packing.

Keen listeners from all over the World await the new edition of the *WRTH*. The 1992 edition has just arrived and as usual the comprehensive country-by-country listings of long, medium and short wave broadcasters are filled with new details. For the first time, the *WRTH* has been able to include complete technical details of Radio Moscow, following the demise of the USSR, and the internal political changes. The *WRTH* has special features including: world satellite broadcasts, receiver test reports, information on worldwide broadcasts in English. There's information on the broadcasters' addresses and their personnel, and maps showing principal transmitter sites. All this information makes the *WRTH* an excellent reference book.

**The ARRL Handbook For Radio Amateurs 69th Edition**
Editors Charles Hutchinson K8CH and Joel Kleinman
N1BKE
The American Radio Relay League (Publishers)
Approximately 1000 pages, price £18.95, available from PW book service, £1 post and packing.

This very large and heavy book, newly-published for 1992, contains much new material. Long since regarded as being a standard reference work for radio enthusiasts, it grows year by year. New entries for 1992 include: new material on RTTY and AMTOR, new material on operational amplifiers, new material on the biological effect of r.f. energy, a design for a 1.5kW h.f. linear amplifier using inexpensive valves, an h.f. noise bridge, new antenna designs, a portable c.w. transceiver for 10 and 14MHz, a transverter and p.a. for 23cm and many other items. An excellent book for your bookshelf.
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FT1000
FT76
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FT747GX
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“A GENUINE PRICE FROM A GENUINE DEALER”
Roger Cooke G3LDI introduces a new feature this month, in the shape of a ‘page three’ sysop. Now you can find out about the people behind the bulletin boards, and all is revealed!

Sysop Of The Month

Starting this issue, I’m introducing ‘sysop of the month’, in the hope that it will encourage a few of you to send me photographs. Let’s have some details of what you do, what you would like to see done, and what you intend to do. It’s all good stuff you know! Hope you like the first offering.

The first in the queue, is Dave Lane G3VOM, sysop at GB7GMX, situated in Swinton in Manchester. Dave, shown in Fig. 1, said he had the shack especially spring-cleaned. All the whisky and gin bottles were removed for the picture!

The equipment in use at GB7GMX is as follows:

- An elderly (?) Amstrad PC1512 complete with five ports, covering 144, 430 and 1.3GHz, along with any two h.f. bands. The various TNCs in use are Kams, RLC 100, MFJ1274. The radios completing the set up are, a TMS31E on 1.3GHz, an FT780R for 430MHz, and on 144MHz an IC22A chirs away. On h.f., two Icom IC735s look after the long distance work.

- Antennas in use at v.h.f./u.h.f., are a helical on 1.3GHz, with collinear and beams for both 430 and 144MHz. The antennas for h.f. include a ‘magnetic loop’ on the low bands with dipoles and long wires for 14MHz upwards.

Dave says his shack is not of the tidy variety, and he sometimes forgets where all the wires go (don’t we all?). He has been interested in packet since 1984, and obtained a TNC from a friend in the USA. Nobody appeared to be interested, so Dave sold it on. He later found out that others were on, but their paths never crossed!

Dave also says that it is easier to get permission to operate amateur radio in the former USSR, or the Commonwealth of Independent States as it’s now known as, than to obtain site-clearance in the UK. Seems Red tape is only available in the UK now!

Father Clive

The second Sysop to be featured, is shown in Fig. 2. This is Colin Chadburn G6WHL, Sysop of GB7KLY in Keighley, W. Yorkshire. Colin is the author, of (or its father really I suppose) of the now-famous ‘Clive’ database. He’s also the PRO for the Yorkshire AX25 Packet Group, and a committee member of the Northern Heights ARES.

Obviously feeling left out of it, Colin’s XYL Julie, is taking the RAE this year. So, in a year or two, Colin might have to make a written request to sit in that chair! However, the pin-up picture, visible just above the PC screen, will have to go when Julie reigns in the shack Colin!

Colin, like many operators these days, came into amateur radio via CB. He presently shares his not-so-cluttered shack with an IBM clone, and what looks like an Amstrad CPC6128, plus other terminals.

He wasn’t over enthusiastic about the hobby until packet came along. Colin says he hasn’t spoken into a microphone since the day his BBS went on the air. In fact, he doubts whether he could even find one!

At 39-years of age, Colin has two married daughters, and he’s also a grandfather with two splendid grandchildren!

Introducing Clive

In case you’ve you haven’t met ‘Clive’, let me introduce it (or him?) through ‘his’ originator, Colin enjoys running the ‘Clive’ database, which is very comprehensive and he was kind enough to supply me with lots of very interesting information. So, with that, I’ll let Colin take over.

“The ‘Clive’ database was born’ on the air in early 1990. His voice was a BSX1, and an elderly FDK750E giving 10W (sometimes) into a dipole. Messages were sent and received through the two nearest BBSs. Confusion then ruled ‘on the air’.

The station was intended to be a part-time affair. However, right from the start it was clear that part-time working was acceptable, but full time operation would be better.

Incoming requests would sit on the BBSs all day waiting for me to come home and boot up the computer, connect, read my mail, and process all the ‘Clive’ messages.

Similarly, the replies were all transmitted by hand. I’d have a print-out of the users callign and BBS, and a list of the files required. Working from that print-out I’d connect to a BBS, do an ‘SP...’ then upload the files.

It was very tedious, but it did prove that the BBS network could take it even if I couldn’t. As amateurs in my home town of Keighley heard about packet, the number of users on 144.650MHz began to increase.

I retired the FDK and bought a brand new Navico to replace it. The 25W output, although better, was still giving unreliable connects. A beam antenna was next on the shopping list, then at last I had a station that could happily cope with all the traffic”.

Popular Clive

“Within a couple of months Clive’s popularity had grown to the extent that I simply had to do things differently. Either I had to abandon the project, or invest some cash in devising a better method of searching and dispatching files.

A few weeks later the sysop of GB7YHF turned up at the club one Wednesday. I began, systematically to pick his brains about automatic forwarding. It wasn’t too long after this meeting that I lost my Practical Wireless, April 1992
since then I have formally announced the end of the experiment. The 'Clive' project as per the original specification has been a huge success, and will continue for the foreseeable future.

Several sysops have asked about the possibility of running 'Clive' as a server to an existing BBS. Since establishing something resembling a decent station, I've graduated from being addicted to packet to being obsessed by it. I have also applied for a NOV to run a BBS, with the hope of re-writing 'Clive' as a server*.

Major Advantage

"One major advantage of 'Clive' having a GB7 call, is the possibility of the database handling of third party messages. In the near future, I hope to attempt the impossible. This will involve cloning 'Clive', and creating a network of databases which communicate with each other. Right now I have absolutely no idea how I will do this, it's all pie-in-the-sky as yet, but we live in hope as the saying goes. Today Keighley, tomorrow the world perhaps?"

All Automatic

"Since 'Clive' became the UK's first packet radio database it has grown quite rapidly. With around 2000 files on the system and 300 calls signs in the log from all over the UK. There are few BBS which can rival the sheer amount of files on 'Clive' let alone it's versatility and ease of use. The latest version is a completely automatic program, which is capable of handling huge amounts of output, splitting large files into packet sized chunks as it goes. It has been great fun to play with if nothing else, and who knows how far it will go. To this day, I still haven't heard of anything even vaguely similar."

My sincerest thanks go to all the lads at the Northern Heights club in Queensbury, for the invaluable help they have always given in helping to make 'Clive' viable. I also thank everyone who has already used 'Clive', as without them I would be very lonely, and no doubt certifiably mad to boot!

A special thank you also, to the many many node and BBS sysops who have handled 'Clive' traffic. Without you, we would all be the poorer!

Latest Developments

Now some of the latest developments concerning 'Clive'. The very first networking version went on test during mid December 1991, between GB7KLY and GB7FCL.

Chris has been writing a utility for use by 'Clive', that searches the messages on a BBS for messages originating from 'unknown Clives'. Should it find one, it automatically sends off a request for information regarding the topics stored on it. Once a reply (automatic), has been received the 'new Clive' joins in the network, and any requests for 'speciality' information on it will be forwarded by 'Clive', to the 'Clive' storing that information. It's as revolutionary a concept as the original 'Clive' which went on the air from a personal mailbox. But a way will have to be found of limiting the number of BBSs that may join a net. It wouldn't do, for a UK station to be transferring requests to one in the USA, at least not with the state of the present network. Such headaches are still some distance away in the future, and the number of networking 'Clives' will need to be carefully controlled. At the moment, the networking will be dependent on the user's choice of topic. A topic may cover quite a wide range of information. For example, the 'SPACE' topic includes 'MIR', 'NASA', Shuttles, Voyager, Galileo, Hubble telescope, etc. I am already trying to think of ways of narrowing down the scope of information that may be requested over the network. Very specific topics, may evolve as more sysops run 'Clive' to store info on 'their' favourite subject. Networking may even be carried out as far as requesting individual files from a BBS, when the identity of the BBS actually storing that information is unknown to the user.

Sign-Off

It's time to sign-off now, but I should mention that Colin is looking for remote sysops for 'Clive'. If you fancy the job, why not contact him G6WHL @ GB7KLY.

As I've run out of space for this month, Clive's commands will have to wait until the next packet. See you then!

As usual, news, photographs, brickbats and comments to G3LDI @ GB7LDI or on (0508) 70278. For 'snailmail' users I'm QTHR.
For Sale Kenwood Trio TS-330SE, second rig, lovely looking condition, sound with new valves, listen on 160m. With original packaging and handbook. Sale necessary, unplugged from 19 months, £260. 05026, Newport, Shropshire Tel: 09527 92563.

For Sale One set of home study course books for Radio Amateurs Examination. All the information required to pass the examination and obtain your licence. Less than half price, £56. Peter GW7UJ. Tel: 01267 63222.

Wanted Pm/Phillips charger unit rel. BC211, or similar. Condition not important. Peter GW4MG2. Tel: 0452 531760.

For Sale NR transmitter 144MHz - 70MHz out, £190. 144MHz beam 7-ele Yaga, £18. 144MHz pirbeam 13-ele, £20. Dual-band beam 3-ele 50MHz-4ele 70MHz, £25. Cash only, buyer collects. John, Bridford-on-Avon. Tel: 09737 82577.

For Sale FT, Akers DK 700UK, 40 Mbit/s, hard disk. Slekoids v1.5A programme inserted. Panasonic professional printer RX-PF520 multi-mode. All in mint condition, very little use cost £300.00, accept £400.00 cash or rent. Tel: 01267 94124.

For Sale £53MHz (100W model) 502MHz TX/RX unit hardly used, £70. Kenwood SM52/B5 Monitorcope, £25. Buttmuff HFV-X f.h. vertical external (new), £130. Paul G3EOL. Tel: 01332 552321 anytime.

For Sale Practical Wireless magazines May 1981-December 1986, as new, any reasonable offer, buyer collects. (0489) 781789.

Wanted pair of VU meters for Uher 4300 Report model: £150. Jack Wales, 21 27 James Avenue, Brighton BN2 1DG. Tel: 01273 674281.

For Sale FT-727Q DX/AN f.h. transceiver, g.c., £89. Kenwood AT232 10-ele. g.c., £100. RN Electronics 50MHz transmitter 23MHz b-50MHz out at 3W output, £130. Variable output p.s.u. (13 V-R-2A). Available for above rig if required. Dinit meters, v.h.f. and n.b.f.m., £45. Steve, 219 James Avenue, Pontefract, West Yorkshire WF8 3DS.

For Sale Yaesu FRG-8800 RX Yaesu FRT-700 TX/RX (mint) hardly used, £745. kenwood TR-220SP. £130. BN

For Sale Oscilloscope Telequipment 20MHz and like your Practical Wireless, it will be delivered within 4-5 working days. With this month's issue of PW, members, including those specially available to all subscribers, have the chance of buying a very handy extension speaker unit. Just right for mobile work or use in the shack, the speaker comes in a matt-black plastic cabinet, and is mounted on a thin wooden strip. The speaker has a built-in noise filter (with on/off switch) and a 3.5mm plug jack fitted on to a 1.4m long lead. With an impedance of 8Ω, a power-handling capacity of 8W, this 100mm diameter speaker in its 110x110x82mm housing will be useful anywhere.

Subscribers' Club Members can buy the extension speaker unit for £8.99, including postage and packing, and like your Practical Wireless, it will be delivered right to your door! A SAVING OF £2.45 (normal price £8.99 plus £2.45 post and packing)
It's nice to see all this shiny new equipment in the mags, isn't it? However, we know that the latest gear doesn't always appeal, especially to those with tight budgets. Thus we have a growing selection of pre-owned equipment, all fully tested and warranted so you have the opportunity to indulge without incurring the wrath of the bank manager — send a large SAE for the latest up-to-date list.

We stock a wide range of accessories including antennas, mounting hardware, cables, connectors, mobile mounts, SWR meters, PSU's, morse keys, coax switches, rotators, scanners and receivers, microphones, headphones and much much more!

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Our showroom is bright, warm and comfortable, allowing you to relax whilst browsing through our latest books, checking out the latest accessories of trying out a new rig on air before you buy. For those unable to visit we offer a speedy mail order service to get goods to you quickly. Unfortunately you will miss out on the refreshments and the charm, wit and experience of our sales staff! Rest assured we always do our best however you contact us!

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Colossal Lift

We had some pretty extreme weather this past January. Strong gales attacked our antenna systems, leaving mine at least leaning over at a drunken angle. In fact, it has been so unpleasant outside that I have not yet been up on the roof to fix them. More unusually, the month of January provided some periods of steady high pressure. The resulting lift must have sent some hearts racing!

Here in the Midlands, we noticed how it played havoc with broadcast TV reception on UHF. All four channels on Sandy Heath were un-viewable on one evening, and only by returning to Sutton Coldfield could anything half watchable be seen. The BBC did at least apologise, and the next day even our local radio station had the weatherman from the local airfield explaining what had "gone wrong".

For the ATV fraternity nothing at all had gone wrong. Phil G1HJA Bristol rang up to say he had got P5 reception reports from France on 24cm, sending just 1.5W. His QSO partner was Jean-François F1EDM (presumably still living in the Le Havre region), and the pair of them achieved a 20 Sporadic-E on occasions, until 405-line receiver many years pioneer' in Ostrava, built a meeting on the day of his visit.

Of course!), he was introduced to Czechoslovakia.

an independent producer, programmes, and hopes to British way of making TV course learning about the British Council four-week Moravian TV. Now he's on a technical operations at visit recently from Ivan DX Visitor signs of good DX.

common-sense looking for the station to work the DX, just don't need a big expensive else, this illustrates that you must have sent some hearts racing. In fact, it pressure. The resulting lifts some periods of steady high pressure this issue hits the streets. The location is the (now) usual one, at Harlaxton (near 'Thatcherville 'in Lincs.) and the date is Sunday May 3. Harlaxton is just off the A1 road, about an hour and a half's drive out of London; it is also 30 miles north-east of Leicester, so it's convenient for the Midlands as well. As well as the trade stands there will be demonstrations and displays, also an outdoor market and a bring-and-buy table. This is the premiere event in the ATV calendar, so be there or else!

Lowestoft Goes Live

Britain's newest television repeater GB3LO, entered service on low power last December. Output power is 1W from a pair of bow-tie antennas, at 88 metres above sea level, co-sited with the 430MHz voice repeater GB3YL.

While not in repeat mode, it radiates a series of useful test signals including the BATC Handbook test card, and also some teletext-style information pages. A call sign page with c.w. ident is radiated at regular intervals too.

Even at low power, initial coverage is good. Paul GB3JD is just one kilometre from the 'box' and has worked Andy G8VLL in Norwich, a distance of 35km. Signal reports have been received from Dick G4RXX also in Norwich. When funds permit a Mitsubishi 'brick' p.a. will be purchased. Donations and signal reports please to Allan G4KDL care of RA Electronics, 133 London Road South, Lowestoft, Suffolk. Well done lads - I hope you get some juicy Continental (and British!) DX through the repeater.

Help Wanted

Tony Feli G7DGW reminds those who can spare the time, that they might wish to become instructors for the novice licence. The Novices, he says, are permitted SSTV and on 1.3GHz and 10GHz fast-scan ATV; bearing in mind how most people can handle both PAL and SECAM colour and any sound sub-carrier, there are also some Russian-made single-standard sets in use, and their owners will be reluctant to scrap these straightforwardly.

ATV Extravaganza

The British Amateur Television Club's annual rally will not be far off by the time this issue hits the streets. The location is the (now) usual one, at Harlaxton (near 'Thatcherville 'in Lincs.) and the date is Sunday May 3. Harlaxton is just off the A1 road, about an hour and a half's drive out of London; it is also 30 miles north-east of Leicester, so it's convenient for the Midlands as well. As well as the trade stands there will be demonstrations and displays, also an outdoor market and a bring-and-buy table. This is the premiere event in the ATV calendar, so be there or else!

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SSTV adds a new dimension to DX, especially on the h.f. bands, enjoyed only by a few.

"I am busy trying to eliminate r.f. problems (on transmit) when operating on the h.f. bands. No problems like this on 144MHz - only lack of activity." Well, I didn't say it, an SSTV'er did! Is it not time to declare slow-scan once and for all dead in Britain now? Shouldn't we just hand over their spot frequencies to packet? I am merely being provocative, not offensive, when I say this mode seems to have ground to a total halt. But I am lucky to give practical work there too."

Slow-Scan News

Thomas GM4CAU, probably Britain's last practising slow-scanner judging by the lack of other reports, writes: "The Sunday sked on 7.095MHz is now well-established. The invitation to others who have built the G3WCY/G4ENA system has produced no newcomers at all. Despite the ORM on 7MHz, good pictures have been exchanged between Britain and Belgium. When conditions permit, we occasionally QSY to around 130MHz where the level of ORM is much lower. "Conditions on 14MHz have been rather low since early October, so the level of SSTV activity has been low too. I read with interest the article by Mike G6IQM 'A New SSTV Standard' and agree with him whole-heartedly. The entry price certainly deters many who would like to try SSTV. Even the construction of the G3WCY/G4ENA deters many would-be newcomers to SSTV. "Some time, the minds of others. The basic SSTV system is a basis for a new approach in order to encourage many more to try SSTV. A reason for joining the 7.095MHz net perhaps At least it is somewhere to thrash out the details of a new standard.

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As you are probably aware, we have yet to achieve 26 class A novices, but over 260 B novices exist, serving to demonstrate that Morse is at the very least of limited interest to the young people of today," says Tony. "Being an instructor myself, I can tell you the course, based as it is on hands-on practical experience, is very rewarding. Indeed I now find this approach preferable to the standard RAE class I teach, but I am lucky to give practical work there too."

Andy Emmerson G8PTh

GB3LO, the Lowestoft repeater is now on the air and awaiting your call. Input is 1249MHz, output on 1316MHz. More details in the column.

Practical Wireless, April 1992
The 1.8MHz Band

Dave GODJA has held his A licence for some years, but has only just got onto the bands with a TS-830S, so this is Dave's primarily a low-power operator, and on 1.8MHz he says it made it from Digglestone to F6KBK.

John G3BDQ (Hastings) says he found conditions on the bands pretty good and your letters bear this out.

Another to use both modes this first foray is John G3BDQ, who keys with R4JA, K2LE, XE3LPS, 4Z4DX, UA0L (Vladivostok), UI3B and 3XOHNU, 5T5CJ, 6W1QJ and 7P8EN.

The 3.5MHz Band

Dave GODJA again; for this first foray on 3.5MHz, Dave mentions c.w. with 4X1NM, BY1PK, KHOAM, 4X1NM, and 3XOHNU, 5T5CJ, 6W1QJ and 7P8EN.

The group VCP1BM, UX4WXL, K21AB, VE1RO, ZL2APW and DLH2/ZC7K all fell into the log at John G3BDQ; the modus s.s.b.

Apart from the usual small fry, Angie GOHGA got among the long-path stuff this time, with W1MK, VC6C, UI3B, UX4WXL, 4Z1XU, 411TU, LX/DK7O and US0N.

As always, for what follows, our thanks to K1AR for his Contest Calendar, to The DX Bulletin, DX News Sheet, The DX Magazine and The Canadian Amateur, plus of course all your letters.

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Practical Wireless, April 1992
Solar Data for January 1992

During the last two weeks of December and for the period up to January 5, there were a record number of auroral events, the largest being an M7.8/B2 flare which occurred on December 28. The solar flux level during this period was high, peaking at 280 units on January 3 whereas the geomagnetic activity was mainly quiet, averaging 11 units for the period.

On January 2, however, the A-index rose to 21, all cards were generally no better afield than 600km or so. Very good, most openings being through to the end of the month. In Chapel-en-le-Frith, Chris GOCLP reports working EM3W, RUMH/UA0GSS, ES0PDP, ES0W, ZA1DA, ZA0BCX on 21, while 28MHz gave EM3W, EIBEPAZ, TA3PB, ZA1HA, ES1CC, CUZAA, XE3ARV, ZL2BB, VUC6M; on s.s.b. he noted ZA0D0XC, EIBEPAZ, ZA1DA, XE3ARV, ZAI0X and 4J4AM. It was c.w. all the way for Ted 9G2HU, on 21MHz VE3EOW, PZ1DY, UA6LC and with QRP KB1FK; on 28MHz we find NZTP, V2NZUM, WVGT, N4TD, K0UT, VE3PRK, AO6C, V3CLAJ, VP5PL, K0H3L, YN5M0IG, WI4AN, K2FA, K6WA and VC3AT, plus QRP with N4AR, KB1FK, K0U5J, UB3AA, L12B1, OH6NPV and CK5EU.

Don G3NOF from Yeovil now; on 21MHz AA4VK/KP1, DUGR, CY1TX, J37ZS, OJIN, PJ3HJ, PZ1EI, TS5M, VE2JKR (Z), XK9AS, 8P5CIC and 9K1C; on 28MHz A47RS, BZ4RC, DU1PK, H3A, K078 (Aziz), V31DX, VP2V/KB5GL, VS6VD, VZU7Y, WA4KD/KP1, WSJ5U, X9AW and ZAI16.

From Kortrijk, Pat DNP7Q went on 21MHz for P4/NENG, ZS0Z, EP/HAPBUS, A516AC, switching to 28MHz and we find HC5M, K02/MM, K8X, 66SHC, A16AD, ZP0W, N11MM, PZ1DY, ZS0Z, EP/HAPBUS, ZV2/HJ16QJ.

John G3BND spoke to YB2AR and keyed with JR2BUDM, YB2UHD, VP2E/KB5GL; on 28MHz he reports just XE2GC on the key, while s.d.i. managed ZA1TH, J37VE, 4Z4DX, YB3OSE, 8P5CIC, 365GA, 7X2A, VP5AFM, AA4VK/KP1 (Navassa and a new one for John), CZ5SS (Prince Edward Is), VC1PBM and TP9FE.

Despite the TVI, Angie GOHGA keyed with N1LG, W1GSU, W2IURU, WA2BBN, K6NID, WA2EJ, K3MMH, NE3P, NJ4V, KBX, WB8E, W8J5U, K8MP, W9Y9G, W9SW, K9VCN, W0PWS, VE3KLM, VE2GD1, VE3XH, EP/HAPBUS, plus sideband to 9HC4M and WA4OZE. On 21MHz he recorded WA2SDN, N4NHQ, W6SANV, VE2SEP, and UL8PBX.

On 21MHz, Leighton GW0LBI was all power low, at 5W of sideband he worked 170/LJ, QRP, ZA1HS, UZ2JV, ZL2G and DX0BC, with 500mW, DLSY at 200mW, 0E65J at 100mW, HAMNW and UC3AA at 50mW. On 28MHz it was milliwatts all the time with YU4ENS and WW6F.

On 28MHz, Andrew G3/VW included RL7PJL, BW70KS, UZ2XXY and W6KSM. Finally, I have a letter from Bernard FE6AY near Grenoble. Bernard copied to me his report to G4ASRS's column, in which he documents several cases where the presence of an auroral event at v.h.f. has been accompanied by odd sounding signals on either 3.5 or 7MHz. Bernard notes such in 1989 and in detail from October 30 through November 1989. Even this is quite interesting, and I feel there should be done by workers to try and correlate these on the lower bands with auroral manifestations.

**Finale!**

That's it for this time. I've had to cut heavily to get it all in - sorry! Deadline dates are: March 16, April 17 and May 21, addressed as always as the head of the column.
if anyone worked any DX during this period. Although I haven't received any reports from UK stations, Jean-Pierre FC1PMD (JN13) mentions that he worked LA1YCA (J038) and L4A5U (J029) on the 144MHz band at 1600UTC and an hour later, Claudio I4XCC (JN56) reported working F1CD1 (IN93), FD1MUL (IN53), 6FANQ (IN40), HDDR UP4V (IN94) via f.a.i. a weak signal mode that quite often occurs during or after a Sp-E opening.

Whilst all this was occurring, propagation on tropo was going really wild with a wide spread Sp-E opening covering many European countries, including CT, DL, F, I, LX, DE, ON, DK, PA, SV, YO and YU. To further confuse the situation, the band was also open to KM1E/CSA, KP2A, HC1BI, PZ1EI, YV6ZZ and the USA! The Sp-E on 50MHz lasted for over eight hours, from 1100UTC, but it was noticed by a number of stations that the skip distance dramatically shortened to 250km around 1550UTC, a sure sign that the m.s.f. was rising towards the 144MHz band.

Tropo

During most of December and January, a fairly stable anticyclone was centred over the UK. This produced large areas of cold air trapped beneath warmer air and extended periods of fog, adding considerable water vapour, the propagation melting pot being set up for some super tropo DX. A number of readers have reported the lengthy opening to the north coast of Spain between December 22-30. Steve Damon G8PYP (J090) started working on the 144MHz band on December 22 and EA1DKV (IN53), EA1DUDU (IN73) and EA1ITA (IN53) on the 23rd. Richard Girding G4FCD (I093) worked EA1DUDU, EA1EBJ (IN73) and EA1ITA on the 22nd and then moved up to the 430MHz band to work EA1NU (IN73) and EA1ITA. Unfortunately, he couldn't find anyone on the 144MHz to give him EA on that band.

Steve Potter GI1JHZ (I082) reported hearing the EA1VHF beacon, on 144.867MHz, for hours at a time but live operators were hard to come by. Using a Trio TR9130, 25W and a 7-element Yagi he worked on Christmas Day, EA1DUDU, EA1EBJ, EA1NV and EB1EHT, all in locator IN73.

On the 430MHz band, Steve uses a Trio TR9500, 10W and a 12-element Yagi and was pleased to work EA1ITA on the 29th for a new country. Mark Trotman GI1FPC (I081) was also happy to work EA1ITA on the 144MHz band, proving that 2W into an 8-element Yagi can work DX under the right conditions.

Rik Royal GI8ESB (I094) found the 430MHz band very frustrating during December because of the power restrictions in force during that month, by the raqutis of the Radiocommunications Agency. True to form, the conditions were very good and although he heard a number of HB9 stations he was unable to contact them. Rick did manage to work FC1PAU by moving him up to 434.2MHz from the 144MHz band, but gave up trying to exploit the unusual frequency!

Located in southern England, Neil Underwood G4LDR (I091) had no such restrictions and was able to work, on December 2, HB9MIN/P (JN37) and FC1CYB (JL71). Neil uses an FT780R, a 50W amplifier and a 17-element Yagi on the 430MHz band.

Richard G4FCD was also able to make the most of the tropo conditions on the 430MHz band by working, on December 2, HB9MIN/P, DES9MN (JL78), DES9HL (JL68), DES9RL (JL79), OX2BHP/J (JN99), OX2BSP/J (JN98), SP2DOD (JL03) and many German stations. Moving up to the 1296MHz band Richard also made s.s.b. QSOs with DK2EG (JN59), DL3NQ (JN49), HB9SAXP and, for his best DX ever, DES9RL.

During many days in January, but especially the period January 2-3 and 11-19, stations situated throughout the UK were able to work much DX on the v.h.f. band. Many P.W readers, including G1THG, G1UGH, G2CZS, G4FRO, G5XWM, G6XMK, G6BTU and GOPOF reported working deep into Europe. Contacts could be made with stations in DL, HB9, I, LA, OE, worked HB9, LX, DE and many DL stations. Contacts were also made on the 1296MHz band with DC4XH (J043), DG18H (J033) and PAF3XV (J029) on the 11th, DB2ZY (JN39), FC1EZQ (JN27) and ON4YZ (J023) on the 12th and DC8UG (J030) on the 13th and DC8UG (J030) on the 11th, DB2W IJN391, FG4T (JN59), DG1BH (J033) and PA3FXV (J023).beginning on the 1296MHz band with DC4XH (J043), DG18H (J033) and PAF3XV (J029) on the 11th, DB2ZY (JN39), FC1EZQ (JN27) and ON4YZ (J023) on the 12th and DC8UG (J030) on the 13th.

Meteor Scatter

Steve Damon GI8PPY (I090) arranged four s.s.b. schedules during the Geminids meteor shower in December. Two scheduled on the 13th produced virtually no reflections but the next two tests, on the 14th, gave some excellent bursts allowing him to work GOISF5 (JN46) and GO4IQQ (JN33) and many others.

Shower? Ulrich Kratsch DL2YEL has re-written a Basic program by D3MGB into Turbo Pascal. The new program, called MS-Predictor, gives distance, beam heading and best elevation for the station you want to work for any of 38 meteor showers. To obtain the program, send a formatted disk, including package and sufficient IRCs, to Ulrich Kratsch, Mangelsdorferstr. 16, D-63480 Guettersloh, Germany.

The 50MHz Band

According to Gabriel EASG6V, the Spanish authorities have agreed that radio amateurs may use the 50MHz band but the official notification will not be published until the spring. Until then, any EA stations that you may work on the 50MHz band are illegal!

A message from Chris SP4TKK, of the SP 50MHz DX Group, said that a meeting had been held at the end of January with the Panstow montage of the Polnische Radio Amateure, and that applications for 50MHz permits could be made during February. Polish stations are expected to have access to the band during March. One station, SP3CUG, is known to be ready with his permit. He has an Icom IC726, a small amplifier of 20W and a 5-element Yagi. A number of stations are now active from Czechoslovakia.
Back Scatter

including OK1OID, OK2BTI, OK2PZW, OK2ZZ, OK3CDX, OK3LJL and OK3LLL. Stations in the Bohemia (OK1) and northern Moravia and Silesia (OK2) areas have restrictions because of a v.t. transmitter operating on 49.75MHz/25.6MHz. The QSL address for Zdeno Sterbacek OK2PZW is Dvorska 16, CS-67801 Blansko, Czechoslovakia and that for Palo Kosinsha OK3LLL is Febr. Vitaska 24, 96101 Malacky, Czechoslovakia.

The first 50MHz licences have been issued in the Lebanon to OD5SK and LA4GHA/OD5 and OD3MS is also expected to be QRV soon. In an opening on February 1, G4JFC. Propagation was apparently multi-hop Sp-E, over a distance in excess of 5000km! If you want to try and get a card direct, write to Mike at P.O. Box 1, 48013 Alia Ate, Kazakh, Russia.

Want to work Rodriguez Island, one of the dependencies of Mauritus? Well, you can’t! But you could if you were QRV 50MHz rig to 386FR. Apparently, he strictly by ticket only and can only be obtained by sending a stamped addressed envelope and names of all applicants to Roy Smith G6GAU, Lykkebo, The Street, Burstall, Ipswich, IP6 3DN.

The expedition to Georgetown, Guyana (G6ULV, G6ULQ, G4CZ and G4CV) will take place between April 20 to May 22. The main emphasis will be on the 50MHz band with operation to be on a 24 hour basis. Look out for any of the above callsigns with the suffix BR1. The operation will also include ten days of activity from PP8. Any QSL cards should be sent via K. R. Diamond, 5MC Radio Club, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY.

- Incidentally, only one 50MHz contact has so far been made from the UK with BR1, and the QSL card in Fig. 1 records the details of the QSL. The contact, lasting more than 15 seconds, was made via multi-hop Sp-E and was particularly pleasing as 3R1AH went QRT the very next day and returned home to Canada as 8R1AH went QRT the very next day. There may be some operation via the OSAR satellites as OSCAR satellites will be brief, as there is a major exception from Thule Island, but if time permits there may be some operation via the RS10/11 and RS12/13 series of satellites. Any QSL cards should be sent via ASAMS7 for s.s.b. contacts and to KAW7/7 for c.w. and RTTY contacts.

Expedition Update

Bill Wiseman K1ME is active on the 50MHz band, until the end of March, with the callsign CSA/K1ME. QSL cards go via his home address, PO Box 120, Woolwich, ME0 4579, USA.

Another keen operator PX3FM, will be active on the 50MHz band from Aruba until the end of March. Cards can be sent via his home callsign PA0FM.

Commencing on March 1 for a four week period, VK0KC will be QRV from Carey Station, Antarctica (OC5S) on the 50MHz band.

Steve Bryan G1SGB is hoping to be active in the Sule Skerry lighthouse during April. He will be active on the 144MHz band, concentrating mainly on WAB.

The VPS35 expedition to the South Sandwich Islands is now set to take place between March 14 and April 26, including a two week stay on Thule Island. The operators include JE3MAS, OZ2BH, WA3YWN, WA1JLS, WB6G, WA7KNT, KJ1, and KJ1R and the team will operate six complete stations including 50MHz and 144MHz e.m.e. Operation via OSCAR satellites will be brief, as there is a major exception from Thule Island, but if time permits there may be some operation via the RS10/11 and RS12/13 series of satellites. Any QSL cards should be sent via ASAMS7 for s.s.b. contacts and to KAW7/7 for c.w. and RTTY contacts.

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Beacon and Repeater News

The callsign DX1HB is to a new beacon active on 50.068MHz from the Philippines. It is running 20W into an omnidirectional antenna from locator PK04.

During the severe gales of December 1991, the antennae for the 50MHz and 144MHz GB3LER

Annual v.h.f./u.h.f. table

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VHF News

The Martlesham Radio Society are holding a v.h.f. round table at the BT Laboratories, Martlesham Heath, Ipswich, Suffolk on April 12. Apart from an opportunity to meet fellow v.h.f. enthusiasts in amicable surroundings, there will be technical workshops, talks and equipment measuring facilities. Admission is strictly by ticket only and can only be obtained by sending a stamped addressed envelope and names of all applicants to Roy Smith G6GAU, Lykkebo, The Street, Burstall, Ipswich, IP6 3DN.

The 1992 Scandinavian v.h.f. meeting will be held in Angelholm, southern Sweden, between June 5-8, at the club headquarters SK70L. If you have any equipment to display or if you wish to give a lecture, then contact me and I will get in touch with 5M0FSK, the SSA v.h.f. manager.

The German radio club DL0WAE is now active on the 50, 144 and 430MHz bands and is looking for schedules via tropo, meteor scatter and e.m.e. Members of the club, located in JD42, include DL1YAW, DL1YDI, DL4YBM and DL6AE. They run 5W into a 4-element Yagi on 50MHz, 400W into four 9-element O25HF Yagis on 144MHz and 10W into two 23-element Yagis on 430MHz, but they expect to have e.m.e. capability on this band soon. If you want to contact George Winter DL4YBM Uplandweg 131, D-4803 Buende, Germany or listen for them on the v.h.f. net 14.345MHz.

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IMPORTANT ANNOUNCEMENT

Sadly due partly to the recession and partly over-trading there has been a large number of bankruptcies, receiverships and closures within the amateur market. These events have left a large number of amateur enthusiasts disillusioned and feeling the repercussions.

As a company that has been in the amateur radio business since 1958, SMC are going to be around for at least another 20 years to offer the best in both service and equipment to the amateur enthusiast, with five showrooms located across the UK, all fully stocked with a wide range of products from connectors to top flight transceivers.

Full demonstration facilities are available at all of the showrooms, so you can 'try before you buy', and our knowledgeable staff will be able to assist in any way they can.

Should anything go wrong our ably equipped and staffed service workshop can call on up to £150,000 worth of spares to fix your equipment with the least inconvenience to you the customer.

Below is a list of most of our secondhand, demo and repossessed stock. Please ring the relevant branch if you are interested in any of these super bargains!!

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<th>SMC Northern (Leeds)</th>
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S/S = Second-hand
S/C = Shop soiled
E/D = Ex-demon
The latest edition of D-i-Y Radio – the RSGB’s 16-page full-colour magazine for beginners of all ages – has just been published!

Each issue features construction projects, a kit review, ham facts, news features, a pull-out poster in the centre, readers’ letters, a competition and special offers.

**D-i-Y RADIO**

Get D-i-Y Radio for the next year,* plus . . .

- A “Can’t wait for my Novice Licence” badge
- A plastic wallet so you can keep your issues of D-i-Y Radio safe
- An RSGB Map of Western Europe (900mm wide and 1200mm high)
- Money-off vouchers
- D-i-Y Club card

*D-i-Y Radio is published six times a year.

**SANGEAN ATS 803A**
(Direct key-in world receiver with quartz alarm clock timer)

**Specifications and features**
- 150-29.9999 MHz continuous tuning with no gaps. Phase locked loop-digital conversion
- Superhet/FM/MW/SW full shortwave
- AM/SSB in 0.001kHz steps
- External antenna jack for better reception
- Adjustable RF gain control to prevent overloading
- Easy tuning
- Separate BASS and TREBLE controls for maximum listening pleasure
- Illuminated display to facilitate night-time listening
- Radio alarm clock timer

**SKY SCAN**
Desk Top Antenna
Model Desk 1300

Built and designed for use with scanners. Coverage: 25 to 1300MHz. Total height – 36ins – 9ins at widest point. Comes complete with 4 metres of RG58 coax cable and BNC connector fitted. Ideal indoor – high performance antenna and can also be used as a car antenna when your car is static.

**SKY SCAN**
V1300 Antenna

Most discones only have horizontal elements and this is the reason that they are not ideal for use with a scanner. Most of the transmissions that you are likely to receive are transmitted from vertically mounted antennas. The Sky Scan V1300 discone has both vertical and horizontal elements for maximum reception. The V1300 is constructed from best quality stainless steel and aluminium and comes complete with mounting pole. Designed and built for use with scanners.

**SKY SCAN**
Magmount MKII

For improved performance, wide band reception, 25 to 1300MHz. Comes complete with protective rubber base, 4m RG58 coax cable and BNC connector. Built and designed for use with scanners.

**Regulated 13-26V DC power supply**
WITH SHORT CIRCUIT PROTECTION

**Model RPS1210**
10-14 amp.
£49.95 + £3.00 p&p

**Model RPS1215**
15-20 amp.
£69.95 + £5.00 p&p

---

**Technical Specifications**

### Sangean ATS 803A

- **Frequency:** 150-29.9999 MHz
- **Display:** Illuminated
- **Amplifier:** Regulated 13-26V DC
- **Antenna:** External
- **Power Supply:** Regulated 13-26V DC
- **Dimensions:** 29.2cm x 16.0cm (11.5in x 6.3in x 2.3in)
- **Weight:** 1.7kg (3.75lbs)

### Sky Scan Desk Top Antenna

- **Coverage:** 25 to 1300MHz
- **Height:** 36ins – 9ins at widest point
- **Accessories:** 4 metres of RG58 coax cable and BNC connector
- **Dimensions:** 29.2cm x 16.0cm (11.5in x 6.3in x 2.3in)
- **Weight:** 1.7kg (3.75lbs)

### Sky Scan V1300 Antenna

- **Coverage:** 25 to 1300MHz
- **Material:** Stainless steel and aluminium
- **Dimensions:** 36ins – 9ins at widest point

### Sky Scan Magmount MKII

- **Coverage:** 25 to 1300MHz
- **Material:** Stainless steel and aluminium
- **Accessories:** 4m RG58 coax cable and BNC connector
- **Dimensions:** 29.2cm x 16.0cm (11.5in x 6.3in x 2.3in)
- **Weight:** 1.7kg (3.75lbs)
beacons were both damaged. However, the units are now operational again, running 40W into a dipole on 50.064MHz and 100W into two 6-element Yagis, beamng at 45° and 135°, on 144 955MHz. Another beacon on 432.955MHz runs 20W into a 12-element Yagi. The photograph, Fig. 2, shows the 144MHz and 430MHz antennas at the Lerrvick beacon site.

It is worth noting that Andy Steven GM4KPK has paid for the major portion of the equipment himself. If you wish to contribute towards the GB3LER fund, you can contact Andy at 27 Dasett Wyder, Dunstonsness, South Woodham Ferrers, Essex on (0950) 60312.

After a break of several years, the Isle of Wight beacon GB3IW is again QRV on 1296-900MHz.

**ORZ Contest!**

A 50MHz Trophy contest will be held on April 5 between 0900-1100UTC. Details are given in the sections for the single operator fixed or portable, multi-operator fixed or portable and listeners. Signal report, serial number, locator and county information must be exchanged.

The last in the present series of RSGB 70MHz cumulative contests will be held between 0900-1100UTC on March 15. The contest exchange comprises of RST, serial number, locator and QTH.

The annual 70MHz fixed station contest will be held on March 29 between 0900-1500UTC. There are sections for single operator, multi-operator and listeners. Signal report, serial number, locator and QTH must be exchanged.

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Summer microwave contests have been scheduled by the RSGB microwave committee to take place between 0930-2100UTC on the following Sundays, April 26, May 24, June 14, July 19, August 16, September 13, October 3-4, the latter to coincide with the IARU contest arranged for the same weekend.

Scandinavian activity contests will be held between 1800-2200UTC on the following dates: 50MHz on March 24 and April 28, 144MHz on April 7 and May 5, 430MHz on April 14 and May 12. Microwave on March 17 and April 21. A full set of rules can be obtained from myself on request of an s.a.e.

Deadlines
Please send your letters to reach me by the end of the month. I always write up the column in the first week of the following month. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM and I can also be contacted at my DX cluster GB7DXC.

Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as G3L cards, awards, certificates, etc., are also required. They will all be returned to you.

The international radio scene continues to be volatile. Some stations continue to cut back the number of languages and hours they broadcast, whilst others plan new images and names! The latest to think of revamping its "corporate image" is Belarus BRT International. The station, which broadcasts in English, has announced that it will have a new logo, change its name and have a whole selection of new jingles, which will give the station a brand new profile.

The station has started relays on f.m. in the Brussels area and is investigating using satellite for services to Europe. Whether this will change the programmes on the station remains to be seen. I recall that on the evening of the Herald of Free Enterprise disaster there was not a single mention of it on the English language service. All the programmes, including the news, were taped and no one in the English service could be reached to come in to broadcast live.

Here's a case of the disappearing radio station! Radio Surinam International from the former Dutch colony in central America, has vanished. The station used to be relaid by RadioBras in neighbouring Brazil, but has been unheard for some months. English language programmes were heard along with Dutch and Tswana between 1700 and 1800 on a 17MHz frequency, but it seems they are no more. Perhaps the political climate has changed in Surinam, rendering the need for external broadcasting to the country's former rulers in Europe unnecessary. Or perhaps they have run out of cash. Roy Merrall reports last hearing the station on 25 September 1991.

Some of the stations relayed by the former Soviet empire no longer have the benefit of high-powered transmitters. These include Radio Afghanistan whose external and domestic services had, since the time of the Soviet invasion, been relayed by transmitters in the Soviet Union. But other operators are making use of the facilities: Adventist World Radio started transmissions from Siberia on February 1 to beam in to southern Asia. Radio Polonia has become Polish Radio Warsaw once again and now is a shadow of its former self. The finances of the station have been severely affected by the state budget which is desperately short of funds. The radio station is now on the air for just 18 hours a day and four language services have been closed. These include French, Italian, Finnish and Swedish.

The main thrust of the station is now towards its eastern neighbours of Russia, Ukraine, Belorussia and Lithuania and to the west to which it is broadcasting English, German and Esperanto. The latter has been retained as the inventor of Esperanto, Ludwig Zamenhof, was Polish. The frequencies and times for English appear in the European News section.

A brand new schedule will take effect at Radio Netherlands on March 29. There will be a new English language transmission lasting three hours between 1330 and 1625. The first and last hour will be the same, but the middle hour will carry a different feature programme. This will replace the 0830 and 1130 broadcasts - the latter beamed to Europe.

The transmissions to Africa at 1630 and 2030 will merge into a new three hour transmission at 1730. There will also be a new three hour block at 0030 for Asia. This is a completely new departure for the station which is currently investigating how to run programmes with continuity announcers which will replace the somewhat cumbrous tape system in operation at the moment.

What does this mean for European English language listeners? It means we'll all have to try to get reception of the services beamed to other parts of the world, which might prove less than easy. In the longer term, however, Radio Netherlands is planning a new European service to be heard throughout the continent in a joint project with Dutch domestic stations. Details are thin on the ground, but keep watching Practical Wireless for the latest news. We'll be printing a schedule of the rearranged English service as soon as we have it.

Last month we reported that Vasily Strelnikov was not working for Radio Moskow anymore and suggested that he perhaps might get a job at Radio Netherlands. Within days of that being typed into the word processor, up pops Vasily on Media Network described as 'Moscow reporter'...!

As this edition of Practical Wireless went to press, a very important radio conference was getting underway in Spain. The World Administrative Radio Conference, WARC-92, is a major frequency allocation conference and could have major effects on the short wave bands for radio amateurs and broadcasters.

International broadcasters are pressing for more of the short wave radio spectrum to relieve some of the overcrowding which exists at present, and several suggestions for expansion into frequencies adjacent to some of the current broadcast bands have been put forward. There is also some pressure for broadcasters to adopt single sideband transmitting from the year 2007 or earlier. This is thought to be a way to alleviate some of the overcrowding, too, but many broadcasters are against this, as insufficient S.S.-capable radio receivers exist at present in the developing world.

For the amateur fraternity there will be moves to harmonise the amateur radio allocation at 7MHz. The WARC-92 promises some healthy arguments over its four week duration and we'll bring you more in future columns.

Broadcast Round-up
Reports to Peter Shore via the PW Editorial Office

Royal Radio Society of Great Britain:

Europe:


Radio Kiev in Ukraine has 24-hour domestic coverage on 5.66, 9.72 and 9.785MHz in parallel with the long standing 4.94MHz. The foreign service can be heard in English to Europe very well at 2230 for an hour on 6.02MHz in parallel with 7.40MHz after 2230. English is again heard at 0245 on a clear 4.825MHz. To North America the transmission at 0100 is strongly heard on 7.40 and parallels

Over to Peter Shore via the PW Editorial Office
Radio Yugoslavia has a short, variable length news bulletin at around 0350 on 7.415 and 7.935MHz. There’s also an English language bulletin at around 0500 on 7.115MHz, usually for a little over ten minutes.

African and Middle Eastern Stations

The Voice of the Islamic Republic of Iran carries English at 1300 on a poor 15.265MHz, in parallel with that old chestnut of 9.022MHz, which at the time of writing, offers reasonable reception.

Iran’s Flag of Freedom Radio continues to be regularly heard by Roy Merrall on 11.47, 9.355 and 9.255MHz. The station announces a schedule of:

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>0900-0950</td>
<td>15.56, 11.47, 9.255</td>
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<tr>
<td>0900-1100</td>
<td>6.045, 9.045</td>
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<tr>
<td>1400-1450</td>
<td>11.16G and 11.47MHz</td>
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<tr>
<td>1630-1825</td>
<td>7.115, 11.47 and 9.355</td>
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Asian and Pacific Stations

Radio Afghanistan, which appears to be no longer relayed from transmitting stations in the former Soviet Union, can be heard with English at 1300 for thirty minutes on 9.635MHz. This is preceded by a half hour German programme, and this is followed by French also for thirty minutes.

Radio Australia’s latest frequency schedule makes the following suggestions for European listeners:

- **700-0900 on 21.775MHz**
- **0900-1200 on 21.725MHz**
- **1430-2100 on 13.755MHz**
- **1630-2100 on 9.865MHz**

The Voice of Free China in Taipei, Taiwan, had English at 2200 on 11.585MHz. The station can often be heard clearly at 1900 with English news from around 1925, also on 11.80, but suffers from interference from SAI signing on for its 1930 transmission.

North, Central And South American Stations

Radio Nacional de Argentina on 11.71MHz is occasionally heard on a clear channel at around 2030, says Roy Merrall, with a very muted VoA. When this happens, a number of other South American regulars appear at around 1945 such as Radio Globo on 11.805, Radio Brasil Central on 11.815, Radio Anhanguera on 11.83; Radio Aparecida on 11.885 and a new one, Radio Gaucha, Porto Alegre on 11.915 (from 2010).

English broadcasts from South America are few and far between these days, but Radio Nacional de Colombia in Bogota broadcasts Colombia DX each Saturday at 2330 on 11.825MHz (unfortunately not the best frequency sandwiched between two other stations). The station’s address is PO Box 94321, Bogota, Colombia.

Radio Havana Cuba was noted by Roy Merrall with English at 2200 on 7.215MHz, with interference from UAE Abu Dhabi affecting the channel. There’s a DXers Unlimited programme on Saturdays at 2210 on the 7MHz channel, repeated Tuesdays at 1920 on 17.705MHz.

The HCJB station has a new outlet on 15.14MHz from as early as 1950 in South America, improving steadily until 2330 and beyond. There is a reasonable parallel on 11.96MHz. RC1 causes problems on 15.14 between 2000 and 2100.

Flexible readers amongst PW readers might like to try logging relays of Radio Miami International by WRN in New Orleans. The relays are daily at 0400 on 7.465MHz. WWCR, also from the United States, carries English at 0800 on 5.935MHz.

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**Back-Scatter**

**African and Middle Eastern Stations**

- **Radio Afghanistan**: English at 1300 on 9.635MHz, preceded by half hour German, followed by French.
- **Radio Australia**: Frequency schedule for European listeners.
- **Voice of Free China in Taipei, Taiwan**: English at 2200 on 11.585MHz, heard at 1900.
- **Radio Nacional de Argentina**: Heard at 11.71MHz around 2030, with muted VoA.

**Asian and Pacific Stations**

- **Radio Afghanistan**: Discontinued.
- **Radio Australia**: Frequency schedule.

**North, Central And South American Stations**

- **Radio Nacional de Argentina**: Heard at 11.71MHz around 2030.

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**Practical Wireless, April 1992**

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oscillator, signal injector, phase lock loop. See "50 Circuits
trolled oscillator, phase sensitive detector, quartz crystal
CIRCUITS BUILT USING DIGITAL ICE voltage con-

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Using 7400 series IDs' BABANI book number BP58 price
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MONUMENTAL MOBILES

IC-229E/H
144MHz FM transceiver
IC-449E
430MHz FM transceiver
- Ultra-compact body.
- One-touch access functions.
- 20 memory channels.
- Illuminated switches and controls for night driving.
- 140(W)x40(H)x105(D) mm.

Photograph shows U.S.A. version

IC-3220E/H
144/430MHz Dual band FM transceiver.
- Simple dual band operation.
- Receives 2 band signals simultaneously.
- Full duplex QSO.
- Optional pager, code squelch, packet beep & tone squelch.
- 140(W)x40(H)x195(D) mm.

IC-1201E
1200MHz FM transceiver
- High sensitivity receiver.
- Stable 10W output power.
- Convenient AFC, RIT and VXO functions.
- 20 memory channels.
- Priority watch.
- Programmable call channel.
- 140(W)x40(H)x200(D) mm.

IC-901
144/430MHz dual band FM transceiver
- Detachable remote controller.
- 6 band capability: 28, 50, 144, 430 and 1200MHz.
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- 150(W)x50(H)x191(D) mm.

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Computing in Radio

0 GO TO 1000
1 SOUND TN, DI: FOR Y=0 TO WC : NEXT : RETURN
2 SOUND TN, DI: FOR Y=0 TO WC : NEXT : RETURN
3 PRINT C$: ;
4 FOR X=1 TO 4: GOSUB 1
5 X=(INSTR(4:00 L'ilfrotett Pace di .00)
6 CLOSE:CLS:
7 OPEN "D:": FOR Y=1 TO 4: NEXT: RETURN
8 CLOSE:CLS:
9 FOR X=1 TO 4: GOSUB 3
10 CLOSE:CLS:
11 IN$=INKEY$("[P]re-recorded tape",2);"^"; RETURN
12 IF IN$="^" THEN 100: GOT0 13
13 IF IN$="^" THEN 100: GOT0 13

Computing In Radio

Richard Wilmot GW3RRI uses his specialist knowledge to remove the mystery often associated with computers and communications. He then introduces us to the increasingly fascinating electronic world opened up by these amazingly versatile machines.

Computing In Radio Showcase

What's available? Who sells it? What does it do? How can I use it? How much is it? You'll find all these questions answered in our 'Computing in Radio Showcase' starting on page XIII.

16-Page Pull-out Magazine
Love them or hate them, Personal Computers are part of the future.

Some applications of PCs in radio have been simply "naturals"—like reception of FAX and SSTV. Who needs old windscreen wiper motors and spark-gap recording paper when it can all be done in software—and manipulated in many ways once captured and saved to disk? (The older readers among you will recall such things from the past...)

There are still plenty of radio enthusiasts who need a nudge in the direction of the technology—although many who once swore at the RFI generated from computers have now been delighted to discover that this is largely a thing of the past with LCD displays. And most traditional desk top CRT systems are no worse than domestic TVs (in fact, most are better).

Walk and chew gum

But personal computers are generally regarded as systems for doing one thing at a time. Radio is essentially a multitasking medium: you tune the radio, listen to the output, switch the mode in "real time"—so why is it that your PC can't do this as well?

Well, using our DESQview multitasking operating environment your DOS PC (IBM Compatible) can. DESQview allows you to run more than one DOS application (including MS Windows) at a time. Applications are appearing all the time to control the new generations of receivers fitted with RS232 serial interfaces.

DESQview is compatible with virtually all the DOS applications that you can think of—although it must be noted that some of the more experimental applications encountered in specialist scientific applications controlling serial communications may occasionally transgress the rules of DOS programming and require special attention.

But tweaking and tuning is half the fun of radio, isn't it? And getting computers and radio to perform tricks that you never thought possible will broaden the horizons of your hobby.

DESQview Users do it in DOS Windows

This publication is aimed at radio enthusiasts—so you'll be encouraged to learn that Quarterdeck technical people understand the excitement and enthusiasm that putting technology to work in creative new circumstances can bring. For example, our own DESQview User Magazine carries a feature on DESQview with packet radio in issue 4.

In the application display shown here in our optional 50 line VGA mode, one DESQview Window is running an application that controls our ICOM R71 through the CT17 interface—and the lower window contains a simple list of frequencies and station information.

A single DESQview script key (macro) has been written (in about 20 seconds) that cuts the frequency information from the list, and transfers it to the window controlling the receiver. The list can be created in any wordprocessor, card index or database.

Imagine...

In another window, you could be receiving SSTV or FAX information—or maybe plotting the orbit of a satellite.

All the time, you'll be online to your local BBS. But remember that you'll need to have enough serial ports, and enough expanded memory to enable you to do these operations simultaneously. 386/486 users have it easy—our QEMM memory manager used in conjunction with DESQview creates DESQview386—a multitasking operating environment that automatically sets up for optimum performance. Owners of 8086/80286 are not abandoned, though—and many facilities, including multitasking, are available through use of our products.

If you use an IBM PC or compatible and you don't use a product like DESQview, then please call us for details of our ever evolving product range, and where to find your nearest dealer.

We'll even try to single out those who have a radio enthusiast on their staff.

Quarterdeck Office Systems UK Limited: Widford Hall, Widford Hall Lane, Chelmsford, Essex CM2 8TD Tel: (0245) 496699 Fax: (0245) 495284
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As a professional in radio communications, specialising in computing applications, Richard Wilmot GW3RRI asks: "Do you operate RTTY or packet radio? Can you display weather satellite or SSTV pictures? I know that many PW readers are already very aware of the many uses to which a home computer can be put in the field of amateur radio and short wave listening. This much is clear from the articles which appear in PW, and from the response to them. There are however, quite a number who haven't yet ventured into this relatively new field of the hobby, for a variety of reasons. I hope that this article will encourage them to take the plunge and get all the benefits that modern computer technology has to offer". Richard Wilmot GW3RRI.

The main reason for a reluctance to become involved with computers, seems to be a feeling that the technology is too complicated. People get the idea that they have to have a degree in micro-electronics and another one in computer programming, before they can begin to understand what's going on! I'm pleased to be able to assure you that nothing is further from the truth!

**New Words And Concepts**

There are new words to be learnt of course, and new concepts to be understood, but the amount of knowledge needed to get started is minimal. It mainly consists of knowing how to connect up the computer system, switch it on and load a program. All this is generally easier than hooking up a transceiver to its various accessories, so everyone has the ability.

Although electronic and programming skills may be very useful to help you find a job, they are not needed to operate a home computer for our purposes. They're no more needed than r.f. engineering skills are needed to operate your transceiver! The transceiver by the way, if it's in anyway a modern rig, contains at least one computer, and quite likely several.

Although specialised skills went into making the computer and writing the program, neither of them is your concern, as you just buy them ready-made. All you have to do is to press the right keys to make the program perform your wishes, while following the instructions which came with it. If you can operate your rig, you are easily qualified to run a computer!

**What Can Computers Do?**

What can computers do for you? The answer to that is more or less anything that you can get a program for. These days, programs are available for a very wide range of radio uses, as well as for business, education, and a wide range of hobbies. And, of course, there are all those games to play!

The programs (often known as software) fall into two natural divisions or groups. There are those for which the computer is connected to a radio, which are used for receiving and transmitting data of various kinds, and programs where the computer runs alone, providing ancillary services such as log-keeping.

**The First Group**

Starting with the first group, the application which most people will be familiar is packet radio. The usual way to operate this is to use a TNC (terminal node controller). This is a hideous jargon term (but never mind what it means, you know what it does!) connected to the computer as shown in Fig. 1.

The use of your computer just as a display and keyboard is not a very demanding task. A very simple program will suffice, although some are another computer, with a built-in program which does the actual work of sending and receiving the signals to and from the transceiver. It sends the received text to your home computer for display, and accepts the messages which you type in for transmission.

**Not Very Demanding**

The use of your computer just as a display and keyboard is not a very demanding task. A very simple program will suffice, although some are
**AOR Receivers via Computer Control**

**ACEPAC-3A** is a new and exclusively developed multi-function IBM-PC based program to further increase the flexibility of the AR3000A and AR3000 receivers. No additional hardware is required other than an AR3000A, IBM-PC compatible computer and a standard serial lead.

The software package is designed to run in conjunction with the AR3000A, which is an extremely versatile start-of-the-art receiver featuring all mode reception with coverage from 100 kHz to 2036 MHz without gaps. An RS232C port is provided ready for connection to any "reasonably priced" PC compatible computer using a standard serial cable, the software runs under DOS.

ACEPAC-3A is menu driven for ease of operation with the basic on-screen help at the touch of a button. A comprehensive manual is also supplied as part of the ACEPAC-3A package. Two disks are supplied, one 3.5 inch 720 kB format and the other 5.25 inch 360 kB. Of course you may install one copy onto the hard drive of your computer.

Default settings ensure you can "get up and go" with the minimum of fuss or delay, these defaults may be changed anytime to tailor the exact configuration to suit your needs. When called, ACEPAC-3A checks the serial port connection for the presence of an AR3000A, if the connection is not established ACEPAC-3A enters emulation mode so that you may familiarise yourself with the software.

Providing you have the appropriate computer hardware, the ACEPAC-3A display is in colour except for the sweep facility (spectrum analysis type graph). For this function you need a graphics card such as DEQA, FEQA or VEGA although Hercules will be supported in all other respects if required. There are two types of display available for the sweep facility: graph-line or dots.

Band activity can be monitored both as a sweep display and as an "X" axis table format with search opening percentage recorded for each frequency. This is useful to indicate "how active" the frequencies are in the programmed search range. In addition to the graphic display, ACEPAC-3A can produce a detailed numerical list from the graphical information which may be printed on an Epson compatible printer.

The signal strength is displayed as a vertical bar with a resolution of 16 steps. Most AR3000A functions are available via remote control and status is displayed on the computer monitor screen: Frequency, Step size, Attenuator, Mode, Memory bank, Scan, Search etc.

ACEPAC-3A offers further storage of frequencies, mode, attenuator and lockdown in the form of memories. One memory file has 400 channels divided into 4 banks of 100 channels. ACEPAC-3A can make more than one memory file to increase the memory capacity but is of course limited by disk space. If you make just one extra memory file you can store 800 memory channels! Up to 15 memory files may be created in each directory containing ACEPAC-3A. Memory files may be down-loaded from the computer into the AR3000A. R.R.P. £119.00 including VAT. Carriage extra £2.00 by post.

**AORSC - Spectrum Coordinator** is a powerful program for the IBM-PC compatible computer, which allows the user to control the AR3000A, AR3000 or AR2500 receivers using the serial port of the computer. Many facilities are offered allowing a high performance radio monitoring system to be put together very simply. The AR3000A supports the "gadget port" (if fitted in the computer) to further increase search and scan speed.

A text display is used to present information to the user about the operation of the software. The status of the receiver and software is displayed on the computer monitor above a list of the memory channel contents. The bottom line of the screen contains a menu providing options for the main facilities of the software. The computer's keyboard may be used to select the frequency and mode of the receiver using dual VFOs. It is possible to switch instantaneously between the two VFOs with a single key press. A fixed VFO offset may be entered into the system and the VFOs locked together using the "tracking" facility so that the offset is maintained while tuning across the spectrum.

A Microsoft compatible mouse may be used to control the receiver instead of the keyboard, this greatly enhances operation of the software since it is not necessary to memorise key strokes in order to use the software.

Three thousand mode sensitive memory channels are provided, each with dual VFOs and 50 character comment. A selection of these memories is displayed on the screen so that the user can review memory contents easily. The display of memory contents can be made to scroll automatically, and the screen can be made to flash so that it is possible to check on the contents of the entire bank of 3000 channels from the VDU.

A comprehensive logging facility allows data to be recorded in logbooks. The logbooks are divided into three separate sections, screen scan or perform baseband audio, band limited scan. Frequencies that are found using the free scan or programmable band scan (PBS) can be transferred directly into the program's memories either manually or automatically.

It is possible by using the PBS, to automatically locate signals and place their frequencies in the top 500 memory channels of the software. In addition, channel occupancy can be calculated optically, it is possible from preset PBSs to set the level of spectrum usage for a band of frequencies to be measured. Similar statistics can be calculated from memory scan with output directed to a printer or disk file.

The Single Frequency Watch (SFW) facility allows statistics about signal activity on a single frequency to be calculated over a period of time. Regular reports on the density of traffic on the frequency can be output to a printer or disk file. This facility allows the number of transmissions per hour to be calculated together with the amount of activity expressed as a percentage of the total time per reporting period. The frequency of reports may be determined by the user.

A list of up to 100 unwanted frequencies can be built up for rejection during scanning operations. It is possible to individually "tag" memory channels so that a Morse character "A" is sent through the VFO offset to alert the user to the presence of activity on a memory channel while memory scanning. Offset Simplex Resolution (OSR) allows both sides of a simplex transmission that are on different frequencies to be recovered by switching intelligently between the two VFOs of the system.

A comprehensive printed operating manual is supplied as part of the AORSC package, pages of helpful information may also be read from disk for display on the computer screen while the software is being used. Two disks are supplied, one 3.5 inch 720 kB format and the other 5.25 inch 360 kB. Of course you may install one copy onto the hard drive of your computer. The computer requires a minimum of two floppy disk drives or one floppy disk drive and a hard drive. R.R.P. £75.00 including VAT. Carriage extra £2.00 by post.

**SCANMASTER 2.** Not an AOR product, it is designed and manufactured by E.M.P. Ltd. Scanmaster is a "self contained black box" which plugs directly into the computer cascade out of the AR3000A and AR2500 receivers. Many facilities are offered allowing a high performance radio monitoring system to be put together very simply. The AR3000A supports the "gadget port" (if fitted in the computer) to further increase search and scan speed.

A comprehensive printed operating manual is supplied as part of the AORSC package, pages of helpful information may also be read from disk for display on the computer screen while the software is being used. Two disks are supplied, one 3.5 inch 720 kB format and the other 5.25 inch 360 kB. Of course you may install one copy onto the hard drive of your computer. The computer requires a minimum of two floppy disk drives or one floppy disk drive and a hard drive. R.R.P. £75.00 including VAT. Carriage extra £2.00 by post.

**CELLCARD** contains the same modem/filter chipset as a cellular telephone. CELLCARD is a powerful diagnostic tool and is available to Scannmaster + ROMCARD can decode the signalling protocols used on the UK TACS system and optionally the AMPS system. It can decode data and channels and can carry out channel hopping and time division multiplexing. CELLCARD can be used as a powerful diagnostic tool and is available to AUTHORISED USERS ONLY!! Prices start from £249.99 including VAT.
more sophisticated, with flashy colour displays and lots of fancy features. This type of program is also used when people send computer data over the telephone. This ensures that such programs have been written for just about any computer ever made. However, whether you can find one for the computer you have, will depend on whether it is still a fairly popular model. As you can see, with the TNC approach you are actually using two computers, and their combined power is far greater than you need. In particular, your home computer is just loafing along, working at a tiny fraction of its capacity.

On the basis of 'why pay for another computer', in the form of the TNC, when you already have one which could easily do the job, packet systems have been produced for some computers which just need a comparatively simple piece of electronic hardware. This demodulates the audio signal and generates the transmit tones, all the rest being done by the program.

A typical set-up is shown in Fig. 2. As it is the hardware which is the expensive part to produce, this approach has brought the price down quite a bit.

**Several Modes**

In the same way that a TNC can handle several modes, as each mode needs just an extra piece of program, and perhaps a variation in the electronics, so the self-contained systems are able to do the same thing. Indeed, there have been an enormous number of programs produced over the last 10 years for a good selection of computers to transceive RTTY, AMTOR, c.w. and the graphics modes of SSTV and FAX. For these last two modes, this method really comes into its own as a TNC is really only geared up to use text, and they are generally unsuitable for transceiving pictures.

**One Stage Further**

It's even possible to take the process one stage further, and have the computer itself demodulate the signal and produce the transmit tones, thus eliminating the hardware altogether. As only a program is now needed, the price is much lower still. This method is not really feasible for packet operation, because of the mode's high speed, but it's very suitable for lower speed modes like RTTY. Whereas the performance on marginal signals may not match the best of the expensive units, there are compensating advantages, like the fact that they are very simple to set up. Such systems represent excellent value for the newcomer. As most computers are unable to accept an ordinary audio signal direct from the receiver, there is usually an interface involved. This converts the voltage to one which the computer can recognise, but this can be very simple and is normally supplied with the program.

**Listening On The Bands**

Although I realise that PW is the magazine for the radio amateur, and its sister journal *Short Wave Magazine* caters for the listener, I also know that many PW readers do little or no transmitting. However, many do like to eavesdrop on both the amateur and commercial utility bands. For these, the computer offers possibly even more scope than it does to the transmitting amateur.

There have been an enormous number of programs written for a large range of computers, to decode and display all of the common modes. Most programs need some sort of hardware, but, again, this is usually not very complicated and normally comes with the program.

The only mode that needs more complex hardware is the reception of weather satellite pictures. This is because of the modulation method

**COMPUTING IN RADIO**

![Fig. 2: Why pay for another computer?](image)
EXCITING NEW PRODUCTS FOR 1992!

Over the past year we have spoken to many of you at radio rallies and telephone to find out the sort of products you want to see in 1992. As a result we have come up with what we feel are interesting new additions to our already extensive range (the UK's biggest).

Our new "Mini-Pak" system...

A few of our other products...

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Call anytime from 8am-8pm Monday-Saturday.

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CONTROL - The dedicated programme for PC control of Kenwood receivers and transceivers. Messages sent and received through the use, and an additional important feature is the inclusion of a total if you too would like to find out about the true wealth of PD

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AMATEUR RADIO SOFTWARE BARGAINS!

New pack of Shareware and Public Domain software for IBM-PC compatible machines now available!

This fantastic value pack includes over 30 programs for use by Radio Amateurs including:

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used, but even then, the requirements are not excessive.

**Relatively Cheap**

The use of these relatively cheap and simple-to-use systems has been a major factor in getting new people interested in the hobby. It can also be a very useful way for anyone to get an introduction to the use of computers in radio, and to the modes themselves, as a receive-only program will be easier to operate than a transceive one.

The number of different signals you can hear is much greater than just the contents of the amateur bands. The SSTV and packet radio modes are amateur-only systems, but they are the only exceptions.

Radio-teletype, or RTTY, is transmitted from countries all around the globe. Each one anxious that you should hear its own version of world and local events.

The results can be fascinating! Not long ago I copied the Xinhua News Agency in Beijing telling the world all about the 4th International kite flying championships in New Delhi!

**Weather Charts**

There’s not much amateur radio FAX about, but there are a lot of weather charts coming through at all times. These are not just the ordinary synoptic charts, the sort of thing you can see in the papers, but include a large range of charts for other purposes.

Upper air forecasts for airliners, wave height and sea ice analysis, land temperature and rainfall records for agriculturalists and many more, are yours for the asking. There are also press pictures, mainly from Germany, which have quite a habit of turning up in your newspaper the next day. These can be really intriguing at times, like the FAXed photograph I treasure, showing a detective entering a house...in his bathing trunks!

**Origins Of AMTOR**

You may call it AMTOR, but this system is actually a commercial mode called SITOR. It was originally developed to provide better ship-to-shore telex links.

The AMTOR system is not only still used for this purpose, (plenty of frequencies to listen to) but also for INTERPOL work (sorry, all the sensitive stuff is scrambled!). Another use is providing the world-wide NAVTEX service, in which stations round the globe take it in turns to transmit gale warnings and advice of navigational hazards to shipping. Saves having to wait for the Radio 4 shipping forecast!

**Satellite Results Impressive**

Satellites are transmitting pictures of the earth to us 24 hours a day, and the results can be really impressive. A geostationary satellite located above the equator sends pictures every four minutes of sections of the earth’s surface covering all of Europe and Africa. Both visible light and infra-red detectors are used to create the pictures. A visible light picture of Northern Europe, including the UK, is sent every 30 minutes during the day, so that you can see how the weather patterns are developing. Transmissions are on 1.69GHz and a special antenna and receiver will be needed.

**Low Orbits**

There are also several satellites in low orbits, each of which gives three or four good passes of 10-15 minutes twice a day, generally once during the daytime and once at night. These satellites transmit continuously both infra-red and, during daylight, visible light pictures.

Because they are so much lower than the geostationary satellite, it’s easier to get a good picture from them, a resolution of 5km being easily obtained. Transmissions are on various frequencies around 137MHz.

It may be possible to get adequate reception using a scanner radio and a discone antenna. If not, a crossed dipole antenna is easy to make or buy. Nowadays, special satellite receivers are becoming more easily available and cheaper, and you can even make them up from kits.

**Morse Still Used**

Even the humble Morse c.w. is still actually used, mainly by coastal stations. You can listen when you’ve got bored with the amateur CQs. You may have been considering getting one of the stand-alone decoders on the market, but if you use your computer instead, you will get added advantages. These include a full screen display, permanent copy to a printer, temporary storage of text and pictures in the computer’s memory and permanent storage on disk. All this and a lower price, too!

**Variety Of Tasks**

Now it’s time to turn to those programs where the computer runs alone. Here, there is a variety of ancillary tasks which your home micro can perform for you. These include log-keeping, contest scoring, teaching you Morse code, locating your contact on a map, satellite tracking and predicting (even controlling the antennas) and more. Most of these things can still be done by hand, as it were, but using a computer offers several advantages. For log-keeping, it can search your log (or logs) for a callsign you type in.

The computer will then show you on the screen who and where the station is, and when you have worked before, even before the CQ call is finished! Some programs may also have the ability to search on a partial call, in case you didn’t copy it all.

Although specific amateur radio or s.w.l. logging programs will usually be easier to use, being designed specially for the purpose, you can, in fact, use any general database program as they have similar facilities.

**Contest Scoring**

Although I’ve never done v.h.f. contest scoring myself, it’s obvious that the old method of plotting locations on a map, measuring the distance with a ruler, and working out the score must...
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have been a very tedious chore. It was also rather inaccurate.

Now, you just type in the station's location! Then the computer calculates the distance and score instantly and effortlessly. It also adds up the totals, printing everything out in the required format.
The Radio Society of Great Britain now even let you submit your entry on disk! Despite this, the disk has to be in the right format, and it's effectively restricted to PC computers.

**Program Plots Position**

If you don't go in for contests, you can get similar programs which are designed to show you where your contact is, by plotting the station's position on a map on the screen. You type in the locator, or perhaps latitude and longitude or National Grid reference, or even the name of the place, and the mighty micro does the rest.

Like the contest logging program, it works out the distance and it also calculates the correct beam heading. All this information is printed up on the screen, together with any other details it cares to provide. These may include local clock time, and if you're DXing world-wide, you may see the great circle path taken by the radio signal curving over the map.

**Satellite Fans Catered For**

Satellite fans are catered for by programs which predict when a given satellite will be visible. They will also tell you its azimuth and elevation during this time, so that you know where to point your antenna.

Programs may give a list of values, and also show the track of the satellite over the earth's surface on a map. If you're lucky, you may even be able to get a system which will control the antenna rotators to automatically track the satellite as it flies over.

---

**In My Day**

Want to learn Morse and get that A licence? There's no problem - just use your computer. In my day (I thought that I'd get that in just once but I promise not to do it again!) you hooked up a Morse key to a buzzer or oscillator, and got an experienced friend to send Morse to you and check your own sending.

This is still an excellent method, if you have the 'right' friends, but it's not so good if you don't! Even the best of pals has his or her own life to lead, and they can't guarantee to be available whenever you want to do some Morse training.

It's particularly advantageous to do at least some practice every day. This is the great benefit of the micro. It can send Morse to you for hours if you want, at any speed and with each character perfectly formed. It will also check your copy so that you can see where you're going wrong. The computer can send your problem characters more often and possibly check your sending. All this at any hour of the day or night - much more handy than the most cooperative friend!

**Choice Is Huge**

The choice of software available is huge. A look at the 'showcase' section of this 'computing in radio' special and the adverts every month, will give you an idea of what there is to buy, and how to find it.

The only general advice I can give you about buying computing gear, is the following: If you are going to need several items to work together, typically a program, a piece of hardware and connecting leads, you should make every effort to get them at the same time from the same supplier.

By doing it this way, the equipment you buy should all be compatible with each other, and if you do have any trouble there's a clear place to go for advice or complaints. Many problems result when items are obtained from different sources, and are either not properly compatible with each other or aren't wired up correctly.

**Buying A TNC**

The same advice is just as relevant if you are buying a TNC. You also need a program for your computer (usually called a driver program) and a connecting lead.

Make sure that you get both with the TNC, and don't be put off by the salesman telling you that you can get them somewhere else. If he can't provide the complete set-up, take your custom elsewhere to someone who can!

**Buying A Computer**

What computer should you buy? Buying a computer can be a more difficult question than what to use it for, once you've got it.

Computers vary considerably in their size, capabilities and ease of use. They also vary in their level of support for radio applications. I am also all too well aware that any advice I give will attract waves of criticism from those already 'computerised readers', who feel that their pet machine has been misrepresented, maligned or ignored altogether. However, there are certain factors which need to be clearly held in mind when you make your choice.

So here I boldly go, and I can only advise 'computerised readers' not to read this part!

**First Time Purchase**

For a first time purchase, I would strongly recommend going for something simple and cheap. Once you've developed some experience, and have a better knowledge of where your interests lie in this direction, you may want to go for a higher specification machine.

This will be able to run the more complicated systems but it will also set you back a lot more money. A large number of users are very happy to stay with a small micro, and they do have their advantages.

Don't get the idea that a small computer can't do anything worthwhile. For most uses, the performance of the whole system is limited by factors other than the computer. So, getting a more powerful machine will not help at all.

Don't get fooled into playing the 'numbers' game, where people buy their computer on the basis of which one can boast the highest numbers: processor speed, amount of memory, etc. For the vast majority of radio uses, these figures are totally irrelevant.

Because the simpler computers are cheap, they are also very popular. So there are a lot of programs available for these machines, and they cover most radio activities.

The following factor, is actually the most important single consideration in choosing a computer. My advice is that your decision should be based on the availability of programs for...
the uses you have in mind. It doesn’t matter how expensive the computer is, or how high its specification, if you can’t get the program you want, then it’s just so much useless electronic junk taking up valuable space in your shack or living room. A program is just as essential to the computer as the electricity it runs on!

Total Market Limited

The radio hobby is not a universal pastime, and so the total market for this type of software is limited. However, the programs still take the same amount of time and effort to write.

This means that the good programs are only available for the more popular computers. The latter comment is a purely economic fact, and it does not imply that other computers are inferior or unsuitable from a technical viewpoint. It only means that not enough people with interests in the radio field have them, to make writing the programs a commercially worthwhile task.

Surprising though it may seem, many people have not realised this essential fact. They blindly go ahead and buy whatever fancy-sounding computer the salesman talks them into!

The new computer owner can then spend a fruitless few days phoning round all the program suppliers, only to find out that their wonder machine is not supported. Some of these frustrated customers then write letters to the radio magazines, complaining that the software houses don’t write programs for their micro, as if it is somehow their duty to do so.

Special Mention

Three computers must be singled out for special mention, for different reasons. The first is the Spectrum. The Spectrum was Clive Sinclair’s creation. It was his biggest hit, before he became obsessed with super-tech and went bust.

When it came out, nearly 10 years ago, it immediately sold in huge quantities and has remained remarkably popular with different groups ever since.

Although it was a pretty basic machine by today’s standards, from the radio point of view the Spectrum had the great advantage that it could read an ordinary audio signal at loudspeaker volume.

The computer could also produce output tones, making available some very cheap receive and transceive systems. Some of these are still selling well today.

Early Model

The early model (called the Spectrum 48k) has been superseded by larger versions. These have more memory and extra features like a proper printer connection and a disk drive. They also have a rather sharper screen display, but this has been obtained at the cost of increased r.f. noise output.

As well as the cheap receive and transceive systems I’ve already mentioned, there have been a large number of other programs written for the Spectrum. These often involve the use of some hardware, and cover a very wide range of radio topics.

Many of these machines provide a performance as good as that obtained from much more expensive computers. You could do a lot worse than start off with a Spectrum.

The BBC Machine

The second computer I’ve set aside for special mention is the BBC machine. The BBC was produced for educational purposes and quickly found its way into just about every secondary school in the country.

Because their children were using it at school, many parents also bought one for home use. For this reason the BBC became the standard computer of its day for ‘serious’ use.

The BBC also became popular with radio amateurs, and a wealth of software was produced. It has connections for printers, disk drives and quite a good graphics screen display. It’s very well worth considering one of these excellent machines for your first steps into the computer world.

The original BBC-B model was subsequently replaced by the BBC Master. This model had more memory and some extra features.

I think that all the radio systems available will run equally well on either model. The systems are unlikely to make much, if any, use of the Master’s extra capabilities, and so it doesn’t matter which one you get.

The BBC machine will always need some hardware to connect with a radio, but it has a convenient connection for such things. It has a reputation for producing a lot of r.f. noise, but this is rather exaggerated, and there are things you can do to reduce this problem.

The Archimedes Range

More recently, Acorn (the company that made the BBC computers) has produced the Archimedes range. These machines are completely different from the BBC and are in no way compatible.

Acorn produce what is called a BBC emulator, which is supposed to allow Archimedes users to run BBC programs. These work by intercepting the points where the program uses the standard BBC system, and then diverting them to the equivalent routines in the Archimedes. Unfortunately, there’s not an exact correspondence between the two computers, and so some conversions are not possible.

It is extremely unlikely that any radio software you get will work using an emulator. This is because these programs usually operate the chips in the BBC machine directly, and will thus not run on a machine with any other internal arrangement.

Quite a few other computer manufacturers have produced BBC emulators for their machines. The same comments I’ve already mentioned apply to these also, as well as to the Electron computer.

The Electron machine was designed to be compatible with the BBC, but it lacks many of the BBC’s useful features and has a different internal hardware. On reflection, it’s a major compliment to the BBC computer, that so many other micros have felt the need to take this step. The answer must be that if you want a ‘Beeb’, as they are affectionately called, ignore the imposters and buy the genuine article.

The PC

Finally, we must consider the PC. The PC was originally produced by IBM as their Personal Computer (hence the initials). Nowadays, equivalent versions are produced by a vast number of world-wide manufacturers, who have found that they could provide the same facilities at a much lower price.

These machines are called ‘compatibles’ and in theory they will run any programs written for the IBM PC. Amazingly perhaps, this is generally true in practice. This is because software writers are very aware that most of their customers are using compatibles, rather than the pukka PC. They make sure that their programs are as universally acceptable as possible.

There are a large number of PCs in use throughout the world and although sales in
the UK have been limited, they are now increasing fast, as prices have been falling recently. There are also a large number of radio related programs available. All this would seem to make the PC or compatible the ideal choice, but there are problems!

**Timers And Connections**

Unfortunately, PCs lack the range of useable timers and a convenient connections for radio interfaces which are often found in the 'simpler' machines, especially the BBC. As a result, you either use the serial port, which is very limited for this type of application, or you have to go to the other extreme and install a complex printed circuit board, containing all the required facilities, inside the PC.

Although it's a straightforward task for a reasonably competent person, newcomers especially, may well be reluctant to open up their computer to install these boards. The extra boards are usually known as 'cards'.

The presence of extra 'cards' in the computer can also produce other problems, if the board's operation clashes with something else in your machine. These need knowledge to sort out.

The original PC came out in 1981, with a specification which looks very primitive compared with what they offer today. Since then, there have been several versions of both the processor, internal hardware and screen display.

Programs written for the original machine should run on today's PC, but the reverse is not necessarily true as software, quite naturally, takes advantage of the latest developments. For this reason, they may no longer be compatible with very early versions which lack an essential feature.

**Up To Date Model**

If you are going to use a PC, it's probably best to get a fairly up-to-date model. This is important, particularly if you are anticipating using it to display a graphics mode such as FAX.

As the PC developed, the standard of the video display improved. Modern programs give a much better picture if use the current video display standard, called VGA. In fact, there all sorts of super-VGA display systems installed in PCs these days. They offer higher resolutions and sometimes more colours.

However, as these are all produced by different manufacturers, there's no agreed standard for the use of these advanced facilities. Some top-end programs are able to use these systems to full advantage. Others tend just to use the 'standard' original VGA modes which are common to all of them.

In spite of falling prices, PCs aren't cheap. You are looking at several hundred £s for a new one with hard disk drive and VGA display, even if it just has a monochrome monitor. You also have to make sure that the Operating System (the piece of software which controls the computer's basic facilities) is correctly installed.

**Experienced Help**

At least in the initial stages, you are going to need someone experienced to help get your system correctly set up. There are various assorted second-hand or surplus PCs to be found at radio rallies. But I would advise against a newcomer getting one of these, unless an experienced friend is on hand again to provide advice.

Computers from this source are really only suitable for the experienced user, who knows what he is buying, how to get it set up and can troubleshoot the problems. The machines that I've seen are also not at all cheap! The software available for PCs is also generally more expensive than the equivalent for the other computers mentioned.

**Good Software Support**

The fact that I've singled out three computers for special mention, does not imply that there are no other suitable machines. For instance, both Commodore and Atari machines have a good deal of radio software support.

These machines are certainly worth considering. However, once you get outside this group the amount of radio software available falls off rapidly.

In general, if you can get a disk system with the computer, do so as it makes life a lot quicker and easier. The PCs are disk-only anyway, but for these you should seriously consider having a hard disk.

This form of storage is a fast, high capacity disk permanently installed in the computer. It can hold all your programs and save you having to mess about with all those floppies!

Once you've used one, you'll see the great convenience it offers. It's virtually essential if you are going to run large programs like graphics packages, and desk top publishing, etc.

If you need the speed and memory of a PC for other purposes, then it can be used for radio as well. Otherwise, it's really way over the top for nearly all radio applications. You are paying a lot for a specification you do not need. The other well-supported machines are much cheaper and very much simpler to set up and use.

**Modest Priced**

You can get a 48k Spectrum for a modest price, around £20 or thereabouts. The final model, the Spectrum +3, which has a proper printer port and disk drive, is available for around £70. A BBC-8 with disk system should set you back no more than £100. You should also be able to buy a complete set-up with monitor and printer at a bargain price as well.

The price I've suggested, may include a lot of useful software. And as I have already mentioned, PC prices are still way above this level.

**Radio Frequency Noise**

You may have heard horror stories about micros wiping out radio signals completely. The amount of r.f. noise emitted depends not only on the particular computer, but also on the frequency and the precise details of how your set-up is arranged.

It's impossible to give simple advice or recommendations. All I can say, is that the stories have usually been embellished in the telling! Most permanent installations don't suffer unduly from noise. There are steps you can take to reduce the level, in the unlikely event that it does cause a serious problem. However, don't let this consideration worry you at this stage.

**A Great Deal To Offer**

You can see that computers have a great deal to offer the radio enthusiast. They can improve existing activities, and at the same time provide access to the new data and graphics modes.

In my opinion, it can't be very long now before the keyboard is as common as the microphone in any amateur radio station. It's a fact of life today that seven year old children, accept the use of computers as part of everyday existence, in the same way that adults watch the television.

Nobody's too old to take the plunge! Countless retired people have not only had great enjoyment from harnessing a computer to their hobby, they've also made a valuable contribution to its development. Whatever your age, why not join them?

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Now you've read Richard Wilmot GW3RRI's introduction to using computers in radio communications, it's time to see what's on offer, who can supply it to you, what it can do and how much it's going to cost you! Naturally enough we start off at A.

Aardvark Computer Services, (E. J. Lilly) 9 Greenfield West, Barley-in-Wharfedale, Ilkley, West Yorkshire LS29 7RB. Tel: (0943) 862585. This company supplies consumables for computer users. They can supply everything required, from floppy disks to tapes and data cartridges, paper, computer furniture, printers and IBM compatible machines. Telephone enquiries are welcomed, and price lists are available.

AMDAT, 4 Northville Road, Bristol, Avon BS7 9GQ, Tel: (0702) 993532 or FAX: (0272) 236908. This company specialises in packaged radio hardware and software for the PC. Their catalogue provides full information on their range of hardware and software for radio on h.f., v.h.f. and satellite. No prices are given in the catalogue, and telephone enquiries are advised.

BOSCAD Ltd., 16 Aytoun Grove, Baldridgbum, Dunfermline, Fife, Scotland KY12 8YX. Tel: evenings only (0382) 729584. This company produces Morse products for PC and Atari. Their PC training manual to be the 'ultimate' computer tutor, and it includes send and receive, punctuation, procedural and also includes English language wording and symbols. It costs £37.50. You can write or telephone and Boscad will send you a free demo of the latest program.

BOSCAD Ltd., 7 Bhookope Grove, Bishop Auckland, Durham DL14 0SW. Tel: or FAX: (0388) 662875. This company providesliterally everything the computer user needs. Of particular interest to the radio enthusiast is the 'continuous card'. The company markets the 'Ultimate service in their 50 -page catalogue No. 3/91, cost £1, from Gemini Shareware. This software is well-known as a specialist supplier in educational software and hardware for the radio enthusiast. Some software, user details available direct from CMB at Baldridgeburn, Dunfermline, Fife, Scotland KY12 9YA. Tel: evenings only (0383) 729584. This company produces IBM PC programs and software for the radio equipment. One product included is the AMT -3 AMTOR/RTTY, Morse products for PC and Atari. Their most popular product is the Code 3, which is an on £29; and provies features such as: Morse with on screen w.p.m. indicator, packet radio AX25 with selective callign monitoring 300 baud, RTTY Baudot/ Murray ITA1/ CCITT2 plus all bit inversion, FAX (up to 16 shades), SSTOR, ASCII, Holschreiber and a host of other facilities. Added to the very comprehensive supplied facilities, HOKA offer extra options for the equipment such as: Oscilloscope (displays frequency against time), Piccolo Mark E., etc. Telephone enquiries are welcomed for the product leaflet which provides comprehensive details and prices.

Martin Hopkins (Computer Broker) Kirbarks, Birds Lane, Midgham, Reading, Berkshire RG7 5UL. Tel: (0734) 712882 or FAX: (0734) 712118. This broker offers a very wide range of secondhand computers and associated hardware, with a lot of equipmant at bargain prices. The comprehensive catalogue invites offers for any of the equipment listed. Telephone enquiries are recommened as the stock changes daily. Some software, user books and manuals are available.

ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 1BB. Tel: (0903) 711010 or FAX: (0903) 711106. This company produces a wide range of educational software, and their Education programs will be of particular interest to anyone wanting to either 'brush up' their French, German or Italian. Prices for the language tutorials are all around the £20 level for disks, and £17 for cassettes. Computers catered for include: Amiga, Amiga Plus, Atari, IBM, Spectrum, Amstrad, Amstrad PCV, Acorn, BBC and Electron Beans. Telephone for further information.

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Interconnections Ltd., 322 Guildford Road, Bexley, Surrey DA14 4AD. Tel: (0863) 794718 or FAX: (0863) 794727. This company offers a very wide range of computer accessories within a large, easy-to-read catalogue. Along with all the necessary computing equipment, spares and ancillaries, the catalogue also has specialised and general test equipment. One product which could prove very useful to PC experimenters is a test card. This card (part ref: 15.01.5505) plugs into an empty slot in a PC and allows the user to mount their own card standing proud of the PC. This then makes the user's card fully accessible for further adjustments.

Lindfield Enterprise Park, Lewes Road, Lindfield, West Sussex RH16 2LX. Tel: (0273) 205001 or 205002. This company supplies Goldstar PCs, CD ROM drives, and CD ROM software. They also dock a wide range of sophisticated computer game software. They have a specialist range of flight simulation software programs for the frustrated pilot.

Road, Shillingford, Bedfordshire SO5 2NY. Tel: (0462) 711600 or FAX: (0462) 711769. This company specialises in software and hardware for the radio amateur and listener. Their most popular product is the Code 3, which is an on £29; and provides features such as: Morse with on screen w.p.m. indicator, packet radio AX25 with selective callign monitoring 300 baud, RTTY Baudot/ Murray ITA1/ CCITT2 plus all bit inversion, FAX (up to 16 shades), SSTOR, ASCII, Holschreiber and a host of other facilities. Added to the very comprehensive supplied facilities, HOKA offer extra options for the equipment such as: Oscilloscope (displays frequency against time), Piccolo Mark E., etc. Telephone enquiries are welcomed for the product leaflet which provides comprehensive details and prices.

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Lightwave, (Computer Cables & Accessories), Unit 3, Atlantic Business Centre, Dock Road, Birkenhead, Merseyside L41 1JW. Tel: 051-365003 or 051-8360322. This company has a very wide range of computer cables, plugs, sockets, adaptors available for literally any purpose associated with computers and interfacing. Further details on the catalogue, and prices from Lightwave, at the above address.

Lucid Publications, George Butler 46B/031, 18 Hobart Road, Ramsgate, Kent CT12 6NW. Tel: (0842) 582939. This small company markets the 'Ultimate Morse Tutorial'. George Butler also reports that he plans to launch his new database, 'OSBase'. Full details on prices and products are available by phone or by writing to the company's address.

Matmos Electronics Ltd., Unit 11, Linfield Enterprise Park, Laves Road, Linfield, Strathlannan, Inverness, Ross & Cromarty, (0641) 482091 or 463830 or FAX: (0444) 484285. This company supplies a variety of computers, scanners, disk drives and related products. Of particular interest to the radio enthusiast is the
realistically priced full Computer Aided Design (CAD) systems they can provide. The 386-20 CAD system, for example, comes with 2MB of RAM, 10MB of hard disk, graphics card, 62Mbytes hard disk drive and co-processor. The system runs Windows 3, MS-DOS, etc. The company specialises in the small size print, there are a great many software developers that had been written, were placed into the public domain software really began. The 'Shareware' or 'Honour Bound' libraries are free for expansion. The Genie Micro is the smallest of the three, but has two full-length expansion cards. It come with a high-density 2.5m floppy disk drive and has a hard disk capacity of up to 500MByte. The Genie Micro costs £1297 plus VAT. The Genie Executive costs £1595 plus VAT. The 'Shareware' or 'Try-before-buy' method of finding software then emerged. The 'Shareware' or 'Honour Bound' libraries is the latest version of the 'Shareware' or 'Honour Bound' method. The 'Shareware' or 'Honour Bound' method is becoming a popular way to obtain software. The 'Shareware' or 'Honour Bound' method is becoming a popular way to obtain software. Many commercial products have their 'Shareware' counterpart. 'Assayroots' is a very popular database program and 'Wormstore' is a popular Wormstore compatible text editor. The ever increasing number of software available. The Genie Professional is supplied with a single 1.4MB floppy drive, with a maximum hard disk capacity exceeding 16Byte, leaving two 2.5m drive bays free for expansion. The Genie Professional costs £1595 plus VAT. All models are available in any PC with CGA, EGA, VGA or SVGA display. Call or write to Timestep for a catalogue.

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Pocketware, (Ray Harris) 78 Kimberley Avenue, Newport Park, Ilford Essex IG3 9TH. Tel: (0405) 792886. This company is currently distributing PC Shareware and PDW software. A catalogue is available free of charge and there is also a comprehensive list of items available. The company has developed by solving other people's PC problems. S&S International was one of the first companies to promote and sell computer software. The company also have a Public domain software library providing programs for IBM compatible PCs. The company also have a Public domain software library providing programs for IBM compatible PCs. They are also producing an electronic PEG 97 files under the heading of 'Airsoft Radio'. The files include a full radio package covering all power takers from radio, and satellite, offering software for PC, and software for the amateur radio market. The files include a full radio package covering all power takers from radio, and satellite, offering software for PC, and software for the amateur radio market. 

The catalogue lists a large number of shareware programs of interest to the amateur radio market. The company also have a Public domain software library providing programs for IBM compatible PCs. The company also have a Public domain software library providing programs for IBM compatible PCs. They are also producing an electronic PEG 97 files under the heading of 'Airsoft Radio'. The files include a full radio package covering all power takers from radio, and satellite, offering software for PC, and software for the amateur radio market. These software programs are designed for use in the amateur radio market. The DE930-view program is included in packed radio and BBS software as the multitasking medium. Quarterdeck are also now involved with work on remote RS232 control of ICAM and other equipment being developed in the UK. Full details of the DE930view program, including a well-written full technical perspective, are available direct from the company at their Chesilfield address.

Siskin Electronics Ltd., 2 South Street, Hythe, Southampton, Hampshire S04 6E6. Tel: (0703) 207567 or 0359 or FAX: (0703) 847179. Siskin

Computing in Radio
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The DRSI PC*Packet Adaptor TNCs must be the most popular PC TNC in the UK. Does not conflict with existing Comms ports

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The DRSI PC*Packet Adaptor TNCs must be the most popular PC TNC in the UK. The DRSI PC*Packet Adaptor plugs into your PC mother board and gives 2 TNC ports

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COMPUTING IN RADIO
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Timestep Weather Systems

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