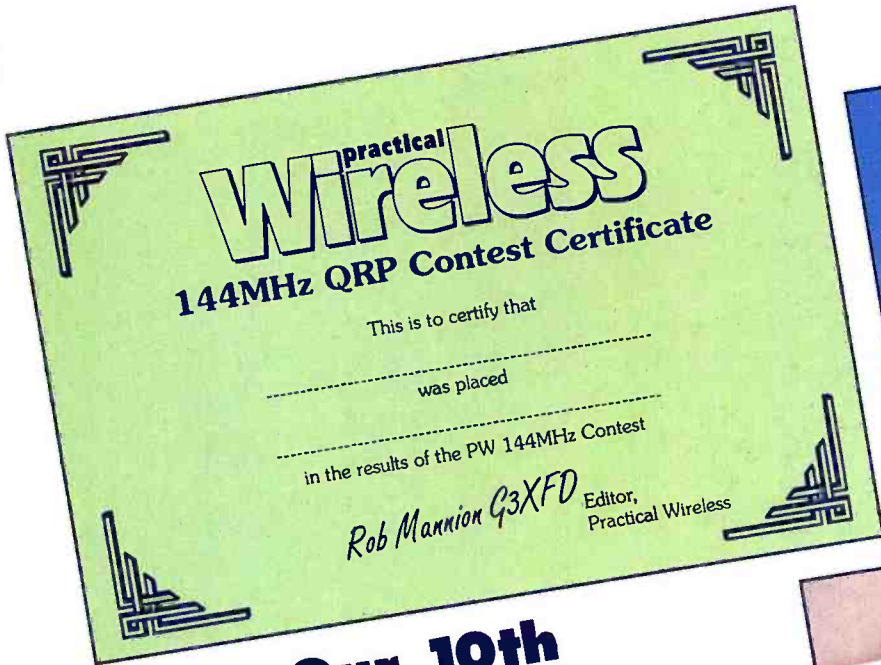


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**Reviewed
The AKD 4001 70MHz
Transceiver**



**Plus
Basic Synthesisers And How They Work
Mobile And Portable Operation On A Shoestring
Focal Point - Special Offer - Getting Started The
Practical Way - CB High & Low
And Lots More!**



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Stuck for Space?

Then why not choose the FT-5200 or FT-6200 dual band mobile transceivers. The detachable front panel can be easily mounted in a convenient location on the dashboard, while the transceiver body can be stowed under a seat or in the boot. For extra security, take the front panel with you, the transceiver is useless without it! So for extremely powerful communication capabilities with maximum user convenience and equipment security, face the facts and pick a Yaesu dual band mobile.



FT-5200/FT-6200

Boot-Mountable High Power Dual Band VHF/UHF Transceiver

- ✓ **FT-5200:** 2m and 70cms.
FT-6200: 70cms and 23cms.
- ✓ **32 Memories:**
16 tunable memory channels for each band.
- ✓ **Channel Steps:**
5, 10, 12.5, 15, 20, 25kHz.
- ✓ **Removable Front Panels For Quick and Easy Installation.**
- ✓ **CTCSS Encode Built-In:**
38 sub-tones selectable from the front panel.
- ✓ **Full Duplex Cross Band Operation:**
Independent squelch and mixing balance, for simultaneous listening or transmitting.
- ✓ **Independent TX/RX Frequencies:**
Odd splits ok on any memory channel.
- ✓ **Programmable Sub-band Limits:**
For band scanning.
- ✓ **Selectable Scan Skip:**
For busy channels.
- ✓ **Backlit DTMF Microphone.**
- ✓ **One-Touch Instant Recall:**
Recall of CALL channels for each band.
- ✓ **Priority Monitoring.**
- ✓ **Dual External Speaker Jacks:**
One for each band.
- ✓ **Built-In Antenna Duplexers:**
Standard feature.
- ✓ **Reversed Masked Full Frequency LCD.**
- ✓ **8 Level Automatic Display/Key Lighting Dimmer.**
- ✓ **Accessories Options:**
FTS-22 (CTCSS Dual Decode Unit), FRC-4 (Pager Unit), DVS-3 (Voice Memory and Pager Unit), YSK-1L (6m Separation Kit Cable), SP-7 (External Speaker).

Performance without compromise

practical Wireless

JUNE 1992
(ON SALE MAY 14)
VOL.68
NO. 6
ISSUE 1023

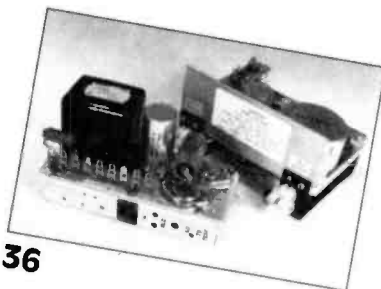
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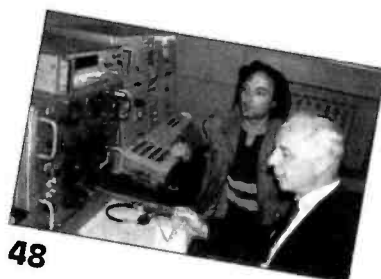
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Published on the second Thursday of each month by PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Southernprint (Web Offset) Ltd., Poole, Dorset, Tel: 0202 622226. Distributed by Seymour, Winsor House, 1270 London Road, Norbury, London SW16 4DH, Tel: 081-679 1899, Fax: 081-679 8907, Telex: 8812945. Sole Agents for Australia and New Zealand - Gordon and Gotch (Asia) Ltd.; South Africa - Central News Agency. Subscriptions INLAND £19.00, EUROPE £21, DVERSEAS (by ASP) £22, payable to PRACTICAL WIRELESS, Subscription Department, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without written consent of the publishers first having been given, be lent, re-sold, hired out or otherwise disposed of by way of trade at more than the recommended selling price shown on the cover, and that it shall not be lent, re-sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. *Practical Wireless* is Published monthly for \$45 per year by P.W. Publishing Ltd. Enefco House, The Quay, Poole, Dorset BH15 1PP U.K. Second Class postage paid at Middlesex, N.J. Postmaster: send address changes to C & C Mailers, PO Box 177, Middlesex, New Jersey 08846 USA.

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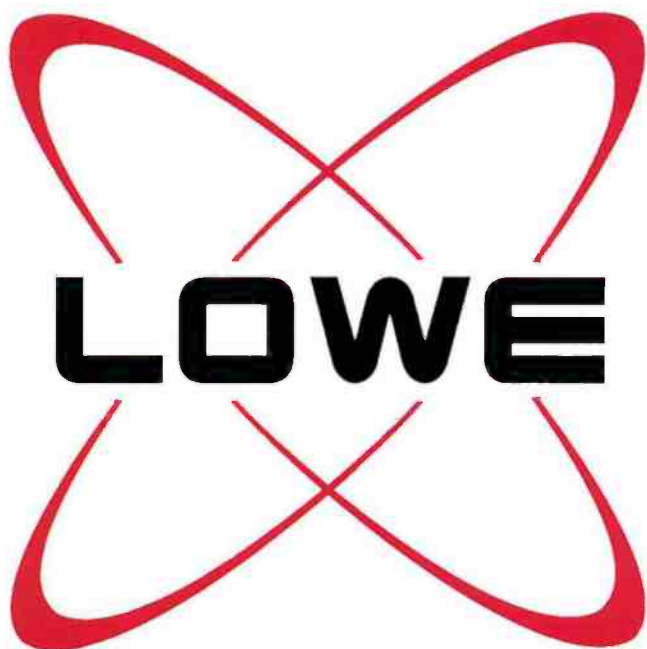
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INTO ACTION

Kenwood's New Compact FM Handheld Transceivers

Imagination combines with state-of-the-art technology to expand the bounds of compact communications, as witnessed by Kenwood's two new FM single-band handheld transceivers: the TH-28E(144MHz) and TH-48E(430MHz). Advanced features include the ability to store both alphanumeric and frequency data in non-volatile memory, alphanumeric message paging — in addition to standard DTSS and pager functions — and a switchable dual-band receive capability. Handheld performance never looked so good.

- Alphanumeric memory function(max. 6 characters)
- Alphanumeric message paging(max. 6 characters)
- Switchable dual-band receive(144MHz and 430MHz)
- 5 watts of RF output with PB-17 high-power battery(opt.)
- 40 non-volatile memory channels, optionally expandable to 240
- 4-position output power control(High/Mid/Low/Economy low)
- CTCSS operation with TSU-7 tone decoder(opt.)
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ELECTRONICS

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Bander DJ-580E**

£369

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The DJ-580E hand-held is the most advanced design ever offered to the radio amateur. Building on the winning formula of the DJ-560E, ALINCO have now reduced the size dramatically and introduced a combination of innovative features that will make your operating even more fun and certainly more versatile.

It goes without saying that ALINCO offer you all the standard features you expect from a hand-held including dual watch, dual controls, scanning, searching, priority, etc. Of course ALINCO's standard of engineering and reliability is now becoming the envy of its competitors. (They're also pretty envious of ALINCO's prices!) Naturally you get a full 12 month warranty including parts and labour. It's the extra features that really make this a winner.

For example you now have ALINCO's patented circuit that retains full operation with dry cells even when battery voltage falls by 50%. Great for emergency applications. You get a programmable auto power off feature, battery saver, digital telephone dialler and three output power levels. And we've only just started! Key in a special code on the keypad and your rig will turn into a fully operational automatic crossband repeater. Key in another code and you will open up the receiver for a.m. airband reception and frequency segments up to 995MHz! You can even use the DTMF feature to send and receive two digit code messages.

To learn more about the transceiver that has already taken the Japanese and American markets by storm, phone or write for a full colour brochure.



"The Most Comprehensive Specification Ever Offered!"

Available direct or from your local dealer

Auto repeater mode
AM Airband Reception
Expanded Receive to 995MHz



Specification

Tx	144-146MHz 430-440MHz
Rx	AM 108-143MHz FM 130-174MHz FM 400-470MHz FM 810-995MHz
Steps	5, 10, 12.5, 20, 25kHz
Memories	42
Power Output	2.5/1.0/0.3 Watts 5 Watts with 12V DC
Scan	8 Modes
Tones	1750Hz plus DTMF Optional CTSS
Sensitivity	12dB SINAD -15dBu
Size	140x58x33mm
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Accessories Supplied	Ni-Cad pack, AC charger, belt clip, carry strap, dual band antenna.

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see the latest models from

YAESU including the**FT890, FT415/815 & FT2400H****NEW****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.

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 into your nearest SMC shop and see one in action!

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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 ie. S20, R1 or repeater call signs, 3SN etc. etc.

All these features are packed into an aesthetically pleasing din size package.

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FT890 MOBILE/BASE HF

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The FT890 is the 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 synthesisers are driven from a single master oscillator both frequency accuracy and stability are guaranteed.

SEE REVIEW IN HAM RADIO TODAY JUNE 92 EDITION

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.

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The Daiwa range of power supplies is proving very popular for all types of applications, both for the professional user and the hobbyist alike. From the smallest 9A continuous PS120MkII, via the extremely popular 24A PS304, to the top of the range 32A

continuous RS40X. All the Daiwa range of PSU's feature variable voltage from at least 3-15V and switchable voltage 1 current metering. Both the PS304 and RS40X have a cigar lighter socket, convenient for powering your handheld.

Also available from Daiwa are some good quality SWR/PWR meters and coax switches.



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DJXIE	Wide band scanning RCVR	NN £225	KENWOOD					
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- Direct Digital Synthesizer
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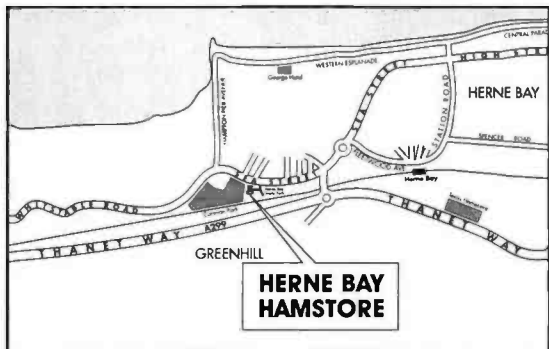


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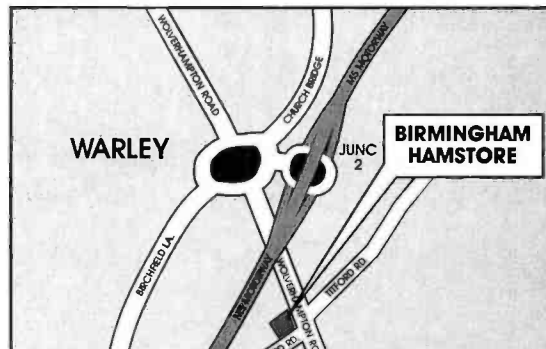
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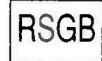
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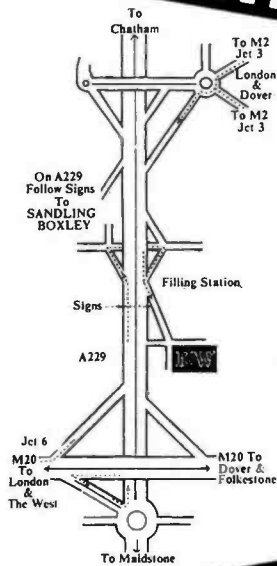
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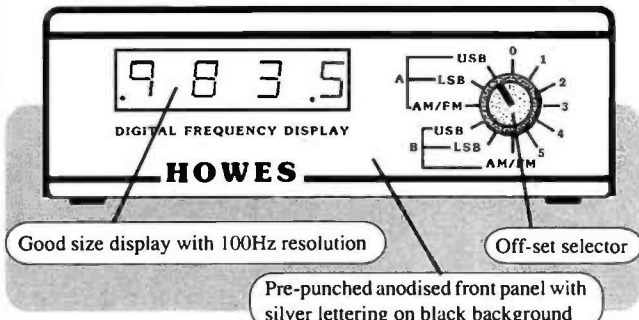
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CVF40 or 80 VFO for TX or TX/RX	£10-90	£18-40
CSL4 300Hz CW and narrow SSB Filter	£10-50	£17-40
DCS2 "S Meter" for receiver	£9-20	£13-80
CA80M Hardware pack (suits 40 or 80M):	£29-90	

You will also need two 50pF tuning caps (£1-60 each) plus a slow motion dial (£6-90).
Total price of transceiver in kit form (including caps and dial): £101-30.

PLEASE ADD £1-20 P&P for kits or £3-00 if ordering hardware.

HOWES KITS are produced by a professional RF design and manufacturing company. They contain good quality printed circuit boards 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 items are in stock and delivery is within seven days.

72 & 73 from Dave G4KQH, Technical Manager.

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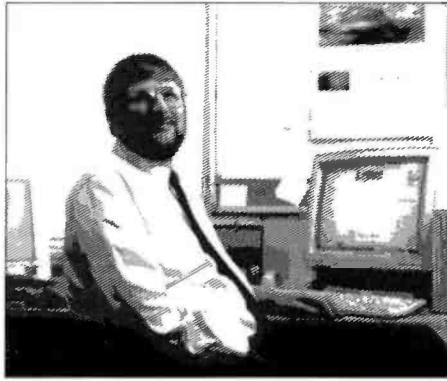
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73 DE Rob Mannion G3XFD

The *PW* team's life appears to be ruled by the telephone. We've all come to the conclusion that Mr Bell has got a lot to answer for!

Most of the calls we receive from readers, are enquiries regarding projects published in the magazine. Many of those calls are referring to recently published articles in the magazine, but occasionally we get enquiries for *PW* articles published as far back as 1960!

Enquiries

Although we try our best to be helpful, technical enquiries over the telephone aren't encouraged. This is because the editorial team is extremely busy. However, because readers are so important, we really do try to help.

Most of the technical enquiries are passed over to Tex Swann G1TEX. Unfortunately, we haven't seen Tex in the office lately...because he's completely hidden by an ever-increasing pile of readers' letters! (he's in there somewhere)

To ease the situation, Tex has suggested a possible solution to the problem. This means he'll be available on the telephone between 12pm and 1pm Monday to Friday.

There are two requirements for this facility, and the first is that the project must have been published since January 1990. The main reason for the 1990 stipulation, is that Tex has been involved in the vast majority of *PW*'s projects since then.

The second requirement, is that the enquiry should be as brief as possible. To this end, it will help if you prepare short notes on the problem, and have the circuit diagram in front of you ready to talk to Tex.

Prepared To Help

Although Tex is prepared to help in this way, we ask readers to try and avoid telephone enquiries wherever possible. A simple postcard, backed up by a circuit diagram or notes will often speed up the enquiry process.

Please don't think that we're trying to avoid our responsibilities, it's just that we get so many enquiries. The common areas for enquiries range from sourcing special components, locating manu-

facturers who've moved (or closed down) and fault-finding.

To round-off, I have a suggestion that could help many readers when fault-finding on projects and other equipment. My suggestion is that readers who want to improve their fault-finding abilities try the *PW* reprint *Are The Voltages Correct?*

Are The Voltages Correct?

The reprint booklet *Are The Voltages Correct?*, provides (at the very modest price of £1.50 plus £1 post and packing), an excellent fault-finding guide. Normally I avoid 'pushing' specific items in 'Keylines', but I've made an exception this time.

Roger Lancaster's series of articles were originally published between June 1982 and August 1983. The booklet guides the reader in the techniques used when servicing with a multimeter.

The author takes the reader through the very basic servicing theory, and then on to transistors. He then continues with digital electronics, finishing off with a look at fault-finding on valved equipment. Altogether, I can thoroughly endorse this booklet...it certainly helped me!

Illegal Multimode Rig

Readers may well remember the 'difficulty' I had when an otherwise illegal multimode CB rig came my way. Unfortunately, I had NOT realised at the time, that the 'relaxation' (allowing illegal multimodes to be converted from 27 to 28MHz) only applied to the original holder of the transceiver.

Eventually, the situation was brought to a satisfactory conclusion, and the Department of Trade and Industry allowed me to get the rig converted. However, despite my suggestion (a voice in the wilderness?) that the 'amnesty' to convert multimode CBs be extended past 31 December 1990, we have in effect lost this source of relatively cheap equipment.

Cheaper Equipment

During the London Amateur Radio Show in early March, I was with a group where the availability

of much cheaper equipment, particularly for h.f., was being discussed. It was interesting to hear the many different opinions during the discussion.

Several members of the group had reminded me about the large number of illegal CB transceivers still in circulation. The result of that conversation, was the suggestion directed at manufacturers pleading for cheaper h.f. gear, published in the May 'Keylines'.

However, during another discussion at the Bournemouth Radio Society's annual 'Junk Sale' on March 29, the subject of the multimode CBs appeared on the scene again. I thoroughly enjoy this event, and so it appears, do many other enthusiasts, because it's obviously 'bursting at the seams' with people even travelling from Wales to attend!

Through The Throng

I was squeezing my way through the throng at the Bournemouth sale, when I collided with someone coming the other way. "Just like a car boot sale, with everyone jumping on all the bargains" he said, and I could only agree!

With that, my new-found friend and I (he's a *PW* reader) carried on talking about car boot sales. During our conversation, he reminded me about the comments I'd made in an earlier 'Keylines' regarding the large number of multimode CB transceivers still freely available at car boot sales.

We both agreed that there are still a great number of multimode 27MHz transceivers in circulation. As inveterate car booters, my wife and I attend many events, and I usually see at least two or three multimodes for sale at each event.

I feel very frustrated that such equipment, ripe for conversion, is out of our 'reach' due to legal constraints. There's no point in drawing the seller's attention to the fact the equipment is illegal. The usual reply is "Don't know anything about that mate, I'm only selling it for a friend!"

Out Of Circulation

Surely, by permitting radio amateurs to buy the otherwise illegal 27MHz equipment, it would be

taken out of illegal circulation? Once the radio amateur had got the equipment (obviously there would have to be a relaxation in the law), it could be converted for 28MHz.

There are probably thousands of car boot sales held in the UK every weekend. Although I've said this before, I feel sure that there aren't enough government officials to 'police' the various events effectively. However, there's a veritable 'army' of enthusiasts who look for radio bargains every week.

I go looking for the 'All-Dry' valved portable receivers. Very often these little sets (in very poor exterior condition where they've been stored) can be bought for a £1 or so. Stripped down, they provide a sturdy case, good variable capacitors and other components for the school radio club I help to run.

But it's a great pity that I, and other amateurs can't take advantage of the 'bargain' CB rigs. Although they're breaking the law, other people do buy them and continue to use them on the illegal channels!

National Society Support

I think it's time to try and get the support of the national society on this matter. With the support of the Radio Society of Great Britain, my 'voice in the wilderness' may end up with some 'amplification'.

Although I respect the reasons and actions taken by the governmental agencies, they are proving to be ineffectual. In my opinion, there must be thousands of illegal CBs still in circulation. To remove the nuisance, the DTI and Radiocommunications Agency need help.

They'll get the help automatically, if they allow us to buy these transceivers for conversion. As a result, radio amateurs will get a good supply of transceivers, and remove illegal equipment from circulation for good.

Surely all this makes sense? If we all work together, the benefits are there to be had for amateur radio and the governmental agencies.

73 De Rob Mannion G3XFD

Receiving You



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

Dear Sir

Thank you for adding my appeal in the 'Can You Help' section of *PW*. I am delighted to say I have received the part I required from Pete Amy of Jersey Marine Electronics Ltd.

Apparently it has been lying in his box of bits and pieces for 10 years and he has now earned himself a bottle of whiskey!

How very kind of him to bother to write and also my thanks to you which is much appreciated. Do you yet know when you will publish your anniversary copy of *PW*?

W. Gordon-Harris
Bexhill-on-Sea
East Sussex

Editor's reply: We're pleased to have been of assistance, but we mustn't forget it takes people like Pete Amy to help too! (Thank you again Pete). The 60th (October) anniversary issue will be published on Thursday 10th September.

Dear Sir

Once again many thanks to you and your team for doing a great job with *PW* - I have enjoyed reading the latest (March '92) issue and also I was able to help a fellow enthusiast!

In the 'Can You Help' section, you published a request from Harold Orriss of Wivenhoe, asking for the valve manual that went with the Taylor valve tester series 45.

It just so happens that I have a model 45D valve tester and the manuals that go with it. When I saw how close Harold lived to me (approx. 10 miles), I rang him up and we spent a very happy Sunday afternoon exchanging information about all sorts of things - some radio, some not! He used to live only a few paces from my home. What a small world!

Thanks for being the means of bringing us together!

Nigel Heasman G4XDK
Manningtree
Essex

Editor's comment: The *PW* team are pleased to help Nigel. In this case, we've got to thank Sharon George our news editor, for making sure we get as many 'Can You Help?' requests in. She's also got the very difficult job of squeezing in the 'Club News' every month. So, perhaps readers can help by keeping items for both sections as short as possible please!

STAR LETTERS

Dear Sir

As the holder of a Novice call sign, I am reacting to your comments in 'Keylines' about the novice being ignored. As a novice myself, it has not happened to me, I am glad to say, but I have been told that I have made a mockery of the system due to my age of 25 years!

Some hard-nosed radio amateurs seem to think it is only for children. So the exam is easier, but it's no push-over. In fact, in America they have a novice licence but it's very easy compared to our own.

Our Novice licence compares to that of the 'technician' level in the USA. I wonder if those radio amateurs who chose to ignore the 2E0 novice call, mentioned in 'Keylines', would ignore a call from the USA, be it a novice or technician. I think not.

I'm taking my Morse test in May, and will be using home-brew and direct conversion receivers. I am sure that any radio amateur in other countries would be glad to make the contact, and not be thinking about the level of entry I have made to use the band.

In the future, it may be an idea to create two new licences. A novice licence linked to age, time and a course, and a similar course, but a City & Guilds test (like the present novice exam) but call it technician level, and attach no age limit or time period. So those amateurs who are hard-faced might at least accept an older newcomer to the hobby, who hasn't taken the full RAE.

As a novice, I'm feeling my feet and enjoying every moment. I plan to take the RAE, as I would love to use 430MHz all modes, etc. After being a novice for a year, I might not make some of the operating mistakes newly-licensed class Bs do every day, due to the lack of a novice scheme in the past.

John Hemming 2E1ANW
Northfield
Birmingham

Dear Sir

After reading 'Keylines' in the April issue, I felt that I had to give you my experience of operating as a novice. I have recently passed my novice exam and purchased a 430MHz hand-held.

In 'Keylines', you said that a novice that you had worked may have been ignored by other operators. Whether or not this is the case on 3.5MHz I can't say, but in my experience on 430MHz, the operators are reluctant to work weak stations. Using only 1.5W, my signal can be very weak at times. Although most operators will take time out to talk to me, some don't.

If people don't take the time to talk to novice operators with low-powered equipment, the novice will become discouraged and give up the hobby. That would be a sad loss.

Chris Langley 2E1ALP
Chessington
Surrey

Editor's reply: Thank you John and Chris, for taking the trouble to write our two 'Star Letters'. The *PW* approach is to fully support the Novice Licence and the holders of Novice call signs. I can only ask radio amateurs in the UK to consider the future of our hobby, and PLEASE allow these keen new operators to progress and enjoy the hobby. Surely there can't be any real objection to the new stations. You've only got to listen to them in action (whether on 'phone or c.w.) to realise that the official Novice course syllabus, has shown up some real shortcomings in the City and Guilds RAE, particularly on the practical operating side. Snobbery has been far too prevalent in our hobby for many years. First it was against holders of the 'B' licence (this is still very evident I'm afraid), and now it appears there's a new target available. I'm now really concerned for our hobby's future, if this prejudice continues.

PW October 1992 Issue

We particularly need reader's letters with memories of *PW* for the Diamond Jubilee issue. Get writing - it's your special celebration too!

Queries

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 each (£1 P&P for one, £2 for two or more).

Send all orders to the Post Sales Department.

Subscriptions

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

Constructional Projects

Each constructional project is given a rating to guide readers as to its complexity.

Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced: A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment 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.

Mail Order

All *PW* services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank). Access, Mastercard or Visa please.

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Thirteen different 'radio' words have been hidden in the letter grid. They have been printed across (forwards or backwards), up and down or diagonally, but they are always in a straight line without odd letters in between. You can use the letters in the grid more than once for different words, and they're not all used. Once you have found all 13 words, mark them on the grid and send it, along with your name and address (photocopies accepted with the flash below please) to our editorial address, marked Competition Corner, Wordsearch June '92. Closing date is Friday 26 June 1992.

Name

Address

.....

.....

.....

Subscription Voucher

Send your entry (photocopies acceptable with coupon) to: June Wordsearch 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 Friday 26 June 1992.

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

Two runners-up: Six months subscription or £10 book voucher.

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- Robert Keyes
- Basic
- Frequency Synthesisers
- Garex Electronics
- Focal Point

Competition Corner
June '92

Send all your news and new product details to Sharon George at the Editorial Offices in Poole

Silent Key

It is with deep sorrow, that the Amateur Radio Club of Nottingham announce the death of their immediate past President, Rex Beasall GOREX (ex G1LRI), who passed away of Sunday 5 April 1992, as the result of a heart attack, aged 54 years.

Rex was a tower of strength to both the well established and the newcomer to amateur radio, and epitomised all that is good in our hobby.

He will be sadly missed by his fellow members of the Amateur Radio Club of Nottingham, who offer their condolences to his widow Jenny, and her family.

Chernobyl Russia 1992

An international group of amateur radio operators will be joining up at Rostov-on-Don, Ukraine, to draw the worlds attention to the continuing problems, the result of the Chernobyl Power-station Disaster. Two stations will be on the air, between April 25-30th US6CH and May 1-3rd 4L6CH. Operators will include UA6LQ, UT4UX, UA3LU, N3CBW, G0NKZ, RA3AA and KC3VO.

Further information from **G0NKZ, PO Box 599, Worthing, Sussex.**

Advanced Antennas & Ancillaries Ltd.

Advanced Antennas & Ancillaries Ltd., formerly Cap.Co Electronics, would like to announce that with the formation of their new company they will produce all products previously manufactured by Cap.Co, to the same high specification with first class materials but at greatly reduced prices, e.g. AMA-3 Kit was £308.15 now £199.50!

Tony Johnston GW4CGP, who originally founded Cap.Co, has joined forces with Maurice Rately GM3HAT of Hatley Antenna Technology, and along with Bill Ellis GOMMY, he will continue to design products to add to the existing superb range.

Of course, Tony is still available to answer any queries you may have, and Helen will look after the administration side as usual.

If you require further information and a new price list, please contact them at the same address, **A.A & A Ltd., Unit 28 Penley Ind. Estate, Penley, Wrexham, Clwyd LL13 0LQ.** Tel: (0948) 74717, FAX (0948) 74728.



Siskin Electronics

Stolen from the Siskin stand at the Blackpool Rally on March 15, was a Fairmate HP2000E scanner, serial no. 19429, unboxed, less instructions and accessories. And it was tied onto the stand! If anyone has any information, please contact Siskin at:

Siskin Electronics, 2 South Street, Hythe Southampton SO4 6EB. Tel: (0703) 207155/207587.

Fareham & District ARC

The Fareham & District ARC will be holding an exhibition of historic radio equipment circa 1890-1939 between June 20 and 28th.

The exhibition will be on board HMS *Warrior 1860*, at the Naval Heritage Area, HM Naval Base, Portsmouth.

For further details, contact **Ray Maclean G0JVE on (0329) 238642.**

Royal Naval Amateur Radio Rally

This year's RNARS Annual Mobile Rally, taking place on 14 June 1992, will be the last to be held at its traditional venue, HMS *Mercury*, nr. Petersfield, Hants. The planned closure of HMS *Mercury* in the near future has forced the RNARS, after 32 years, to move their rally in 1993, to HMS *Collingwood*, Fareham, Hants., just a few miles away. The new venue will be larger, more accessible and will have better facilities for traders and visitors.

Jamboree On The Air 1992

Jamboree on the Air (JOTA) takes place this year over the weekend of October 17 and 18th. Now in its 35th year, the event gives Scouts and Guides all over the world a chance to meet without having to leave their own towns, and to learn about amateur radio. In 1991, radio amateurs working with local Scout and Guide groups, operated nearly 400 stations throughout the UK, demonstrating amateur radio to more than 20 000 people.

If you would like to help, you should approach your local Scout Group and ask the Leaders to send for the new fact sheet on how to take part in JOTA. It is available from The Scout Association's Resource Centre, Gilwell Park, Chingford, London E4 7QW.



The next step is to complete the JOTA Application forms available from the Radio Society of Great Britain. These combine a Special Event Licence Application and a JOTA registration form for The Scout Association. If you plan to use your existing club call-sign, the registration details should still be returned to the RSGB, so that your station can be included on the JOTA station list. This list and a JOTA newsletter, including details of the first UK JOTA puzzle activity, will be sent to all registered stations just before the event.

For further information, contact **John Fogg on 071-584 7030.**

Can You Help?

Kevin Hayes ZL4MD, PO Box 143, Cromwell, 9191 New Zealand, is keen to restore an International Marine Radio Co. (London) receiver, Model IMR42, S/N73, but cannot locate any technical data.

The set is about World War II vintage, octal valves, etc. He has tried the various PW advertisers, but to no avail. Even a circuit diagram would help. He will willingly reimburse any reasonable costs.

Recently I have acquired the working 'head' of a Collins s.w.r./p.w.r. meter. Research shows its part number is 302C-1, and it was fitted into the Collins speaker console, part number 312B-4. Can anyone help with a circuit diagram of this 'head' wiring to its meter and the switching circuitry involved? All costs will be reimbursed. **Bob Leask G4CEO, The Birches, 80 Mill Road, Sharnbrook, Bedford MK44 1NP.**

My main interest on h.f. is slow scan TV, and I am using a Spectrum Computer and G1FTU's programme. I would like to upgrade my system by making an interface for the Spectrum to run a 3.5in disk drive, and run the s.s.t.v. transmit/receive facility on my Amstrad PC1512. Does anyone out there know of a programme for IBM 'clones' that can transmit/receive s.s.t.v., possibly using an interface card?

The request for the disk drive interface for the Spectrum, is partly as an educational exercise for me, as I do not know how they work - hence the request for info. on how to make one rather than buy one! **Nigel Heasman G4XDK, 15 Brooklands Road, Brantham, Manningtree, Essex CO11 1RN.**

Silent Key - Fred Judd G2BCX

It's with great sadness, and a sense of loss, that we announce the passing of Fred Judd G2BCX on 10 April 1992. Fred died in the early hours, in hospital at Norwich from a heart attack, although he had been expecting to return home within a few days.

The funeral, attended by many friends, relatives and the editors of *PW* and *Short Wave Magazine*, took place at the Norwich Crematorium on Thursday April 16. Everyone on *Practical Wireless* would like to extend their deepest sympathies to his wife Freda and family, on their loss.

The name and callsign of Fred Judd G2BCX was known throughout the world of amateur radio, hi-fi and science. Although Fred would have been 78 years old in June, he was still extremely busy writing for *PW* and *Short Wave Magazine*.

The 'Radio Personality' feature on Fred G2BCX, will still appear, as planned, in the *PW* 'Antenna Special' in our September issue (published August 13). We can't think of a better tribute to such a prolific and popular writer and designer.

Rob Mannion G3XFD.

Flight Refuelling ARS

The Flight Refuelling ARS (G4RFR, G0FRR, G6SFR) will be celebrating its 10th Anniversary on Saturday 15 May 1992 at its HQ in Merley, nr. Wimborne, Dorset. Special event callsign GB2FRA will be operational on all h.f. bands.

The Society was initially formed in an effort to bring together like-minded v.h.f. amateurs, but over the ensuing years activities have expanded to encompass all aspects of amateur radio. From an initial 16 members, the Society now has over 100, including 48% class A, 31% class B, 5% Novice and 16% short wave listener, of whom most are currently studying for the RAE.

In May 1987, the Society completed the construction of a purpose-designed HQ complex, which is currently the venue for RAE, c.w. and four Novice training courses, as well as being open for use seven days a week.

For further details of FRARS, please contact the Hon. Sec. Ian G2BDV, who is QTHR.



Summer Expedition To Sri Lanka

Four British radio amateurs are going to Sri Lanka this summer, and they plan to be active from June 11 until July 4. The callsigns to be used include: 4S7DGG, 4S7JVG, 4S7DBG and 4S7PNG.

Additionally, the group have been issued with the callsign 4S0UK for use in the Asian DX Competition. The amateurs taking part in the Sri Lanka trip include Doug Goodison G0LUH, Jon Vasek G0OHV, David G0MRF and Paul G0ONA. The group plan to use three transceivers on all bands, on c.w. and s.s.b. Further details from Doug Goodison G0LUH, QTHR.

Special Event Station GB4GWR

The Vale of White Horse ARS, in conjunction with the Great Western Society, will be operating the special event station GB4GWR from Saturday 23rd to Monday 25 May 1992, at the Didcot Railway Centre in South Oxfordshire. This will be the tenth anniversary of this successful station, which in the past has made contact with radio amateurs with an interest in railways from Hawaii to Australia, as well as most corners of the United Kingdom.

The callsign GB4GWR will also be celebrating the 25th anniversary of the Great Western Society moving into Didcot engine shed to start the fledging Didcot Railway Centre. The Railway Centre is internationally recognised as the largest collection dedicated to a single railway company, in this case the Great Western Railway.

In addition, 1992 is the 100th anniversary of the abolition of Brunel's 7-foot broad gauge. Examples of the original trackwork are on display at the Railway Centre.

The special event station will be operating from a train which used to collect Railway 1932 Ocean Saloon coach. This is part of a train which used to collect trans-atlantic passengers from Plymouth and whisk them to London. The Great Western Railway was in steep competition with the Southern Railway to see who could get the passengers to London in the greatest comfort, and in the shortest possible time.

Contact with GB4GWR, which will be acknowledged by a special QSL card, will be valid for the Great Western 150 Steam Award. Full details of the award are available from John O'Hagan G4PFY, QTHR, on receipt of a stamped addressed envelope.

It is hoped that the station will be active from 11am to 5pm, each of the three days on 144MHz and h.f. It is hoped that the 144MHz f.m. station will transfer to the footplate of one of the working steam locomotives for a short period each day. The QSL cards from these contacts will be signed by the driver and fireman.

Anyone wishing to visit the Railway Centre can exchange QSLs in person. Entrance is via Didcot Parkway British Rail station. Further information on the steam events is available by telephoning (0235) 817200 during office hours.

Marconi Remembered In Salisbury

On Saturday 28 March, a group of people gathered at the 'Roving Kennels' at Three Mile Hill near Salisbury, to commemorate Marconi's pioneering radio work in the area nearly 100 years ago.

The occasion was to unveil a plaque, which pays tribute to the early experiments carried out at the bungalow by Guglielmo Marconi in conjunction with the Army. These early successful experiments, led to the rapid development and growth of radio communications.

The plaque was presented to Mr and Mrs Blackburn, the current owners of the bungalow and the kennels alongside, by the President of the Salisbury Radio & Electronics Society, Sir Evan Neapen Bt. G5YN. The unveiling ceremony, co-ordinated by John Hart G4POF Treasurer of SR&ES, was carried out jointly by Peter Turrall, Publicity Manager for GEC-Marconi and Terry Barnes G13USS, President of the RSGB.

Peter Turrall presented the Salisbury Society with books on Marconi and a history of the Marconi Company. Peter also read out a hand-written letter from Marconi's widow, Maria Christina, who now lives in Rome, sending her best wishes and appreciation of the event.

Also attending the ceremony were John Case, immediate past president of the RSGB, and Peter Chadwick, the executive vice-president of the RSGB. Other representatives included Colonel Philip Whitmore and Sergeant Nigel Kirkby from the Royal Signals headquarters at Blandford, Mike Halpin from Salisbury District Council Tourism Department and Rob Mannion G3XFD, Editor of *Practical Wireless*.



Terry Barnes G13USS, The RSGB President shakes hands with Peter Turrall of GEC-Marconi following the unveiling ceremony.

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"A GENUINE PRICE FROM A GENUINE DEALER"

The 70MHz allocation has been rather neglected by many operators over the years, but the introduction of the AKD 4001 f.m. transceiver is bringing new life to this fascinating band. Rob Mannion G3XFD, tried one on behalf of PW, and rediscovered the joys of 70MHz.



Review

The AKD 4001 70MHz Transceiver

Around 20 years ago there was a great deal of activity on 70MHz along the south coast. In those days, almost without exception, we were of course 'rock-bound', using surplus p.m.r. gear.

I had an old a.m. boot-mounting Pye 'Ranger', which fitted nicely in my motor-caravan (the rig itself was mounted in the 'upstairs' bedding storage above my head!). Most of the crowd 'sat' on 70.26MHz, and you could have a QSO literally at any time of the day.

The 70MHz band was great fun, and it proved to be an excellent part of the spectrum for mobile working. To be honest, I always preferred it to 144MHz. This was because the mobile-to-mobile range was better and there always seemed to be less flutter.

So, I was exceptionally pleased to hear that the AKD 4001, an f.m.-only transceiver, was now freely available for the UK market. I may be wrong, but I think that the AKD transceiver is only the second ever commercially-built 70MHz rig dedicated to the radio amateur.

I've no doubt that someone will prove me wrong, but I think the only other 70MHz transceiver specifically built for the amateur market, was the TW 'Communicator'. However, enough memories for now, as it's time for me to share my recent experiences with the AKD 4001.

Simple And Basic

I took delivery of the AKD 4001 directly from the AKD stand at the London Amateur Radio Show. It's a very simple and basic rig, and anyone should be able to install it very quickly.

The transceiver came well-packed, and was supplied with everything needed for the rig, except the mobile mounting bracket. In fact, the mobile mounting bracket is the only item supplied as an optional extra with the AKD 4001.

I soon had the rig fitted in my car, and found myself chatting to new-found friends on 'four'. But, at this point I must say that I was far from impressed with the mounting bracket itself.

In fact, the mounting bracket to go with the rig was of poor quality material. It was flimsy, and not finished to the same standard as the transceiver. Despite this, I managed to use the bracket to secure the AKD 4001 into my car.

Basic Book

I've already described the AKD 4001 as a basic rig, and that's not meant to be a criticism. Following on with this, I have to say that the information book supplied with the transceiver is also basic!

The manufacturer's leaflet does not provide a circuit, or even a description of the transceiver. Personally, I always feel the need for a good circuit diagram, and I don't think it's too much to expect at least a block diagram. However, if you take the lid off and look inside, it's re-assuring to see the attractively designed and well-made p.c.b. In fact, I was surprised at such a simple looking transceiver working so well!

Despite the lack of a circuit, the little booklet does tell the operator all they need to know to get on the air. Strictly speaking, and unless anything goes wrong, I suppose that's all you need to know!

The transceiver is pre-programmed with all available 70MHz f.m. frequencies. The tuning, controlled by 'up-down' push-switches, is in 12.5kHz steps and it covers the range from 70.250 to 70.4875MHz.

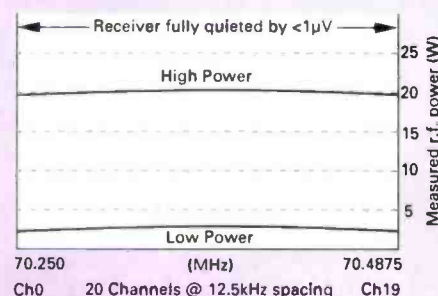
There are three buttons for tuning control on the 20 programmed channels. The left-hand button tunes down, and the right-hand button tunes up. The centre button returns the transceiver to channel 16 (70.450MHz) which is the calling frequency.

Apart from the audio volume control, squelch, on-off switch, microphone socket and the i.e.d. channel indicator, that's it! The rig is very straightforward indeed.

Table 1. AKD 4001 Frequency Channels.

Channel number	Frequency in MHz
00	70.2500
01	70.2625
02	70.2750
03	70.2875
04	70.3000
05	70.3125
06	70.3250
07	70.3375
08	70.3500
09	70.3625
10	70.3750
11	70.3875
12	70.4000
13	70.4125
14	70.4250
15	70.4375
16	70.4500
17	70.4625
18	70.4750
19	70.4875

Table 2. Results of the PW workshop tests.



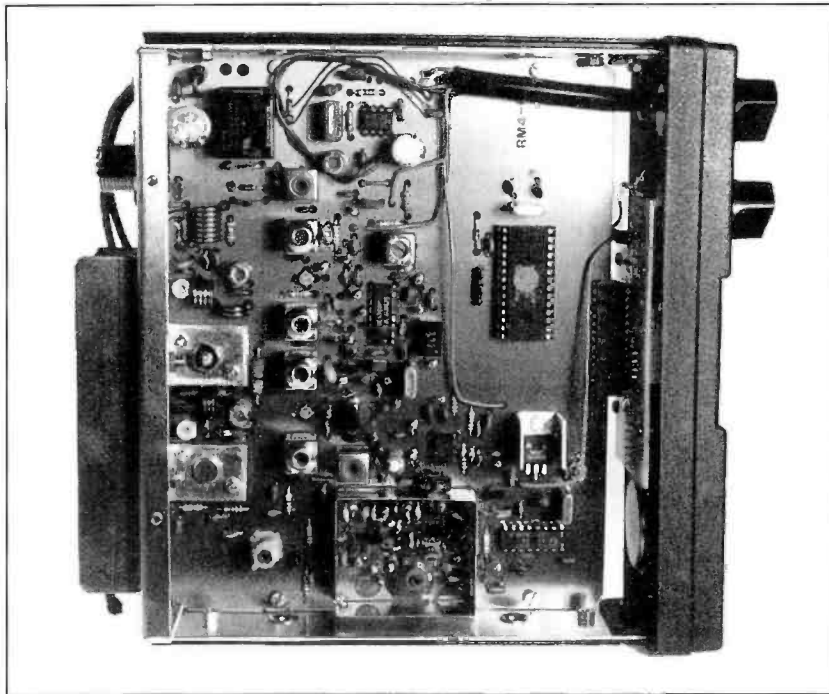


Fig 1: An inside view of the AKD 4001, clearly showing the neat, simple lay-out.

Excepting the information from the manufacturer's specifications, I can't tell you anything much about the receiver or transmitter. However, we tested the rig in our workshop, and our results are shown in **Table 2**.

On The Air

Once I had got the rig on the air, I had a great deal of fun. I'd fitted the rig quickly, because the review period coincided with a trip to visit the Derby Radio Society. The journey up to the midlands, seemed the ideal chance to work as many stations on 70MHz as I could.

Occasionally, I have an excellent idea, and ensuring I was on 'four' on the journey up to Derby was one of them. In fact, I was in QSO continuously from Northampton until arrival in Derby.

Most of the activity on 70MHz in the midlands seems to be concentrated in the Derby, Leicester and Nottingham areas. I was particularly pleased to have help from Dennis G8BAV who 'talked' me in to my Hotel, all the way from the M1 (thanks Dennis!).

I was getting good signal reports, and the receiver provided very good copy of the other stations. It was delightful to be able to work so far, with so little flutter on the incoming signals.

The transmitter consistently received good reports for signal strength, and I only had two adverse comments regarding the transmit audio during the test period. To be fair to the transceiver, I think these were due to me shouting into the mike! (a frequent, unconscious habit of mine I'm afraid).

The receiver seemed to be extremely sensitive, and coped very well with the wildly varying signal levels that occur with mobile working. The audio was more than adequate, despite the small loudspeaker and my (very noisy) elderly Ford Escort estate.

Squelch Operation

The only feature on the the rig I felt unhappy with, was the squelch operation. Although no details are provided by AKD, the many 4001 owners (that I've spoken to) all seem to experience its odd behaviour.

The squelch, so I'm told, is provided by the main

receiver i.c. It seems that the on-board chip facility has a mind of its own at times, and the squelch will (for no apparent reason) drop out. Of course, in a mobile situation, the operator then probably thinks that there's someone else about!

On top of this, the squelch seems to operate just as the transceiver goes to transmit. This gives the false impression of a very 'scratchy' relay and an unhealthy switching action.

Fortunately, the effect does not appear on the transmitted output. In fact, I've had some excellent reports from other stations on 70MHz.

Mobile-To-Mobile

I must say that I thoroughly enjoyed getting back on to 70MHz. It was particularly delightful to get sustained mobile-to-mobile QSOs of more than 30km.

On the way home from Derby, I was in contact almost continuously for two hours with the same fixed stations in the Derby and Leicester area, even when I was over near Spalding in Lincolnshire!

Anyone buying the AKD 4001 will realise it's built to a price. Despite that, in my opinion, the transceiver provides good value for money. Having said that, there are several little 'extras' that I'd like to see fitted within that price.

I would, for example, like to see luminous arrows on the tuning control buttons, and the central square (return to calling channel) button treated in the same way. This would make mobile operating safer at night. The other suggestion is that AKD fit a simple l.e.d. 'transmit' indicator.

There are now so many of the AKD 70MHz transceivers around, that all sorts of 'mods' are available. One station I worked, had already modified his 4001 to 'scan' all the channels, which I think is an excellent idea.

Another modification which seems quite popular, is an off-set tuning facility. This helps get over the problems caused by the (inevitable) clash, when stations are on slightly different frequencies.

I've no doubt that these little 'foundation' rigs will prove to be very popular for many years to come. It won't be so long before we have 'mods' appearing in our 'What A Good Idea' section!

Summing Up

In summing up, I can only suggest that if you want to get on 70MHz for a reasonable price, this is the rig for you. Apart from the mobile mounting kit, which I've already mentioned as being below standard, you'll have a great deal of enjoyment on 'four' with this rig.

There's already a great deal of packet radio operation on 70MHz. Because of this, AKD can supply the transceiver modified for packet work. I can vouch personally for the level of packet operation on 70MHz, for despite being able to get many QSOs, the human operators were definitely outnumbered by the computerised versions 'talking' to each other!

The transceiver has got quite a 'punch', and I found that on many occasions I kept the power switch to the 'low' level. The full power (25W) level comes in handy for longer mobile-to-mobile working.

I suppose that the highest recommendation I can give for the AKD 4001, is that I intend to buy the review model. The next job I've got to do is to ask AKD if they'll supply me with a circuit diagram for the rig, then I'll be able to add some of the 'mods' I've heard about.

Review

Editorial note: In reply to my comments, AKD's spokesman said that the design of the mounting bracket will probably be changed soon. However, they are open to suggestions from users as to what form it should take. So, it's a case of 'answers on a postcard please', to AKD at Stevenage!

Regarding the circuit diagram, AKD say that due to some small changes in the circuitry, and one major change to the type and style of the microprocessor, they have not issued circuits yet, although they will respond to demand.

Finally, they suggest that 4001 users "try not backing off the control" when using the squelch. (as suggested in the owners instruction booklet).

My thanks for the loan of the review transceiver, go to AKD at Unit 5, Parsons Green Estate, Boulton Road, Stevenage, Hertfordshire SG1 4QG. Tel: (0438) 351710, who can supply the AKD 4001 for £193.75 including VAT, plus £5 post and packing..

Thanks also to Dee Comm, for the 70MHz whip antenna used during the review period. The whip fits directly into a standard CB gutter or magnetic antenna mounting. Contact Dee Comm, at Unit 1A, Canal View Industrial Estate, Brettel Lane, Brierly Hill, West Midlands DY5 3LQ. Tel: (0384) 480565.

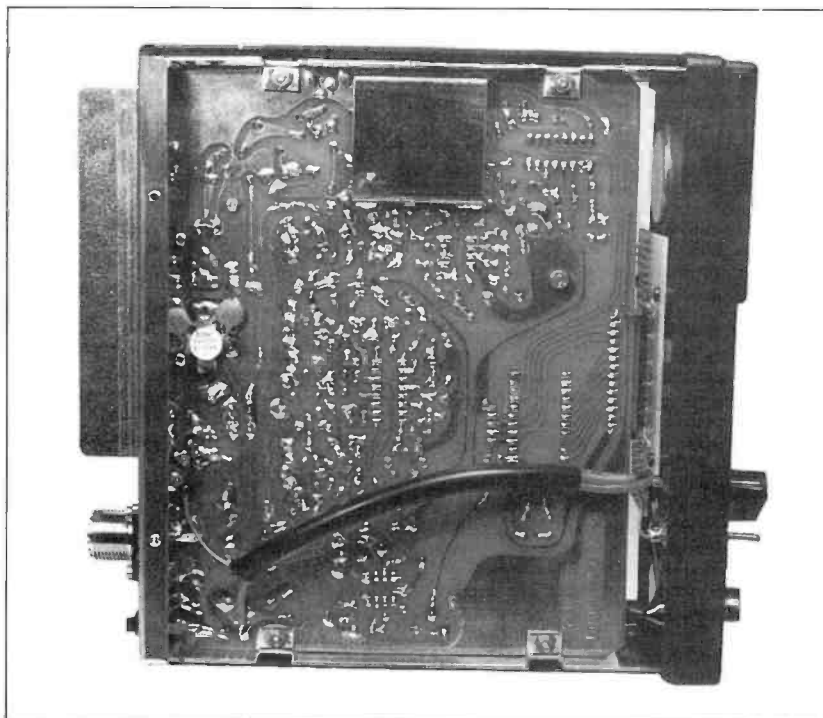


Fig 2: An underside (copper track) view of the transceiver. The aluminium extension at the bottom left-hand side is the p.a. heatsinking.

Manufacturers Specifications

General

Modulation	f.m.
Frequency range	70.250 to 70.4875MHz (20 channels)
Supply voltage	13.2V ± 10%
Channel spacing	12.5kHz
Speaker	8Ω internal
Operating temperature range	-10° to +50°C
Frequency stability	10ppm over temp. operating range
Antenna connection	50Ω SO239
Supply	In-line fused

Transmitter

Output (r.f.) power	25W (high)
Output (r.f.) power	5W (low)
Current consumption	3A (high)
Current consumption	1.5A (low)
Conducted harmonic content	-70dB carrier
Audio distortion	< 3%
Audio response	6dB/octave over range 300Hz to 3kHz
Deviation	±4kHz

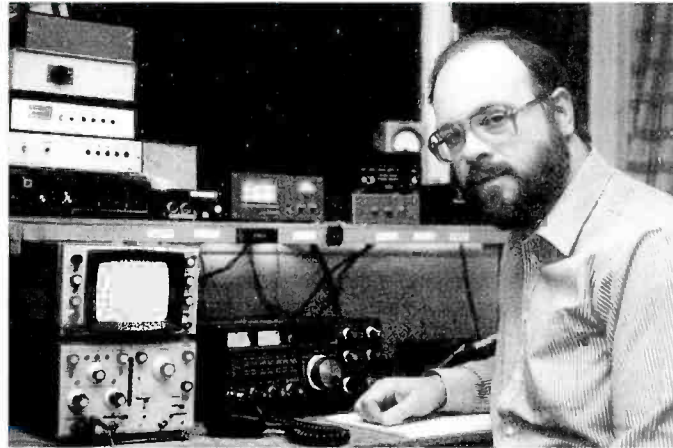
Receiver

Sensitivity	Front panel socket
Adjacent channel sensitivity	Better than 0.25µV for 12dB SINAD
Blocking	56dB (for 6dB degradation)
Image response	90dB
Audio response	70dB
Audio output	6dB/octave de-emphasis between 300Hz to 3kHz
Supply current	2W
	130mA (squelch on)

Review

The 10th Annual Practical W

Once again it's time for the 'fun' v.h.f. contest event of the year. As usual, Dr Neill Taylor G4HLX, now invites you all to have a go at and enjoy this year's anniversary contest, with the added bonus of some excellent prizes!



Dr. Neill Taylor, preparing for the 10th annual Practical Wireless QRP Contest.

The Practical Wireless 144MHz QRP Contest was introduced in 1983. It rapidly became a favourite with those who are keen on low-power v.h.f. operating, with v.h.f. contest enthusiasts, and with all who enjoy a day of activity on the 144MHz band with a chance of some DX contacts.

By 1984 the contest was attracting a record-breaking number of entries. The contest has been held every June since 1983, and is supported by regulars year after year, together with a welcome number of newcomers each time, many of them getting their first ever taste of contest operating. To celebrate the success of the contest, in this its tenth year, coinciding with the diamond jubilee of PW itself, we're offering some special incentives to those who enter this year's event!

Special Prizes

Two valuable prizes are being offered to the winning group and to the runner's up:

Overall winner: First Prize, the 'Rutland Windcharger' wind-driven generator, kindly donated by Marlec Engineering of Corby, Northamptonshire.
Second place overall: Second Prize, a set of 12V solar panel chargers, kindly donated by Bob Keyes GW4IED.

These environmentally-friendly prizes, should enable two lucky groups to keep their rechargeable batteries topped up in future QRP contests! And of course we mustn't forget all those entrants 'north of the border', and as usual **The Tennamast Trophy will again be awarded to the leading station in Scotland.**

Certificates For All

As it's the 10th anniversary, we're going to recognise the fact that all entrants deserve a reward for their efforts in the contest. Many of the entrants do very well, without ever quite achieving one of our awards. So, this year we are issuing certificates to all contestants.

The certificate will show your position in the results table, and any special placing (such as leading station in a locator square). **To claim your certificate, make sure you send a stamped addressed envelope with your entry!**

The Results

As usual, the results which will appear in PW later in the year, will show the top stations in separate categories such as: multi-operator, single-operator, single antenna, and the leaders in all locator squares. These will appear, as well as a summary of the position of all stations in the overall results.

A more detailed results table will be sent out with the certificates. We shall also be publishing some results covering all 10 years of the PW QRP Contest, so maybe some of the groups who have done well year after year, but have never quite reached the top, will get some recognition.

Read The Rules

Will all entrants please read the rules carefully at least three times. Do this now, just before the contest, and again when you're about to send in your logs!

The co-operation of the

contestants makes the adjudicator's life so much easier when the covering information is given as required by rule 6, and when logs conform to rule 5. Remember - errors and omissions may cost you points!

Summer Sunday

As usual, the contest takes place on a mid-summer Sunday in June, so let's hope for some suitable weather for the portable stations, and for some good propagation conditions. Good luck everyone, and good DX!

Neill Taylor G4HLX

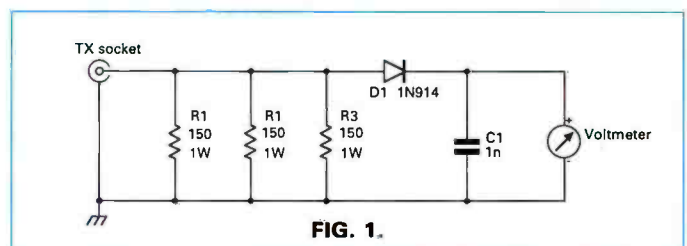


FIG. 1.

Everyone on the Practical Wireless team and the publishers, would like to take the opportunity to thank Neill Taylor G4HLX, for all his hard work over the last 10 years. Without his adjudication and organisation, the contest would not be possible. Well done Neill! This year's winners and runners-up will be invited to meet Neill at a special presentation ceremony at the 1992 Leicester show.

PRACTICAL WIRELESS 144MHz QRP CONTEST 1992

Date	Callsign	Locator	Sheet No Of	
Time GMT	Callsign	Report & Serial No		Locator
		Sent	Received	

ireless 144MHz QRP Contest

Rules

1: General. The contest is open to all licensed radio amateurs, fixed stations or portable, using s.s.b., c.w. or f.m. in the 144MHz band. Entries may be from individuals or from groups, clubs, etc. The duration will be from 0900 to 1700UTC on 21st June 1992.

All stations must operate within the terms of the licence. Entrants should observe the band plan, and keep clear of normal calling frequencies (144.300MHz and 145.500MHz). Keep clear of those used by GB2RS during the morning (144.250MHz and 145.525MHz).

Keep clear of any other frequency that's obviously in use for non-contest purposes. The station must use the same callsign throughout the contest, and may not change its location. **Special event callsigns may not be used.**

2: Contacts. The contacts will consist of the exchange of the following minimum information:

(i) callsigns of both stations
(ii) signal report, standard RST system

(iii) serial number: a 3-digit number incremented by one for each contact, starting at 001 for the first.

(iv) locator (i.e. full 6-character IARU Universal Locator) for the location of the station. Information must be sent to, and received from, each station individually, and contact may not be established with more than one station at a time.

Simultaneous operation on more than one frequency is not permitted. If a non-competing station is worked and is unable to send his full universal locator, his old-style QTH locator (QRA) or his location may be logged instead.

However, for a square to count as a multiplier (see rule 4, either a full 6-character IARU universal locator, or full 5-character European QTH locator must have been received in at least one contact with a station in the square. Contacts via repeaters or satellites are not permitted.

3: Power. The output power of the transmitter final stage shall not exceed 3W p.e.p. If the equipment

in use is usually capable of a higher power, the power shall be reduced and measured by satisfactory means.

The simplest way is often to apply a variable negative voltage to the transmitter a.l.c. line, reached via the accessory socket. The output power can be accurately measured using the simple circuit of Fig. 1. Connect this to the 50Ω output of the transmitter, and adjust the power so that the voltmeter does not exceed 16.7V during a good whistle into the microphone.

4: Scoring. Each contact will score one point. The total number of points gained in the eight-hour period will then be multiplied by the number of different locator squares in which contacts were made (a 'square' here is the area defined by the first four characters of a universal locator. Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = $5 \times 52 = 260$).

Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log, and clearly marked as a duplicate.

5: Log. The log submitted as an entry must be clearly written on one side only of A4 sized (210 x 297mm) paper (the normal way up, not sideways), ruled into columns showing:

- (i) time GMT
- (ii) callsign of station worked
- (iii) report and serial number sent
- (iv) report and serial number received
- (v) locator received (or location).

Underline or highlight the first contact in each of the locator squares worked. At the top of each sheet, write: (a) callsign of your station (b) your locator as sent (c) sheet number and total number of sheets (e.g. 'sheet no. 3 of 5'). The sample log sheet shown opposite illustrates how each sheet should be headed.

6: Entries. Accompanying each entry must be a separate sheet of A4 sized paper bearing the following information: (a) name of entrant (or

of club, etc.) in a group entry as it is to appear in the results table (b) callsign used during contest (including any suffix) (c) name and address for correspondence (d) details of location of station during contest; for portable stations, a national grid reference is preferred (e) locator as sent (f) whether single or multi-operator. A single-operator is an individual who received no assistance from any person in operating the station, which is either his permanent home station or a portable station established solely by him/her.

If multi-operator, include a list of operators' names and callsigns (g) total number of contacts and locator squares worked (h) list of the locator squares worked (i) a full description of the equipment used including TX p.e.p. output power (j) if the transmitting equipment is capable of more than 3W p.e.p. output, a description of the methods used (i) to reduce and (ii) to measure the output power (k) antenna used and approximate station height a.s.l.

Failure to supply the previously mentioned information may lead to loss of points or disqualification. The following declaration must then be written and signed by the entrant (by one responsible person in the case of a group entry): 'I confirm that the station was operated within the rules and spirit of the event, and that the above information is correct'. This declaration concludes the entry, which should be sent, with the log sheets, to: *Practical Wireless Contest*, c/o Dr. N.P. Taylor, G4HLX 46 Hunters Field, Stanford in the Vale, Faringdon, Oxfordshire SN7 8LX.

A large s.a.e. should be enclosed, if a certificate and full set of contest results is required. Certificates will not be awarded to entrants failing to supply an s.a.e. Entries must be postmarked no later than 6th July 1992. Late entries will incur a heavy points penalty.

Any other general comments about the station, the contest and conditions during it are welcome, but should be written on a separate sheet of paper. Photographs of the station are also invited (but please

note that these cannot be returned).

If the photographs are not available by the time the entry is submitted, they may be forwarded later, to arrive by 9th August 1992.

7: Miscellaneous. When operating portable, obtain permission from the owner of the land before using a site. Always leave the site clean and tidy, removing all litter. Observe the Country Code.

Take reasonable precautions to avoid choosing a site which another group is also planning to use. It's wise to have an alternative site available in case this problem does arise.

Make sure your transmitter is properly adjusted, and is not radiating a broad or poor-quality signal, e.g. by overdriving or excessive speech compression. On the other hand, be aware that your receiver may experience problems, due to the numerous very strong signals it will have to handle, and that this may lead you to believe that another station is radiating a poor signal.

Before reaching this conclusion, try heavy attenuation at the receiver input. The use of a high-gain r.f. pre-amplifier is likely to worsen strong-signal problems. So if you do use one, it is best to be able to switch it off when necessary.

8: Adjudication. Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts will carry a heavy points penalty. Failure to supply the complete information required by rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification.

In the case of any dispute, the decision of the adjudicators will be final. Special prizes will be awarded to the overall winners and runners-up, and the *PW* Tennamast trophy will be awarded to the leading Scottish station.

Every entrant will be awarded a certificate (provided they supplied a stamped addressed envelope with their log). The certificate will show their position in the results, and any special endorsement such as leading station in a locator square.

June 21 0900-1700GMT.

VHF Contests Hints And Tips

The first bit of advice I'm going to pass on, is very basic! Don't leave your planning until the evening before the contest to, work out what you're going to do! Start planning straight away.

You can enter the contest on your own (single-operator), but consider the benefits of getting together with a few friends to form a group. You can share equipment, know-how, and operating time on the day. Don't forget that it's eight hours of continuous contest working, and it can be quite tiring on your own. Many hands can make light work of antenna erection too!

Operating from your home station is possible, but there are many advantages with portable operation. Apart from the fresh air and sunshine (we hope!), newcomers are constantly amazed with what they can achieve with low power from a hilltop, particularly when the other stations are on hilltops.

Clear Take-Off

Choose a portable site with a good clear take-off in as many directions as possible. Height above sea level isn't everything, but the peaks of local hills are a good place to start looking. Make sure the site you select will be easy to get to with antennas and equipment.

Of course, be sure to obtain whatever permission you may need to use the land and the access routes to it. Most landowners will respond positively to a courteous request. If I were you, I'd take along a copy of this magazine to explain what it's all about.

What Equipment?

Decide what equipment you are going to use. Almost all activity will be on s.s.b., though you might pick up a few contacts on c.w., and even f.m. in some areas.

You are restricted to 3W output power. So if you use a transceiver capable of more than this, you'll have to find a way of reducing the power. (see the contest rules for a simple way of checking the output power). Just turning down the microphone gain isn't good enough!

You'll need a horizontally polarised antenna, preferably a beam with as much gain as you can muster. However, this ideal must be balanced against the difficulties of erecting a really enormous array. This can be difficult if you don't have a proper portable antenna mast to support it.

Some means of rapid and convenient rotation is essential. If the operator or one of the team can reach the antenna pole, to use the 'arm-strong' method while still keeping an ear on the rig, this is probably better than a relatively slow-moving electrical rotator.

Headphones A Must

Headphones are a must if you want to concentrate, you'll also need a separate set for the operator's assistant or check-logger. A loudspeaker is also needed, so that everyone else can hear what's going on.

Fist or desk microphones are fine, but a boom microphone on a headset has the advantage of leaving both hands free for logging, etc. This is especially important, if you use a foot-switch for the push-to-talk.

Whatever type you use, choose a microphone with a good 'punchy' sound to it. You might like to increase the 'punch' of the audio with some speech processing or compression.

If you use speech compression, please avoid overdoing the process. It can lead to broad and anti-social signals and ends up reducing your intelligibility rather than enhancing it.

A receive pre-amplifier is another item you may feel you need. If so, do make sure you can switch it off (see remarks under rule 7). You'll probably find you rarely need it however.

Main Problem

Unless you are operating from a site remote from much of the activity, the main problem your receiving set-up will have is the large number of strong signals. The receiver's dynamic range is likely to be more important

Are you new to v.h.f. contest operating? If you fancy having a go at the Practical Wireless QRP Contest for the first time, Dr. Neill Taylor G4HLX offers a little sound advice to help you on your way!

than its ultimate sensitivity.

For a portable power supply, a large battery ought to be sufficient. However, do make sure it is going to last the eight hours, and it's a good idea take along a spare fully-charged battery if you can.

Dry Run

Don't wait until the day of the contest to try all the equipment out for the first time. Have a 'dry run' a week or so beforehand, and invite critical remarks on the signal quality from some locals. This might be a good time to write up a check-list of items to remember to take with you.

You'll need to work out the IARU universal locator for the QTH you are using. Most operators find it helps to have this, and the station callsign, written up on a large sign in front of them.

You should be prepared for the chance that some other group are also planning to use 'your' site (see rule 7). Just in case, you should also know the locator of any alternative sites which you have considered.

Get together all the stationery that you need. You'll need log sheets (it saves time to have all the contact numbers written in the appropriate column in advance), scrap paper and check log (see below).

It's a good idea to take a locator map and a copy of the *Call Book*, and plenty of pencils, etc. Oh yes and don't forget to take a clock!

When the day itself comes, arrive on your site allowing plenty of time. This will allow you to get antennas erected, and the station operational well in advance of the 10am (local time) start.

There are bound to be unforeseen problems. Everyone will be much better prepared to start operating, IF they've had time to settle down before the 'off'.

The Aim

The aim of the contest, is to contact as many stations as you can, in as many locator squares as possible. You should exchange with each station: a signal report, serial number and locator (plus callsigns, of course) with utmost accuracy. This requires speed and precision on the part of the operator.

In general, the necessary operating standard is achieved by being careful and deliberate in what you say, and perceptive in the way you listen. 'More haste, less speed' is a good motto.

Rushing everything, will only lead to needless repetition or errors in what is received and logged. You also lose nothing by taking the time to be courteous. Nobody is impressed by the operator who is super-slick, but has no time for a simple 'good morning', 'thank you' or '73'.

Most stations spend some of the time, sticking to a frequency and calling CQ, and some time tuning around answering other stations' CQ calls. If you're a newcomer to contest operation, it's probably best to start with the latter suggestion. At least it gives you a chance to breathe in between each QSO.

Information In Order

In the QSO, send the information in the order the receiving operator is expecting it - report, contact serial number and locator. Avoid repetition where it's not necessary, and use standard phonetics to confirm letters

in the callsigns and locator.

A very common error, is to omit a 'P' from the end of a callsign, so take special care about this. If you miss anything the other operator sends to you, or even if you are unsure about it, simply ask them to repeat the information.

Never finish a contact, until you have told the other operator that you have received all the required information, and heard a similar confirmation from them (the code 'QSL' has returned to common use for this purpose). Write everything down in the log as you work.

Some groups prefer to have a second person to actually keep the log. Despite this, personally I like to have control of the pencil myself while operating!

It helps here, if you have developed the ability to say one thing while writing another simultaneously! A few groups have tried using a computer for logging. However, someone who is a great advocate of computers, and has worked with them for 20 years said to me: "you still can't beat pencil and paper for log-keeping in a contest!"

You must avoid working the same station twice. Unless you've succumbed to computer logging, this is best achieved by having a large sheet of paper divided into 26 sections, with a letter of the alphabet written boldly in the corner of each.

Check Log

As each station is worked, it's callsign is added to the list in the appropriate section, according to the first letter after the prefix (so G4HLX goes under 'H'). This is called the 'check-log', and is maintained by someone who's job it is, as each QSO starts, to rapidly check whether a station has been previously worked.

This check-logger must really stay alert, in which case he or she will outstrip any computer. Now perhaps, you are beginning to see how single-operator working can be hard work!

When you are ready to call CQ yourself, choose a clear frequency. Check that it is really clear by asking 'is this frequency in use?', preferably more than once.

Be aware that, due to beams pointing in opposite directions, it's quite possible to be accidentally 'sharing' a frequency with another station. This only comes to light when one of you moves the antenna.

Since you are after as many different locator squares as possible, it pays to try different directions with the beam. Some stations like to keep a small locator map with the squares worked shaded in, and this method helps to spot which areas need to be concentrated on.

Vacating The Site

Before vacating the site, make quite sure you have left the it clean and tidy, taking any rubbish home with you. Write up neat copies of the logs.

A computer can be useful, and appropriate software could perform another check for duplicate contacts, but hand-written logs are perfectly acceptable. Don't forget to highlight the first contact in each different locator square. Don't forget also to provide a list of all the squares worked, as well as the other information required by rule 6.

Don't delay - you have about **two weeks** from the contest to get your entry in the post. Try to remember that we like to have your brief comments about the contest, and any anecdotes you might have of your experiences, on a separate sheet of paper.

Hard Work?

Perhaps I've made it all sound like hard work now! But very many entrants have found how enjoyable and rewarding contest operating is, and the *PW QRP Contest* is an ideal event for your first try.

If you are 'bitten' by the contest bug, there are plenty of v.h.f. and u.h.f. contests throughout the year organised by the RSGB. However, in the meantime, make friends, work the DX, do as well as you can and whatever else happens...enjoy yourselves. Everybody should enjoy the experience when taking part in the 10th annual *Practical Wireless* 144MHz QRP Contest.

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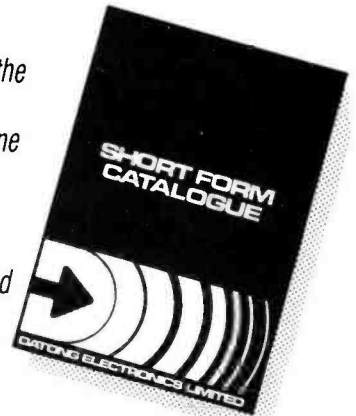
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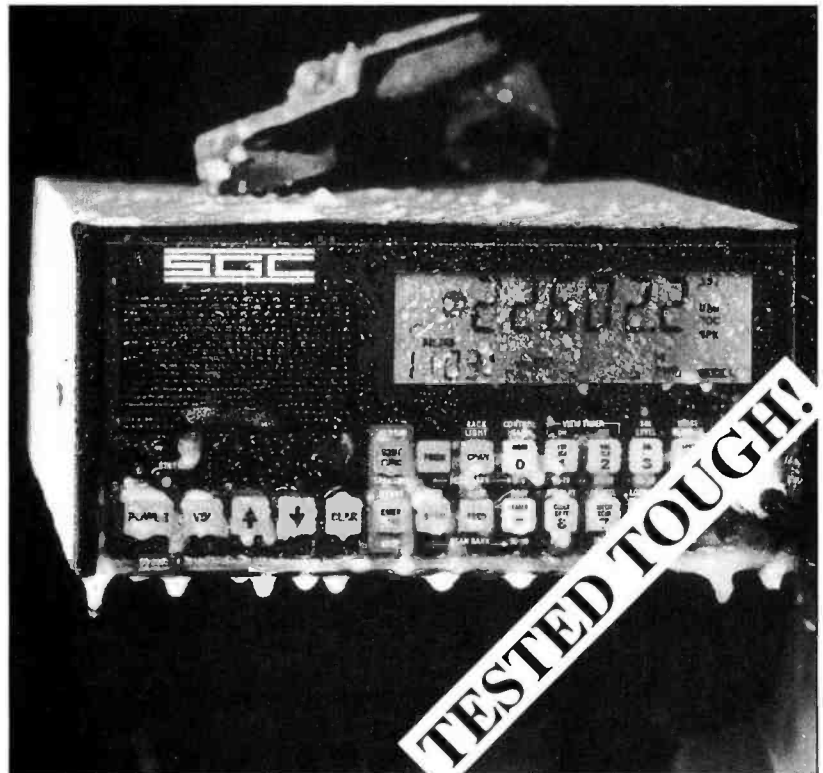


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R.A.S. (Nottingham)

Basic Synthesisers And How They Work *Part 1*

Synthesisers appear in virtually all new receivers and transceivers today. They appear in one form or another, and they offer tremendous advantages over other forms of local oscillator. This is particularly true now that large parts of these synthesisers can be contained within a single integrated circuit.

As a result of the use of synthesisers, we have come to expect many facilities. These include very good frequency stability, accurate frequency setting, multiple memories, remote setting of the frequency and scanning.

There are many more facilities which would not be possible, if it were not for the use of synthesisers. Yet, the circuitry behind these now common systems, present many challenges to the designer.

There are many ways of achieving the required result. However, if the cost is to be kept to a minimum without compromising the performance, then the designer's job is made more difficult.

Analogue Methods

Initially, analogue methods were used for synthesising signals. Analogue techniques involved taking a signal, dividing it in frequency, and then mixing this signal with others generated in the same way.

As you can imagine, this required very good filtering if it were to be successful, and the levels of spurious signals were to be low enough. Because of the design constraints, these early synthesisers were very expensive. This meant that they were only used in specialist applications.

Another method, is to store the shape of the waveform in a memory, and then read out various points on it which are then converted into an analogue form. This type of synthesis is known as Direct Digital Synthesis (d.d.s.).

The d.d.s. technique is now finding its way into some of the more expensive amateur rigs. However, the form of synthesising which has been almost universally accepted today, is based around the phase locked loop (p.l.l.).

Phased Locked Loop

The phase locked loop which is at the heart of most of today's synthesisers, is basically a form of servo system. It consists of a number of basic building blocks, as shown in Fig. 1.1.

The basic operation of the loop is quite simple. The phase of the two signals entering the phase detector is compared, and an error voltage is generated, according to the phase difference between the two signals.

This error voltage is then filtered, and is used to control the frequency of the oscillator. This is done in such a way, that the phase difference between the signals entering the phase detector is reduced.

Phase Difference Reduced

Eventually, a point is reached when the phase difference is reduced to such a degree that it remains

constant. This means that the phase difference between the two signals, is not changing.

This is significant, because there can only be a frequency difference between two signals, if the phase difference is changing. It means that when the loop has reached this state, the frequency of the reference or incoming signal, is **exactly** the same as the voltage controlled oscillator.

There may seem little point in generating a signal, at exactly the same frequency as one which already exists. However, there are a number of uses for a p.l.l., even in its basic form.

Widely Known Use

The first, and most widely known use of the p.l.l., is in the demodulation of a frequency modulated signal. In the role as a demodulator, the incoming signal is fed into the loop as the reference.

The loop will then act, so that the voltage controlled oscillator (v.c.o.) will follow the instantaneous frequency of the signal. In doing this, the v.c.o. has to move up and down in frequency, and it will require a varying tune voltage. It's this tune voltage which is buffered, and then used as the demodulated output.

Other uses of p.l.l.s are wide and varied. Sometimes they are used to give a constant signal, when the reference is interrupted for one reason or another.

This can be done by making the time constants in the filter long, so that the tune voltage and hence the v.c.o. frequency, is stored when the reference is not present. One common use for this method, is found in televisions for use in the colour demodulation circuitry.

Synthesisers are an integral part of amateur radio nowadays. To help our understanding of how they work, Ian Poole G3YWX offers his services as a 'guide' to take us through the maze of modern synthesiser circuitry and techniques.

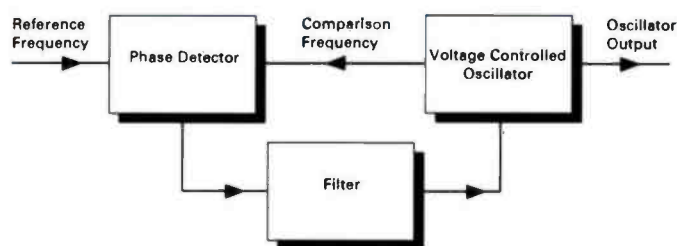


Fig. 1.1: A block diagram of a basic phase locked loop (p.l.l.).

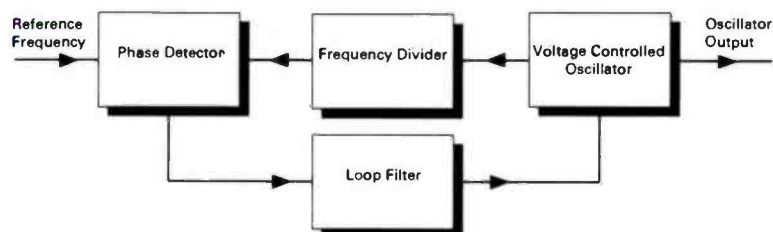


Fig. 1.2: Block diagram of a basic synthesiser using a divider.

Fig. 1.3: A basic synthesiser, with the reference oscillator frequency divided.

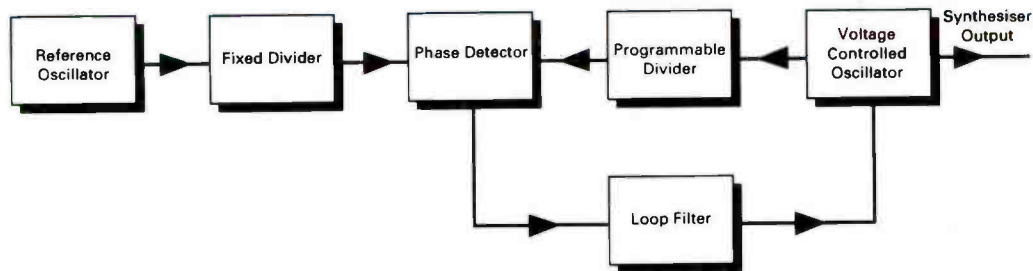
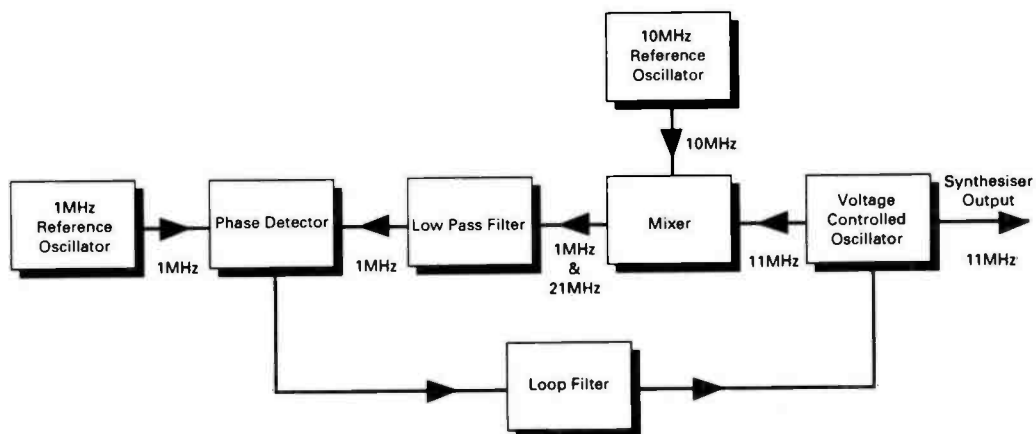


Fig. 1.4: A synthesiser using a mixer in the loop.



In the PAL TV system employed in the UK and elsewhere (for example), a colour reference burst is given at the beginning of each line. A reference oscillator is then needed, to store the phase information for the rest of the line, until it can be re-synchronised at the beginning of the next line. Naturally, p.l.l.s are ideal for this application.

Further Ingredient

In order to turn a p.l.l. into a synthesiser, a further ingredient is needed. This is obtained by placing a divider into the loop, as shown in Fig. 1.2, so the v.c.o. can be maintained at a different frequency to that of the reference.

To see how this works, I'll use the example when the divider is set to two. The phase detector will still have two signals entering, and it will generate an error voltage. This will be dependent upon the phase difference it sees between these two frequencies. In turn, the error voltage will cause the frequency of the v.c.o. to tune to a frequency, which makes the two inputs to the phase detector the same.

For this to be true, the v.c.o. must be operating at twice the reference frequency. Similarly, if the divider is set to divide by three, then the v.c.o. must oscillate at three times the reference frequency, and so on for other division ratios.

With these conditions, the synthesiser can step in frequency, by an amount equal to the reference frequency entering the phase comparator. In most practical applications, fairly small steps are needed.

Transmitter Example

Let's take a 144MHz f.m. transmitter as a typical equipment example using a synthesiser. The synthesiser will need to have a step size of 25kHz, if it's to be able to cover all the necessary channels.

It's not easy to develop a reference oscillator with the required stability at 25kHz. To overcome

this problem, it is usual to have a crystal oscillator. This will run at a much higher frequency, possibly 1 or 5MHz.

The higher frequency is then divided down by a fixed amount. This is shown in Fig. 1.3, and it provides the much lower frequency signal for the phase comparator. You'll also see that the division ratios for the divider, may have to be quite large in some instances.

With the 144MHz transmitter, if it's to operate over (for example) the range 145 to 146MHz, with a phase comparison frequency of 25kHz, then the divider will have to operate over the range 5800 to 5840.

Not The Only Way

Using a digital divider is not the only way of using a p.l.l. in a synthesiser. It's also possible to place a mixer into the loop, as shown in Fig. 1.4.

The effect of a mixer is quite different, but every bit as useful. This is because it essentially adds a frequency offset into the loop.

The way in which a mixer acts in the loop, can be reasoned in exactly the same way as the divider. Again, the effect of the loop is to try to reduce the phase difference between the two signals entering the phase detector.

Eventually, there will be a small and steady phase difference between them. In turn, this means that the frequency of these two signals is the same.

External Signal

So, if an external signal is fed into the mixer in the loop, then the v.c.o. will have to run at a frequency which is the sum of the reference and the external signal. To put some figures into the block diagram, take the example of a reference signal of 1MHz and an external signal of 10MHz.

For the loop to be in lock, both signals entering

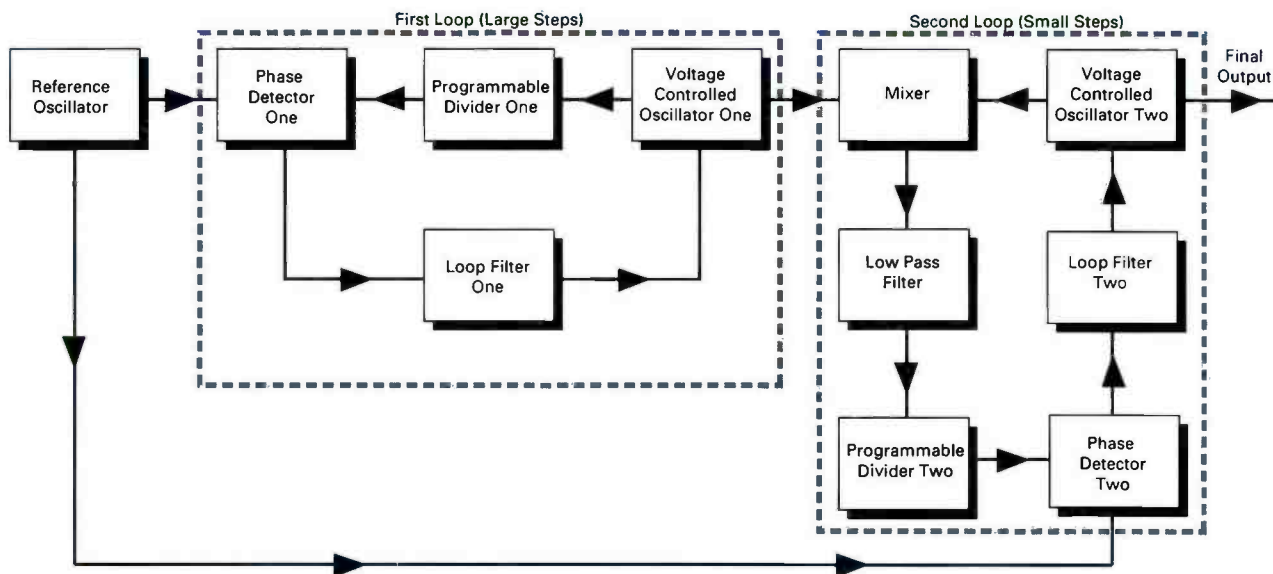


Fig. 1.5: A two loop synthesiser (see text).

the phase detector must be at 1MHz. In turn, this means that the output from the mixer must be at 1MHz.

For the loop to be in lock, this means that the oscillator must be running at a frequency of either 9 or 11MHz. Normally, the oscillator is made to run on the high side of the external oscillator.

The oscillator would be prevented from trying to 'lock' onto the image, by restricting the range or 'steering' it. In the example I've provided, you can see that if the frequency of the reference oscillator is raised by 1kHz, then the frequency of the v.c.o. will have to increase by the same amount for the loop to remain in lock.

Similarly, if the reference falls by 1kHz then the v.c.o. frequency will fall. The same is also true if the external oscillator frequency is varied.

This form of loop is very useful. For example, the frequency of a stable low frequency oscillator (which could even be another synthesiser), can be transferred to a much higher frequency.

There are advantages with this technique. It's much easier to have a low frequency synthesiser, with small frequency steps, than making a single loop version with the same steps.

A mixer could be used, but the use of a p.l.l. is much better. This is because a p.l.l. gives much lower levels of spurious signals, and the filtering is much simpler.

In fact the filter, Fig. 1.4, is a simple low pass type. If a mixer was used, a more complicated and expensive band-pass filter would be needed. The use of a p.l.l. offers a wide variety of options to the designer, as he may not just use the second loop in this basic form.

More Than One Loop

There are many ways in which synthesisers can be made up with more than one loop. The way it's done, will depend upon factors like the use of the

synthesiser, its frequency range and other specifications which may be important.

An example of how a multi-loop synthesiser can be made up, is shown in Fig. 1.5. From the diagram, you'll see that comparatively small steps can be achieved without the need for excessively large division ratios in any one loop.

This approach can pay large dividends in several features of the loop, and most noticeably in terms of the phase noise performance which is often very important. By extending the principle shown in Fig. 1.5, it's possible to include more loops and achieve even smaller steps.

In fact, many top-of-the-range synthesisers will have up to 10 loops or possibly more. However, synthesisers like these are usually only found in specialised signal generators costing many thousands of pounds.

Closer Look

Having looked at synthesisers in terms of their overall block diagrams, it's worth taking a closer look at the contents of some of the circuits. One of the most important sections of any synthesiser, is the loop filter, and that's just one of the other features I'll be talking about next time.

Next month, Ian Poole continues his guided tour of synthesisers. You'll find it very helpful with future projects in PW.

CB HIGH & LOW

By 'Quaynotes'

This month, 'Quaynotes' takes a closer look at some 27MHz CB radio antennas, and provides some useful test reports for the many keen mobile CB operators.

This time, I thought a few test reports on some antennas for 27MHz CB would prove useful. The antennas loaned for testing, were supplied by Nevada Communications of Portsmouth, Hampshire.

Three base loaded mobile antennas were sent for test, and I used one, the Dallas T443, in conjunction with the review/test report on the Midland 77-104 27MHz CB radio transceiver, which was published in *PW* (March 1992 issue).

Magnetic Mounting

Manufactured in Italy, these antennas are suitable for magnetic-mounting using a large mount, of at least 160mm diameter or a gutter-mount. For test purposes, I used the magnetic-mounting method. Each antenna was mounted at the centre of a car roof for both the s.w.r. measurement and road suitability.

The Dallas T443

The first antenna, the Dallas T443, is the shorter of the three. This antenna has a stainless steel radiating element 1.2m long.

The base loading inductance is large, and as the s.w.r. curve, Fig. 1, indicates the response over the 27MHz UK CB band is fairly flat. This results in a relatively low s.w.r. at each end of this band.

Longer Radiating Element

Secondly, I looked at the Detroit T444. This model has a longer stainless steel radiating element of 1.46m, and a smaller inductance base loading coil.

In my opinion, this antenna might be considered to be the longest recommended for operation on a conventional car. If you attach it magnetically, the mount must be large.

The s.w.r./bandwidth response is similar to that in Fig. 1, and again the s.w.r. is suitably low at the band ends. It's tuneable for either the UK or CEPT CB frequency allocations.

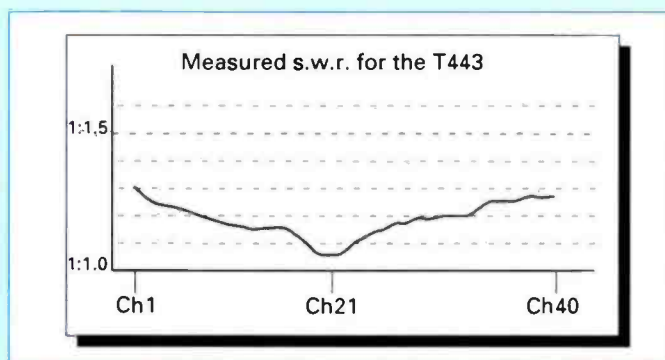


Fig. 1: The s.w.r./bandwidth chart for the 'Dallas' model T433 27MHz CB (UK) mobile antenna.

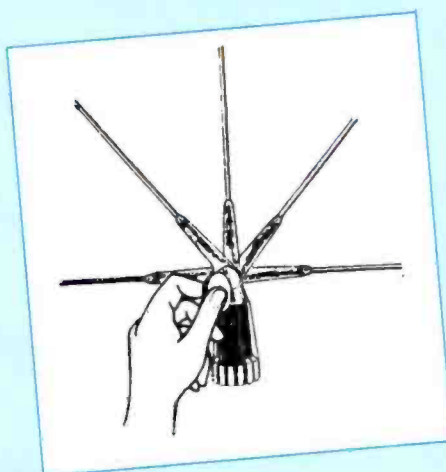


Fig. 2: The whip section of the antennas can be set vertically for normal operation at any angle, or lowered parallel to the car roof.

Long Element

Lastly, comes the Boston T444. With a long stainless steel radiating element of 1.77m, this antenna would look a bit out of place, except on a very large car.

This model might be considered more suitable for large lorries, etc. In this case, I

would recommend the use of a large mag-mount, or a gutter-mount, or a bracket if there's no rain gutter.

On this antenna, the s.w.r./band-width response is flat. The s.w.r. is not greater than approximately 1.25:1 at the ends of the UK and CEPT bands, and it's suitable for 40 channel coverage.

Length Adjustment

Each antenna has provision for length adjustment. This is achieved at the lower (base) end of the radiator, which can be moved in or out of the loading coil connector by a few millimetres (there's an Allen key provided for this job).

It may be necessary to cut very short lengths (approximately 5mm at a time) from the top of the whip. This adjustment should be regarded as a last report, to obtain a 1:1 s.w.r. at a band centre.

Particular Features

One particular feature, applicable to each antenna, is that as the radiating element is locked to the base coil with a large knurled screw (no screwdriver required). This allows the element to be released from the vertical and lowered parallel to the car roof before entering a garage, as in Fig. 2.

Finally, there's an extra (important) feature on each of the antennas against the British climate. This extra precaution takes the form of a rubber gland to prevent entry of water into the mounting socket.

Summary

Well, that's the lot for this time. My thanks go to Nevada Communications for their help with the test antennas. I hope you found the 'potted' reviews of interest.

Don't forget that I'm always pleased to receive your letters, and I would be happy to discuss any of your CB problems in this column. Cheerio for now.

For further details and prices of antenna and mounting systems, contact: Nevada Communications, 189 London Road, North End, Portsmouth, Hampshire PO2 9AE. Tel: (0705) 662145.

Quaynotes

Getting Started The Practical Way

"A device without an oscillator either doesn't do anything or expects to be driven by something else (which probably contains an oscillator). It is not an exaggeration to say that an oscillator of some sort is as essential an ingredient in electronics as a supply of d.c. power."

Horowitz and Hall *The Art of Electronics*

We've already built a number of oscillators in this series. Because of this, I know you won't really be surprised that we're going to build another form of oscillator this month!

There are many types of oscillator used in radio construction. This time we are to meet one of my favourites, the Colpitts Oscillator. This particular variant of the Colpitts also introduces something new in this series, a crystal controlled oscillator.

Quartz Crystals

No doubt you will have seen quartz crystals, those beautiful natural crystalline formations found in rock structures. They can be so beautiful they're often sold as decorative objects.

Scientists (rather unromantically) call the material 'natural crystalline silicon dioxide'. But scientists do things like that don't they?

Quartz is said to have **Piezoelectric** properties. This term means that if the crystal is subjected to some mechanical strain or stress (pushed, bent or bashed!) it produces a small electrical voltage across some of the crystal faces.

Two-Way Effect

The piezoelectric effect is interesting, because it also happens the other way around. In other words, it's a two-way effect.

If the crystal has a voltage supplied across it in a suitable manner, it will produce movement or mechanical force. The correct term for a device

using this effect is a **transducer**.

Quartz crystals can convert movement into electrical voltage, or voltage into movement. This is a useful property which is used widely in electronics.

A common example of the quartz crystal transducer is the crystal microphone, which changes sound waves into voltage. Another example is well-known crystal earpiece, which changes voltages into sound waves.

Incidentally, (so we don't forget the two-way effect) crystal microphones can be used as crystal earphones and vice-versa.

Familiar Pick-Ups

You might be familiar with the once very common crystal pick-ups. These were used for translating the movement of a needle into a voltage, which was then fed to the gramophone amplifier.

I can remember one particular crystal pick-up very well. It was when I was a student, working during my holidays in a seaside amusement arcade at Cleethorpes in the early 1960s, when I was asked if I could fix a broken jukebox.

'You're a radio ham, see if you can fix it!' So, I had a go at repairing the 'thing'.

What a crude device it was! It was a heavy crystal pick-up driving a single 'beefy' valve (a 6L6). There was enough voltage output from the pick-up to be able to just use the one valve amplifier! It was crude, but so was much of the music on the records!



This month's project, a crystal 'activity' tester.

To use his own words, the Rev. George Dobbs G3RJV is going to talk about "Bits of stone that oscillate" before describing this month's practical exercise, which is a crystal checker project.

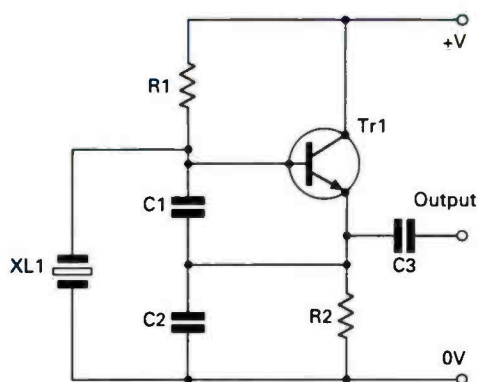


Fig. 1: An oscillator circuit, using a crystal as its frequency fixing component (see text).

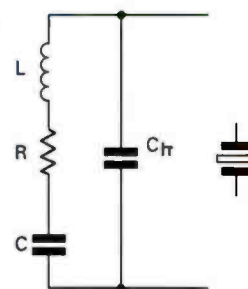
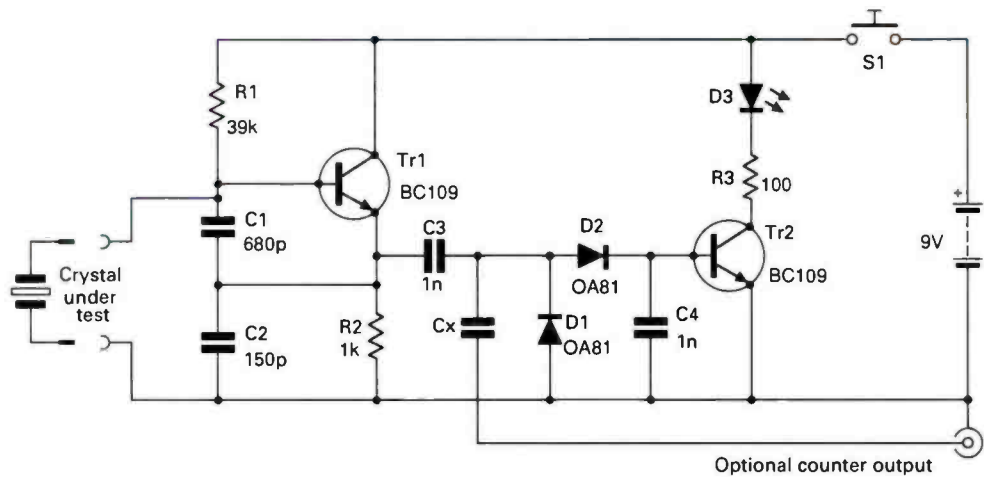


Fig. 2: The crystal really does work like a tuned circuit. The diagram on the left of the illustration is the equivalent electrical circuit of a crystal, and the symbol to the right is that used to represent a crystal in a circuit.

Fig. 3: Circuit of this month's project, a crystal activity checker (see text).



Crystal Oscillators

For crystal oscillators, the piezoelectric effect is used by cutting very small pieces of quartz in a particular way. The cutting is carried out along particular surfaces.

The cutting process produces a piece of crystal, which can then be made to respond like a tuned circuit at a frequency which depends upon the size and cut of the crystal.

The diagram, Fig. 1, shows an oscillator circuit which uses a crystal as its frequency fixing component. The crystal, the left hand component, can be considered as a high-quality tuned circuit.

Feedback Pathway

The first question to ask about any oscillator should be 'where is the feedback pathway'. The answer to that question, lies in the two capacitors between the emitter and the base of the transistor.

The transistor has no load in the collector circuit, it's in the emitter. So, as it passes current, a voltage appears across the resistor in the emitter.

The voltage developed across the resistor provides the output, but it also appears at the junction between the two capacitors. If it's an a.c. signal, the top capacitor will couple some of it back into the base, providing the feedback path.

The amount of feedback is controlled by the ratio of the values of these two capacitors. The top one will couple some back into the base, while the bottom one will decouple some to ground. This is the Colpitts Oscillator.

Tuned Circuit

The crystal really does work like a tuned circuit. The diagram, Fig. 2, shows the symbol used to represent a crystal in a circuit. The illustration also shows the equivalent electrical circuit of a crystal.

Let's take a look at what's happening inside the crystal. A good look can help us understand this common, but taken-for-granted device.

Inside the crystal, we'll find some inductance (L), some resistance (R) and some capacitance (C) in series with extra capacitance (Ch) provided by the crystal holder. But that will be enough of crystal theory, and if you want any more, you can read it up in a textbook. We want to build a working circuit!

Useful Test Equipment

The Circuit Fig. 3, shows a simple but very

useful piece of test equipment, based upon the Colpitts crystal oscillator. It's also similar to our last project, the dip meter.

The 'Crystal-Checker' is a unit for checking quartz crystals of the type used in radio circuits. These crystals can often be found very cheaply on the surplus market. Our simple checker will show if they're fit for use.

The 'Crystal Checker' is also provided with an output so that the frequency at which the crystal will oscillate can be checked on a digital frequency meter. It could also be checked by listening for it on a suitable receiver.

The left-hand side of the circuit is the same as Fig. 1, which shows the Colpitts Oscillator. This time however, the crystal has been replaced with a couple of crocodile clips. The clips enable crystals to be connected in and out of the circuit.

The values of C1 and C2 have been selected to cover a wide range of frequencies. The output from the oscillator is coupled via C3 into a pair of diodes, D1 and D2.

Similar Method

The diodes, D1 and D2, convert the oscillator signal into a d.c. signal. This is similar to the method used to measure the oscillations in the dip meter project.

The d.c. voltage is amplified by Tr2 to a level that can drive an l.e.d. The power supply, a PP3 Battery, is switched on and off by a push button.

The test operation is simplicity itself. A crystal is clipped into the circuit and the button is pressed. If the crystal oscillates, the l.e.d. will glow.

A small value capacitor enables some of the signal to be used to drive a frequency counter. The value of Cx (the output coupling capacitor) will depend upon the counter in use.

When choosing a value for Cx, select one which just allows the counter to give a reliable reading. I found that a value of 47pF, seems to do the job with my frequency counter.

Building The Checker

The prototype 'Crystal Checker' was built on a small p.c.b. as shown in Fig. 4. It contains all the components except the switch, battery and clips.

Also shown in Fig. 4, is the layout while Fig. 5, illustrates the component side of the board with the component overlay. Naturally, the circuit could be built on a small piece of 'perfboard' using the same layout.

The whole unit is mounted in a small plastics box. I arranged it so that the clips emerged from one end, and the push switch on the side. A suitable output socket, (I used a phono socket), can be added for the output to the frequency counter.

Easy And Cheap

The 'Crystal Checker' is easy to build, and cheap. This month's project makes an ideal companion to test surplus quartz crystals when you attend radio rallies.

These commonly available crystals, are often used as the frequency determining components in small transmitters used by novices and QRP (low power) operators. You never know, we could meet up one day, testing crystals on the same stand! Cheerio for now.

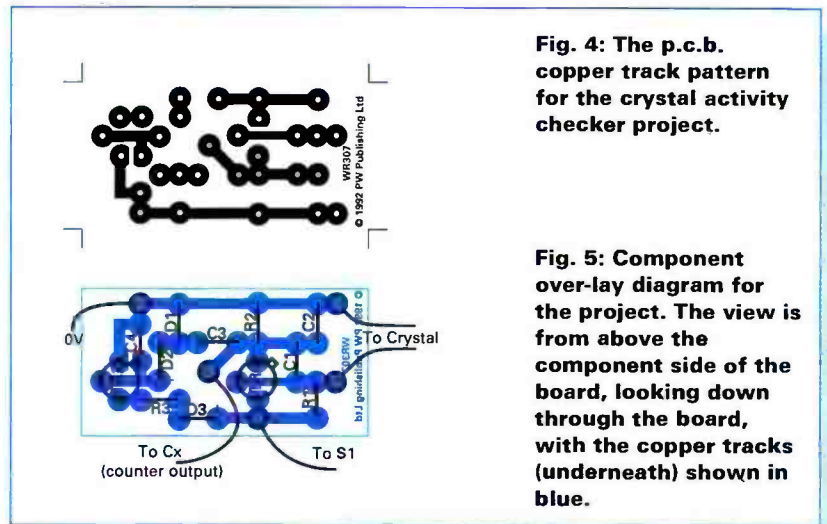


Fig. 4: The p.c.b. copper track pattern for the crystal activity checker project.

Fig. 5: Component over-layer diagram for the project. The view is from above the component side of the board, looking down through the board, with the copper tracks (underneath) shown in blue.

Shopping List

Resistors carbon film 5% 0.25W

100Ω	1	R3
1kΩ	1	R2
39kΩ	1	R1

Capacitors

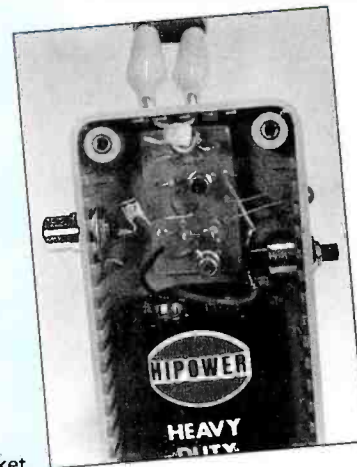
150pF	1	C2
680pF	1	C1 (disc ceramic)
1nF	2	C3, 4
Cx	(See text)	

Semiconductors

OA81*	2	D1, 2 *(or equivalent)
BC108/109	2	Tr1, 2

Miscellaneous

Push-to-make switch, PP3 battery and clip, two small crocodile clips, phono socket (or similar) for counter output. Everything mentioned, are common components, available at most component retailers. Case (ABS plastic 100 x 50 x 25mm) Maplin WY03D or similar.



A close-up view of the project, showing the method of connecting the frequency-counter coupling capacitor, and the interconnecting wiring.

Radio Diary

May 16: All Formats Computer Fair will be held at Sandown Exhibition Centre, close to M25, three minutes from Esher railway station, parking for 6000 cars. This is intended to be the regular future venue for the London fair. Further details from **John Riding** on (0225) 868100.

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 10am, doors open 10.45am. Talk-in on S22. Bring & Buy, bar and cafeteria. Free parking and loads of stands. Entry and parking of Wetherby to Harrogate Road. Separate arrangements for disabled visitors off Hookstone Wood Road. Details from **Mike GOMMK** on (0423) 564353/507653 or FAX (0423) 520992 or @GB7CYM.

May 17: The 'Parkanaur' Rally will be held at the Silverwood Hotel, Lurgan, Co. Armagh. Doors open from 12 noon. There will be the usual trade stands, Bring & Buy, bookstall, QSL bureau, etc. Talk-in on S22, 145.550MHz. The proceeds of this rally will go to the Stanley Eakins Memorial Fund, at Parkanaur, near Dungannon. This is a very worthy charity, and they hope to see a really good turn out of everyone interested in all aspects of radio and electronics. Details from **Jim Lappin** on (0762) 851179.

May 24: The Plymouth Radio & Electronics Fair by the Plymouth Radio Club will be held at Plymstock

Comprehensive School, Church Road, Plymstock. Over 25 stalls selling electronic, computer and radio components. Many second-hand bargains for the enthusiast. Free parking. Bring & Buy, club station on the air, bookstall, hot & cold buffet and grand raffle. Doors open 11am, admission is £1 at door. For further information, phone **Plymouth 787181**.

May 24: The 16th East Suffolk Wireless Revival 1992 is to be held at the Maidenhall Sports Centre, Ipswich, Suffolk. Among the main attractions this year will be Bring & Buy, car boot sale, book stall for RSGB books and vintage radio display. Suffolk Data Group, satellite/e.m.e. prediction service, antenna measurements, BYLARA, RAIBC, Scout Radio, RAYNET stands and Ipswich Area Novice and RAE Exam bookings. All the usual traders, plus non-radio stalls and childrens' play area. Refreshments and bar available. Lots of other attractions, providing an enjoyable day out for all the family. The price of admission (including ample car parking) is £1. Talk-in on S22 (GB4SWR), listening out on GB3PO (R2) and GB3IH (RB4). Send an s.a.e. for free maps. Doors open 10am. **Bob Baal G7HZV, 14 Gainsborough Road, Felixstowe, Suffolk IP11 7HS, or via packet, G4YQC @ GB7MXM. Trader enquiries only to Syd Mason G0JMY, 367 Norwich Road, Ipswich IP1 4HA, tel: (0473) 748515.**

*May 30/31: The RSGB will be holding

their eighth National Amateur Radio Show at the National Exhibition Centre, Birmingham.

June 7: The Northampton Radio Club will again be holding their Radio Computer & Electronics Rally at the rear of the 'Red Lion' public House, (500 yards from junction 16 of the M1 motorway). This year there will be room for four times more stalls, as they have booked an extra field just for parking. Doors open 10am. Pub and cafe will be open all day. Talk-in on S22 and on GB3NH (RB3) and 1.933MHz. All enquiries to **Paul Young** on (0327) 41267.

June 7: Bury St. Edmunds ARS Car Boot Sale will be held at the Scout Pavilion, Stanton. Doors open 10am until 4pm. Admission free. Light refreshments available. £3 per car boot. Talk-in on S22. Send an s.a.e. for a free map. Details from **GOMEV QTHR. Tel: (0359) 50271.**

***June 14:** Royal Naval ARS have their Annual Mobile Rally at HMS *Mercury*, nt. Petersfield, Hants. Dozens of trade stands; a Bring & Buy; flea market; radio-controlled power boats and trains; local radio clubs and repeater groups; childrens' rides and amusements; vintage fire engine; TV detector van; ices and refreshments; arts and crafts' exhibition; two Grand raffles; spectacular arena displays and other attractions, making this a great day out for all the family. Talk-in on 144 and 430MHz, free parking and picnicking, free admission for children, adults £1.50, no dogs except guide dogs. For full details, contact **Cliff Harper G4UJR, 34 Neva Road, Bitterne Park, Southampton SO2 4FJ. Tel: (0703) 557469.**

June 20/21: Preston 'Guild' Hobbies Fayre is to be held in and around the grounds of Tulketh High School, off Tag Lane, Preston. One of the largest local exhibitions of crafts, hobbies, pastimes and sports, staged in the north-west. The fayre runs for two days, with the Preston ARS flying the flag for 'amateur radio' and 'amateur electronics'. Any profits from this event will be split between local charities and Tulketh High School. Trade stands and activities cover everything from armchair hobbies to the super-adventurous, with something for everyone, whatever age group. **Eric Eastwood G1WCO, 56 The Mede, Freckleton, Preston, Lancashire PR4 1JB. Tel: (0772) 686708.**

June 21: Denby Dale & District ARS will be holding their Rally at Salendine Nook High School, Huddersfield. Easy access from M62, junction 23 eastbound, junction 24 westbound. Doors open 11am. Usual traders, craft stalls, etc. Bar, catering, car boot sale, Bring & Buy, ample parking. Talk-in S22 and SU22. Details from **Philip G4FSQ on (0484) 644827.**

June 21: The Newbury & District ARS will be holding their Fifth Annual Car Boot Sale at Achland Hall & Recreation Fields, Cold Ash, Newbury, Berkshire. From 10am until 3pm. Free admission and parking. RSGB Morse tests - contact RSGB for bookings. Childrens' play area and refreshments. Site open to traders from 8am, £7 per pitch, payable on the day. Further information from **Norman on (0635) 863310 or Richard on (0635) 46241.**

* Practical Wireless & Short Wave Magazine in attendance.

Mobile And Portable Operation - On A Shoestring

Part 1 The Power Supply And Other Ideas



Fig. 1.1: Inverters can solve many problems for constructors who wish to use valved equipment.

Rob Mannion G3XFD, is a keen mobile and portable operator. In order to encourage more operators to try this type of operation, Rob's got some ideas to get you on the air, with the minimum of expense. There's even an opportunity to use those old 'bottles' in the junk box.

The summer is creeping up on us, and it's the time when many radio amateurs (including me!) try to combine the hobby with other activities. Last year, I successfully managed h.f. portable operation while my wife and I were on a canal holiday. It provided many QSOs, and it was great fun.

There's a real challenge waiting for anyone, working with low power and with temporary antennas. Operating in this way is often coupled with less-than-ideal locations...especially in deep canal cuttings when you're holidaying afloat!

Basic Ideas

I had one or two basic ideas, and although I didn't have time to do much before the holiday, I had time to build a very simple transmitter. Apart from working on 144MHz with my hand-held transceiver, I'd decided on low power (not really QRP) c.w. operation on 7MHz.

This particular idea came to me, mainly because I had several 7MHz crystals, plenty of valves, and several useful power supplies. It was the availability of the 12V d.c. inverter units that helped me to decide on the simple valve transmitter.

Inverter Answer

Obviously, if you're going to use a valved rig, portable or mobile, an inverter is the answer for the power supply. Fortunately for experimenters and home-brew enthusiasts, there's a plentiful supply of 12V d.c. to h.t. inverters from an unusual source.

Garex Electronics, now based in Devon, have a steady supply source of reliable inverters, removed from p.m.r. equipment for a number of years. All the inverters come from high-power valved transceivers.

I first came across the inverters at a rally. Garex tidy them up and make them ready for experimental use, before selling them (with full technical details and circuits) at rallies, shows and by post. As sold, the units are small sub-chassis, ready to go, as in the photograph in Fig. 1.1.

Biggest Problem Solved

Thanks to the service provided by Garex, the biggest problem for anyone wanting to use valves, is solved. The power supply is taken care of, and it won't cost an arm and a leg.

The circuits for the two different inverters sold by Garex are shown separately. The first inverter, illustrated in Fig. 1.2, is ideal for smaller transmitters, and it provides a nominal 250V at 150mA.

The second inverter, is ideal for higher power use, and the circuit is shown in Fig. 1.3. Garex Electronics provide a switching circuit, to cover the eventuality of the inverter failing to start under heavy load conditions.

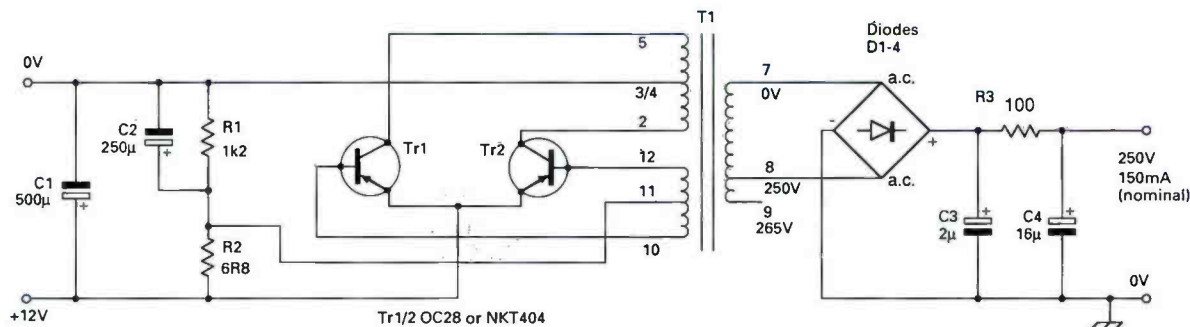
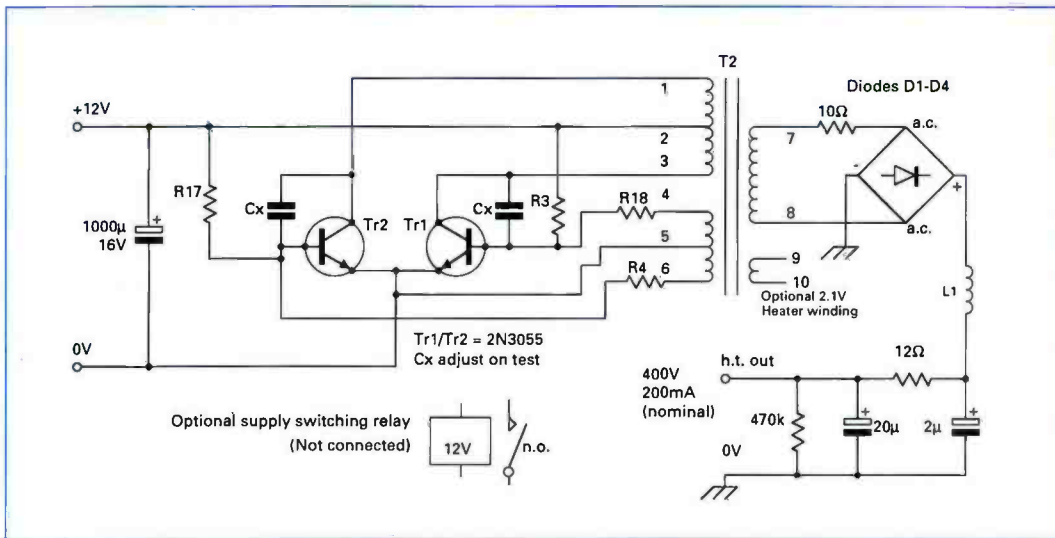


Fig. 1.2: The circuit diagram of the 250V d.c. 150mA (ref. GX15) Garex Electronics inverter.

Fig. 1.3: Circuit diagram of the 400V d.c. 200mA inverter (ref. GX30) Garex Electronics inverter.



Duty Cycles

Although the inverters are well-built and conservatively rated, they are **NOT** designed for continuous duty cycles at their nominal ratings, such as running a receiver. Obviously perhaps, the inverters are designed for the duty cycles encountered in radio-telephone operation.

In other words, they're quite suitable for providing power for a power amplifier, an ordinary transmitter, and anything else that doesn't need continuous power. This of course means that they can be used for powering a valved c.w. transmitter (which I'll describe next time).

I've been using these inverters for quite a number of years. Although the units can't be recommended for continuous work at anywhere near their maximum capabilities, I'm pleased to report they can be used successfully when precautions are taken.

Many enthusiasts would like to try 'playing' with valves. Quite a few of the budding 'gaseous state' fans (that's Tex Swann G1TEX's favourite term for valves!) are put off by the problems with the power supply.

Well, I'm pleased to report that the inverters could be a way out of the problem. They can be used to run a small receiver, or other project, for several hours at a time **providing** the inverter is running below 50% of its maximum rating.

In practice, I've found that operated in this manner, the inverters run cool. They also provide what I consider to be a very safe high-voltage supply for a school radio club.

The inverters, providing you screen them in aluminium cases, are quite safe. With this method, there's not much chance of accidental shock, and the occurrence of inverter 'whine' (radio frequency interference) is much reduced.

Full details on how to buy the inverters are given at the end of this article. Of course, I have checked that Garex Electronics can cope with the demand, but it's wise to get your order in first!

I don't normally like to publish projects that rely on what can turn out to be 'difficult to find' surplus items, but there's always an exception to break the rule. However, I'm assured that there are enough to go around!

Single Valve Oscillator

So, now you've got your inverter, what can you do with it? In my case, I built a single valve crystal-controlled oscillator. This, as I've briefly mentioned, Practical Wireless, June 1992

worked on 7MHz.

For the receiver, I used a car radio for the tuneable i.f., in conjunction with a simple converter. The converter was actually a modified *Practical Wireless* 'Forty-Niner', 6MHz to 1MHz converter (published in *PW*, January 1990). I used an 8MHz crystal to provide the local oscillator signal.

The bandspreading provided by the conversion to 1MHz, was adequate for c.w. work. The b.f.o. was provided by adding an adjustable amount of feedback on the car radio i.f. stages.

I found that the gain provided by this method was very reasonable. The 'regenerative' detector or 'Q-multiplier' effect provided the b.f.o., and the 'rig' was ready to go.

Massive Batteries

The 12V power supply was provided by the narrow boat's (only 'landlubbers' call them 'barges'!) massive batteries. I only needed to fix up the antenna, and that was very simple indeed.

Although I used the very lightweight Lake Electronics TU2 Mark 2 a.t.u., (ideal for this job, with a built-in QRP s.w.r. meter), you can avoid having to take extra equipment, by choosing a resonant length of 'long wire'.

I decided to be clever, by choosing a 20m length of wire, which offers an excellent match on 7MHz without a complex a.t.u. By the way, I chose 7MHz, not because it's my favourite band (which it is), but because with relatively low power, it's possible to get many European and inter-G QSOs throughout the day.

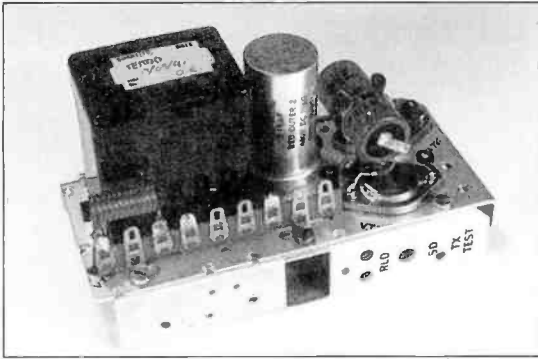
Other Bands

The simple transmitter I'm going to describe next month, can work very well on any band between 1.8 and 7MHz. It also has the advantage that you can use quite a few different types of valve in the circuit.

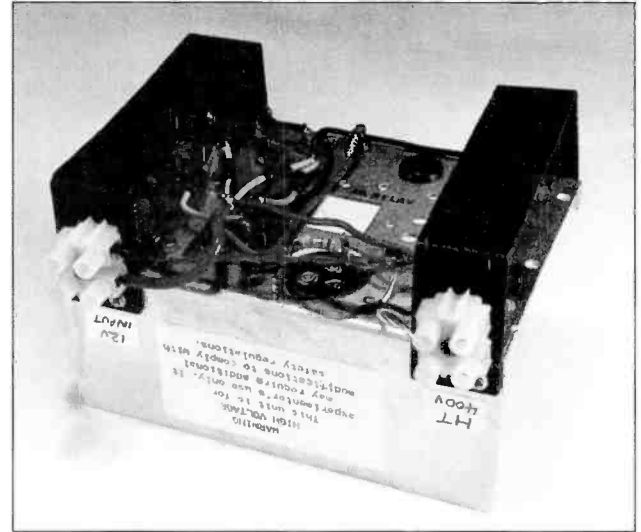
I'm not ashamed to say that the transmitter project has been published before. In fact, it first appeared (of course!) in *PW* nearly 30 years ago, and the design has proved itself many times over.

When the design first appeared, the crystal-oscillator p.a. was choke-modulated. This provided a cheap form of modulation, ideal for local 1.8MHz working. There's no reason why we shouldn't use it again!

There's also no reason at all to stop you working c.w. mobile with this rig either! Don't worry, I'm not advocating that anyone should try working c.w. when they're actually mobile, just that you try a



The 12V d.c. to 250V d.c. 150mA inverter, shown as supplied and ready to use (connection details and circuit are supplied with each unit).



The 400V, 200mA version of the inverter, showing the underside of the unit.

The inverters are available directly from:
Garex Electronics,
 Station Yard,
 South Brent,
 South Devon
 TQ10 9AL.
 Tel: (0364) 72770.
 FAX (0364) 72007.

Inverter 1.
 (250V 150mA) Garex
 order ref. GX15,
 costs £11.25 including
 post and packing.

Inverter 2.
 (400V 200mA) Garex
 order ref. GX30,
 costs £12.25 including
 post and packing.

Next month, I'll be providing some other practical ideas, along with the circuits of the valved c.w. and 'phone transmitter. Cheerio until then!

very simple rig on c.w. when you're parked somewhere.

Morse Mobile

Working Morse when you're in a mobile environment, might sound a bit like a joke. However, it's an idea with sound common sense, and it can allow you to achieve far greater ranges with surprisingly little power.

Obviously, mobile transmitters, particularly on the h.f. bands, can be at a great disadvantage. This is because the antenna has to be a compromise. But, even with a QRP c.w. transmission, it's surprising what you can achieve with a base-loaded whip antenna.

In the past, I've used a straight key for c.w. operation from the car, but last year at the Ham Vention in Dayton, I saw a better idea in action. The operator I saw working, was using a small electronic keyer strapped to his leg, in the same position and fashion as the knee-pads used by RAF air-crew.

I stood and watched, and listened, as the American amateur worked DX station after station. Although his receiver was fully transistorised, the transmitter used the modern equivalent of the famous old '807' valve.

Getting Ready

So, I hope that I've given you some ideas and that you're getting ready. There's no need to feel out of it because you can't afford expensive modern equipment. There's no need either to embark on long and complicated projects, unless you want to.

There is no real need to invest in expensive mobile antennas and mountings. To this end, the cheap and easily available CB gutter and magnetic

mountings can help.

You can buy an adaptor from the various antenna dealers at rallies, and these will allow you to use the many commercially available base-loaded whips for the amateur bands. Alternatively, you can strip off the original 27MHz winding, and experiment with other windings (with the help of a dip-meter) and re-tune the antenna onto the lower h.f. frequencies.

So Many Ways

There are so many ways to enjoy portable and mobile working on a tight budget, that I could write pages on the subject. But, before I finish off this month, why not start looking for a good-quality, older style medium wave car radio for your tuneable i.f.?

It's also a good idea to look out for several long broomstick handles. These can help provide an almost 'instant' portable trapped dipole antenna that can really work the DX, and be assembled and erected by one person.

Not Ashamed

I am not ashamed that most of my amateur radio activity is really basic. I get tremendous satisfaction in achieving a lot from a little. If this approach helps get other people active on a rather neglected facet of the hobby, I'll be very pleased.

Surely, there's no earthly reason why we can't use hybrid equipment again? My Yaesu FT75 has proved itself incredibly reliable over the last 22 years. That in itself proves a point in my mind.

That's the lot for this time. In the meantime regard my suggestions as a challenge. Why don't you try portable and static mobile operation on a shoestring, it's great fun.

Errors & Updates

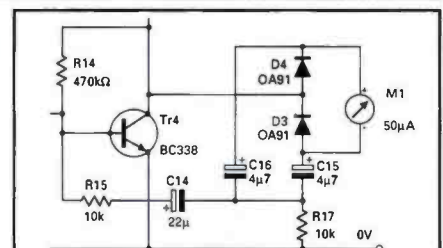
A Simple Inductance And Capacitance Bridge PW April 1992

In the circuit diagram (Fig. 1.4) on page 30 of the April issue of *PW*, three capacitors, C14, 15 and 16 were reversed. Diode D3 was also shown reversed in that diagram. The partial circuit diagram (right) is shown correctly.

Look at the diagram Fig. 1.6 (detector overlay) on page 32 of April's issue. Diodes D3 and 4 are correctly orientated, as is capacitor C16. But capacitors C14 and C15 both need turning round on the circuit board.

There was also a slight misalignment of the figures on the drawing of the dial as shown on page 25 of May's issue of *PW*. Rather than reprint the dial layout again, we will provide replacements. Send an s.s.a.e. large enough to accept the full dial layout to the address (right).

We apologise for these errors, and they will be corrected before the printed circuit boards have the overlay pattern printed on them. So no further action needs to be taken unless you are building the circuit up yourself, Editor.



This small section of circuit replaces the similar section, in Fig. 1.4 on page 30 of the April 1992 issue of *PW*, as described in the text.

Address for the dial:
 Inductance Bridge Dial Replacement, Practical Wireless, Enelco
 House, The Quay, Poole, Dorset BH15 1PP.

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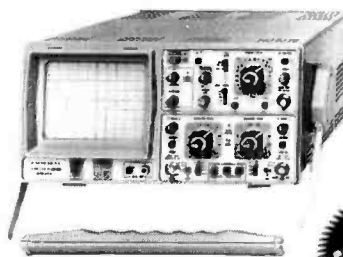
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Mathematics For The RAE

This month, Ray Fautley G3ASG provides the answers to the problems set in April's edition of his column, before looking at the various aspects of phase and the a.c. wave-form.

Before looking into phase and its meaning in a.c. wave-forms, I think that you should have the answers to April's questions. It wasn't an 'April Fool' joke, and I'm assured by the Editor that this was merely an oversight by a certain sub-editor who was still in shock after suddenly becoming a grandfather! (Yes, Tex Swann G1TEX became a grand-dad very recently and he's still boasting! Editor).

So, without further ado, here's the answers for you:

- 1) a (20W)
- 2) c (37.8W)
- 3) d (10mW)
- 4) c (10W actually 9.999392W)
- 5) d (4.847V)

Question five was rather different! With this one, you had to work 'backwards'. Despite this, I'm sure you managed to get them all correct of course...didn't you?

Phase

The only other facet of sine (sinusoidal) waves that we need to worry about, is **phase**. Don't worry about the term, it's only another name for time. You'll already know about 'phases of the moon' (new-moon, full-moon, etc.) and these terms are only referring to times in the month.

You can compare the relationship of the wave-form of the voltage applied across a purely resistive load to the wave-form of the current flowing through the load. You'll also find that they are the same **shape** although their **amplitudes** are likely to be different.

The positive peaks, negative peaks and zeros of each wave-form occur at exactly the same instant in time. This coincidence is referred to as **being in phase** (in other words, they're in time together) and it **only** happens when the load is a **pure resistance**. The relationship is shown in the diagram, Fig. 1. In most circuit analysis, the voltage wave-form is taken as the reference wave-form.

Load Reactive

What happens if the load is not a pure resistance? In order to find out, I'll take two extreme cases where the load is said to be **reactive**.

(i) Assume that a sinusoidal voltage is applied across a pure inductance, as in Fig. 2. In this case, the current through the inductance is **not** in phase with the voltage.

In fact, the current follows, or **lags behind** the voltage. The difference in time between say, the positive peak of the

voltage wave-form, and the peak of the current wave-form will be exactly one quarter of a cycle (90°).

This effect is much easier to visualise if you look at Fig. 3. In this diagram, point 'A' represents the **voltage** positive peak and point 'B' the **current** positive peak.

By referring to the horizontal (or 'x') axis you can see that the current positive peak, point B, occurs a quarter of a cycle (90°) **after** the voltage peak (point A). The current is of course **lagging** behind the voltage.

(ii) The second case occurs when a voltage is applied across a pure capacitance, similar to the method used for inductors. Again, as shown in Fig. 4, the current is **not** in phase with the voltage. This time however, it occurs **before** the voltage, and the current is said to be **leading** the voltage by 90°.

Real Components

Of course in real life, no components with pure inductance or capacitance are obtainable. There's always some resistance (however small) present, either in series or in parallel with the reactive component.

The effect of the resistive part of the reaction of inductance or capacitance, is to **reduce the phase difference** to something less than 90°.

Successful Questions

For you to be successful with the RAE questions, it's only necessary to understand what a phase difference looks like in a wave-form drawing. You should also be able to evaluate the amount of difference in degrees (°) or fractions of a cycle.

To make this easier, (for the questioners?), phase differences are likely to be in multiples of 45° (which is one eighth of a cycle) in the examination questions.

Fractions of one cycle: 0, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, and 1.

Phase shift in Degrees: 0° 45° 90° 135° 180° 225° 270° 315° 360°. The illustrations in Fig. 5, shows the various shifts in diagram form.

If you can recognise 0°, 45°, 90° and 180° phase differences (or phase shifts) corresponding to 0, 1/8, 1/4, and 1/2 cycle differences (or shifts) this would be sufficient for you to be able to cope with the RAE questions on the subject.

That's all for this month. Next session we begin another topic, and I'm pleased to hear that many readers are finding maths a bit easier now. It's not that difficult is it?

Theory

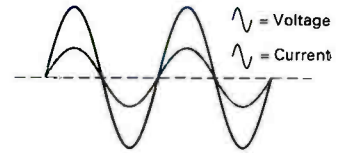


Fig. 1: The only time the current (shown as a broken line), is in phase with the voltage (shown as a continuous line) is when the load is a pure resistance (see text).

Fig. 2: A circuit containing pure inductance (see text).

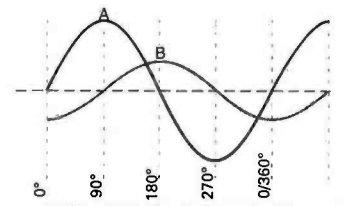
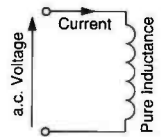


Fig. 3: In a circuit where the load is reactive, the current will lag behind the voltage (shown by the continuous line). Point 'B' represents the current peak, and it can be seen to be lagging by 90° (see text).

Fig. 4: When a voltage is applied across a pure capacitance, the current is not in phase, but this time it's leading the voltage by 90° (see text).

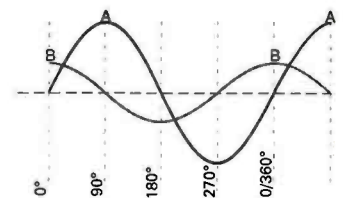
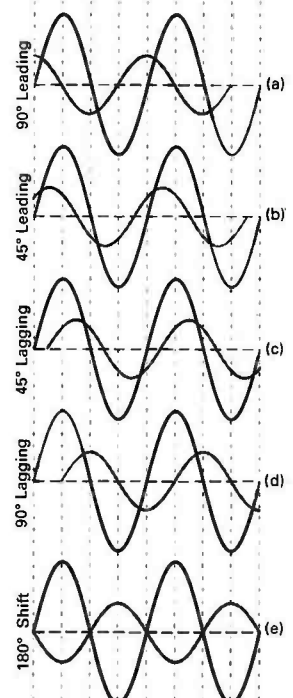


Fig. 5: Phase-shift shown in degrees: (a) 90° leading (b) 45° leading (c) 45° lagging (d) 90° lagging (e) 180° phase shift (see text).



Reflections

This month, Ron Ham looks into the valuable source of information provided by enthusiasts who log everything from meteorites to sunspots and satellites.

This time, I'm going to consider the value of keeping logs and sending reports, or in other words, creating a record for posterity of extraordinary events. In the world of radio, a record can take the form of a QSL card, photograph, a detailed report or perhaps an article on the subject for a technical journal.

The latter suggestion may require some background material, which has to be traced by searching for original sources. If you do have to research, it's well worth remembering that the reference section of a public library or newspaper archives are a mine of information.

I often wonder, if the rapidly advancing technology of the past decade has reduced our need for research. After all, we can now obtain almost immediate information, on practically any subject, through the 'electronic' media.

It's now possible, wherever we are, to talk directly to each other by radio or telephone. We can also transmit data around the world by computer from our homes or place of work and get the latest facts from frequently updated bulletin-boards or teletext.

'As-it-happens' news darts its way around the earth via satellites, to reach us through our domestic radio and television receivers. Any of this information, if we need it, can then be recorded and stored for the future on audio or video magnetic discs or tape. It's all good stuff, but the news has to be found first before it can be transmitted and recorded!

Good Advice

Many years ago, when my thoughts first turned towards buying a computer, a friend, in that high-tec industry gave the good advice: "get yourself a good magazine on the subject"! This I did and I've never regretted it. Now why didn't I think of that, especially as I had been pushing that same theme in the world of radio for ages?

If you take a look in any large newsagents, you'll see a wide variety of technical journals, for the business and home user. They cover all subjects from astronomy to the weather, and each magazine is packed with the current specialist adverts, articles and editorial comments.

For example, think of all the contemporary news and technical progress from the world of radio that's been recorded since 1932, by the editorial staff and authors of *Practical Wireless*. The same can be said over the past 60 years about other long-established publications like *Short Wave Magazine* and the original *Wireless World*.

Article And Records

We can learn a lot today, by referring to articles written by people who were 'there at the time'. It can also be done by tracing records that were kept privately or by official departments, long before we were born.

Nowadays, it's simple to take a photograph, like the gathering storm shown in Fig. 1, and freeze that instant 'in time' for all to see in the future. However, before the advent of the camera, some 150 years ago, visual images were passed down through the ages by descriptive text, drawings, paintings and sketches.



Fig. 1: A gathering storm 'frozen' in time.

Weather Popular

The weather is one of the most popular scientific subjects found in early documents, letters and literature. This is because the weather, of course, has affected the lives of everyone throughout history.

Joan found a typical example of this while researching the 19th century diaries of a country Canon. On 16 July 1856, this Reverend gentleman wrote: "Last night about 11pm, we had a tremendous downfall accompanied by some continual vivid sheet lightning, which emanated from a luminous cloud moving from south to north. It lasted about half an hour".

Furthermore, these diaries revealed that around 1530 on 20 June 1858, a "terrific thunderstorm" took place. Shortly before this began, the Canon had taken his seat at London's Crystal Palace for a concert which, in addition to the stars, had a chorus of "32 men and 30 women".

He wrote "The storm of thunder interrupted the proceedings for some time, and greatly terrified the ladies who shaded their eyes from the lightning, which glanced through the glass with great effect." From this study, Joan learnt that 'electrical' storms took place on the days mentioned, and the Canon's description of the events left a

'photograph' in her mind of what happened.

Picture Record

A picture, is therefore a record of a particular moment in time. It cannot be repeated, and is captured each time an artists paints a canvas, or a camera shutter is operated.

This same point is emphasised by three spectacular photographs of a solar event taken, over a 10-minute period, by **Cmdr Henry Hatfield** (Sevenoaks), through his spectrohelioscope, at 1221, **Fig. 2**, 1227, **Fig. 3** and 1231, **Fig. 4**, on November 30, 1989.

On the same subject, a close look at **Figs. 5 and 6** shows the interesting way in which the shape of the sunspots altered, in a relatively short time, with the rotation of the sun. To enable these drawings to be made, at 0830 on February 27 and 1145 on the 29th, respectively, **Patrick Moore** (Selsey) projected the sun's image through his telescope on to a screen.

Monthly Observations

Before I launch into the monthly observations, it's time to pay a tribute. In the future, researchers will know a lot more about the range of solar and ionospheric activity that occurred during February 1992. This will be because of the records kept by dedicated people, about their own specific observations.

Such reports, published together in this and other scientifically-minded magazines, will show the general relationship, at that time, between sunspots and their effect on the earth and its complex atmosphere.

Solar Reports

At his solar observatory in Bristol, **Ted Waring**, reports that during February, by using the projection method, he counted 28 and 31 sunspots on the 7th and 24th respectively. In my view, it was the activity associated with the large



Fig. 2.



Fig. 3.

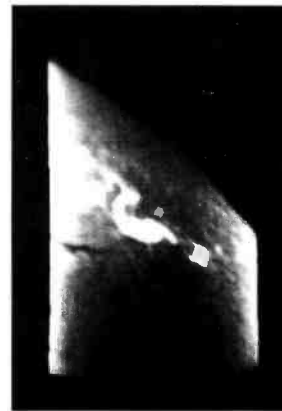


Fig. 4.

number of spots on the 7th, that was responsible for the extensive radio-blackout on the 9th.

The radio black-out became obvious from the 28MHz beacon logs I received from **Gordon Foote** (Didcot), **Henry Hatfield**, **Ted Owen** (Maldon), **Fred Pallant** (Storrington), **Ted Waring** and **Ford White** (Portland). The logs showed that hardly any international beacon signals were heard on that day.

Although cloud sometimes hampered his work, Henry Hatfield located two sunspot groups, and an active chain of spots near the west-limb at 1242 on the 15th, 2gps, 11 filaments, five small quiescent prominences and a small flare at 1005 on the 17th, 2gps, 11fs, five very small qps and two slightly active plages at 1245 on the 21st, 6gps (one very active), 24fs and 10 small qps at 1242 on the 27th and 7gps at 1302 on the 29th.

Richard Gosnell, (Swindon) reported a very large sunspot near the edge at 1600 on the 8th. **Tony Hopwood** (Upton-On-Severn) wrote "solar flare events" on the 1st and 27th.

In Edinburgh, **Ron Livesey**, using a 2.5in refractor telescope and a 4in projection screen, observed four active areas on the sun's disc on days 5, 6, 13, 20 and 21, 5 on the 10th, 11th and 22nd, six on the 3rd and seven on the 23rd, 26th and 28th.

Ford White observed two very large sunspots during the morning of the 26th, and Henry Hatfield's radio telescopes recorded individual bursts of solar noise, on 136MHz, on days 6, 7, 20, 21 and 23 and at 1297MHz on the 7th. Henry also recorded periods of continual noise, on 136MHz, on the 5th, 10th, 17th and 27th.

Auroral Reports

Ron Livesey, the auroral co-ordinator for the British Astronomical Association, received visual reports for February, of 'glows' during the overnight period on the 1st, 3rd, 7th, 9th, 11th, 25th,

27th and 29th, 'ray bundles' on the 1st, 2nd, 3rd, 9th, 26th and 27th, 'active moving storm' on the 20th and 26th, 'corona' on the 20th and 26th and 'all sky' on the 2nd and 26th, at various times from observers mainly in Northern England and Scotland.

However on the 1st and 2nd reports came in from Chicago, Ottawa and North-Dakota. "A proportion of our observations come from meteorologists at airports, the weathership *Cumulus*, the fishery protection vessels *Sulisker*, *Suliven* and *Westra* together with officers and men of the British Volunteer Observer Fleet reporting meteorological data to Bracknell," wrote Ron, in his monthly section report to the BAA.

Ron is also pleased to receive details of both optical and radio auroral observations from non-BAA sources. You can write to him at Flat 1/2, East Parkside, Edinburgh, Scotland EH16 5XJ.

Between them, **Tony Hopwood** and **Doug Smillie** (Wishaw) heard auroral reflected radio signals, at varying strengths, on days 1, 2, 3, 4, 8, 9, 10, 20 and daily from the 23rd to the 29th. **Gordon Foote** copied weak auroral warning from the German beacon DK0WCY (10.144MHz) on the 2nd and 10th.

Magnetic Observations

Magnetic observations, come from the various types of

magnetometers used by **Tony Hopwood**, **Karl Lewis** (Saltash), **Ron Livesey**, **David Pettitt** (Carlisle) and **Doug Smillie**. Between them, they recorded magnetic storms on days 1, 2, 3, 8, 9, 20, 21, 22, 24, 25, 26, 27 and 29 and often disturbed conditions on the remaining days.

Ionospheric Reports

Ionospheric reports start off with a look at TV! "Here's February's log, with Dubai and Iran putting in a daily appearance, on Ch.E2 (48.25MHz), via 'F2' propagation around lunch-time," wrote TV DXer **Simon Hamer** (New Radnor) on the 28th.

In addition, Simon identified signals from New Zealand on Ch. 1 (45.25MHz) at 0800 on the 8th and Australia on Ch. A0 (46.172MHz), China on Chs. C1 and C2 (49.75 & 57.75MHz) and Malaysia and Thailand, on Ch. E2, on the 12th.

Bob Brooks (Great Sutton) identified morning disturbances in the (upper) 'F2' region of the ionosphere, with his DX TV gear, almost daily between February 5 and 24. Although most of the pictures he received around Ch. E2 (48.25MHz) were distorted, smeary and unidentifiable, he did see subtitles and a caption on the 11th, a "crescent with a star" logo on the 17th and 18th and a "chess board" pattern and Arabic captions on the 20th.

Carl Bowen (Strelley)

reports strong, very smeary, signals on Chs. E2 and R1 between 0900 and 1000 on the 22nd and after 1000, a programme on Ch. E2, that looked like Dubai. Next day, from 0930, Carl reports seeing "smeary and ghosting" signals from the Far-East (possibly Malaysia) on Ch. E2.

David Glenday (Arbroath), saw pages of the Koran at 1420 on the 19th and **Andrew Jackson** (Birkenhead) received a test card from Iran TV on the 7th, Arabic and possibly South-American voices, below Ch. E2, on the 8th and Arabic writing early on the 22nd.

Lower down, in the 'E' region of the ionosphere, while short-lived sporadic disturbances were in progress, **Simon Hamer** received pictures from Iceland on Ch. E4 (62.25MHz), at 1230 on the 20th, and **Bob Brooks** logged test-cards from Denmark and Norway on the 20th and 24th.

Richard Gosnell heard multiple-echoes on the signals from Radio Norway (25.730MHz) and Deutche Welle (25.740MHz) at 0830 and 1220 respectively on the 15th. My thanks to you all for your dedicated efforts. These detailed reports, I feel sure, will assist our new readers and the many students of propagation alike.

Reflections

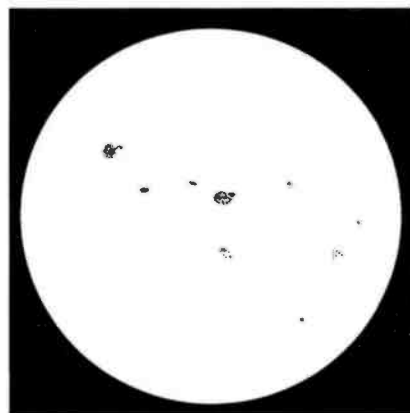


Fig. 5:
Sunspots, 27
February 1992,
0830.

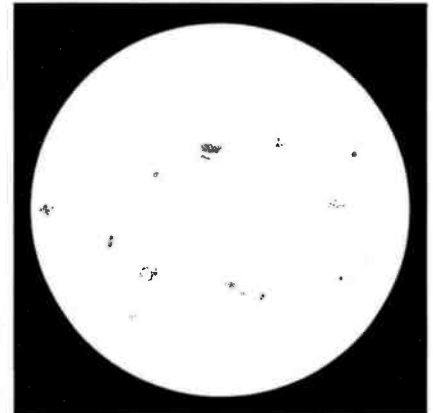


Fig. 6:
Sunspots, 29
February 1992,
1145.

PACKET PANORAMA

This time round Roger Cooke G3LDI provides news on the event of the year for amateur radio teledata enthusiasts, and reports on the interesting new PAKTOR system from Germany.

I'm pleased to report that there's now a confirmed date for the British Amateur Radio Teledata Group's 1992 Rally. This grand event is now planned for Sunday September 13.

The BARTG rally will be held at the Sandown Park Exhibition Centre, Esher, Surrey. The man to contact for further information is Peter Nichol G8VXY. His address is: 38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB. Tel: 021-453 2676.

Successful Rallies

Peter has organised the previous successful rallies, and tries to cater for a wide range of data interests, not just RTTY. This of course is the reason for the name change to the British Amateur Radio Teledata Group.

The 'T' originally stood for Teletype in the early days. In those days, I operated very loud and oily teleprinter machinery. But I must say that the old equipment had a charisma that doesn't seem to be shared by its electronic counterparts. Even so, I don't think I shall be changing the PC for a 7B!

New System From Germany

I'm pleased to say that with a little help from my friends, we've got some information on the new PAKTOR system from Germany. Preparing the information was interesting! Just as Reg G8QR had almost completed a translation from the original German, for me to include in the column, Frode LA2RL made the following available! However, Reg admitted that it was good practice anyway!

The PAKTOR system has some very interesting and useful features, especially as far as h.f. working is concerned. Using MSYS, I can appreciate the variable PACLEN according to retries, but varying the baud rate in the same manner is a major change. It will be interesting to see if PAKTOR becomes popular.

Short Description

As readers will no doubt be interested, I thought a short system description would be a good idea.



Roger Cooke G3LDI

Nowadays, AMTOR and PACKET RADIO (PR) have become rather popular ARQ techniques in amateur radio.

Nevertheless, concerning poor-quality channels, their performance is far from the optimum. The AMTOR system, matched to old mechanical teletype technology, represents state-of-the-art technology of some 20 years ago. This was when PR was adopted from the X.25 protocol for data exchange on high-quality telegraph lines.

For example, PACTOR (PT), was specially designed for operation in noisy and fluctuating channels. This is an improved half-duplex synchronous ARQ system combining the reliability of PR with the fixed AMTOR time frame.

Design Considerations

Let's have a look at the principal design considerations. The PAKTOR system comprises all important AMTOR or PR (two-way) characteristics:

Fixed timing structure and full synchronism to ensure maximum speed, fast and reliable change-over/break-in, required bandwidth less than 600Hz, 100% ASCII compatible (true binary data transmission) extremely low

probability of undetected errors (16-bit CRC), independent of shift polarities, no multi-user overhead in a narrow-band channel, inexpensive hardware (Z80 single-board), high operational comfort (built-in message storage system, etc.) listen-mode (monitor), FEC-mode (CQ-transmissions, etc.).

Novelty

As a novelty in Amateur RTTY, some additional powerful features have been realised. These include optional coherent mode, in other words, the system clocks are locked to frequency standards. (These can be, for example, DCF77, TV deflection signals and other high precision broadcasts, transmitted from Rugby MSF in UK), on-line data compression (Huffman coding), automatic speed change (100-1200Bd) without loss of synchronisation.

There is also fully acknowledged link termination (no QRT-timeout required), memory ARQ (even noisy packets can be restored).

System Details

Now it's time to have a look at some of the system details.

Timing: The basic PT transmission frame is very similar to AMTOR; blocks (packets)

containing data information are acknowledged by short control signals (CS) sent out by the receiving station.

Shift levels are toggled with every cycle, in order to support memory ARQ (see below). Since the shift polarity is clearly defined at synchronisation time, any conventions concerning 'mark/space' become obsolete.

Cycle duration is 1.25s
Packets 0.96s = 192 (96) bits at 200 (100) baud

Control signals: 0.12s = 12 bits, each 10ms long

CS-receive gap: 0.29s

Change of transmission speed only alters the internal packet structure; all other timing parameters remain constant.

Packets: General packet structure: G/header/20 (8) data bytes at 200 (100) baud/status/CRC/CRC/. Header: This byte enables fast synchronisation and delivers auxiliary information (memory ARQ, listen mode). Data: arbitrary binary information.

Status: system control byte (2-bit packet number, TX-mode, break-in, request, QRT). CRC: 16-bit cyclic redundancy check based on CCITT polynomial $X^{16}+X^{12}+X^5+1$, calculated over the entire packet (except header).

Control Signals (CS): Four CS are used. As a compromise between reliability and fast detection, a CS length of 12-bit was chosen. CS1: 4D5, CS2: AB2, CS3: 34B, CS4: D2C (all hexadecimal (to base 16) numbers, l.s.b. right). The mutual Hamming distance is 8-bit, thus minimising the chance of receiving a false CS. CS1/2 and CS3/4 form symmetrical pairs (bit reverse patterns). CS1..3 have the same function as their AMTOR counterparts; CS4 serves as the speed-change control. In contrast to AMTOR, CS3 is transmitted as head portion of a special change-over packet (see below).

Starting A Contact

When starting a PAKTOR contact, the calling station ('master') sends special synchronisation packets:

/head (100bd)/.address (8 bytes,

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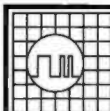
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The WX-2000 is a stand alone radio facsimile terminal designed to produce hard copy images from various facsimile services including Weather charts, Maps, News media and even Satellite pictures from NOAA, GOES and METEOR etc. The WX-2000 simply requires an audio signal from a shortwave or satellite receiver capable of receiving facsimile signals. The built-in high resolution (8 dots per mm) thermal line printer produces crisp images with high resolution. The WX-2000 is also capable of simulating grey scale which is ideal for Automatic Picture Transmission by weather satellites.

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Printing method: Thermal line printer 8 dots per mm

Printing scale: 2 (B/W) or 16, selectable

Paper width: A4 (210mm) x 30mm

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PACKET PANORAMA

100bd)/address (6 bytes, 200baud)/ Normally, the receiver only uses the 100-baud-section to achieve a fast synchronisation. The 200-baud-section supplies additional information about the channel quality: If it is received correctly, the first CS will be CS4, otherwise CS1 is sent.

In turn after having synchronised a CS4 or CS1, the master will continue with sending normal data packets at 200 or 100 baud, respectively. The first transmitted characters contain the 'system level number' (PACTOR software version), followed by the master address (callsign).

Changing Direction

In a similar fashion to AMTOR, the receiving station (RX) can change the transmission direction whenever it has received a valid packet. For this purpose a special change-over packet is transmitted, starting at the CS time frame.

The transmitting station (TX) will switch to RX mode immediately after it has received the CS3 which forms the first section of the change-over packet. It then reads in the rest of that packet and transmits a CS (CS1 and CS3 = acknowledge, CS2 = reject) timed at the last three bytes of the former packet frame.

To force a break in, the TX sets the BK-status-bit (this corresponds to AMTOR '+?').

Speed-Down

As a speed-down facility is only useful in poor conditions or at low data input rates (e.g. manual typing), both directions are treated unsymmetrically.

Speed-down: The RX may request speed-down after any incorrectly received packet by sending CS4, which immediately forces the TX to build up 100-baud packets (any unconfirmed 200 baud information is repeated at low speed).

Speed-up: Any valid packet may be confirmed with CS4, forcing a TX speed-up. In case the following high-speed-packet is not acknowledged after a number of tries, the TX will automatically perform a speed-down.

Contact Termination

Now it's time to look at contact termination. Cutting an ARQ link inevitably leads to the problem that information has to be transmitted

without final acknowledgement.

The PT applies special QRT packets, providing an expensive but rather effective solution. These packets contain an active QRT status bit, and the RX address in byte-reverse order (low speed pattern).

If this address is found during the standby synchronisation procedure, the RX responds with a single transmission of the final CS (the timing relations before standby are stored). This method will always guarantee a well-defined QRT.

Average Amount

Character frequency analysis of typical English or German texts, shows that the average amount of information per character does not exceed four bits. For that reason, ASCII text transmissions often carry a redundancy of 50%, which could be avoided by using a variable length code matched to the character distribution.

The most popular example of such a code is Morse. The PACTOR data compression mode applies Huffman coding with nearly optimum efficiency, yielding up to 100% speed gain. Every packet contains a compressed data string; character code lengths vary from two to 15-bits.

Conventional

In conventional ARQ systems, the TX has to repeat a packet until it has been received completely error-free. It's evident that the probability of receiving a complete packet dramatically decreases with lower S/N ratio.

The only way to maintain the contact in that case, is to shorten packet length and/or to apply error-correcting codes. This in turn, will greatly reduce maximum traffic speed when conditions are good.

The method chosen by WAA Research Group is to sum up corresponding bit samples of subsequent packets, and to test if the mean value (reduced to a 0/1-decision) passes the CRC. To keep quantising errors small, the samples are taken from the f.s.k.-demodulator low-pass-filter output by means of an 8-bit analogue to digital converter.

Assuming white Gaussian noise, this accumulation method - also known as 'memory ARQ' - will obviously converge even at a low S/N ratio. Furthermore, since shift levels are toggled with every transmission, constant interfering signals within the receiver passband

will not affect the resulting mean value.

To prevent accumulation of old request packets, the header is inverted with every new information packet, thus serving as a RQ indicator (similarity test).

Monitor Mode

The listen or monitor mode resembles packet radio monitoring. In this, the receiver scans for valid packets which are detected by CRC match.

This 'brute force' method was chosen in order to ensure maximum flexibility, although it consumes a considerable amount of the available c.p.u. capacity.

Bulletin Transmissions

The CQ and bulletin transmissions are supported by means of a special non-protocol mode. Packets are transmitted with one or more repetitions; with the CS receive gap omitted.

Since the listen mode does not require synchronisation, the transmitting station possesses great freedom of selecting packet repetition rate and speed.

Bread Board Programs

The first PACTOR programs were running on 'bread-boarded' Z80 single-board computers. These early experiments led to the development of a stand-alone 'PACTOR-Controller' with built-in modem and tuning display.

The conventional operating modes, BAUDOT and AMTOR, were added in order to maintain compatibility and (what might be more interesting) to allow easy comparisons. Assuming typical conditions, PACTOR traffic can be expected to run four times faster than over an AMTOR link.

Development And Testing

After a long period of development and testing, the hardware for PACTOR, as presented in the German magazine *CQ-DL* (November 1990), is now available. The PACTOR Controller (PTC) consists of two boards, the main-board (100 x 160mm) and a front panel. The PTC has the following features:

* Modes: PACTOR, AMTOR (ARQ, f.e.c., Listen), RTTY.

- * Special features of PACTOR: Error free data transmission, four times faster than AMTOR
- Complete ASCII dataset on one level available
- Memory-ARQ, bad data packages are restored
- On-line data compression (Huffman Algorithm)
- Automatic speed adaption depending on r.f.-conditions (100 baud, 200 baud)
- Unproto mode (f.e.c.)
- Listen mode (to observe PACTOR QSOs)
- Identification in c.w. every seven minutes and at QRT
- * Connectors: RS232, power, transceiver
- * Power supply: 9 - 14V d.c., 200mA
- * Developed in c.m.o.s./h.c.m.o.s. technology as far as possible
- * Digital tuning control: eight l.e.d.s.
- * Comfortable status display: 12 l.e.d.s.
- * Demodulator with analogue to digital converter and switched capacitor filters
- * Easy calibration by software support
- * Lithium battery buffered realtime clock
- * Automatic Logbook function, battery buffered
- * Build in PMS system (personal mailbox), also battery buffered.

Mode Developed

The PACTOR mode has been developed by DF4KV and DL6MAA, the whole PACTOR Group also includes DL3FCJ, DL2FAK, DLLZAM, DK5F1I and DF4WC.

Ordering conditions: A PTC can be delivered completely assembled or as a kit including all parts.

PTC assembled and calibrated \$390
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Payments are due in advance.
Address all orders to:
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GERMANY

I hope you found the news on PACTOR interesting, and no doubt we'll be hearing more from Germany soon.

So, that's it for another month. News, comments and pictures to G3LDI @ GB7LDI, QTHR, Tel: (0508) 70278.

Return Of OSCAR 21

After a long absence due to lack of uplink commands, brought about by a 'strike' of the main satellite commanders, OSCAR-21 (also known as RS-14) is back on the air. The familiar sounds of the strong 145.800MHz digital telemetry, first re-appeared on March 14. The next day, this was followed by a frequency switch to 145.838MHz, after which on came the 'RUDAK' and the analogue transponder.

The transponder is extremely sensitive, and it has a very strong downlink. On test, just 100mW of 435.910MHz c.w. or s.s.b., came back as a 16dB over-the-noise signal on 145.880MHz.

The first QSO on the born-again RS-12, was made between myself and Ron Pearson G3CAG, who lives in Milton Keynes.

Successful MIR Contacts

Many readers have reported successful speech f.m. and packet QSOs with U4MIR and U5MIR, and the mailbox aboard. John G6SVJ, wrote: "I have been very lucky, and worked both Sergei and Alexander during one pass!

"I had a contact with Sergei on orbit 34754 at 1841UTC. My wife asked if I was going to contact them again, to which I replied that only if she could think of a good question to ask, as I don't agree with calling

them just to hear your callsign coming from MIR on every pass, giving others a chance.

I called Sergei at 2017 and got an instant reply, and said "Hi Sergei - when will Alexander be using the microphone? Over". The reply was "Sometime", but within two seconds, MIR transmitted again, "G6SVJ this is U4MIR". So commenced my first QSO with Alex!"

Strange Articles

The strange articles about the

MIR space station printed in the British and American press such as "...a lone seriously ill cosmonaut marooned in space, in dire need of food supplies and medical assistance with no hope of relief..."

Here's another example: "... the MIR space station is falling apart due to lack of maintenance ..."

And yet another: "... secret arrangements are being made to land MIR in the USA ..." (!). These are further examples of the current spate of highly irresponsible 'journalism', intended to sell newspapers by artificially created sensationalism, rather than to inform and educate readers with the truth.

The cosmonauts, Commander Alexander Volkov (U4MIR) and Mechanic Engineer Sergei Krikalyov (U5MIR) heard from radio amateurs, the content of this 'news', and reacted with a mixture of amazement, annoyance and disbelief.

Although they have had a few problems, such as a reduction in the space walks, and other parts of their research programme including a reduction in the number of tracking ships, all was well with the crew and the station itself.

New Crew

On March 17 at 1022, the SOYUZ-TM-14 space ferry lifted off from Baikonur. The ferry was taking the new crew, including Commander Alexander Viktorenko U9MIR, Engineer Mechanic Alexander Kalery U8MIR, and guest cosmonaut Klaus-Dietrich Flade DP0MIR into 'Mission-92'. Docking was achieved on March 19 at 1130UTC.

To go up with TM-14, the German Space Agency and DF0VR produced a digital synthesised speech system. This may either be programmed to a variety of tasks.

The synthesised system can transmit a message containing information about various amateur radio activities and experiments carried out by the crew. These can be sent from a digital memory through a beacon transmitter, or to operate as a store-and-forward speech repeater.

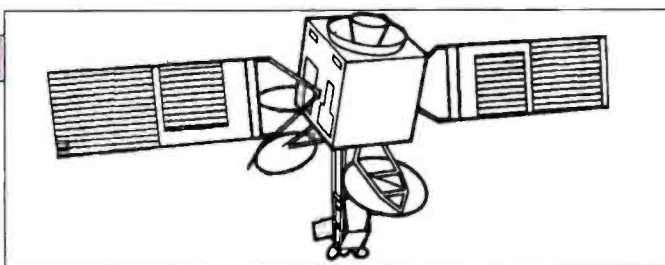
In the store-and-forward mode, the system records calling amateur f.m. stations for one minute, and in the following minute the stored data is re-transmitted through the beacon transmitter as synthesised speech. It's hoped that storage space will permit the continuity of this facility on all future missions.

After carrying out 14 experiments, Klaus DP0MIR together with Sergei U5MIR and Alex U4MIR, returned to earth in SOYUZ-TM 13. They landed safely in Kazakhstan around 0800UTC on March 25.

Following the mission, Leo UA3CR is suggesting to RSF that for posterity they retain their callsigns for terrestrial use. This would be rather in the same way that Ernst Krenkel kept his icebreaker ship's callsign 'RAEM'.

The two new 'Alex' amateurs, will remain aboard MIR until their return to earth in SOYUZ-TM 14 on 9 August 1992. Their main tasks will be to continue the series of scientific experiments, and also carry out some repair work in and on the space station.

Both the new crew have



Satellite Scene

by Pat Gowen G3IOR

This month Pat Gowen G3IOR, welcomes the return of OSCAR-21, shows a photograph taken by OSCAR-22, provides news of the latest amateur radio manned missions, OSCAR-13 DX, takes us to the RS3A command centre, and tells the truth about April's direct robot QSL story!

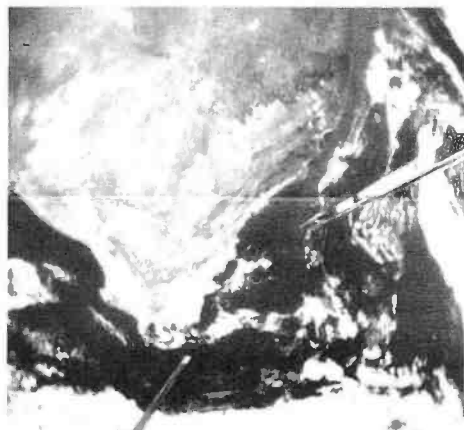


Fig. 1: From Dave Hulatt G4WFQ of Huntingdon, comes the snap-shot of ZS-Land, taken by the charge-coupled device (c.c.d.) camera onboard OSCAR-22, alias UoSAT-5.



Fig. 2.



Fig. 3.



Fig. 4.

Russian nationality, although Viktorenko was born in Kazakhstan and Kalery in Latvia.

Alex Viktorenko, who manned MIR before them from late 1989 to early 1990, only occasionally activated his callsign U9MIR on 145.550MHz f.m. Alex Kalery was very keen to join the mission. He has been waiting for his MIR trip for a very long time, having been a back-up crew member on several occasions, but without the opportunity to go to MIR.

Next Crew

The next crew going to MIR, will be the CIS's Solovyov, Avdeyev and the visiting French cosmonaut Michel Tognini or his back-up Jean-Pierre Haignere. They are planned to be launched in SOYUZ-TM 15 on 26 July 1992.

Viktorenko and Kalery will return to earth, together with the French cosmonaut on August 9. Anatoly Solovyov worked in MIR for several months in 1990, but this mission will be Serge Avdeyev's first 'flight'.

The crew have completed their amateur radio training with UA3CR. Experiments are expected to continue with the future crews' amateur radio activities from MIR including f.m. 'phone and packet radio in the 144 to 146MHz band.

The communication specialists at the MIR Control Centre TsUP, are known to be very enthusiastic with the results of the packet radio activities of the MIR crews. As a result, they have now started to use the packet radio equipment for the data transmission link between MIR and TsUP. It's gradually replacing the old 50baud 'Stroka' RTTY equipment.

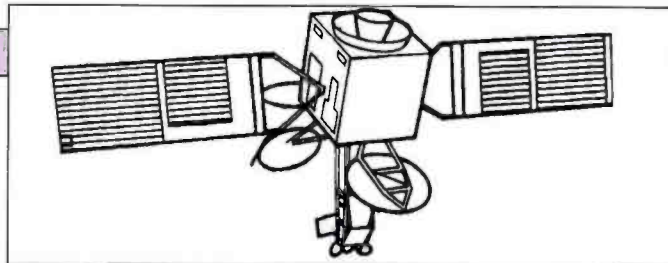
Shuttle Missions

As I write this column, the STS-45 *Atlantis* mission manned (and womanned) by N5WQC, N5WQW, ON1AFD and Kathy Sullivan N5NYY, has been placed into a 57° inclination orbit, which takes it right over the whole of Europe.

Hopefully, many amateurs will have made effective QSOs, penetrating the huge European pile-up, on one of the four newly-planned Region 1 uplink frequencies of 144.700, 144.750, 144.800 or 144.850MHz.

John's Delighted

John G6ZQE, of Wymondham, Norfolk, was delighted to work FO0CI, operated by Arie PA3DUU from the very rare Clipperton Island (QSL via N7QQ). He also worked VP25E by WB6LYT and KK3K (QSL to the home call), but sadly, he missed



VP2V/KK3K.

Also on, or coming onto the satellite are other 'rarities' such as: V31DN, 3D2RR by Lew, K0RR (QSL via WB0WAO), ULJUM8MM by Vlad (QSL ES1RA) and VK9Y by VK9CK and VK9CL (QSL F61MS). Late breaking, and updated A-0-13 DX-information, is always available from several DXers on OSCAR-13 itself on a downlink of 145.890MHz.

New Fund

From Andre ON1AIG, comes information on the setting up of the ESDX, the European Satellite DX fund. This was founded by Jeff GW7BGA, Alec GW1MNC, Hardy DC8TS, Bernard DG6MGP, Jussi OH5LK, Frank ON1ACN and of course Andre ON1AIG himself.

The main purposes of the foundation are to provide material assistance. This will include transceivers, antennas, power supplies, linear amplifiers, pre-amplifiers and low loss feed-lines to DXpeditions operating through the satellite(s).

Additionally, the fund will sponsor air-freight for the equipment that the DXpeditions are taking with them. It will also support training for the operators going on such DXpeditions to help familiarise them with satellite operating, to supply reliable azimuth and elevation tables for the period of the operation and to handle the QSL cards.

The new fund will phase-in, and co-operate with the American Satellite DX-fund managed by John KL7GRF. However, it will mainly support DXpeditions departing from Europe, with logistics and in the field of fund raising.

Andre points out, that it will be far cheaper for European operators to send their QSL cards direct to the ESDX, rather than to a distant country.

Although the response will be far faster than via a bureau, the service is aimed at QSL cards for the expeditions that the European or American DX-fund supports. The ESDX does NOT intend to act as a bureau for day-to-day satellite QSOs.

If an s.a.e. is included, QSLs will come direct to you. If not, they'll be sent to the QSL bureau of your country, so cards, even via the bureau, will arrive much faster.

If you need more details, contact one of the founder stations

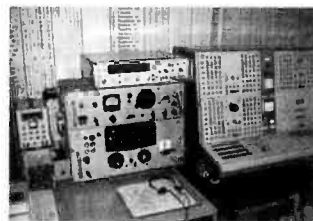


Fig. 5.

(named above) on OSCAR-13, who will be found normally on a downlink of 145.890MHz. If you wish to send your voluntary contribution in any form please address it to: European Satellite DX-fund, PO BOX 26, B-2550 Kontich, Belgium.

Satellite Snap-Shot

From Dave Hulatt G4WFO of Huntingdon, comes Fig. 1. This is a snap-shot of ZS-Land, taken by the charge-coupled device (c.c.d.) camera onboard OSCAR-22, alias UoSAT-5.

The image was taken at 0845UTC, on 29 February 1992 when the spacecraft was over a sub-satellite point of latitude 33° south, and longitude 22° east, just east of Cape Town.

Dave downloaded the image at his station near Huntingdon. Using software tools written by NK6K, he was able to convert the signals into a standard image format called 'GIF'.

The UoSAT-5, as it is also known, was launched on 17 July 1991. This satellite incorporates lessons learned from previous UoSAT c.c.d. experiments.

The image gathering equipment has a 110° wide-angle lens. This provides a field of view only slightly smaller than the satellite footprint itself. Resulting images measure 1600 by 1800km.

The image array itself measures 578 by 576 pixels, providing ground resolution in the order of 2km. Each pixel is eight bits, giving a black and white image with 256 levels of grey.

Station Visit

Keen satellite enthusiast Olle Eckblom SM0KV, recently went with Leonid Labutin UA3CR to visit the RS-10/11 and RS-12/13 command station near Moscow. He kindly sent the following photographs for us all to see.

The photograph Fig. 2 shows satellite station 'head' Andy



Fig. 6.

Mirinov, demonstrating to Olle (foreground) how the system works. In the picture, looking from left to right in Fig. 3, is Andy, Olle, with Leo UA3CR explaining the logging, and Andy's helper at the station.

Shown in Fig. 4, are the same people. Leo is showing Olle some of the RS satellite photographs, that have been taken since the days of RS-1.

The photograph in Fig. 5, is a close-up view of the station's receiving and frequency measuring equipment on the left, with the main satellite command console on the right.

At the time of writing, the future of RS3A and the RS satellite programme is still uncertain.

However, one very well known amateur satellite enthusiast (who has asked to remain anonymous) has already offered a handsome sum to help to keep things going.

The photograph in Fig. 6, is Olle's shot of the *Vostok* launch vehicle, used to put the RS satellite series into space, being hoisted into place.

Direct Card Spoof

To the many who failed to get their QSL card directly delivered from RS-12, and to the two readers who claimed to have done so, and especially to the many who spotted the give-away clues, the answer is YES, the RS-12 Robot direct QSL facility experiment was an April 1 spoof!

Sorry about that readers (He isn't really sorry readers! Editor). I just couldn't resist it! You will never believe anything I write again! However, we'll return to satellite sanity next month. It's then I'm intending to answer one of the main questions on what you need to get started on the amateur satellites.

See you next time!

People always tell me that discretion is the better part of valour. Despite this advice, I'm afraid I have never been able to hold my tongue when I thought something ought to be said!

For this reason I'm taking this opportunity to express my concern about the way our ATV hobby is going. As it happens, these concerns are not mine alone, and the same opinions have been expressed very graphically by two other amateurs. I challenge you to disagree with me, and put up a more convincing argument.

Growing Old

We all know that amateur radio is growing old. The hobby is so old that in the United States, the highest proportion of radio amateurs are around or past retirement age. Amateur radio is not attracting young people as it used to.

With ATV, the situation is just as bad. Look at our own BATC committee. It's formed by the same 'old' people, year in, year out.

Everyone on that committee is dedicated, but we're not getting any younger. Some of us no longer even have the time to go on the air, which makes me wonder how representative we can be. Is there really no-one younger and more in touch, who would like to help make the decisions which keep our club and specialised mode going?

Developed

Why is it, even with the technically most developed and most demanding of all the amateur radio modes, we have a struggle to attract new members? People used to blame the cost of the equipment, but now you can hardly give away used video gear. There were plenty of TV transmitters under £100 at Harlaxton last year.

Bill WA6ITF, thinks it's the people on ATV that are the problem. Not to put too fine a point on things, he thinks they're boring! In fact, Bill thinks ATVers are the worst advertisement for amateur television, and I think he's got a point.

In the 'olden days', any amateur who was sufficiently competent to produce and transmit real video, was considered a genius. Genuine

FOCAL The World of ATV POINT

In his bi-monthly view on the world of amateur TV, Andy Emmerson G8PTH takes a hard look at the hobby, and decides it's time he shared his opinions on what's wrong with the hobby. Over to you Andy!

technical ability was required, and this earned a lot of respect, regardless of what was actually being transmitted.

Nowadays things are different. Any fool can buy a video camera and hook it up to a transmitter.

I've already said you can pick up the equipment ready-made for a song nowadays. So, nobody is going to be impressed with video for its own sake.

Yet, what do you see on ATV most of the time? A static interior of a shack, or worse still, computer graphics!

Slide Show

If you're lucky when you're watching ATV, you'll get someone's slide show or home movies. The only snag is that you saw them last week as well. What a waste of spectrum! How can ATVers legitimately claim they are making valid use of the bandwidth?

Bill WA6ITF says: "I have to tell you that every time I bother to tune in on local ATV and see the same crapola that I have seen for the past 15 or 20 years, I can easily understand why a ATV is such a transient mode. It's attraction wears thin very quickly, and the ham who was so gung-ho in September has gone off to packet or back to his f.m. repeater by January."

What Can Be Done?

Continuing his thoughts, Bill wrote "So, what can be done to turn this around? Here are some ways:

1. Openly solicit and print articles on basic TV production using home video gear.
2. Solicit and print articles on professional TV production: how shows are written, how to edit, proper camera and shooting technique.
3. Solicit and print articles

from those of us who produce and direct the ham videos.

4. When new ham radio-related videos come out, review them for content and interest.

5. Solicit and print articles about broadcast and film professionals who are also ATVers.

6. Consider writing and publishing an ATV show production handbook.

7. Run an annual contest for the best ATV shows - hold the ATV Emmy awards - tape around to all ATV repeaters.

8. Form a national ham radio news bureau. Solicit tape of major ham happenings and produce a monthly 10-minute video news review."

Thousands Of Ideas

"There are probably tens of thousands of other - and maybe even better - ideas, but sitting up at 2am and with this 'flu' bug it is hard to think of them. Suffice to say that ATV can be made interesting to a lot more hams if it offers a bit more than Pete's parakeet and Mary's sewing box. Until it does, I am afraid that I, and a lot of others, will watch satellite TV instead. It's your deal, 73, Captain Betacam." Bill WA6ITF.

Solitary Occupation

I find it difficult to disagree with Bill's comments. Another problem is that ATV seems to be a very solitary occupation, though that may reflect its limited appeal.

Of course, there are some excellent TV repeaters, which have been constructed by some very worthy groups of motivated people, but let's be honest, don't some of these repeaters exist in name only now?

I haven't received a report mentioning the repeaters at Bath, Hastings, Leicester,

Crawley or Stoke-on-Trent for years! Do they even exist any more?

And the problem is not confined to the UK either, as **Hans HB9SVW** from Switzerland confirms. "Team spirit is a funny thing," he says, "Everyone wants to benefit from the improved facilities of TV repeaters, but when an extra pair of hands is needed to repair them, nobody can spare the time".

"And why is it that so few people understand you cannot erect and optimise antennas by remote control from a warm parlour? All some people can do, is crack jokes over two metres".

"But now here's the most important point in my view, namely that people are generally so ignorant about the technicalities and possibilities of their chosen mode. This doesn't seem to be the case with packet radio."

Own Experience

It was interesting to hear an opinion from Switzerland. My own experience suggests that many people in ATV do have a very good idea of what's going on inside their equipment, but not all do!

In some respects, this is the result of our own publicity ("look how easy it is to get on the air with ATV"). Manufacturers producing ready-to-run transmitters, are hardly going to say their equipment is tricky to use, even though they assume users have some basic knowledge.

I used to get very upset with the people on 430MHz a.m. who said they did not need a 'scope to detect the linearity of their signals. They would add cascade a MM 50 or 100W amplifier behind a 10 or 20W vision transmitter, and then wonder why they got worse video reports when the amplifier is switched on!

Frequency modulation on 24cm is a lot more tolerant on non-linearity, but I do wonder whether people who use unmodified satellite receivers, realise they could get far better results. Oh well!

So why are ATVers their own worst enemy? Are they really hell-bent on boring each other to death, or are they drifting from the hobby from apathy? Is anyone still reading this column, or should we pack up and admit defeat now? What do **YOU** think?

R7

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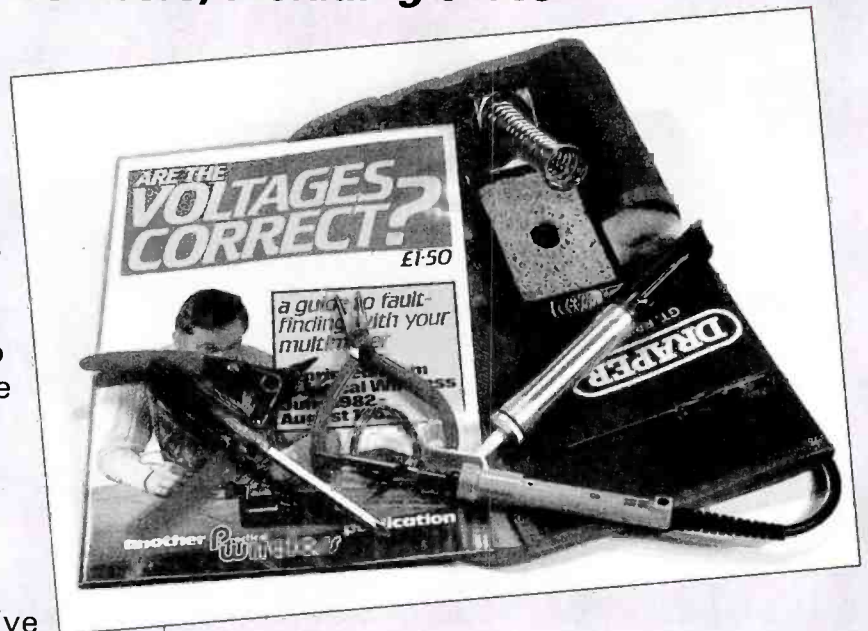
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For Sale IC2E + new c/case, charger, v.g.c., £115. IC2A c/case, g/cond, £85. Bearcat BC50XL, as

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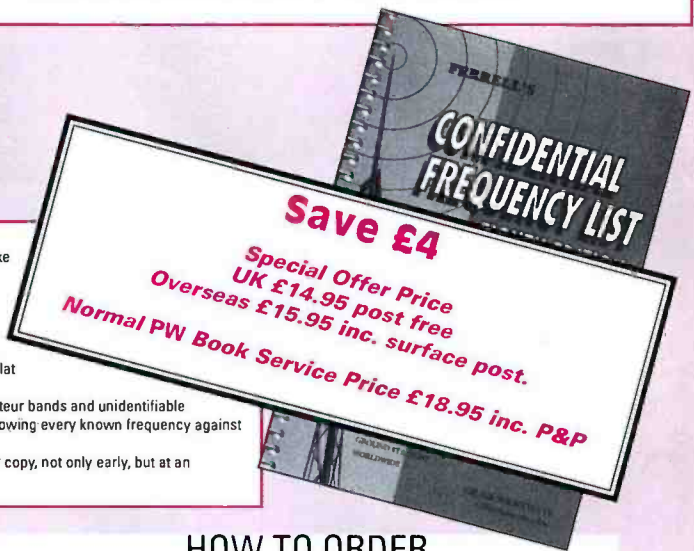
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Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

I must send a great big thank you to all those valuable bulletins for their information, including: *Contest Calendar*, *DXNS*, *TDXB*, *The Canadian Amateur*, *The DX Magazine*; also to those who responded to my anguished cry for early letters, because of a shorter deadline this issue.

Novices

As I'm writing this month's offering, another group of novices are awaiting their exam results, including our first local batch. Please remember your own 'New Chum' days, and give the novice lads and lasses a shout if you hear them, whether at h.f. or v.h.f. They are the DXers of the future!

Conditions

When it comes to conditions, it was an odd sort of month. I find it doubly irritating when I switch the rig on, and find that the bands are all on the go, only to lose everything under that familiar S8 roar of rain static. However, on the other hand your letters indicate that overall, things weren't too bad at all.

The Awards Manager of the UK Six Metre Group wrote to advise me of the Summer Sporadic-E Contest on June 6. Throughout the 24 hours (UTC) of this date, get on the band and work two-way, or if countries not having 50MHz allocated are about, you can work them cross-band!

Observe your licence conditions, and if the QSO is Eu-Eu, then keep out of the 'DX window' between 50.110 and 50.130MHz. Exchange, callsign, RS (T), membership number if you have one, and Maidenhead Locator (only four digits required); no serial numbers.

Score one point per contact, plus one more point if the other station is a UKSMG member. Multiply the sum of these, by the sum of the total number of countries and the total number of squares. One contact can count for both a country and a square.

Any reasonable log will be accepted, but the official log sheets are preferred. They are obtainable by sending a large s.a.e. to Maureen Wright GW8ZCP, 6 Cwm Eithin, Wrexham, Clwyd, Wales LL12 8JY. Please post completed entries no later than July 8, to the same address.

When it comes to awards time, there's the G8VR Cup for the UK winner, and a goblet for the 'Rest of

the World' winner. There are also certificates to runners-up and section winners.

Categories are: Single-op fixed stations, s.w.l., and 'all others' including portable and multi-op.

Islands On Air

Islands on the air chasers will be pleased to know that W1/G4DZC, KC1YR, KA1USL and N1BRM will be on Nantucket Island, NA46 Massachusetts Group, over the weekend of May 29/31. Activity on the h.f. bands, 50MHz, and 144MHz, though the latter hardly concerns us!

The Aves and Clipperton activities seem to have pleased lots of people and provided many operators with a new one. A big thanks for putting them on the air, and everyone should be pleased at the group's efforts.

The 14MHz Band

For a change, let's make a start this time with 14MHz - the band where it is all said to happen! Leading off is Don GM3JDR, in Aukengill, who wrote that the band wasn't used all that much but DU3HF, 4K3/UW10G and VK6VK were duly booked in on c.w.

I've got a first report from Dechlan EI9HQ, in Co Dublin. Dechlan passed his test on February 14, and had just three weeks on the band, with 25W and c.w. only for the first year. On 14MHz he worked IKOPRG, SM6MDX, DL2JX, LA5UK, UV3QU, OH5NO, EA3GGG and OK1AQN.

In Stevenage, Angie G0HGA used 5W during the ARRL DX CW contest to work a string of US states, while outside this and with normal power output, NK2U, WA6AJB, N9SW, W9AND/4, WG3U, UL2TB, VE1CH and 5A7LB were all raised on the key.

Another one to play the low-power game is Leighton GW0LBI in Trelewis. Leighton stuck to his key and was rewarded by VE0MMZ/W4, W3GG, KG1G, KF8QE, plus milliwatt contacts with GM3XUW and YU7BCH.

Over the water now to Mervyn GI0PML in Ballymena. Mervyn has some very pertinent comments when he notes that while his contacts may seem mundane to many, he runs low - or very low - power most of the time.

In addition, Mervyn has been dipping his feet into the c.w. waters and finding it great fun. The 14MHz

list includes OK1BLC, SM5CBC, SM3AKG, DL40BJ, DL2DRR, ES1ED, ON5NI, CU2QN, DK5TM, DL9GUN, HB9LI, IK2OAH, DL1BS, RX3ADI, UZ4FXI, OE5UKU, SP7BCA, IK2OCJ, EA1BSU, ISNZR, UT4JWJ. Turning to s.s.b. we find Y55PG, RX3ADI, LA5GC, CQ0VY, UZ4FXI, GM3FJA, YL2KF, SP7HIW, YT2MZ, DL0EH, IK6QRH, UB4CG, HX3LY, FF1IPA, RW3PW, ON4VT, EI2HI, GW3FDK, SM3AT, FE5TI, SM5GA, SM0KER, DL7VCW, LY3BA, LY2ZO, UA6JD and RB5GI.

Just nicely in time, the letter from Pat ON7PQ in Kortrijk; Pat keyed with VK4WUU, FG/DK7UY, YX0AI, KC6/WV5S, JW0GB, KC6VV, FK8FS/50USA, 6W6JX, FK8FG, VP2MAX, FS4PL, C56/GM3YOR, KC6VV again, 9J2S, BY4W, KK6RT/KH0N, F00CI and HK0NAF.

Now I turn to the 'sideband king', namely Don G3NOF in Yeovil. Don spoke to C31SD, HS1CHB, HZ1MM, KC600, NL7BY, N9MDW/5N6, T30A, UJ8JJ, V73AZ, V85KGP, YB0HX, YX0AI, 5H3DC and 9M2BA, all worked between 1600 and 1900Z.

It was sideband this month too, for Mary G0NZA, in Kirkby-in-Ashfield. Mary worked 3A2LU, VK6NC, VP2E/P/DK7UY, VK4WUU on Bribel Is, IOTA OC 137, QSL via DF2UU, SV8/SM0TXM (Paros Is, EU 067), VP2M/G4KTP, VK3AQI, VK3ANT and NP4RC.

Ted G2HKU is, as he puts it, not back to S9 yet, but he progresses. To prove it, he picked up the microphone and raised VU2JJQ, 9K2RA/NLD, 9K2US/NLD, 9K2JH/NLD and 9V1XQ. The /NLD was a suffix for National Liberation Day.

New Chums

Don't forget we were all 'New Chums' once! Dechlan EI9HQ, our new correspondent is still in the 'New Chum' stage. Unfortunately, he's finding it hard going when people come back to him too fast on the key.

Please give the newcomers a chance, after all, it's pure bad manners to go back to a 12 words per minute, signal at 25w.p.m. Anyway, a little courtesy never hurt anyone!

The 7MHz Band

Some love 7MHz, some hate it! Don GM3JDR likes it, and to prove it he keyed with ZL2RA, ZL3ABV, ZL2UV, ZL1AZE, VK3YD, VK3BYE, VK7RQ, J37M, H18A, JW0C, 3X0HNU, CX1BBL, UW1ZC/JW, EM3W, C08RCD, CM2AF, C02MA, C02VG,

GW3INW/HK3, UZ0AB, UA0JB, UA9JXX, PY6X0, PY1WAS, PR7P0, PU2F0N, PY8AQL, PY4ZO, PY8RR, PY1AIM, PY1BYK, PY1SA, PY7MG, PY1DZV, PP5MN, 9N1MM, 9N1HMB, YV5CBJ, J79DX, VP2EY, LU1EPQ, LU2BRG, YV4AU, TI4CF, OA4AMM, 4K4/UA1ZFQ, K6GWN, K7LJ, N7MC, K7ABV, K6DC, K6RK, W6JZH, WA6BMB, K6RG, K6DT, K7R0, N6TV; all the Ws by long path, 1400-1500UTC.

Dechlan EI9HQ tried it out, and keyed with NV7N/MM, G3UEH and FB1SZ.

Next Angie G0HGA; who is another c.w. addict, and the mode netted her PY1CE, WA1FXB, VP2V/W2GUP, A92DQ and UA9JJX.

The key is the only mode at Pat ON7PQ, where 7MHz yielded YX0AI, PA0CXC/ST0, K6/WV5S, XE1/JA1QXY, C56/GM3YOR, FY5FY, A41JZ, TI2CCC, JT1CS, FM5BH, VP5/K06WW and AP/WA2WYR.

Although he made only one contact, John G3BDQ is still cross about the band! He heard the Clipperton expedition on c.w., here on the evening of March 6 but couldn't hook them. If you must have a 'gotaway', do it in style seems the principle here! However, YS1AG was a new country for this band.

As for Mervyn at GI0PML, his QRP rig - sometimes as low as 10mW - was tried in both modes on 7MHz, and the signal was shown to be covering the whole of UK and Europe nicely. It's a pity that although Mervyn mentions his inverted-V for 21MHz is in the loft, he doesn't say what he has for the other bands.

From Worcester Park in Surrey, Eric G0KRT runs a Lake DTR-7 at about the 1W level, a Lake TU2 a.t.u., 26m top and either a quarter-wave or a 5m counterpoise. This very basic set-up managed ON4KAR, GD0LQE, OF7EU, DL1TP, DL0EBV, DL2MAG, DL2XW, DL3YD, OL5IAH, F1JGA, F6ACD, EC1DGK, IK2ERA, IK2SHA, IK3EOT, IN3MTA, OZ2JI, PA3FSY, SM6DGE, OK1JJF, UA9CM, UA9BN, UB5RJ, UC1WWW, UC2OAZ and YL2UZ. Interestingly enough, whatever was worked with the quarter-wave counterpoise was equalled by the 5m version, which is intriguing.

As for Ted G2HKU, he keyed with EA6ZY, UH8EA and ZA1TAJ.

The 1.8MHz Band

Not a lot in the way of reports on 1.8MHz this time around. John G3BDQ seems to have more or less deserted the ship, though he did try

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a bit of s.s.b. for I3QJZ, IR4T, IK5EPU, OK1DXS, HB9JAP, OE2FBN, EA3ALD, EA3CWK, UZ2FWA, UB3IDX and IV3PRK.

A new reporter is **Martin GW00UV** in Trelewis, where he sits on 1960kHz with some 61m of wire and an FT101E. Martin made contacts with G3JJJA, G3YXM/M, G3AZT, G2FFN, G14ERM, HB9JAP, G4VQH, G14ERM, DL7UCW in Berlin, GM4JEC in Orkney, GM0JFB, GM0HIG, G0NEV and G0HND, all one assumes on s.s.b.

Also in Trelewis is Leighton GW0LBI who also has a 61m wire for this band, but put c.w. into it to raise EA3KU, GD4BEG, G4DBN, DJ8WL, plus s.s.b. to DL7UCW, E19FK and HB9CXZ.

Finally for this area, Angie G0HGA has a 'nil' report, and there's only me who managed to miss every one of my skeds on the band!

The 3.5MHz Band

Ladies first this time, as we look at the 3.5MHz band. Angie at G0HGA raised UL7JW, UA9CM, Europeans, and W10X at 0020z, for a 579 during the big aurora on the 21st.

Still sticking with the low-power, Leighton GW0LBI notes that he keyed with GM4EWM (who was also QRP) G0GZN and PB0ALG.

From Kortrijk, Pat ON7PQ baited his hook with dits and dahs to put the following into his keep-net: KP2J, VK5AFO, J37M, T14SU, YX0AI, UA1A/N72X, PA0CXC/ST0, 6V6JX, 8P9DX, JJ1VKL/4S7, 9M2AX, VE6SV, H18A, PJ9JT, VK6HD, 7P8DX and 9K2ZZ.

On to GM3JDR, who raised JA7IUJ, JA1CGM by long path, J79DX, W5QN, WB4FDT/5, PJ2AM, C08DY and OX3CS.

The WARC Bands

We'll soon have to think of a new name for the WARC bands! For a starter, **Vince 9H1IP** (M'Scala, Malta), who used sideband to find (18MHz) K6SMF, VP5/KF80Y, FS/JE2HCJ, ZL2AAG, AC8W/AHO (Saipan), ISOPFD, C08LY, YV3AZC, J8/G0OPX, 4U1ITU, FK8GK and YX0AI, while on 24MHz the net closed around V27A, FS/JE2HCJ, UI8QU, VP2EST, CP1FO, XE1ENK at 2300z, HK0/HK5JPS (San Andres), VK9XN (Christmas Island), 9M2AX, 7Q7XX, C08LY and YX0AI for Aves.

A late letter from **Andrew G3VWC** in Bath indicates he is keeping Prof Murphy at bay, so has been able to key with VK7AAQ, ZC4CZ, KL7U, WN3T, EA8AF and RA9MQ.

Mike G0KDZ (Thirsk) sticks to 10MHz c.w. and notes that in the couple of weeks before his letter conditions had been superb, with rows of USA stations to be worked, and marked sleep deprivation as a result! Mike raised replies from J8/G0GPX, ZL4HB, VQ9RS, V2/VE5ERA, C06CG, UJ8S, JA0AWF, JJ1LWV, FY5YP, 4K2CC, 4K2MAL, OY9JD, K6VX, W7ZQ, W7EXR, W7VY, U0AG, 8P9DX and K6XT.

For Don G3NOF the month was memorable in that the F00CI Clipperton expedition filled in the last gap to give him a 'full house' of current DXCC countries.

On 18MHz there were F00CI, YX0AI for Aves and 3D2AG for Rotuma, while on 24MHz we see EA9UA, FR5ZU/T (Tromelin), HK6HFY, ISOPFD, J42MAC (=SV), K7BTL (Nevada), O60MHT, P40MR, S79KMB, T77C, UH8EA, UM8MBA, VE7IM, VK6AZL, VP2EST, VS6CT, XE/DJ60V, XX9AW, YB2ARO, YB0WWL, Y11AZ, Y11RM, YX0AI, Z21HJ, 4J7GWW, 6Y5EW, 6Y5/K6JAH, 7Q7XX, 7X2DG and 9M2AX.

It was sideband again for Mary G0NZA, who mentions 18MHz with KL7TC, CN8FR, ZL2APW and VK4CRR.

This month, Ted G2HKU was caught in the act of having a sideband contact with VG3XN on 24MHz! His conscience must have pricked him, because he went on to complete c.w. QSOs with YX0AI, ZD80K, WA9ESX, N6AW, N4UB, VU2MIR, 7Q7XX, 9K2MU/NLD, FS4PL, YL2MR, 9M2AX, 8P6DX, V2/VE5ERA, ZA1TAZ, W7ULC, VC3XN, K1ZZ/EA7 and K2MGR, before shifting to 18MHz for 5H3RA, W2CY and 7Q7XX.

Sideband was the preferred mode at John G3BDQ's on 18MHz for DU1AK, and on 24MHz for DU1AK, P3QJE, VK9XN, 9M2AX, TA1AL, UA0FF (Sakhalin), many JA stations, UA0AXX for Vladivostok, 4K2CC (Franz Josef), XX9AW (Macau), Z21HJ, EA9TL and PJ8AD on Saba Is.

On 18MHz, Martin GW00UV has a 5/8 wave vertical, with which he raised W5SAL K1IED, CE0YFL (Easter Island), E1P/DJ60V, K3LGC and Europeans.

From Trelewis, Leighton GW0LBI

tried low-powered c.w. 10MHz netted him DL4BCD, SP2JS, OK2PSJ and W4FGO, while 18MHz provided the path to HB9LO and OE3SIW.

Bringing up the rear of the WARC file, Pat ON7PQ tried 24MHz c.w. for JAs assorted and including JA8AQ, HL2KTX, V2/VE5ERA, FG/DK7UY, YX0AI, HF0POL, 7Q7RM, ZP6CW, ZD80K, XE1/AA6R, FR5GG, J8/G0GPX, C02VG, OX3XR, VS6GA, 9M2AX, VP5/KD6WW, VK9NS, 9Y4KB, 7Q7XX and FS4PL; 18MHz for CE8IVH, KH6CD, V2/VE5ERA, C08LY, 9K2MU, HC5AI, YX0AI, VP5/KD6WW, PA0CXC/ST0, KL7HF, HC7SK, 4K2CC, OA4AMM, 3B8FG, VK9NS, 3B8FR, 5N0SKO, VP2V/W2GUP, KP2J, 9Y4KB and ZC4ZC. On 10MHz we see Z21HS, 5V7JG, V2/VE5ERA, J37M, YX0AI, K1DQV/KP2, 7Q7XX, VQ9RS, PA0CXC/ST0, XE2/K7GE, XE1/JA1QXY, J8/G0GPX, KP2/KA5Q, 7P8SR, FM5BH, 9K2MU, ZD8LI, JJ1VKL/4S7, VP5/KD6WW and AP2/WA2WYR.

The 21 And 28MHz Band

I've only just got room for the 21 and 28MHz reports! Andrew G3VWC keyed with W7CFL (Utah), W0ZZ/6, U050GQ, VE5GL, W7FVR and AC4LU all on 28MHz.

On 28MHz, Dechlan E19HQ offers IK1S1J, SV2BFL, OH6LVP, RA1WF and SM4BEI; as for 21MHz, Dechlan connected with DH0SBN, YU2LP, IK4RSQ, OZ7MJ, HB9BIU, KA2DUM, KD4JPA, WB1C, WB0UV, WN2A, K9QYC, K9PDW and NR0U.

Leighton GW0LBI, keyed with IT9ZAM, RA3RFH, UA1AAH on 21MHz, while on 28MHz the tally added OK2BMA, UA6AQK, W1EF, K2ONP, OG3TZ, W80A and KB1FK. All with 5W or less.

Yet more c.w., this time from Pat ON7PQ, who notes (28MHz) VK9XM, YX0AI, HF0POL, C56/GM3YOR, F00CI (Clipperton), VP2V/VE4GV, VP5V, JX3P and 3X0HNU; on 21 we find J37M, YX0AI, KC6GG, 9X5HG, FR5DD, FS4PL, HF0POL, 9J2SZ, C56/GM3YOR, HS0AC, 9K2ZR, 3B8FG, J39GH and KH6CD.

The mike at John G3BDQ managed on 21MHz JX9EHA, but on 28MHz it accounted for AP2MYC, AP2JZB, 7Q7XX, A71BY, RH0Y, TA5C, VP25EBN (Anguilla) and 9K2ZC; the key on 28MHz dealt with C56/GM3YOR and on 21MHz VP2ES, 4K3/UA9XLZ, VK9XM and 4J4GMK.

Ted G2HKU went on 21MHz c.w. for C56/GM3YOR, 4J4GMK (Mali Vysotskij Is), UL8LWA, TU4SR and UA9KQD; but on 28MHz the key worked on PQ8/PP5IW, W3ARK, J7/DL6LAU, 8P6BX, EX3T, W0UN, K3ZO, K1AR, K3LR, K1ST, W3LPL, K4XS, N4RJ, K5MA and K2LE/1; sideband for 9H4CM and ES5MC.

Mary G0NZA found an interesting one on 28MHz when she spoke to VE1RCAF/AM, and followed with JH6CDI, JW7FU, UA0FF (Sakhalin), UA0CIE, PY1FC, 9K2ZZ/NLD, 7X2VLK, 9L3BM (a YL) and V47ITU.

I turn now to Don G3NOF, who went on 21MHz for FF6SMN, FF0XX, F00CI, HZ1AB, N6AV, NH6GC, ST0YD, V85KGP, W6FOZ who was QRP, YX0AI, ZF2ND, ZF2RT/ZF8, 3D2AG (Rotuma), 4K2CC, 5T5CJ, 7L1WII and 7Q7RM; on 28MHz he contacted AP2MYC, HC8K, HK3MAE, N7QQ/MM (The Clipperton crew en route), V2/VE5RA, V47ITU, VE7BLA, W0CP, ZX0MXK (San Sebastio Is), 5Z4FO and 9K2TC.

Angie G0HGA stuck to QRP during the ARRL DX CW contest; with 5W on 28MHz she knocked off VE3 plus 16 states in every call area apart from W6. Outside the contest we see UF6FAL, K1JD and the small fry. On 21MHz she raised East Coast Ws Europe and the USSR (Commonwealth of Independent States or CIS now).

The 21MHz band for Don GM3JDR included ZL1CH, UA0QUE, UA0FJ, 4K3/UW10G, 4K3/UA10L, BZ1OK, 4K2CC, 4K30LL and ZL30E; for 28MHz the account said ZS6BID, BY8AC, T14CF, PY1BK, Z21FN, VS6BG, VU2ROI, ZA1TAC, YV5DTA, JAs and Ws.

Finally, it's Mervyn G10PML's turn. His list had to be cut down this time, even though he seems to have neglected 28MHz; on 21MHz with the indoor inverted-Vee he worked UC2AJE, DL5NDH, OH2BGX, EA3FJP, UB4UDJ, 6FDMQ, IK2PTM, EC2AWQ and DL6ALJ.

Deadline

It's deadline time again. Your reports should reach me at the address above by, respectively May 13, June 15 and July 14. My thanks for all your support, 'bye for now.

Solar Data For March 1992

As usual, I'll start off with solar data. During the first two weeks of March the quiet side of the sun was facing us, and as a consequence very little solar or geomagnetic activity was observed. On March 8, there were two M type flares. On March 15,

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VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

there was a large M7.8/3B flare together with a 10 flare of 1400 flux units.

It's interesting to note, that between March 2-7 no DX was reported on the 50MHz band. But following the flares on the 8th, the band opened later in the day to V51, A22, ZD8 and ZS6.

On March 9, there was an excellent opening to Southern

Back-Scatter

Africa, with contacts being made for the first time during this solar cycle with stations located in ZS1, the most southern point of the continent.

Similarly, no DX was reported in the UK (apart from Jersey!) between March 10-15. However, on the day following the flare activity on March 15 the 50MHz band opened up again to A22, V51, ZS6 and ZS9.

During March, the solar flux levels varied from a high of 200 units on the 2nd, slipping to a low of 155 units by March 6, but they recovered slightly towards the end of the month. The Boulder geomagnetic A-index was mainly unsettled during the period, peaking at a storm level of 22 units on March 22.

Forecast May-June 1992

During the forecast period for May-June, a number of changes will be observed to the prevailing propagation modes effecting the v.h.f. bands. It's forecast that the earth will be less effected by the geomagnetic activity from the sun.

It's the geomagnetic activity which gives rise to auroral propagation, and although a few events are to be expected, they will probably be of a minor nature, and less common than of late.

Similarly, the trans-equatorial path on 50MHz to South Africa and South America will slowly disappear during May, to be replaced by numerous Sporadic-E openings. These will normally effect the 50 and 70MHz bands on an almost daily basis. They will also occasionally reach up to the 144MHz band, giving some spectacular openings.

In previous years, I have been a firm believer that there will always be a good 144MHz Sp-E opening during the first week of June. But although the prediction was correct up to 1990, it was totally wrong last year with the Sp-E being replaced by numerous auroras.

Sporadic-E Season

As I have already described, we're now entering the main Sp-E season. In the northern hemisphere this occurs between April and August, with a minor peak in late December or early January.

As a generalisation, Sp-E can be detected on the lower frequency v.h.f. bands during daylight hours. On the 144MHz band however, the best times for monitoring will be between 1100-1300UTC and 1700-2000UTC, especially throughout June and July.

The Sp-E cloud can be quite small, and moving very rapidly. So on 144MHz in particular, you may not have much time to make a contact and go looking for another.

Callsigns, report and a 'roger' are all you need exchange. With a little practice, you can complete the contact in 10-15 seconds.

Whatever happens, it's most important that your v.h.f. station is fully operational and ready to be used at a moment's notice. It's no good looking for the microphone or the log book in an opening that may

only last for a few minutes! See you in the pile-up!

Auroral Activity

Virtually no auroral activity was recorded during the first three weeks of March. The Shetland Island beacon GB3LER (50.064MHz) was heard aurorally on March 9 between 1800-1900UTC, but very little else was found.

At the QTH of **Simon Lewis GM4PLM** (I075) there was a visual aurora on March 16 and 17. Although the beacon DK0WCY, (10.144MHz) was sending auroral warnings nothing seems to have come of it.

During the evening of March 21, I worked a number of GM stations on the 144MHz band, but there was very little else to be found.

Dave Ackrill G0DJA, runs an Icom IC202, 3W and a 9-element Yagi with mast-head I.n.a. Dave's particularly pleased that he has been able to work a few stations via aurora.

During a recent event, he was called by LA1BEA who was 589 (obviously Auroral-Es) and received a report of 559. The LA1 then reported his power as 300W. This was some 20dB more than G0DJA was running, fitting in nicely with the 3 S-point difference in signal strength!

Dave mentions that this QSO proves that calling CQ using low-power, can turn up some surprising contacts. As a member of the G-QRP Club, he advocates the use of low power and is always looking out for two-way QRP contacts on the 144MHz band.

Meteor Scatter

Silvio Rua IW1AZJ, is very interested in making meteor scatter tests with stations located up to 1500km from JN35. Silvio can be QRV any morning between 0500-0700UTC.

He runs 200W into an 11-element Yagi, and uses either s.s.b. or c.w. up to 1200 l.p.m. on any frequency below 144.400MHz. Send your sked proposals to Silvio at Corso Corsica 193, I-10135 Torino, Italy or via his packet radio b.b.s. @ I1YLM.ITA.EU.

The following data applies to meteor showers occurring during May and June. The information will help you determine in which direction to beam, at specific times and when the shower is below the horizon.

The Arietids meteor shower will be encountered between May 29 and June 19, peaking on

Sunday June 7. Although this is a rich shower, the particles are small and therefore the bursts are of short duration.

Between 0500-0700UTC beam north or south, 0700-0900UTC beam north-east or south-west, 0900-1100UTC beam east or west, 1100-1500UTC beam north-west or south-east. The shower radiant is below the horizon between 1800-0200UTC and is therefore not usable for meteor scatter.

The Zeta Perseids meteor shower will be encountered between May 23 and July 15, peaking around June 8. Between 0500-0700UTC you should beam south or north, 0700-0900UTC beam south-west or north-east, 0900-1300UTC beam west or east, 1300-1500UTC beam north-west or south-east. This stream is below the horizon between 1700-0500UTC.

The June Lyrids meteor shower is usable between June 10-21, peaking on June 16. It's a complex stream with multiple peaks and is circumpolar, meaning that it does not set or go below the horizon. This shower is generally found to give its best results on the north-south path between 1900-2300UTC and 0300-0700UTC.

Moonbounce

Moonbounce activity during March, was enhanced by the first leg of the REF e.m.e. contest. At moon-rise, from 1530UTC on March 14, **John Regnault G4SWX** worked (on the 144MHz band) DL3DWW, DK5LA, DL5MAE, F6KSX, HB9CRQ, I1KTC, I2FAK and LZ2US.

Later in the evening John made c.w. contacts with K2GAL, N5BLZ, W5UN and W8WN. Moon-rise on March 15 found EA2LU, OH7PI, SM4IVE, SM5DCX, SM5MIX, RA6AAB, RA6HHT and UA9SL.

As the moon rose well above the horizon, contacts continued to be made with F1FLA, HG1YA, I5JUX, LA9NEA, OE3UP and ON7RB all getting in the log. From 2000UTC, contacts were getting hard to come by as Faraday rotation (the twisting of a signal's polarisation)

was causing real problems. However, contacts were made with LA8YB, RB5AL, UA9FAD, N1BUG and W5UN.

On January 22, **Shep W7HAH** successfully completed an e.m.e. test with **Kari OH2BC** on the 50MHz band! The interesting point is that W7HAH only runs a single M2 11-element Yagi (okay, so it's 14m long!) at 20m above ground with no elevation control and a 1kW amplifier.

Incidentally, the pre-amplifier was in the shack, fed via 60m of Heliac feeder from the antenna. At the time of the QSO, the moon was 6° above the horizon, giving some ground gain but still demonstrating that the four Yagi array at OH2BC is working well.

The Italian Radio Amateur Association are sponsoring a year long e.m.e. contest, for contacts made on the 144, 430, 1296 and 2300MHz bands up to 31 December 1992. There's no contest exchange, other than the normal TMO or RST report.

Each QSO is worth 100 points. The final score is calculated by multiplying the QSO total by the number of DXCC countries + 1.

For example, if you contact 30 stations in 10 countries, the final score is $20 \times 100 \times (10 + 1) = 22000$ points. Confused? I don't think you could have been confused as much as I was, when first reading about the awards.

For example (and I quote): "If any station will win in more of one band must choose only a prize after knowing all position tables". For further information I suggest you contact **Giovanni Zangara IW0BET**, P.O. Box 36, 00100 Roma Centro, Italy!

The 50MHz Band

There was very little DX activity on the 50MHz band during the first three weeks of March, although VK6PA was heard by **Richard Lax G4AHH** (I091) at 1034UTC on March 1. An opening to Africa occurred on March 8, between 1130-1400UTC with A22BW and ZS6WB being worked, and the beacon V51VHF and ZD8VHF was also heard.

Conditions on March 9 were very much better, and among the stations worked between 1200-1600UTC were ZS1EK in Cape Province, ZS4S in the Orange Free State,

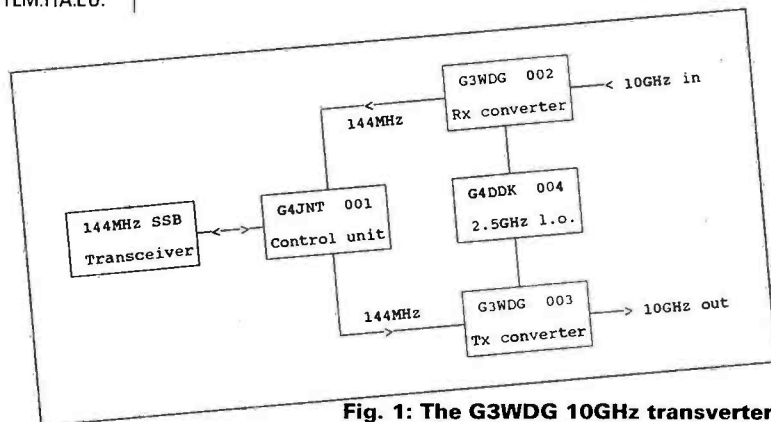


Fig. 1: The G3WDG 10GHz transverter block diagram.

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ZR5ADQ and ZS5W in Natal and ZR6AUI, ZS6JON, ZS6PW, ZS6XJ and ZS6XL in the Transvaal.

The beacon ZS2SIX (KF25) on 50.005MHz, was also putting in a good signal to the UK, despite only using a dipole antenna. Very little was worked in mainland UK on March 10 but at 1100UTC, **Geoff Brown GJ4ICD** (IN89) managed to dig out 4S7AVR in Sri Lanka for a new one.

Another good South African opening occurred between 1400-1800UTC on March 16. This allowed A22BW, ZS4S, many ZS6s and ZS9A to be worked, mainly on c.w.

The DX Cluster alerted me at 1300UTC, to an opening on March 20. Thanks to the warning, I was able to make s.s.b. contacts with A22BW (KG38), ZS6AXT (KG33), ZS6BTL (KG23), ZS6TJ (KG34), ZS6WB (KG44) and ZS9A (JG77) in Walvis Bay.

Johan Van de Velde ON4ANT, has reminded me to change his callsign in the tables from that of his previous one, ON1CAK. On the 50MHz band Johan runs an FT736R and a pair of 8-element Yagis.

He has now notched up 98 DXCC countries, although the list did include EA, EA6 and EA8, so it's 95 good ones at the present time. During February, Johan worked some tremendous DX.

He worked W1, W2, W3, W4, W8 and VE on the 11th and 12th, and on the following morning JA6/JR6. Later in the day, Johan worked YS1AG in El Salvador, for a first ON-YS contact on the 50MHz band.

Johan reports some excellent propagation during the period February 15-25, working VK3, VK6, VK8, JA1, JA2, JA3, JA9, JA0, PT7NK, PT9FH and 5V7JG. On February 22 he contacted all continents, the days total included A22BW, JG2BRI, KJ4E, KP4BZ, PT7CB, PY0FF (Fernando de Noronha), UL7GCC, VE1YX, YV4DDK, ZD8LII and ZS6LN.

Conditions during March were not as good. Despite this, Johan managed to find TM6CHU (IN98), TR8CA and VK6PA on the 1st and ZS6AYE on the 8th.

In last month's column, I mentioned an opening to the States which occurred on January 6. This has prompted **Ian McCabe G0FYD** (IO83) to write in reporting that during this unusual opening (it was Sp-E at both ends of the path) he worked K4RWP (EM86), KC4FOT (EM77), W4QV (EM95), WB4WTC (EM95), WD5K (EM12), WD5FEN (EM14), K8HFX (EN74), N8DJB (EN81), N8GJM (EN72), K9EIC (EN52), K9HMB (EN52), KE9I (EN61), K9VGE (EN52), W9JMS (EM65), W9PHJ (EN62), WF9X (EN63), N0ICA (EM28), W0DFK (EM47) and W80V (EN35).

It's interesting to plot these locator squares on the map, which was published last month, to give an idea of the geographical spread of the opening. Ian also reports another good opening on January 7.

This opening was between 1343-1604UTC, during which he worked 13 stations in W1, W2 and W3. At 1648UTC, he heard K6STI (San Diego, California) at 52 calling CQ. But as that station reputedly runs

1.5kW output, no contact could be made.

It should be noted that the UK-W6 path is a very difficult one to crack. Unfortunately, as far as I know, very few, (if any) QSOs have been made during this solar cycle.

The Kuwait City Amateur Radio Club station have now received a permit for the 50MHz band. The club were expected to be QRV with 100W and a 5-element Yagi, from early April. The QSL manager is K8EFS.

A Japanese operator is now active from Tanzania (K193) using the callsign 5H3RA. He's expected to be active until April 1993. QSL cards go via JA3PAU.

The 70MHz Band

On 70MHz, a series of five cumulative contests held during January-March, provided an increase in activity on an otherwise very quiet band. Interesting contest QSOs made at my QTH, included EI2CA/P and EI9FK/P (IO63), GM3TAL (IO86) Fife, GM4AFF (IO87) Grampian, GW3SSK located in Mid Glamorgan, GW6TEO (IO71) a rare 70MHz square in Dyfed and G3WXC and G8DDY (IO90) on the Isle of Wight.

PA, working through his local repeaters GB3CM (RB14) and GB3SM (RB13). Unfortunately, at that time John had not received his callsign, so he could only listen to the DX. Of course, when 2E1ANW was eventually received the lift conditions had disappeared!

John uses an Icom-30A, running 1W into a home-made 4-element beam, and has managed to work stations up to 90km away. He says if more stations used f.m. simplex, they would be surprised at the distances that can be achieved.

John listens on the f.m. calling channel (SU20) on Sundays between 1100-1300UTC, and Wednesday evenings between 2000-2200UTC and would welcome any reports or QSOs.

Are there any other novices out there? Drop me a line to let me know who you are contacting, and which v.h.f. bands you operate on.

The 10GHz Band

Until fairly recently, most activity on the 10GHz band has been restricted to wide-band f.m. systems using Gunn diodes and mixer diodes. These are almost akin to a

signal. This produces an output signal at 10368MHz, in the narrow-band section of the 10GHz.

A similar process is used in the receive direction. In this direction a 10368MHz signal mixes with the 10224MHz l.o., to produce an i.f. which is then fed to the 144MHz transceiver.

Extensive use is made of microstrip circuitry, (similar to a conventional p.c.b.) eliminating the need for mechanical engineering.

No special tools or facilities are required. Plumbing is a thing of the past and obtaining components for the transverter is easy.

All 10GHz modules are supplied as 'short kits'. They include all p.c.b.s, chip components and other hard-to-get items.

Boxes, GaAs f.e.t.s and other components are easily available from well-known sources and are listed in the comprehensive booklet available with the kits. The modular approach of this transverter system, means that the design can be purchased and built in easy stages.

Most constructors start with the G4DDK004 local oscillator, followed by the G3WDG002 receive converter. This gets you listening on the band, then by adding the G3WDG003 and G4JNT001 you end up with a state-of-the-art 10GHz transverter. The results are quite amazing, and many fixed stations are now discovering the real excitement of the band.

To give you some idea of the capabilities of this band, a transverter, shown in the photograph, Fig. 2, was placed unceremoniously on a bar stool inside a display stand, which itself was inside a large building at Sandown Park Race Course.

The small antenna, actually a Solfan horn, was pointed towards the window about 6m away. Signals were immediately copied from the home QTH of G3ZFP in Studham, Bedfordshire, over a distance of 52km.

What impressed me most, was that the received signal sounded very auroral, due to multi-path scattering from the prevailing rain. I do love that auroral sound!

For further details of the kits, contact **Petra Suckling G4KGC**, 314A Newton Road, Rushden, Northamptonshire NN10 0SY or telephone (0933) 411446.

Optical Communications

Harry Bourne ZL10I, (Auckland NZ) has had a lifetime's interest in optical communications. Although he has noticed work carried out in the USA and Australia, he has not heard of any similar amateur radio activities in the UK.

Actually I did carry a brief report in the March 1991 issue of *PW*, in which I described optical wavelength tests on the 474THz band (474 000GHz!) over a 4km path carried out by **Chris Whitmarsh G0FDZ**, using a 2mW helium neon laser tone modulated by a slotted disc and an optical filter and PIN photo-diode detector. Incidentally, back in 1930, Harry was G2KB,

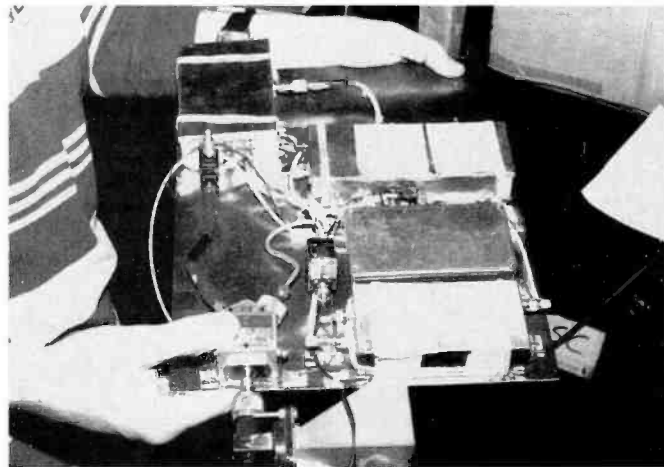


Fig. 2: A 10GHz transverter built by G3JVL. Photograph by G4VXE.

Novice Report

It's a pleasure to receive a 430MHz band report from novice **John Hemming 2E1ANW** (Birmingham). He mentions that the novice schedule does not allow activity on the c.w./s.s.b. section of the band. Only the sub-band 433.00-435.00MHz may be used, effectively limiting activity to f.m. (The RSGB VHF Committee, in conjunction with the Licensing Advisory Committee are looking at changes to this schedule).

John reports that on many days during January and February, tropo conditions were enhanced. He heard many DL and PA stations on f.m. simplex, operating around 433.500MHz (SU20).

He also heard stations in GU and

microwave form of crystal set!

Nowadays, thanks to the availability of modern devices, and to the development by dedicated microwave radio amateurs, such as G3JVL and G3WDG, there a number of transverter designs available.

These enable narrow-band modulation modes, such as c.w. and s.s.b., to be used on the 10GHz and other microwave bands. And there's not a piece of waveguide in sight!

The principle of operation of the G3WDG design, is really quite simple, as Fig. 1 shows. An oscillator running at 2556MHz is fed to receive and transmit converters. Both these units have on-board quadruplers, which multiply the local oscillator source up to 10224MHz.

In the transmit direction, the 10224MHz is mixed with a 144MHz

previously from Bristol and Rugby, and in later years operated as G2AH/W4 from the British Embassy, Washington DC. During his professional research career he was involved in the development of electric discharge lamps and their use in daylight signalling, and later with the development of lasers in the USA. He would be interested to hear of any work carried out by UK radio amateurs in the field of optical communications, and would like to have details of transmitter sources, types of receiver detectors, optical lens systems and whether tests have been conducted on c.w. voice or data. You can contact ZL10I by packet radio @ ZL1AB.AKL.NZL.OC or at 54 Whitehaven Road, Glendowie, Auckland, 1105, New Zealand.

Editorial Comment: I've looked back into the *PW* archives, as I remembered at least two 'light' projects. The first one I built, was the 'Photophone', published in August 1963. The other, much more successful project 'A Light Beam Telephone' by John Thornton Lawrence, appeared in the June 1970 issue of the magazine. I built this unit, and it was very successful I seem to remember! G3XFD.

Aeronautical Mobile

Now it's time to take off and look at aeronautical mobile activity! The Netherlands Air Force Radio Amateur Society (NAFRAS) is a society for radio amateurs that work, or have worked for Koninklijke Luchtmacht, the Royal Dutch Air Force.

This year the society celebrates their fifth anniversary. By way of celebration, they will be operating from an aeroplane during the Royal Dutch Air Force show on Saturday June 20 at the Gilze-Rijen Air Base. As the aeroplane will be flying at

March 1992 will be remembered for many international radio news stories. The BBC's Daventry transmitting station which beamed the first programmes of the Empire Service overseas in 1932, closed with the end of the winter schedule on March 29.

The final transmission was a World Service in English broadcast on 15.07MHz, moved from Skelton specially for the occasion. The Daventry commitments move to the less well known BBC station at Woodferton, which has been primarily a Voice of America relay station for many years.

The VoA has now moved its UK relays to other VoA sites including Playa de Pals in Spain. Romantics amongst you will probably agree that it is a shame that Daventry could not see out the BBC World service's 60th anniversary which will be celebrated during December of this year.

Meanwhile the Thai cabinet has approved the construction of a new relay station for the BBC in Thailand. Two 250kW transmitters are to be installed at the site which was originally to have been a joint project with Radio Netherlands. The Dutch

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high altitude, it's quite likely that UK radio amateurs will have the opportunity to contact **PI4NAF/AM**. The station will be operative between 1400-1600 Dutch local time on 145.450MHz (S18) using f.m. mode. For further information or skeds write to Chris Fraikin PA0CJN, Spervverhorst 90, 2317 ZP Leiden, Netherlands.

Expedition Updates

It's back to earth now for some expedition up-dates. The Fontainebleau Radio Club are mounting an expedition to the Balearic Islands, (EA6) between June 25 to July 6.

The club will operate from JM19 on 144MHz with 500W and two 17-element Yagis, 430MHz with four 21-element Yagis, 1296MHz with four 55-element Yagis, 2.3GHz, 5.7GHz and 10GHz bands.

The group will be mainly active via tropo, Sp-E and e.m.e. Skeds will be taken on the v.h.f. net 14.345MHz.

Planning a 50MHz expedition to Kaliningrad (UA2F) during the Sp-E season in July, are UL7GCC, UL8GDD and PA3EUI.

Uffe OZ1D0Q and Soren OZ1FTU, will be active on the 144 and 430MHz bands between July 13-31 from various squares on the Black Sea coast of Turkey. Although primarily an m.s. expedition, they will also be QRV for tropo and Sp-E contacts. Further details will be given next month.

Contests

I have news of a 70MHz phone

contest that's being organised by the WAB group. It's to take place on Sunday June 7 between 1400-1800UTC, and UK stations exchange report and serial number, WAB square and county.

Contest rules, and supplies of contest stationary can be obtained by sending an A4 size s.a.s.e. and three first class stamps to the contest manager G. Horsfield G4SKQ, 2 Linden Road, Ecclesfield, Sheffield, South Yorkshire S30 3XL.

Another 70MHz contest, this one a c.w. event, has been organised by the RSGB. This contest will take place on Sunday June 14, between 0800-1100UTC.

The contest exchange consists of callsigns, report and serial number, locator and QTH. There are sections for the single operator fixed station, all other categories and listeners.

Later in the day, between 1300-1600UTC, a 50MHz c.w. contest will take place. The rules are similar to the 70MHz event, with the exception that QTH information does not need to be given.

To encourage more participation in RSGB contests, a new certificate of merit has been introduced. It will be awarded to the highest placed fixed and portable single operator station, running no more than 25W output to a single antenna.

Summer microwave contests have been scheduled by the RSGB microwave committee. These will take place between 0900-2100UTC on the following Sundays: May 24, June 14, July 19, August 16, September 13 and 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 May 26 and June 23, 144MHz on June 2 and July 7, 430MHz on June 9 and July 14, Microwaves on May 19 and June 16. A full set of rules can be obtained from myself on receipt of an s.a.e.

Diamond Jubilee

To assist me in preparing for a very special **60th anniversary issue of *PW*** later in the year, I'm looking for examples of v.h.f. work in the early 1930s. I am particularly looking for logs from the year of 1932, but any information would be much appreciated.

Details of bands, contacts, equipment, in fact anything that reflects the history of the radio hobby relating to the v.h.f. bands. If you can't go back that far I would still like your help in reporting events of 20, 30, 40 or 50 years ago to help illustrate the long life of *PW* and its contributors!

Deadlines

Deadlines have to be met, so 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 QSL cards, awards, certificates, etc., are also required. They will all be returned to you.

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Broadcast Round-up

Reports to Peter Shore via the *PW* Editorial Office

government withdrew funding some months ago and so the BBC was forced to continue alone.

But as short wave sites close in the UK, other broadcasters in Europe push ahead with alternative means of delivering their programmes. Radio Sweden's new schedule from March 30, saw the start of satellite relays on Astra-1B and Tele-X. English is carried at 2030GMT on the Comedy Channel transponder on Astra, channel 26 at 11.597GHz with the audio sub-carrier at 7.74MHz. On Tele-X, Radio Sweden uses the TV4 transponder at 12.207GHz on the audio sub-carrier at 7.38MHz. For those without satellite equipment, the one hour English service is also

heard on the medium wave channel of 1.197MHz.

Deutsche Welle is already using Astra for its radio programmes, but plans a regular daily television service from April using Eutelsat II-F1. It is thought that this will consist of news in German and possibly English, together with features about Germany. There is already a limited television service for broadcasters overseas with taped programmes shipped for rebroadcast.

March was also the month in which the World Administrative Radio Conference, WARC-92, ended after more than four weeks of debate and discussion on the reallocation of some parts of the

radio frequency spectrum. Of particular concern to international broadcasters - and their listeners - were the issues of possible expansion of the short wave broadcast bands (HFBC) and an allocation for the new Broadcasting Satellite Service-Sound (BSS-Sound).

Broadcasters in the industrialised world wanted significant expansion of HFBC to attempt to alleviate some of the overcrowding which exists at present, notably on frequencies below 10MHz. They also wanted to try to get hold of some of the Tropical Bands, which are presently allocated exclusively to stations operating in the Tropics. Such frequencies, around 3-and 4MHz, would be useful for short range operation in Europe where, for example, the Netherlands finds it very difficult to cover the United Kingdom effectively using 5.955MHz.

However, broadcasters came up against formidable opposition from the developing world which did not want to reallocate frequencies from their fixed services to HFBC. Eventually a compromise was

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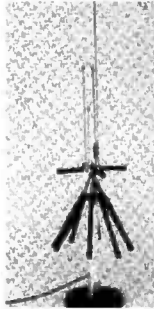
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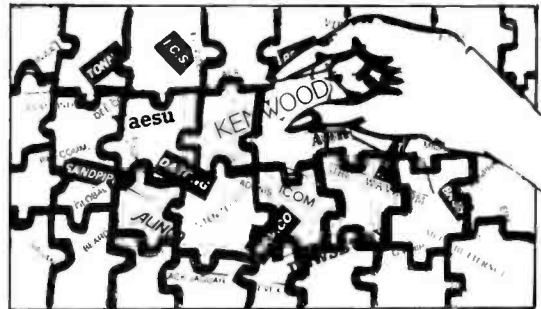


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agreed, with broadcasters gaining 790kHz of new spectrum, although only 200kHz of that was below 10MHz. The new frequencies (see the table below) will not be available for broadcasting until 2007. They will have to be used for single side band operation only.

For the future, international radio may move to new technology and direct radio by satellite. This will be provided by BSS-Sound operators who will launch satellites and develop compact portable receivers costing less than £100, which will only need a small whip antenna to receive the satellite signals - not a SKY-TV type dish!

The provision of an allocation for BSS-Sound proved even more difficult to resolve than expansion of the short wave broadcast bands. The most technically suitable frequency range for this service, is around 1.5GHz, but many countries, including a majority of European countries, already make heavy use of that part of the spectrum, with the military having significant commitments there. An alternative allocation was proposed around 2.5GHz, but the technical arguments against this were severe. The satellite would require four to six times more power to achieve the same coverage as at 1.5GHz and receivers would be less portable, needing larger antennas and reception would suffer from the effects of local topography to a far greater extent than at 1.5GHz.

On the very last day of the Conference, agreement was reached for an allocation at 1.452 to 1.492GHz, of which the top 20MHz can enter service immediately. It could be the incentive needed to get systems off the ground, and receivers onto the market within the next three years. International radio may never be quite the same again.

Radio Australia's Darwin transmitting station, will benefit from additional transmitters by the end of next year. There will be two 250kW transmitters together with a larger antenna switching matrix, and a more sophisticated computer control system. When the Australian \$5.75 million has been spent, Darwin will have five transmitters.

Derick Marker of Bracknell wrote to me to say that he has recently borrowed a Sangean ATS803A digital short wave receiver and found it good throughout all the bands and has a good b.f.o. The set retails at a little over £100.00 and covers 150kHz to 29.999MHz continuously. There is stereo f.m. with headphones and a large digital display shows the frequency and other important data. It's a large size portable, measuring 29x16cm, weighing 1.7kg without batteries. This set is also marketed under other names around the world, and it may be possible to find examples at a lower price.

European Stations

All times GMT (=UTC)

Radio Albania's services have been reduced dramatically, with

English noted at 2200 on medium wave 1.395MHz, in parallel with 9.76 and 11.825MHz with reasonable reception at my QTH. Other English services are noted at 0230 and 0330 on 11.825 and 9.58 and at 1430 on 9.76 and 7.155MHz.

Radio Austria International has English to Europe:

0730-0800, 1130-1200 on 6.155 and 13.73MHz
1430-1500 on 6.155, 13.73 and 21.49MHz
1830-1900 on 6.155 and 5.945MHz
2130-2200 on 9.87, 6.155 and 5.945MHz

Radio Netherlands' new English language schedule took effect from March 29. The station is now on the air:

0730-0830 to the Pacific on 11.895 and 9.63MHz
0830-0930 to the Pacific on 11.895MHz
0930-1030 to the Pacific on 11.895 and 9.62MHz
1330-1430 to South Asia on 21.665 and 17.605MHz
1430-1530 to South Asia on 21.665, 17.605, 15.15 and 9.89MHz
1530-1630 to South Asia on 17.605, 17.58, 15.15 and 9.89MHz
1730-1830 to Africa on 21.59, 21.515, 9.605 and 6.02MHz
1830-1930 to Africa on 21.59, 21.515, 9.605 and 6.02MHz
1930-2030 to West Africa on 21.59 and 17.605MHz
0030-0130 to East N America on 11.835, 6.165 and 6.02MHz
0130-0330 to South Asia on 13.70, 11.655 and 9.86MHz
0330-0430 to West N America on 9.59 and 6.165MHz

European listeners are recommended to try the 1930 broadcast on 21.59MHz, which should offer best reception. There are no transmissions beamed directly to Europe. *Media Network* can be heard at 1950 in the West African transmission and at 0150, 0750, 0950, 1350, 1550, 1750 and 1950GMT Thursdays and at 0050, 0250 and 0350GMT Fridays.

Radio Centras from Vilnius in Lithuania, can be heard on the last Saturday of the month from 0700 on 9.71MHz. Announcements in English identify the station.

Swiss Radio International has made some changes to its schedule, and the Monday to Friday programme line-up has been changed. The first 15 minutes consists of a five minute news bulletin, followed by Swiss newspaper comment on international issues. The second 15 minute module offers a closer look at the Swiss fabric, including on Mondays science and technology, Wednesdays business and economics and on Fridays the arts and culture. Weekends retain the

usual programmes of the *Swiss Shortwave Merry Go Round* and *Grapevine*. The station is now heard on Astra 1A on Transponder 9H at 11.332GHz on audio sub-carrier 7.20MHz. Meanwhile short wave frequencies continue in Europe:

0600-1200 on 3.985, 6.165 and 9.535MHz
1200-1400 on 6.165, 9.535 and 12.03MHz
1400-2145 on 3.985, 6.165 and 9.535

English transmissions are heard at 0600, 0900, 1100, 1300, 1500, 1700, 2000, 2200, 0000, 0200, 0400.

African And Middle Eastern Stations

Radio Iraq International, the new name for Radio Baghdad, is now heard in English with a news bulletin at 0100 beamed to North America on 11.945MHz. 17.74MHz is also noted for this broadcast which starts at around 2315 and runs for some three hours.

Asian And Pacific Stations

J G Hunt in Stourport-on-Severn, Worcestershire, advises me that Adventist World Radio in Agat, Guam, transmits an English language programme daily at 1610-1700 on 11.98MHz which has been well received recently. On Saturdays at 1620 they broadcast *DX Asia-ways*. It was during this programme that they announced relays from Novosibirsk in Siberia. The schedule announced was:

English
0100-0200, 0700-0800 and 1300-1400 on 11.855MHz
1900-2000 on 9.835MHz
Burmese
0000-0100, 1200-1300 on 11.855MHz
Hindi
0200-0300, 1400-1500 on 11.855MHz
Russian
0500-0700 on 11.855MHz
1700-1900 on 9.835MHz
Mandarin
0900-1200 on 11.855MHz
2100-2400 on 9.835MHz

Reception reports for the Guam and Novosibirsk transmissions should be sent to AWR, PO Box 310, Hong Kong. If anybody hears these transmissions, please drop a line to the 'Broadcast Round-up' column.

Radio UlaanBaatar International has sent a frequency schedule which shows transmissions to the European area on 11.79 at 1610-1710 and 1840-1910 with a 50kW transmitter and a 250kW transmitter at the same times on 11.85MHz.

The Radio New Zealand schedule from March to October is:

0000-0800 on 17.77MHz
0800-1200 on 9.70MHz
1200-1530 on 9.51MHz
1630-1900 on 9.67MHz
1900-2130 on 11.735MHz
2130-2400 on 17.77MHz

The 17MHz channel gives good reception in Europe up until sign-off at 0800.

The Sri Lanka Broadcasting Corporation, SLBC, has introduced a new transmission to North America which is heard at 2330 on 15.425 and 0445-0515 on 15.425 and 9.72MHz. The European service is at 2000 until 2130 daily on 15.12 and 9.72MHz. The station has benefitted from the installation of a new 300kW transmitter supplied by the Japanese, which uses the SLBC site at Ekala for relays of NHK Radio Japan.

North, Central And South American Stations

J. G. Hunt wrote with a schedule for Radio Havana Cuba:

0000-0600 to East and Central North America on 11.95MHz
0200-0430 on 5.965MHz
0400-0600 to the Caribbean on 6.18MHz

0400-0800 to Western North America on 11.76MHz
2000-2100 to Europe and Africa on 17.705 and via Russia on 9.76MHz
2200-2300 to Europe and Africa on 7.215 and Caribbean on 9.62MHz

Mr Hunt writes that at his location, the only satisfactory evening transmission is 17.705MHz.

The frequency 9.76 is co-channel with VoA, whilst 7.215 suffers from heavy sideband splashing from adjacent channels.

Radio Havana airs *DXers Unlimited* at 2030 on Saturdays.

The HCJB service in Quito, Ecuador, has a new mailing address of Casilla 17-17-691, Quito, Ecuador. The station has a Monday telephone call-in show, heard in the North American transmission and world-wide on the single sideband outlet. On May 25, John Beck, host of the HCJB programme *Ham Radio Today*, will be taking calls. The phone-in number is 010 593 2 241 560.

Additional Frequency Allocations

HF Broadcasting

From kHz	To kHz	Bandwidth kHz
5900	5950	50
7300	7350	50
9400	9500	100
11600	11650	50
12050	12100	50
13570	13600	30
13800	13870	70
15600	15800	200
17480	17550	70
18900	19020	120
Total		790kHz

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EB91	1.50	EY500A	3.00	QOY02-6	1.50	6B8A	1.50	6V6GT	4.25
EB80	1.50	EZ80	1.50	QOY03-10	19.50	6B8T	5.00	6K4	3.00
EBF89	1.50	EZ81	1.50	QOY03-10 Mull	15.00	6B8E	1.50	6X5GT	2.50
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EC31	9.50	GZ32	6.50	QOY06-40A Mull	40.00	6B8E	2.25	12AU7	2.25
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ECC82	2.25	KT61	7.50	SP41	6.00	6B8T	6.00	12BH7A GE	6.50
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EC90	1.50	N7E	9.00	U37	7.50	6C6	3.50	30P4	2.50
ECH45	3.50	DA2	2.70	UABC80	1.50	6C86A	3.00	30P19	2.50
ECH42	3.50	DA2	2.70	UBF89	1.50	6CD6GA	5.00	30P13	1.50
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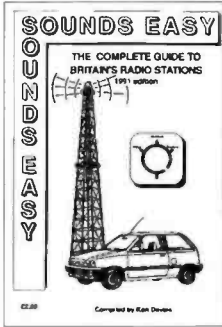
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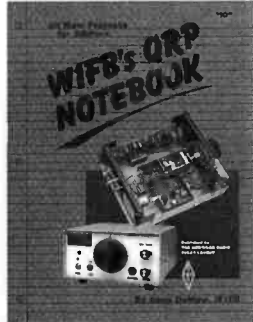
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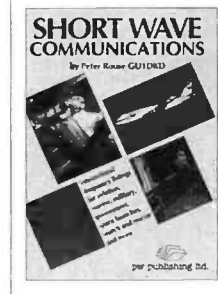
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