Enter Our 10th Anniversary
144MHz QRP Contest

Reviewed
The AKD 4001 70MHz Transceiver

Plus
Basic Synthesizers 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!
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

- 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
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### YAESU

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### ACCESSORIES

We have available simply too many accessories to list, including Antennas, Linears, PSU's, Cases, Manuals, Spares, Software, TNC's etc. Why not give us a ring with your requirements.

### OUR GUARANTEE OF SATISFACTION

All products carry a **FULL ONE YEAR WARRANTY** and are brand new and boxed. Should you experience failure of any rig, providing the product is in 'as new' condition with all packaging etc, if we cannot repair within 10 working days WE WILL REPLACE the unit. We feel that this guarantee is the best in the industry and second to none.

### PART EXCHANGE INFORMATION

We are dying to get hold of your clean and working equipment and we GUARANTEE that our **COST TO CHANGE will be the lowest** you have ever seen. Remember - we are not part of any cartel and we sell for prices which are more in line with world markets. Special deals are cash price & no part exchange. We also handle commission sales, please ring.

We can supply almost any brand of equipment including: Ameritron, AEA, Alpha Delta, Uniden, Bencher, Alinco, Kantronics, Diamond antennas and many more.

### ORDERING

You can order by Telephone or FAX. All prices INCLUDE VAT. INSURED next day service by 12.00 is £15.00 inc VAT. Access & Visa are welcome, however, there is a 2.5% surcharge for this facility. SPECIAL HAM CLUB PRICES available. Education & Corporate orders are accepted on receipt of written order. Some items may take up to 14 days delivery if not in stock. Office hours Mon-Fri 09.00 to 17.30 Sat 09.00 to 13.00

**Radio Shopper is a trading name of Network Systems (EC) Ltd**
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.)
- Auto power-off
- Auto battery saver
- 10-minute time-out timer (TOT)

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Our price £325!

STOP PRESS: New MFJ 20M QRP rig with 500Hz CW filter £179.95

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NEW! Highly Sensitive Frequency Counter
Optronics "2300"
Self powered - it can sniff frequencies from over 100pf! 1MHz - 2.4GHz
£149.95 Inc. n-cads & charger

Discos! DJ-560E
2m/70cm
Our price £299!
We've got a batch of current dual band DJ-560's to offer at a discount price. Dual watch 2m/70cms. All factory fresh and guaranteed with extended receive coverage, DMF, tone squelch etc. Send for colour brochure but hurry if you want to pick up a bargain!

MFJ Products from stock!
300W
HF ATU

The MFJ-948 is a complete 300W aerial matching unit. It is built on a high quality chassis, balanced feeders, and is simple to wire. A dual needle VSWR/power meter makes adjustment simple and a 3m aerial wire with a time-out packages the package. Panorama value £129

Other MFJ products:
MFJ-949D ATU as above but with 300W dummy load £199.00
MFJ-901B ATU less switch load and meter. Super! £66.95
MFJ-264 3.5W dummy load. DC-500MHz £69.95
MFJ-266B 300W dummy load DC-160MHz £135.95
MFJ-516 HF 300W/100 Watt power meter £31.95
MFJ-812B 144MHz/200W power meter £29.95
MFJ-110 Fabulous world clock with map £29.95
MFJ-32 Pocket radio handbook. Super guide! £19.95
MFJ-1286 Gray Line Graphics Programme for IBM £23.95
MFJ-1288 Easy digital logging programme £41.95
MFJ-1004 144MHz/432MHz preselector £99.95
MFJ-100A Indoor active antenna station. 0.3-96MHz £84.95
MFJ-1272B TNC/digital interface £36.95
MFJ-722 Super hot audio filter £89.95
MFJ-723C Touchable audio filter £108.95
MFJ-207 Antenna analyzer. Brilliant idea! £99.95
MFJ-557 Self contained CW practice key and oscillator £20.95
MFJ-407C Electronic key. 5.5-7WPM Self powered £69.95
MFJ-931 Antidip HF ground wire. Ideal for drums etc £99.95
BY-1 Genuine Banana Plug. A precision product £69.95
MFJ-704 HF Low Pass Filter £39.95
MFJ-108 Dual-time deck top clock. LCD Display £19.95

STOP PRESS: New MFJ 20M QRP rig with 500Hz CW filter £179.95

MICROSET POWER SUPPLIES AND LINEARs

List
List

70cms 0.8-3 in 15-20W max out SSB/FM £119.00
2M 10-50W in 200W max out SSB/FM £229.00
1.8-525 MHz, 5.20-200 watts £1165.00
VULR-30... 70cms/200W £84.95
VULR-35... 70cms/150W £79.00
R-25... 2M 1.4W to 30W max out SSB/FM £79.00
R-30... 2M 1.4W to 30W max out SSB/FM £89.00
R-10... 1.8MHz to 2000MHz £89.00
R-50... 2M 10-20W 30dB gain £75.00
R-65... 2M 10-20W 30dB gain £95.00
R-70... 2M 10-20W 30dB gain £95.00
R-110... 5W 120W £99.00
R-135... 20W 200W £99.00
R-150... 20W 300W £129.00

Electronic Keyer £79.95

Mobile Antennas and Masts

Mobile Antennas and Masts

Waters & Stanton
UK's Largest Selection of Ham Radio Products

Don't miss our OPEN DAY! Sunday 10th May 1992
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.

**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

- **Weight**
  - 410g

Accessories Supplied:
- Ni-Cad pack, AC charger, belt clip, carry strap, dual band antenna.

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FT470 £299 c/w FNB20/SMC28
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: CT’CSS 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!

Now in stock

NEW
FT2400H
2m FM Mobile – Rugged & Reliable

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

The FT2400H is based on a one piece diecast alloy chassis which allows a full 50W RF output without the need for forced air cooling.

Some of the features of the FT2400H include automatic display dim controls with 8 different levels to suit almost all ambient light conditions, a flip-down front panel hides a number of the minor controls allowing trouble free mobile operation – no unexpected channel changes or scanning.

Probably the most useful feature is the ability to programme the memory channels with an alpha numeric code up to 4 characters long to easily identify certain memories i.e. S30, RI or repeater call signs, 3SN etc. etc.

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

Try one today we think you’ll like it!

Available from stock

SMC HQ, S.M. HOUSE, SCHOOL CLOSE, CHANDLERS FORD INDUSTRIAL E:

Carriage charged on all items as indicated or by quotation. Prices and availability subject to change without prior notice. Same day despatch whenever possible.

Practical Wireless, June 1992
The FT890 is the exciting new all band multimode HF mobile/base transceiver from Yaesu. Designed to replace the very popular FT757/GX and FT757/GXII, 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

DAIWA POWER SUPPLIES
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 PS120M2, 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 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.

POWER SUPPLIES
- PS120 M2: 3-15V Variable 9A/12A max. £69.95 C
- PS304: 1-15V Variable 24A/30A max. £129.95 D
- RS40X: 1-15V Variable 32A/40A max. £189.00 D

COAX SWITCHES
- CS201: 2 Way SW39 DC-600MHz 1kW £13.95 A
- CS200/2: 2 Way N DC-3GHz 1kW £27.50 A

SWR METERS
- CM101: 1.8-150 MHz 15/150/1500W £59.95 B
- CM103N: 150-525MHz 20/200W £59.95 B

LINEAR AMPLIFIER
- LA208H: 2m 1.5-5W in 30-80W out £159.95 C

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possible. Up to £1000 instant credit subject to status written quotation on request. Yaesu distributor warranty, 12 months parts & labour
Martin Lynch is a licensed Credit Broker - written details on request. Typical APR 32.9% Please add £10.50 for 48hr delivery.
PAY A VISIT TO

TOP VALUE AT SUPER HAMSTORES THIS MONTH
THE NEW ICOM IC-728 HF TRANSCEIVER

- All HF Bands Tx
- General Coverage Rx
- Speech Compressor
- Passband Tuning
- Direct Digital Synthesizer
- 26 Memories
- Handmic Supplied
- 3 Scanning Functions

The exciting NEW IC-728 represents excellent value at only £825.00 inc. VAT. The IC-728 is at Hamstores NOW!

Hamstores stock a wide range of new Amateur gear plus a large selection of second-hand and ex-demo stock including; BARENCO, DIAMOND, COMET, SONY, AOR, LOWE, DRAE, CUSHCRAFT, KANGA KITS, DEECOMM, ALLGON, TOYO, AEA, CDR, MET, MFJ, AKD, ICOM, YAESU, KENWOOD, ALINCO, JRC etc.

Watch this space for more news, 73's, Chris G8GKC, Gordon G3LEQ & John G8VIEl.

Both Stores NOW OPEN TUESDAY - SATURDAY. 09:00 - 17:00 Weekdays. 09:00 - 16:00 Saturdays.

Payment by Access, Visa and Switch. Part-exchanges welcome, finance can easily be arranged (subject to status). Interest free credit is available on selected new ICOM products.

If you cannot visit an ICOM HAMSTORE in person we operate an efficient, computer-based Mail order service. Stock items normally despatched within 24hrs.

Practical Wireless, June 1992
It's nice to see all this shiny new equipment in the mags, isn't it? However, we know that the latest gear doesn't always appeal, especially to those with tight budgets. Thus we have a growing selection of pre owned equipment, all fully tested and warranted so you have the opportunity to indulge without incurring the wrath of the bank manager — send a large SAE for the latest up-to-date list.

**Don't forget** — we stock a wide range of accessories including antennas, mounting hardware, cables, connectors, mobile mounts, SWR meters, PSU's, morse keys, coax switches, rotators, scanners and receivers, microphones, headphones and much much more!

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KW has been serving radio amateurs in Kent for many decades — a tradition the new KW will be continuing! Be you man of Kent or Kentish Man, everything for the amateur is right here in the heart of the country. A quick look at a map will also show how easy we are to get to from other areas. Sussex Man and Surrey Man will find us via the M25/M20 network and convenience for the M2/A2 route makes it ideal for London Man to leave the problems of the City behind. The Queen Elizabeth II bridge at Dartford also means that Essex Man can reach us very quickly.

Our showroom is bright, warm and comfortable, allowing you to relax whilst browsing through our latest books, checking out the latest accessories of trying out a new rig on air before you buy.

For those unable to visit we offer a speedy mail order service to get goods to you quickly. Unfortunately you will miss out on the refreshments and the charm, wit and experience of our sales staff! Rest assured we always do our best however you contact us!

We look forward to serving you. 73's Tom G6PZZ

Practical Wireless
PROBLEMS WITH YOUR RIG?

We are the major servicing/repair centre for all amateur, PMR and commercial radio equipment...

- Suppliers of all these makes and offering a full service and spares back-up
- Supply and installation of all PMR and commercial radio systems
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- Collection and delivery service available if required
- Trade service enquiries welcome (special rates)

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C.M.HOWES COMMUNICATIONS

NEW KITS!

The HOWES DFD4 is an add-on Digital Readout for analogue receivers and transceivers. If you have an FRG7, an analogue FT101 or a similar type of rig, then the DFD4 has been designed with you in mind. The DFD4 is a frequency counter that can be programmed for any IF offset so it can be used with almost any radio, including the old Government surplus sets. It can also count down as well as up, so it is suitable for “reverse tuning” rigs too.

To make the DFD4 even more versatile, we now offer the PMB4 Programable Matrix as an optional kit. This enables you to switch between six different programmed offsets, so the DFD4 can be used with more than one radio, and to compensate for IF frequency differences when switching modes. Also new is the CA4M “hardware package”. This contains a custom made case with pre-punched anodised aluminium front panel (see drawing above), plus switch, knob, BNC socket, nuts and bolts etc. to enable you to achieve a high standard of finish for your project.

DFD4 Kit: £39.90
DFD4 PCBs: £59.90
PMB4 Kit: £9.90
CA4M Hardware: £19.90

Mail Order to: Eydon, Daventry, Northants NN11 6PT
Tel: 0327 60178

HOWES QRP CW Transceiver

BUILD A QRP TRANSEIVER!

To build a transceiver with our kits is a simple modular, step by step approach. You can start with the receiver, and then add on the transmitter at a later date if you wish. Variou accessory kits are available to increase the facilities, these range from a simple signal meter for the receiver to extra filtering and of course, digital readout. We offer a matching range of “hardware packs” (case, knobs etc.) to enable your station to look as good as factory equipment! Whether you fancy a single band CW transceiver, or more complex dual band SSB/CW rig, all these kits are designed to be within the scope of the ordinary home constructor.

The well thought out designs and the backing of professional RF test facilities mean you can build with confidence!

Single band 40 or 80M CW transceiver:

Kit Assembled
DF840 or 80 SSB/CW receiver £15-90 £22-70
CTX40 or 80 QRP CW transmitter £14-80 £21-80
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 (suit 40 or 80M): £29-90

You will also need two 50pF tuning caps (E1-60 each) plus a slow motion dial (E6-00). Total price of transceiver in kit form (including caps and dial): £101-30.

PLEASE ADD £1-20 P&P per kit 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.
ARE are pleased to announce that we have re-opened under new ownership and, with what is the widest range of equipment ever offered from a single source in London – plus fantastic bargains in secondhand ex-demo, commercial and hire equipment!

Also, we can cater for export to almost anywhere in the world.

REMEMBER, we are only a phone call away for good, honest friendly advice, a brochure you might need or just a chat.

73’s – Alan and Jez.

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POWER SUPPLY, ATU, BUILT-IN
See Peter Hart’s review in April Radcomm

ANOTHER WINNER FROM KENWOOD
Phone for ARE price.

THE ICOM TRADITION CONTINUES
Built-in PSU ATU General coverage RX

See all of these and us at RSGB ‘92 stand C8

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DON’T DELAY CALL 081-997-4476
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 enquires 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.

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 bargain 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 L 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
Dear Sir

Once again able to help a fellow PW – I have that go in the ‘Can You Help’ section 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 Orris 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
Mannington
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!

Dear Sir

As the holder of a Novice callsign, 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 worked may have been ignored by other operators.

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 callsigns. 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.

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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 each. Binding costs: £3 for one, £5 for two or more.

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 wireless 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 reader 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.

Wordsearch Competition

Q K G Q R S E F Z A Q C V L V P Q A E R K H
S E V A N U N O I J Y L G O Z C G O Y S G K
E R R A M O T V J E H A H I J Y Q A W R H J Q
M E O K L I O L F M L C V F A O S R K O E Z
G O C S L G R A F B E W F A F G T A E O O
K G B N I Y K G E N S B N S A W Y P Y S A Q
L W S I E S A E L K D H A A F S Q J N T S N
G F E C L B E T J Q C W W S P G X I Z R L N
U B B H I E J H L T F E I E I R G I M I Z C
V J W A Y N Q R T L D O H N X C A Y U N V B
H F E B V Z O F E N I U C C D S V L Y G S M
L S T Q J V P R L T Q Y E T A L C I S O G Y C
K Q E H R Y U D T S F S N H L A H K J S I U
L C W Y G P E H F C K O Y R O P T A T J P R
Q J D H E U C I D Y E S U C P R O S R F K U
D W K T L K Y O P M D L C R N V S I Y G P F
I X Y V C L T J N O A S E S M E W P N R E T
V L A F R M Z R U T Q P X C E U H P T C R
A H Z K E A O K E Y E J M B E K T Q X V W G
O M S S H B X H W B J S L S Y R Q R E G Z L
J Z V I E C J T U L O Y T O X D A F E R N T
B M G P Y U S Q Y K E R S H U A N G F S F W

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 wards or backwards), up and down or diagonally, but they are always in a straight line without odd let-

Mobile
Shoe String
Four Metres
Crystal Checker
QRP Contest
Neill Taylor
Rutland Windcharger
Solar Panel
Robert Keyes
Basic
Frequency Synthesisers
Garex Electronics
Focal Point
Jamboree On The Air 1992

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 £198.50!

Tony Johnston GW4CSP, 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 Ltd., Unit 28 Penley Ind. Estate, Penley, Wrexham, Clwyd LL13 0LD.

Tel: (0948) 74717, FAX (0948) 74728.

Chernobyl Russia 1992

An international group of amateur radio operators will be joining up at Rostov-on-Don, Ukraine, to draw the world's 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 1 -3rd 4L6CH. Operators will include UA6LO, UT4UX, UA3LU, N3CBW, GONKZ, RA3AA and KC3VO.

Further information from GONKZ, PO Box 599, Worthing, Sussex.

Siskin Electronics

Stolen from the Siskin stand at the Blackpool Rally on March 15, was a Fairmate HP200SE 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: (0239) 207155/207587.

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.

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/N 73, but cannot locate any technical data.

The set is about World War II vintage, octal valves, etc. He has tried the various P/W 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 GOJVE on (0329) 238642.
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.

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 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 G4PDF 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 John Whitmore and Sergeant Nigel Kirby 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.

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 G2BRIA 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.

Additional information on the Society and special event call signs can be obtained from John Case, G0FRR, "Flight Refuelling ARS, 87 Old Park Road, Wimborne, Dorset, BH21 7QG".

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 25th 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 former Great Western Railway 1832 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 was in steam competition with the Southern Railway to see who could get the passengers to London is 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, ORTH, 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 FM 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.

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 call signs to be used include: 4S7JVG, 4S7DBG and 4S7PNG.

Additionally, the group have been issued with the callsign 4SOUK for use in the Asian DX Competition. The amateurs taking part in the Sri Lanka trip include Doug Goodison G0LULH, Jon Vasek GOOHW, David G0MRF and Paul G60NA. The group plan to use three transceivers on all bands, c.w. and s.s.b.

Further details from Doug Goodison G0LULH, OTHR.

Newdesk '92
Mr. and Mrs. John Hardwick G3XMR, 5936.

**Sunday Activities**
- Please send in all your 'Club News' items to Sharon George at the editorial offices in Poole.
Leighton & District ARC meet in rooms 4
of Leighton Park School, High Wycombe, on
10th May 7.30pm. Details from Mike Woodford
G4JVG, Holmwood Park, Spalding, Lincs. G0GIG
on (0978) 845858.

Leafield & District ARC meet 1st and
3rd Mondays, 8pm at Robin Woods
Community Centre, Prospect Road, Ossett.
More details from Ian GOOFN on 081-894 9131.

Leek Heath ARC meet at Thursday
evenings. 7.30pm to 9.30pm at New Nets
League, Old Buck's Head, Shrewsbury. On May 21
there is a talk on 'Morse and CW', followed by a
'Morse contest'. For more details, please contact
Newman GOKEB, 61 Selbourne Avenue,
Stockport, Cheshire SK7 1NR.

Leigh & District ARC meet at 2nd
and 4th Thursdays, 7.30pm at The Railway
Hotel, Liphook, Hampshire. May 20 is
'Crazy Golf Night'! More details from
Barraclough G7DWY on (0484) 716453, early
nights.' More details from Walter Craine
G7GXY on (0380) 830383. Vale of Evesham RAC.
Further details on the club at Alasard on (0808) 41508.

Verulam ARC meet on 2nd and 4th
Tuesdays, 7.30pm at the RAC Association
Headquarters, New Kent Road (off Malborough Road),
St. Albans, Hertfordshire. 2nd Tuesdays see their
activity evenings and 4th Tuesdays are their main
monthly meetings. On May 26, Mike Demerson
G2XGV will give a talk entitled 'Radcom'.
More details from Walter Craine G7GXY. "The
Kreescot, Abbots Langley, Watford, Hertfordshire W0D6SR.

Wakefield & District RS meet on
2nd and 4th Fridays, 7.30pm at the Club House
at Wakefield Cricket Club Pavilion, Firs Lane, Wakefield
Hour, London NW1. May 14 is a lecture by
Stan Woods, Marconi Historian, on 'Early
Radio Transmission at Teddington'. For more
details, contact Brian Barlow G3PMF, 5 The Crescent,
Abbotts Langley, Herts.

Wallsend & District ARC meet at
7pm at Westgate Methodist Hall, Westgate
Road, Saltburn-by-the-Sea, North Yorkshire on
May 13. Further details from John Barlow GJCWX,
Saltburn.

Walton & District ARC meet on
Tuesday evenings, 7.30pm at the Community
Centre, Farnborough Road, Sutton, Surrey.
More details from John GOAAR on (0978) 842599.

Walton & District ARC meet at
7.30pm at the Community Centre, Farnborough Road,
Sutton, Surrey. For details of other meetings and
events, please contact Dave Stallon G0WDF,
13 Overlands Road, Sutton, Surrey.

Wakefield & District ARC meet at
7.30pm at The Railway Club, Ossett. Further
details, please contact Dave Stallon G0WDF,
13 Overlands Road, Sutton, Surrey.

Weston-super-Mare ARC meet at
7.30pm at Crealy Memorial Hall, Weston-super-Mare.
May 14 is 'Club News' item as short as
possible.' More details from Malcolm Butler
G4DMD, 44 East Stratton, Nr. Winchester, Hants
SO12 3JU. Tel: (0962) 895055.

Werral ARC meet 1st and 3rd
Wednesdays, 7.45pm at Ivy Farm, Arrow Park
Road, Birkenhead, Wirral. More details from
Alex Seed GOGRO on 0931-644 086.

Weedpecker Radio Group meet on
Monday evenings, 8pm at Richmond Place, Edge
Road, Southport. Tel: 0925 766322.

Weymouth ARC meet at the finalists
Club News item as short as possible.' More
details from Ian Wright G4VJR on (0925) 766322.

Yeovil ARC meet at Red Cross
Hotel, Gravel Avenue, Yeovil. May 15 is 'An 88th Superheat
Meeting' at G3PCJ, the 21st is 'Protective Multiple
Earthing' by G0AXK and the 28th is a
Construction & Operating night. Further
details from Mike Woodford G4JVG, Holm Wood
Road, Fosse, South Petherton, Somerset TA13 5DX.

Help us to help you, by making your 'Club News' item as short as possible.
<table>
<thead>
<tr>
<th><strong>YAESU</strong></th>
<th><strong>ICOM</strong></th>
<th><strong>KENWOOD</strong></th>
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<tr>
<td>FT5200 — FT736 — FT26</td>
<td>IC781</td>
<td>R5000</td>
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<td></td>
<td>ICR1100</td>
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<td>ICW2</td>
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<td>TS450</td>
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<td>IC7100</td>
<td>including ATU</td>
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<td>IC2410</td>
<td></td>
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<td>IC4SRE</td>
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<tr>
<td></td>
<td>ICR9000</td>
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**ARA 1500**
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Size: 940 mm high
64 mm diameter
Gain: 11dB
Intercept point 3rd order + 44dbm
£163.00

**YUPITERU/AOR**

<table>
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<td>AOR 3000A</td>
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<td>AOR 1000 (1 only)</td>
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<tr>
<td>AOR 2000</td>
<td>£259</td>
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**SHINWA SR001**

‘Fantastic price’
Remote control
full feature
receiver
£299

**JRC**

<table>
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<tr>
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<tr>
<td>NRD535D</td>
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<td>inc ECSS + band with + 1kHz filter</td>
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**JRC**

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**PRE-OWNED UNITS**

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<td>Sony PRO80</td>
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<td>Tandy PRO38</td>
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<td>Grundig Satellite</td>
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<tr>
<td>ICR71</td>
<td>£675</td>
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**FREE!**

matching Kenwood PSU
when you buy

<table>
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<tr>
<th>Model</th>
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<tr>
<td>TS850</td>
<td>£1475</td>
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<tr>
<td>or TS450</td>
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**ALINCO**

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<tr>
<td>DJF1</td>
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<tr>
<td>DJS1</td>
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</table>

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Practical Wireless, June 1992
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.

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 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 that the AKD transceiver is only the second ever commercially-built 70MHz rig dedicated to the radio amateur.

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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 (70.4500MHz) 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.

<table>
<thead>
<tr>
<th>Channel number</th>
<th>Frequency in MHz</th>
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</thead>
<tbody>
<tr>
<td>00</td>
<td>70.250</td>
</tr>
<tr>
<td>01</td>
<td>70.2625</td>
</tr>
<tr>
<td>02</td>
<td>70.275</td>
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<td>03</td>
<td>70.2875</td>
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<td>70.350</td>
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<td>09</td>
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<tr>
<td>10</td>
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<tr>
<td>11</td>
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<tr>
<td>12</td>
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<td>13</td>
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<td>14</td>
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<td>16</td>
<td>70.450</td>
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<td>17</td>
<td>70.4625</td>
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<tr>
<td>18</td>
<td>70.475</td>
</tr>
<tr>
<td>19</td>
<td>70.4875</td>
</tr>
</tbody>
</table>

Table 2. Results of the PW workshop tests.

Practical Wireless, June 1992
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 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.e. 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 i.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 watch 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.
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, Breetel Lane, Brierly Hill, West Midlands DY5 3LQ. Tel: (0384) 480565.

Manufacturers Specifications

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<tr>
<td>Modulation</td>
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<tr>
<td>Frequency range</td>
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<td>Supply voltage</td>
<td>13.2V ± 10%</td>
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<td>Channel spacing</td>
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<td>Speaker</td>
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<td>Operating range</td>
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<td>Frequency stability</td>
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<td>Antenna connection</td>
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<td>Audio distortion</td>
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<td>Audio response</td>
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<td>Image response</td>
<td>70dB</td>
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<tr>
<td>Audio response</td>
<td>6dB/octave de-emphasis between 300Hz to 3kHz</td>
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<tr>
<td>Audio output</td>
<td>2W</td>
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<tr>
<td>Supply current</td>
<td>130mA (squelch on)</td>
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Fig 2: An underside (copper track) view of the transceiver. The aluminium extension at the bottom left-hand side is the p.a. heatsinking.
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!

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 regular 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: 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!

Read The Rules

will all 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 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.

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.
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.c.l. line, reached via the accessory socket. The output power can be accurately measured using the simple circuit of Fig. 1. Connect this to the SOG 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 x 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 or received 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 (k) to reduce and (l) 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 signed 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, GH4HLX 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 overdriev 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 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 Ten Namastrophy 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.
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. 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 a.s.b., although 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 stations will use a rapid and conventional 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 eye on the rig, this is probably better than a relatively slow-moving mechanical 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 (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.

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 G4HXL offers a little sound advice to help you on your way!

For a portable power supply, a large battery ought to be sufficient. However, do make sure it is going to last the entire contest. You'll need a space 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 the site.

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 a little early. 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 '7'.

Most stations spend some of the time, sticking to a frequency and calling CD, and some time tuning around this frequency in use?, preferably more than once. If you hear an operator calling CD, and some time tuning around this frequency in use, it is an ideal event for your first try.

In the ClSO, 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 '7P' from the end of a callsign, so take special care about this. If you miss anything the other operator sends to you, or 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 come to common use for this purpose). Write everything down in the logs 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 I'm on air.

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, some of one of your operators, and has worked with them for 20 years said to me: "you still can't beat pencil and paper for logging 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 28 sections, with a letter of the alphabet written boldly in the corner of each.

Check Log

As each station is worked, it's added to the list in the appropriate section, according to the first letter after the prefix[so G4HLX goes under 'G']. This is called the 'check-log', and is maintained by someone who has it, 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 not stop working any computer. Now perhaps, you are beginning to see how single-operator working can be hard work!

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

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 'G']. This is called the 'check-log', and is maintained by someone who has it, as each QSO starts, to rapidly check whether a station has been previously worked.

Checking the Site

Before vacating the site, make sure you have left 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.

Vacating The Site

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 14MHz QRP Contest.
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**Practical Wireless, June 1992**
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.
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 resynchronised 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...
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.
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 tunable for either the UK or CEPT CB frequency allocations.

**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.

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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.

![Measured s.w.r. for the T443](image)

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

![The whip section of the antennas can be set vertically for normal operation at any angle, or lowered parallel to the car roof.](image)

**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.

![CCIPB HIGH](image)

By ‘Quaynotes’

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By ‘Quaynotes’

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Practical Wireless, June 1992
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!

Theory

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.

Practical Wireless, June 1992
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! Cheeroio for now.

**Shopping List**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistors</td>
<td>carbon film 5% 0.25W</td>
<td>100Ω</td>
</tr>
<tr>
<td>capacitors</td>
<td>150pF</td>
<td>C2</td>
</tr>
<tr>
<td>semiconductors</td>
<td>OA81*</td>
<td>Tr1, 2 *(for equivalent)</td>
</tr>
</tbody>
</table>

**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.

**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 25: 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, boot sale, car and tea. Free parking and loads of stands. Entry and parking of Wetherby to Harrogate Road. Separate arrangements for disabled visitors off Howstoke Wood Road. Details: from Mike GOMKKK on (0423) 650300/6653 or FAX (0423) 620092 or GB87CYM.

May 17: The ‘Parkanaur Rally will be held at the Great Yorkshire Showground, Harrogate, North Yorkshire. Showground opens 10am, doors open 10.45am. Talk-in on S22. Bring & Buy, boot sale, car and tea. Free parking and loads of stands. Entry and parking of Wetherby to Harrogate Road. Separate arrangements for disabled visitors off Howstoke Wood Road. Details: from Mike GOMKKK on (0423) 650300/6653 or FAX (0423) 620092 or GB87CYM.

May 27: The Plymouth Radio & Electronics Fair by the Plymouth Radio Club will be held at Plymouth.
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 lower power use, 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.
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 valued 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 components, 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, 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.

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 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. with each unit.

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.

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 Hamvention 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.
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Practical Wireless, June 1992
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 am 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!)

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

1) a (20W)
2) c (37.8W)
3) d (10mW)
4) c (10W actually 9.99392W)
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 different times. 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 questioner?), 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?
This month, Ron Ham looks into the valuable source of information provided by enthusiasts who log everything from meteorites to sunspots and satellites.

If you take a look in any large newsagent, 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.

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.

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.

A picture, is therefore a record of a particular moment in time. It cannot be repeated, and is captured each time an artist 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 spectrophotometer, 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) photographed the sun's image through his telescope on to a screen.

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.

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 solar storms that took place on the 30th of February, that had a major effect on the earth's ionosphere, causing widespread blackouts over the entire United States.
number of spots on the 7th, that was responsible for the extensive radio-blackout on the 9th.

The radio blackout became obvious from the 28MHz beacon logs I received from Gordon Foote (Didcot), Henry Hatfield, Ted Owen (Maidon), 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, 11fs, 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, 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 Westru 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 DKOWCY (10.144MHz) on the 2nd and 10th.

Magnetic Observations

Magnetic observations, come from the various types of magnetometers used by Tony Hopwood, Karl Lewis (Salisbury), 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 26th.

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 “cheese board” pattern and Arabic captions on the 20th.

Reflections

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,
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 PACTOR 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 PACTOR system has some very interesting and useful features, especially as far as h.f. working is concerned. Using MSYS, I can appreciate the variable PACTOR system details. As a compromise between reliability and fast detection, a CS becomes obsolete. The mutual Hamming distance is 8-bit, thus minimising the chance of receiving a false CS. I believe that the PACTOR system has some very interesting and useful features, especially as far as h.f. working is concerned. Using MSYS, I can appreciate the variable PACTOR system details.

**Short Description**

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

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. AMTOR, 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 PACTOR 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 (X30 single-board), high operational comfort (built-in message storage system, 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 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 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). 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 PACTOR contact, the calling station ('master') sends special synchronisation packets:

- head (100bd)/.address (8 bytes, Practical Wireless, June 1992
WHAT DO YOU WANT?

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BRIDGE CRL Services type CT492 general purpose CRL Bridge Meter Ind. with Auto Balance portable battery operated, rcvs. £140.
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BRIDGE CRL Services type CT492 general purpose CRL Bridge Meter Ind. with Auto Balance portable battery operated, rcvs. £140.
TX speed-up. In case the following can be confirmed with CS4, forcing a speed-down after any information is repeated at low forces the TX to build up 100-baud speed. 

Speed-down: The RX may switch to RX mode immediately after it has received the last three bytes of the former change-over packet is transmitted, thus serving as a RQ monitor mode. In this, the receiver scans for valid packets which are detected by CRC match. 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 QZ-DL (November 1990), is now available. The PACTOR Controller (PTC) consists of two boards, the mainboard (100 x 100mm) 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 i.e.d.s.
- Comfortable status display: 12 i.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 DL3PCl, DL2FAK, DII2AM, DK5FI and DF4WC.

Ordering Conditions: A PTC can be delivered completely assembled or as a kit including all parts. PTC assembled and calibrated $390

PTC kit including all parts $320

Payments are due in advance. Address all orders to: Dr. Thomas Rink, Röntgenstr. 36, 6450 Hanau I, 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 G3JLDI @ 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 145.833MHz, 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!”

G6SVJ this is U4MIR”. So 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…”

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 ‘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 Volkov U4MIR, Engineer Mechanic Alexander Kalery U8MIR, and guest cosmonaut Klaus-Dietrich Flade DPOMIR into ‘Mission-92’. Docking was achieved on March 19 at 1130UTC.

To go up with TM-14, the German Space Agency and DFOVR 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 former, 16 seconds of 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 DPOMIR together with Sergei U8MIR 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
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 UM1R 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-Francois Claudi. 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 May 10. 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 crew's amateur radio activities from MIR including e.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 50 baud 'Stroka' RTTY equipment.

**Shuttle Missions**

As I write this column, the STS-45 Atlantis mission (mandated and manned) by NSWQC, N5WQW, ON1AFD and Kathy Sullivan, SN5Y, 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, but they will have to wait a bit longer to hear the results of the shuttle's experiments.

**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 worked on 2200E by WB8LYT 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, KORR (QSL via WB9WAO), ULU/M8MM by Vlad (QSL ES1RA) and VK9Y by VK9CL and VK9QG (QSL F6SIMS). Late breaking, and updated A-O-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 Frank GW7BGA, Alec G1WINC, Hardy DC8TS, Bernard DG6MOP, 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 from 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 cooperate 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 (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 Huntington, 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 Huntington. 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 10° 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 itselfmeasures 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 SM0KVY, 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 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.
The World of ATV

In his bi-monthly view on the world of amateur TV, Andy Emmerson G8PHH 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!

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 WAG6TF says: "I have to tell you that every time I bother to tune in on local ATV and see the same crap that I have seen for the past 15 or 20 years, I can easily understand why a TV 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 setting 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 show, 73, Captain Betacam." Bill WAG6TF.

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?

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If you have a subscription, you will know all about the Practical Wireless Subscribers’ Club. If you don’t, read on! Membership is free and automatic for all subscribers, and it’s our way of saying ‘thank you’ to all those who have enough faith in their favourite magazine to pay for it ‘up front’.

This month, Practical Wireless Subscribers’ Club members have the chance to buy an excellent ‘Draper’ tool kit and receive a free copy of our popular re-print booklet Are The Voltages Correct? (normal price £1.50 plus £1 postage and packing). What better combination could there be? Armed with your new tools, and the book, you can get busy on repairs! The tool kit includes the following items: A 16/18W ‘Antex’ soldering-iron, workshop bench soldering-iron stand, a solder-sucker, small pliers, side-cutters, electrician’s screwdriver, medium sized Philip’s screwdriver and solder. All these tools are stored in a ‘roll-up’ type carrying wallet.

As a member of the Subscribers’ Club, you can get your tool kit with a free copy of the Are The Voltages Correct? for £19.95 including postage and packing (add £2 to overseas orders for despatch by surface mail).

So, hurry and don’t miss this excellent offer that will encourage you to get busy in the shack and help you to keep your tools together!
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The Eighth Edition of the popular Ferrell's Confidential Frequency List has been extensively revised to take account of the many changes that have taken place in the last few years. Many of these changes result from the most recent events that have occurred in Eastern Europe and the former Soviet Union. There has also been a big change round in the marine frequency allocations. Ferrell’s has also changed its format dramatically to ensure that it keeps up with events and to meet the demands of its users.

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Practical Wireless, June 1992

Back-Scatter

I must send a great big thank you to all those valuable bulletin writers for their information, including: Contest Calendar, DXNS, TDXB, The Canadian Amateur, The DX Magazine, and 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 give the newcomers a

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
to go, only to lose everything under that familiar 56 roar of rain

Islands On Air

Islands on the air chasers are

The Awards Manager of the UK

Scores one point per contact, plus

As I'm writing this month's

As for Mervyn at G3PML, his

Don't forget we were all 'New

Some love 7MHz, some hate it!

Don't forget we were all 'New

When it comes to awards time,

Conditions

As for Ted G2HKU, he keyed with

Some love 7MHz, some hate it!

The 14MHz Band

For a change, let's make a start

Islands on the air chasers are

When it comes to awards time,

The 14MHz Band

For a change, let's make a start

The 1.8MHz Band

At Clipperton expedition on c.w., here

New Chums

Don't forget we were all 'New

The 7MHz Band

Some low 7MHz, some hate it!

The 7MHz Band

Some low 7MHz, some hate it!

The 1.8MHz Band

Not a lot in the way of reports on

For a change, let's make a start

As for Ted G2HKU, he keyed with

As for Mervyn G3PML, his OPR

As for Ted G2HKU, he keyed with

In Stevenage, Angie GOHGA

Don't forget we were all 'New

Some love 7MHz, some hate it!

Some love 7MHz, some hate it!

New Chums

Don't forget we were all 'New

The 1.8MHz Band

Not a lot in the way of reports on

As for Ted G2HKU, he keyed with

As for Ted G2HKU, he keyed with

The 1.8MHz Band

Not a lot in the way of reports on

The 1.8MHz Band
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A little letter from Andrew G3VWC in Bath indicates he is keeping Prof Murphy at bay, as he has been able to key with VK7AAQ, Z4C2Z, K7U7, WN3T, E8AF and R9AMQ.

Mike G0KZD (Thinks) sticks to 10MHz CW 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.

Sideband was the preferred J8/G0DGP, ZL4HB, V2/VE5ERA, C06C9, LU7JS, JAIADWH, J1JLGV, FZ5FYR, 4K2C, 4K2MAL, D5YJD, K8XW, 7WX10, WV7Y, U1JLP, U1JLPX and Z29DQ.

For Don GN9MO the month was memorable in that the F0ICI Clippernet expedition fell into its task to give him a "full house" of contacts from DXCC countries.

On 18MHz there were F0ICI, YXOAI for Ayes and 3D2AG for East Coast, with 5W on 28MHz she knocked off 5Z4F0 and 9K2TC.

Standing sideband, he key on 28MHz dealt with 3GDF/9, 3J01/K0NJ, 3X6/LX3K, 3B0/W2WYR.

He mentions 18MHz on 3GDF/9, 3J01/K0NJ, 3X6/LX3K, 3B0/W2WYR and 4K2CC (Fry). On 21MHz she raised East Coast stations, and DL6ALJ and W4FGO, while 18MHz provided the path to HB9L0 and OE3SIW.

The mike at John G3BDQ never got to key with G0KZD (Thinks), as he has been able to key with VK7AAQ, Z4C2Z, K7U7, WN3T, E8AF and R9AMQ.

A late letter from Andrew G3VWC in Bath indicates he is keeping Prof Murphy at bay, as he has been able to key with VK7AAQ, Z4C2Z, K7U7, WN3T, E8AF and R9AMQ.

Going to the 3.5MHz Band

Ladies first this time, as we look at the 3.5MHz band. Angie at GOHGA raised UL7JW, UA9CM, Europeans, with 5W on 28MHz she knocked off 5Z4F0 and 9K2TC.

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His conscience must have pricked him, because he went on to sideband for 9H4CM and ES5MC.

Kate at Goon was able to key with VK7AAQ, Z4C2Z, K7U7, WN3T, E8AF and R9AMQ.

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A late letter from Andrew G3VWC in Bath indicates he is keeping Prof Murphy at bay, as he has been able to key with VK7AAQ, Z4C2Z, K7U7, WN3T, E8AF and R9AMQ.
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 main 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 155 units by March 6, but they recovered slightly towards the end of the month. The Boulder geomagnetic A-index was mainly un 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 paths 50MHz to South Africa and South America will slowly disappear during May, to be replaced by numerous sporadic-E openings. This 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 auroral openings. Similarly, no DX was reported in the lower frequency 28MHz bands during May, to be replaced by sporadic-E activity in June.

**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 quite often be encountered at specific times during May, to be replaced by sporadic-E activity in June. For example (and I quote): "If any station will win in more than one band must choose only a prize after knowing all position tables". For further information I suggest you contact Giovanni Zangara IWOJET, P.O.Box 38, 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 G6ANH (OH1) at 1034UTC on March 1. An opening to Africa occurred on March 8, between 1100-1300UTC with AZ2BW 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, ZS45 in the Orange Free State, was causing real problems. However, contacts were made with LA9YB, RB5AL, UA9FAD, N1B8G and W5IR.

On January 22, Shep WHAI successfully completed an e.m.e. test with Kari OH2BC on the 50MHz band! The interesting point is that WHAI 144MHz Sp-E 11-element Yagi (okay, so it's 14m long!) at 20m above ground with no elevation control and a 1W amplifier.

Incidentally, the pre-amplifier was in the shack, fed via 60m of Heliax feeder from the antenna. At the time of the QSO, the moon was 8° 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 worked. If you have contact 30 stations in 10 countries, the final score is 20 x 100 x (10 + 1) = 22000 points. Confused? I don't think you could have been confused as much as I was, when I first reading about the awards.

For example (and I quote): "If any station will win in more than one band must choose only a prize after knowing all position tables". For further information I suggest you contact Giovanni Zangara IWOJET, P.O.Box 38, 00100 Roma Centro, Italy!
Back-Scatter

November Report

It's a pleasure to receive a 430MHz band report from novice
John Reming 2E1AWW (Birmingham). He mentions that the
novice schedule does not allow activity in the c.w./s.s.b. section
of the band. Only the sub-band 433.00-433.500MHz (SU20). The
Kuwait City Amateur Radio Club station has now worked a
Received signal at 1038MHz, in the narrow-band section of the 100Hz.
A similar process is used in the receive direction. In this direction a
1038MHz signal with the 10224MHz i.o., to produce an i.f. which
is then fed to the 144Hz transceiver.

Extensive use is made of microwave circuitry, similar to a
conventional p.c.b. eliminating the need for mechanical engineering.
No special tools or facilities are required. "Buying a thing of the past"
and the "discovery" of all the "hard-to-get" items.

On 70MHz, a series of five cumulative contacts during January-
March, provided an increase in activity on an otherwise
very quiet band. Interesting contest
GOFDZ, using a 2mW helium neon
15kW 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 has now worked a
permit for the 50MHz band. The club
was expected to be GVR with 100W
and a 5-element Yagi, from early
April. QSL manager is KG2S.
A Japanese operator is now
active from Tanzania (KG13D) using
the callsign 5G3RA. He's expected to be
active until April 1993. QSL cards go
via JAPSAU.

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1.5kW output, no contact could be
made. It should be noted that the UK-
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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

Novice Report

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previously from Bristol and Rugby, and in later years operated as G2AHW/4 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 any transmitter sources, types of receiver detectors, optical lens systems and whether tests have been conducted on c.w. voice or data. You can contact him by packet radio @ ZL1AB.AKL.NZL 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. It was the most 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 aeronautical mobile work, or has 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 high altitude, it's quite likely that UK radio amateurs will have the opportunity to contact PH4NAF/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 Frankin PA0OJN, Sperwerhorst 90, 2317 ZP Leiden, Netherlands.

### Expedition Updates

It's back to earth now for some expedition up-dates. The Fontainbleau Radio Club are mounting an expedition to the Balearic Islands, (EAI) 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, 1268MHz 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 UL7GC, UL8DD and PA9EU.

Uffe OZ1DOQ 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 ORV 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 from the RSGB. This contest will take place on Sunday June 14, between 0800-1100UTC.

The contest exchange consists of call signs, report and serial number, locator and OTH. There are sections for the single operator fixed station, all other categories and listeners.

Later in the day, between 1200-1600UTC, a 50MHz c.w. contest will take place. The rules are similar to the 70MHz event, with the exception that OTH 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. Microwave contests on May 19 and June 16. A full set of rules can be obtained from myself on receipt of a.s.e.

### Diamond Jubilee

To assist me in preparing for a very special 60th anniversary issue of Practical Wireless, I am 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 furnish me with this information, I would still like your help in reporting events of 20, 30, 40 or 50 years ago to help illustrate the long life of P W 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 your letters by 'phone transceive at my mailbox GB7TM/1 and I can also be contacted at my DX cluster GB7TCX.

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.

March 1992 will be remembered for many international radio news stories. The BBC's Daventry transmission 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 Woolferton, 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 Pais in Spain. Romantics amongst you will possibly agree that it is a shame that Daventry could not be kept as a small 15kHz station which the World Administrative Committee 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 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 spread spectrum from March 30, saw the start of satellite relays on Astra-1B and Tele-X. English is carried at 2030GMT on the Comedy Channel transmitter on Astra, channel 26 at 11.576MHz with the audio sub-carrier at 7.74MHz. On Tele-X, Radio Sweden uses the TV4 transmitter at 12.076GHz 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-F. 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 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 (HFC) and an allocation for the new Broadcasting Satellite Service-Sound (BSS-Sound).

Broadcasters in the industrialised world wanted significant expansion of HFC 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 2.9 and 4MHz, would be useful for short range operation in Europe where, for example, the Netherlands finds it very difficult to reach 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 HFC. Eventually a compromise was
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agreed, with broadcasters gaining 79kHz 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 technologically 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 switched into 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 written to me to say that he has received recently. On Saturdays at 11.98MHz which has been well heard in English with a news bulletin at 0010 heard at 2315 and runs for some three hours.

### African And Middle Eastern 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 11.58MHz 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:

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0900-1000</td>
<td>11.55MHz</td>
</tr>
<tr>
<td>1200-1400</td>
<td>9.705MHz</td>
</tr>
<tr>
<td>1400-1700</td>
<td>6.155MHz</td>
</tr>
<tr>
<td>1900-2100</td>
<td>5.945MHz</td>
</tr>
</tbody>
</table>

### Asian And Pacific Stations

Mr Hunt writes that at his location, the only satisfactory evening transmission is 17.76MHz. 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 17-7-764, 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

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>5600</td>
<td>5900</td>
<td>30</td>
</tr>
<tr>
<td>7300</td>
<td>7500</td>
<td>20</td>
</tr>
<tr>
<td>9400</td>
<td>9500</td>
<td>100</td>
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<td>11600</td>
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<td>12050</td>
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<td>13970</td>
<td>70</td>
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<tr>
<td>15230</td>
<td>15240</td>
<td>200</td>
</tr>
<tr>
<td>17480</td>
<td>17550</td>
<td>70</td>
</tr>
<tr>
<td>18900</td>
<td>19020</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>290kHz</strong></td>
<td></td>
</tr>
</tbody>
</table>
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