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INSIDE

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With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

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*CW narrow optional

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Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

PRACTICAL WIRELESS
PW

MAY 1990
(ON SALE APRIL 12)
VOL. 66
NO. 5
ISSUE 998

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Prestel 202671191

Contents May 1990

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Regular Features

PUBLISHED on the second Thursday of each month by PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Blackmore Press, Shaftesbury, Dorset. Tel: 0747 53034. Distributed by Seymour, Winsor House, 1270 London Road, Norbury, London SW16 4DH. Tel: 01-679 1899, Fax: 01-679 8907, Telex: 8812945. Sole Agents for Australia and New Zealand - Gordon and Gotch (Asia) Ltd. ; South Africa - Central News Agency Ltd. Subscriptions INLAND £19.00, EUROPE £21, OVERSEAS (by ASP) £22, payable to PRACTICAL WIRELESS, Subscription Department, PW Publishing Ltd., Enefco House, The Quay, Poole , Dorset BH15 1PP. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the publishers first having been given, be lent, re-sold, hired out or otherwise disposed of by way of trade at more than the recommended selling price shown on the cover, and that it shall not be lent, re-sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

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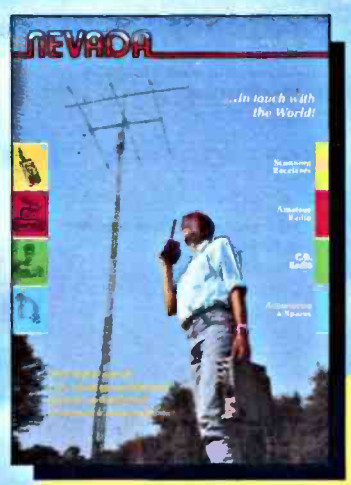

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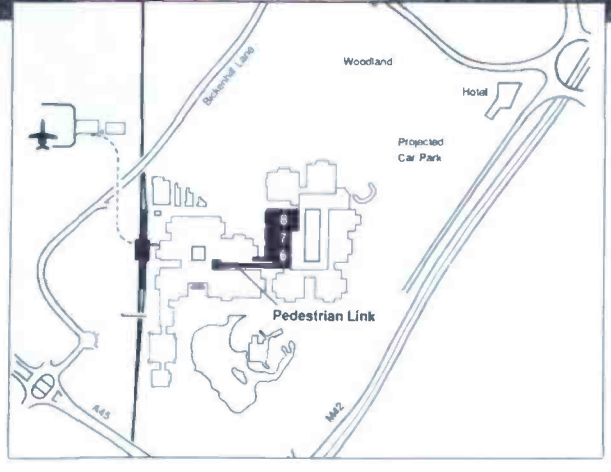

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This very high quality 2m/70cm FM dual band mobile transceiver has been specially designed to provide maximum performance and operating convenience in an ultra compact package. An impressive array of features gives maximum flexibility in mobile installations. The transceiver has an output power of 45W (VHF) 35W (UHF) and incorporates a high/low power switch. The unit is provided with 10 programmable memories. Channel spacing is in 5, 10, 12.5, 20 and 25kHz steps. There are four scanning modes:

1. VFO scanning of the entire band. 2. Memory scanning of selected memories. 3. Programmed band scanning of a selected segment of the band. 4. Priority scanning allows selection of a frequency, in VFO or memory, to serve as a priority frequency.

A duplexer is built-in so that when an antenna for both bands is in use, only one feeder cable for the transceiver is necessary.

The unit is supplied with a comprehensive instruction manual. It is illegal to transmit with this unit unless you hold a Radio Amateur's Class B (or A) licence.

Quote Reference DBT50 **£499.95**

VHF/UHF FM Dual Band Handheld Transceiver

- ★ *6W VHF/5W UHF Output Power (with optional 12V battery pack)*
- ★ *Cross Band Full Duplex Operation*
- ★ *Frequency selection by Direct Keyboard Entry or Step Up/Step Down*
- ★ *Automatic Battery Save Function*
- ★ *20 Memory Channels*
- ★ *Built-in DTMF Keypad and Encoder*
- ★ *Amazing Compact Size Only 3×6×19 cm approx.*

This unit is very compact and is one of the smallest dual band transceivers currently available. With the battery pack supplied output power is 2.5W for VHF and 2W for UHF. Frequency selection is either by direct keypad entry of the required frequency or by using step up/step down buttons in increments/decrements of 5kHz, 100kHz and 1MHz. An automatic battery save (ABS) function will extend battery life considerably. There are 20 memories (10 VHF and 10 UHF) for storing operating, offset and tone frequencies. The scanning facility has a priority function which has the ability to scan between chosen VHF and UHF frequencies. A 10dB RF attenuator is switch selectable and can be used in areas of high RF saturation.

Quote Reference DHT50 **£369.95**

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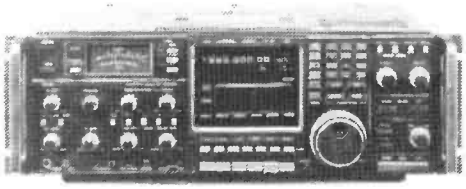

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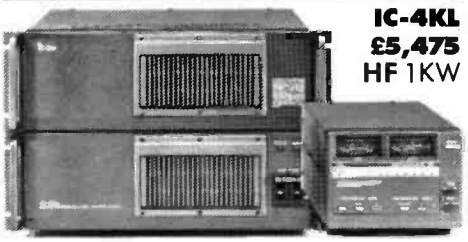

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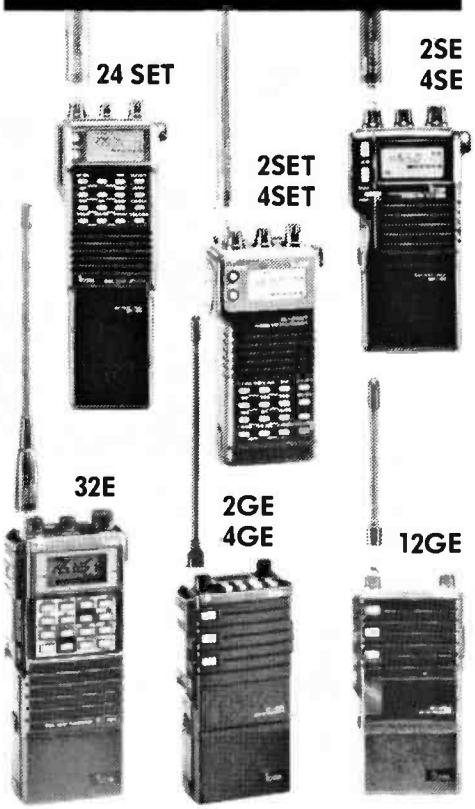

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The FT-747GX is a compact SSB/CW/Am and (optionally) FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminium heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

WARNING: If you buy FT747GX not designed for the U.K. market, these may not be fitted with AM/CW filters which you may not be able to obtain.

IMPROVED PERFORMANCE AT NO EXTRA COST!

Yaesu's **FT757GXII** is a HF compact transceiver which offers full featured performance just about anywhere, on holiday, on the road or in the shack. Remarkably similar to the **FT757GX** the **FT757GXII** has a number of improvements which enhance the pleasure and ease of operation with no detriment to the electrical performance. The improvements include memory storage of operation mode, slow/fast tuning selection, automatic step change according to mode, IF Notch filter, 10 memories and VFO to VFO scan.

Other standard features include RX coverage from 500kHz to 30MHz, TX from 160m to 10m (WARC bands included), 100W RF output, SSB (LSB+USB), CW, AM & FM, iambic electronic keyer and AF speech processor.

A whole host of options are available to increase the operating pleasure.

So no matter where you are why not try **Yaesu's FT757GXII** full featured transceiver.

- ★ All mode SSB (USB+LSB) CW, AM and FM
- ★ All Band Tx (General Coverage RX)
- ★ 100% Duty cycle (100W, CW, FM 25W AM)
- ★ Pushbutton mode selection
- ★ Switchable VFO steps (All modes)
- ★ New Notch Filter
- ★ Dual VFOs and 10 memories (Freq & Mode)
- ★ Computer compatibility (with optional interface)

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NOW EVEN BETTER the FT757GX MK2

NEW IMPROVED FT767GX

Yaesu have upgraded this popular HF and VF/UHF base station transceiver. The improved version is now available with enhanced synthesiser performance and VFO tuning rate. Read Chris Lorek's review in "Ham Radio Today".

- ★ ALL MODE LSB/USB, CW, FISK, AM & FM
- ★ ALL BAND Transmit, General Coverage Receive
- ★ Optional VHF/UHF units (6M, 2M & 70cms)*
- ★ 100% DUTY CYCLE (Key down CW for 30 mins)
- ★ Built in AUTOMATIC ATU (one memory on each band)
- ★ Computer & Packet radio compatibility

OPTIONAL ACCESSORIES:

50/767 6M Unit 10W O/P	£179.00
144/767 2M Unit 10W O/P	£179.00
430/767 70cms Unit 10W O/P	£225.00
FL7000 500W PEP HF Linear	£1600.00
SP767 External Speaker	£69.95
FIF232C Computer Interface	£75.00

For existing owners of the FT767GX who purchased their sets through Yaesu's official UK distribution network, Yaesu are offering an upgraded local unit for a nominal charge. Please contact us for details.

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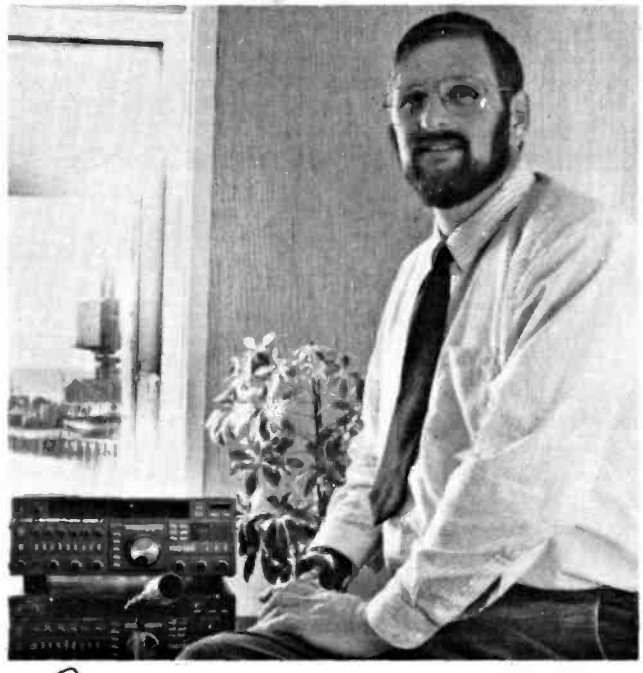


Rob Mannion G3XFD

It must be Spring - the rally season has started! The many and excellent mobile rallies and shows up and down the country are very important to *PW* and our sister publication *Short Wave Magazine* as we can meet and talk to readers. Many of you take the opportunity to 'bend' the editor's ear, and feedback such as this can be very useful - if sometimes uncomfortable. Joking apart, most of you who have criticism and suggestions about *PW's* approach to the radio hobby present it in a very positive and helpful way.

As *PW* strides forward into the new decade we are very conscious of the fact that we must try to cater for our readers in the best way possible. And let's face it - without you there would be no magazine. To this end, throughout 1990 at all the shows and rallies that *PW* and *SWM* attend, you'll be given the opportunity to fill out a questionnaire.

The forms will enable us to gather as much information as possible from you all as to what you, the reader, require from the magazine. The data will enable us to evaluate your likes and dislikes and you'll also have the chance to suggest ideas for new features and projects. We very much value your comments and all it will cost you is a few moments of your time and opinion. In return your completed form will be entered in a free draw. The the first lucky winner was Marie G0LAS from Kent, who won her prize at the Picketts Lock Show in London in March. Marie chose an *ARRL Handbook* - so don't forget, spare a few moments at our stand and help us to help you and you could help yourself in more ways than one.

The Show Must Go On

It's a little while since we had an amateur radio show in London. It's a very long while since we had a show where parking was unrestricted and free. The Picketts Lock Centre in North East London proved to be an ideal venue in this respect. As the spacious venue is not far from the M25, with good rail communications for those not brave enough to drive on the motorway (I kid ye not, I even had to avoid a glass-reinforced plastics Dinosaur in the middle lane near the M11 turn-off), the choice of location seems ideal. If there were any serious concern that a show based in London was wanted by the amateur radio public, the number of visitors to the *PW* stand from Scotland, Wales, Northern Ireland, Eire, France, Belgium, Holland, Germany, Italy and Greece should surely convince any one.

The organisers - the Southgate Radio Club - worked incredibly hard and showed what could be done. I've never seen such a willing bunch of workers. They were everywhere and they and all the traders proved that the two-day event has much potential. What a pity that they were let down by the lamentable public conveniences. However, I'm assured by the organising committee that various problems such as this will be sorted out for next show - to be held on the 8th and 9th of March 1991 -and speaking for myself, I'm looking forward to the next show despite the M25 Dinosaur!

Getting There

Many people who know me are fully aware of my interest in railways. As a founder member of the British Railways Amateur Radio Society along with Ron Hooper G3SCW (now sadly a Silent Key) I have retained much of the railwayman in my outlook to rail travel. Knowing full well that many enthusiasts wishing to travel to the big shows such as Leicester and the NEC near Birmingham, would often prefer to let the 'train take the strain', I asked BR Inter-City if it would be possible to arrange special bargain tickets for those of our readers wanting to travel by train. Unfortunately, after several letters and phone conversations, BR officials politely but firmly stated that they had more than enough passengers travelling to both locations without encouraging even more by offering special rates. Perhaps we'll have more luck when a show is organised in a location served by a threatened or less well-used railway service. Anyone for a national show on the Welsh Borders? (All Change at Craven Arms Please).

Conversion to Four Metres

Have you recently bought an ex-p.m.r. transceiver with a view to converting it to 70MHz f.m. operation? If you have, I would be pleased to hear from you and details of the particular rig you've bought. In fact, we'd like to hear about any successful conversions that have been carried out on the various transceivers that can be found.

To close this month's piece I have to thank readers who've written to me on the valve topics in previous *Keylines*, and pose a question to those of you who enjoy home construction. Do you, when building a design published in *PW*, prefer to work from the circuit alone (with tips on construction but without comprehensive guidance) or do you prefer the complete circuit, guidance, p.c.b. and over-lay service that we provide now? Either way, I would like to know your preferences. Don't forget - there's room for extra comments on our forms available at a rally near you this season.

Come and see us there and help us to help you!

RM

Receiving You...

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.
Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

★★★★★STAR LETTER★★★★★

Discrimination

Dear Sir

As an old-time radio enthusiast who had the regrettably useless privilege of exemption from the RAE forty years ago may I say that while I fully sympathise with your remarks on discrimination it is unfortunately the case that it has already been introduced into the novice licence concept, with the intent of promoting Morse even at the risk of defeating the purpose of that concept. Events over the last few years confirm that, by and large, DX is what attracts while Morse tends to repel.

It will always be the case that some will hold themselves better than others, but his would be easier to bear if the Morse test were a qualification for those who actually want to use Morse on the air, rather than a device for preventing access to all forms of h.f. transmission.

I am well aware of (and do not dispute) all the merits of Morse which are so repetitiously trotted out (indeed its qualities of penetration are, as I write, being demonstrated by two characters hammering away in the middle of one of the 'phone sections - I would not dare try that the other way round!). But there are people who can fully satisfy examination requirements and do have the price of, or could even build, an h.f. rig but are barred from the h.f. bands only because they have no aptitude for Morse; they cannot see why they should be made inferior compared to, say, those of us who have contrived to scrape through the test but who do not want to, could not, and have no intention of trying to carry through a Morse QSO. It is long past time for work to begin to secure an all-bands, no Morse test licence in this and other countries. This would be perceived to be logical, which the existing situation is not; and indeed, as Morse passes out of use in other spheres while amateurs increasingly indulge in RTTY/AMTOR/packet/data transmission (and Morse itself can be encoded and decoded by machine) continuing imposition of the test as a condition of access to amateur radio indeed is illogical.

I must hasten to emphasise that I am not decrying Morse. I would be happy to accept, indeed I advocate, that the licence conditions should be so amended that the Morse sections of the h.f. bands are legally reserved for the use of Morse by those who pass the test. That, I submit, should be a sufficient privilege to underpin Morse elitism. And as to the perpetuation and propagation of enthusiasm for Morse I suggest it remains true in all spheres that a volunteer is worth two pressed men.

Alex L. Dick ('Sandy' GM0IRZ). Dundee

To All Rally-Goers

Dear Sir

The Lancastrian Rally Committee offers its sincere apologies to the many people who were under the impression that the Lancastrian Rally was to take place on Saturday 27 January 1990, as published in *Practical Wireless*, January and February 1990. We must point out that this was NOT the fault of the committee, but an error on the part of *Practical Wireless Magazine*. We have contacted Rob Mannion, the editor of *PW*, who has given us a firm undertaking to print a full apology and correction as soon as possible, as well as an offer to promote the rally during the coming year. We are now quite satisfied with *PW's* response.

We ourselves made every effort to inform as many people as possible, by putting out announcements on GB2RS, Packet and even having a station on 2m on Saturday morning telling all and sundry that the rally was not taking place this year. However, we do realise that this is small consolation to the 60 or so people who made the journey to Lancaster only to be disappointed on arrival. Again, we can only offer sincere apologies and hope that this will not deter you from attending the rally on the correct date, which is Sunday 27 January 1991.

Finally, to the 150 plus people who phoned our contact numbers during January, thank you for your patience and understanding. To the best of my knowledge, not one of those who phoned was ill-mannered, ill-tempered or anything other than courteous and good-humoured. We look forward to seeing you all at Lancaster in January 1991.

M. Sherlock G4ZYN
pp. J. Brown G0JSM
Chairman Lancastrian Rally Committee

Editor's comment: When you send in rally details a long way in advance of the event, please mark the year very clearly!

Dear Sir

First, thank you for an excellent magazine.

Secondly, I must say that I am not a fan of letter writing but I need info and I think you can help me.

Last evening, I had my first 2-way QSO is SSTV with UV9WV. Reports exchanged, both 595, frequency was 14.233MHz, eight seconds and time 17.40GMT. His QTH was UFA and name (the standard) VLAD!

Please can you tell me the date of the start of SSTV in the USSR and further, can they work any other data, AMTOR, Fax, etc?

Since Richard Thurlow G3WW went dark screen and Les Curno stopped writing there is no column devoted to SSTV and this is a shame since there are many more amateurs using the mode through computers.

Finally, I received the above station via an FT-767GX: TX the GX-2 Technical Software an ancient BEEB and RX ROBOT 400C, my output was 60 watts, antenna 2 ele, tribander, tower down, 8m.

Continue the good work.

Clem Blumfield, Shrewsbury, Shropshire

Dear Sir

Whilst I am slowly recovering from a long illness, and recovering old valve radios, I noticed a distinct change in the pattern of the broadcast reception and wonder if anybody else has noticed this too?

For about a year I have been practically unable to receive Voice Of America on 5.695mc and the next frequency and the next. I know the transmission is there because occasionally I hear it crossed over with GDR and Prague. Sometimes I cannot receive CSM Boston at all, in the 29 or 31m band. This morning for the first time they came roaring in, Cuba disappeared, Ontario almost invisible at 2200 or 1400 or 1800. South American stations nil. SRI disappears. Then some days the entire band from 5MHz to 23MHz is smothered with whistles at every channel, some of the public commercial channels are inaudible on any receiver I have, Sanyo, Bush, Murphy. Some days the whistles have gone entirely from all channels.

Has any other listener noticed this?

I understand that the E-layer is now full of junk hardware from space shots. The clutter is so close that ongoing work is not at risk of damage from collisions. If that is true, shouldn't the metal junk reflect radio transmissions and cause unusual results?

The other question is this: looking once again at the time quota for obtaining a licence, I wonder, that every police officer, fireman, gas repair plumber, water board repair group all have transmitters which they use continuously. Have they all passed the RAE licence examination?

My Scottish forebears would say "is that a fack..."?

John D. Berridge
Whitchurch
Cardiff

Competition Corner

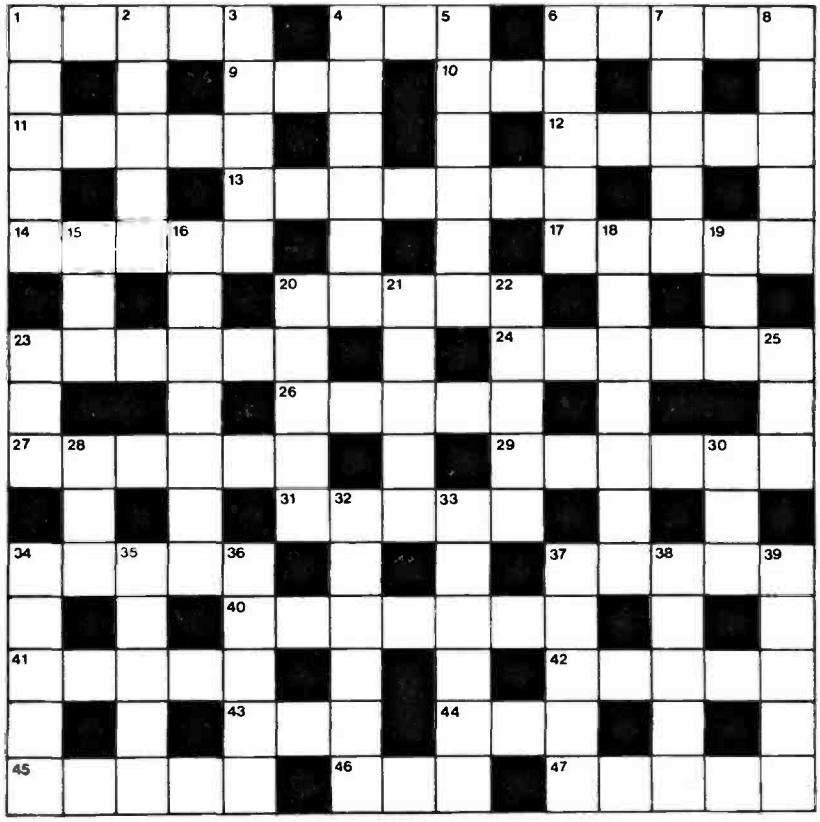
Clues

Across

1 Beam search matches syllables (5)
4 Lorry front, taxi (3)
6 Give plants private drink (5)
9 Podded vegetable (3)
10 Frozen 6 across (3)
11 USA bird emblem (5)
12 Unsatisfactory fruit drop (5)
13 Hated opponents (7)
14 Meant to happen (5)
17 Urgent move makes less speed (5)
20 Insane behaviour (5)
23 Gilded bronze furniture (6)
24 Raised children on hind legs (6)
26 Worthless ox tum (5)
27 Energetic atom after radio (6)
29 Devious gallery (6)
31 Ideal sleep vision (5)
34 Wire width measurement (5)
37 Extra equipment (5)
40 Butter holds in place (7)
41 Calculating snake cleans German windscreen (5)
42 Bring on oneself (5)
43 Metal container (3)
44 Sleepy physical action agrees with wink (3)
45 Portable light song (5)
46 Liquid power of humour (3)
47 Before due (5)

Down

1 Storage platform (5)
2 Jargon (5)
3 Hurry, time measurement (5)
4 Photographic equipment, in private (6)
5 Island costume (6)
6 British nationality (5)
7 Trainer domesticates (5)
8 Home on the extent for cooking (5)
15 Wind constituent in waves (3)
16 Making Gretna Green marriage (7)
18 Modified to another 30 down (7)
19 Fasten old school identification (3)
20 Cut volume dumbly (5)
21 Sound - in the rough (5)
22 Milky quality (5)
23 Female germ cell (3)
25 Short Delaware (3)
28 Initially American intelligence (1,1,1)
30 Equipment in current employment (3)
32 Competition involving 3 down (6)
33 Oak fruits grow (6)
34 Dyslexic numerical diagrams - hard work! (5)
35 Below (5)
36 Worldly power made safe (5)
37 Putting by, stage whisper (5)
38 Not a medal, but internal covering anyway (5)
39 Grubby signals (5)



Complete the crossword, fill in the form below and send your entry to PW Publishing Ltd., May 1990 Crossword Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP.
Closing Date 10 May 1990.
The Editor's decision on the winner is final, no correspondence will be entered into.

Name .....

Address .....

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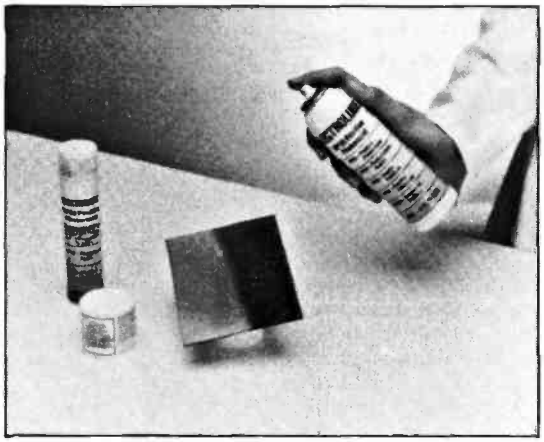
The **two runners-up** can choose from either a six month PW subscription or £10 in book vouchers.

Newsdesk '90



Dual Channel 'Scope

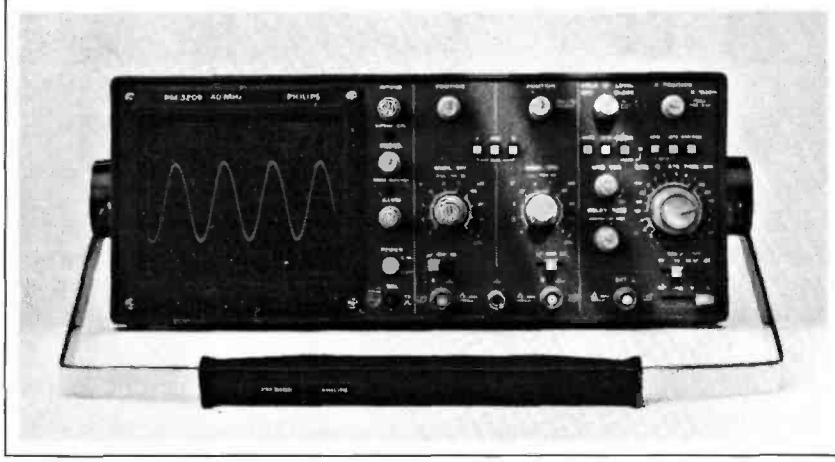
STC Instrument Services now have added two Philips oscilloscopes with a dual-channel facility in their range.

For under £350, the PM3208 is a 20MHz product while the PM3209, at under £600, covers the 40MHz bandwidth and also offers a delayed timebase facility.

Both instruments offer such features as a variable hold-off to ensure a stable display for complex pulse trains or data streams; an X-Y mode for display of waveforms (including Lissajous figures); TV triggering for display of video signals and the ability to connect to a frequency counter (or similar instrument) to obtain higher accuracy measurements.

The two units have 80 x 100mm rectangular screens offering parallax-free readings and the ability to illuminate if, for example, photographs of displays are required. Both instruments are supplied with high-quality probes as standard.

STC Instrument Services
Dewar House
Central Road
Harlow
Essex CM20 2TA.
Tel: (0279) 641641.



Non-CFC Photoresist

Believed to be the first aerosol photoresist product using an ozone-friendly propellant, new Electrolube RP50 is a fast-drying positive resist for one-to-one reproduction of circuits, diagrams and images on metals from transparent positive masters.

Available in 75 and 200ml aerosols, RP50 is suitable for small production requirements. Both 1 and 2.5 litre bulk containers are also available for larger volume users. With a solids content of approximately 12%, RP50 aerosols have a shelf-life of one year unused and give coverage of approximately 2.2m² (75ml) and 5m² (200ml).

Processed RP50s clear green colour produced a high contrast image with a resolution of better than 0.1mm and a fine spraying nozzle ensures extremely thin, uniform edge-to-edge coating, with thickness entirely within the operator's control.

After applying RP50 to a clean, grease- and dust-free surface, the coated boards are left to dry overnight or alternatively oven dried for 10-15 minutes at 75-80°C. The design artwork is then placed on to the coating which is then exposed to a uv light source. Development is carried out using diluted Electrolube Photoresist Developer producing a clear green image of those areas not exposed to the uv, on a copper background. The bare copper areas are then acid etched away. The remaining photoresist on the design patter is removed with undiluted Photoresist Developer leaving behind the printed circuit pattern ready for subsequent operations.

Electrolube Ltd
Blakes Road
Wargrave
Berkshire RG10 8AW
Tel: (0734) 404031

Used Postage Stamps

As many readers may remember, John T Allsopp G4YDM has been collecting used postage stamps to help buy a TX/RX for a disabled amateur friend. Well, the last appeal was very successful and many people sent notes asking him did he want more than the parcel they had just sent. Unfortunately, he can't reply to everyone individually otherwise he wouldn't get much done!

His message to all - "Yes, I'm still collecting". So if you have any used postage stamps, send them to:

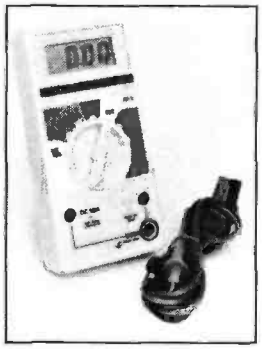
John T. Allsopp G4YDM
30 Manor Park
Concord Village
District 11
Washington
Tyne & Wear NE37 2BT

COMEX 90

COMEX 90, the mobile communications exhibition and conference will be held in the Telford Exhibition Centre, Telford on October 16-18. If you would like more information on this event, contact:

John Graham,
Frametrack Limited, Keswick House,
207 Anerley Road, London SE20 8ER. Tel: 01-778 5656

Basic Measurements



The latest hand-held digital multimeter from TMK Instruments provides the user with all the basic measurements using a single, easy-to-use, rotary switch. Model G85 has a clear 1999 count three and a half digit liquid crystal display with automatic zero, polarity, over-range and low battery indication. Housed in a yellow rugged case, the G85 has recessed safety sockets and test leads. This highly reliable and value-for-money instrument has many applications and is fully guaranteed for one year.

Two d.c. voltage ranges measure to 200V, have a 10mV resolution and a basic accuracy of 0.7%, a.c. voltages goes to 500V in one range with a 1V resolution. Direct current up to 10A with a 10mA resolution and a basic accuracy of 1.5%. Ohms are measured in 2 ranges to 2MΩ with a best resolution of 1Ω, while diode test are carried out at 3 volts and 1mA. Model G85 is supplied ready for use with a battery, test leads, carrying case and instructions. The physical dimensions are 73 x 148 x 32mm. The G85 costs £39.95 excluding VAT.

TMK Instruments
Building 3
GEC Estate
East Lane
Wembley
Middlesex HA9 7PJ
Tel: 01-908 3355.

Newsdesk '90

Dial Search

The latest edition of *Dial Search* by George Wilcox is now available, that's the sixth edition.

The telephone is designed to 'connect you' to all sorts of interesting and useful people. So is every portable radio. Yet many radios in the home stay tuned to one station all the time! Getting more variety of listening is not a matter of chance or magic or even special training. It is largely a question of having the right details to hand - you need a directory. That's why George Wilcox wrote the first edition of *Dial Search* way back in 1981.

Dial Search can save hours of frustration and make home listening worth while - whether your interest is in music or in news from home or abroad.

There are two maps included in the book, the first inside the front cover is a Map of European Broadcasting Stations. The second, inside the back cover, is of the Broadcasting Stations in the British Isles. Other chapters include: Abbreviations, Spot the Tune, Broadcasts in English, Frequency Bands, Longwave, Medium wave, v.h.f.\(f.m.) and Shortwave.

Dial Search is available from the PW Book Service at £3.95 plus 75p post and packing.

PRO-2004 Upgrade Kit

If you own a PRO-2004 you will be well aware that it has 300 memory channels. This modification kit gives you the opportunity of increasing this by 100, like the 2005.

For just £2.50 you get the the two necessary diodes and a new keypad overlay and full, detailed instructions. Also included with the package is an A4 sheet of other mods you may wish to do, such as fitting a mains socket, 30MHz stepping, etc.

The instructions for the modification should be straightforward enough for most users to be able to do. Although, as you are warned, if your set is still under guarantee this modification will invalidate that guarantee.

P. Beckett
3 Pasture Close
Whitmore, Newcastle
Staffs ST5 5DQ

1 1-40	2 41-80	3 81-120
4 121-160	5 161-200	6 201-240
7 241-280	8 281-320	9 321-360
0 361-400	•	CLEAR
PROGRAM	ENTER	

Straight Key Day

The European CW Association's Straight Key Day, organised on behalf of EUCW by the Scandinavian CW Activity Group (SCAG), will be held on Saturday 23 June 1990, and is open to all amateur c.w. operators who enjoy working on the hand key, whether regularly or just occasionally.

This is not a contest. The idea is to put aside the electronic keyer for the day and use a hand-key for relaxed QSOs! Those taking part should call CQ SKD on frequencies between 3.540 and 3.570MHz, 7.020 and 7.040MHz, 14.050 and 14.070MHz, or anywhere on the 10MHz band.

Participants having at least five contacts with other straight key station may vote for the best hand-style or 'fist' worked, one vote for each of the three considered best. A 'Straight Key Award' will be sent free of charge to every operator who receives at least two votes.

Although it is expected there will be good support from British based EUCW member clubs, **all** UK c.w. operators are invited to join in to help make this event a resounding success. Logs and votes should be sent before 17 July 1990 to:

The SKD Manager
Daniel Klintman SM7RXD, Adjunktsgatan 3D
S-214 56 Malmoe, Sweden

Eddystone Users Group

Mr W.E. Moore has decided to form an Eddystone Users Group. During a recent visit to the Eddystone factory, he obtained agreement to use facts and data from their manuals in a group newsletter. This would be sent to members and would be operated on a non-profit basis, only a nominal charge for post and printing.

Anyone interested should send an s.a.e. to:
Mr W.E. Moore, 112 Edgeside Lane, Waterfoot
Rossendale BB4 9TR.

G-MEX 1990

Around 3000 radio and electronic enthusiasts turned up at Trafford ARCs second Great Northern Rally at Manchester's G-MEX Exhibition Centre on March 4. If you look carefully you can just about make out the *PW* and *SWM* stand. Many thanks to all those readers who came and said hello. As a team we look forward to seeing many more amateurs and s.w.l.s in the forthcoming months as well as in 1991 Rally Season.

Inner & Outer Hebrides DXpedition

Alan G1EUU and Colin G1JME will be using the callsign GM1WAB/M whilst on their inner and outer Hebrides DXpedition. Their timetable is as follows:

May 26 - Grantham to Ardrossan

May 27 - Arran, Gigha, arrive late on Islay

May 28 - Islay, Jura, Luing

May 29 - Mull, (Iona*), South Uist

May 30 - South Uist, Benbeculla, North Uist, Baleshare, Grimsay, Bernae

May 31 - Skye, Harris

June 1 - Harris, Lewis, Great Bornae

June 2 & 3 - Activate NB, NC, ND, NH, NJ, NO, NT, NS, NX and NY squares. The frequencies in use will be 144.440 & 50.200MHz, 430MHz by arrangement on 144MHz.

*The Isle of Iona may not be mobile operation.

QSL via with s.a.e. via:
G1EUU
68 Aire Road
Grantham
NG31 7QP

Newsdesk '90

DX from Morokulien

The East Leeds ARC G0MFF was formed only a few months ago. They are, in the main, contest orientated and have already entered many contests under the club callsign.

The club has now finalised arrangements to go even further afield to no lesser place than Morokulien on the border of Norway and Sweden (JO69DW). The borders of both Sweden and Norway actually run through the 'shack' in Morokulien, hence callsigns for both countries have been issued.

For those who have never heard of Morokulien, it is only a handful of kilometres from Charlottenburg, Sweden or about 115km north-east of Oslo.

Five members of the club, G7ELS, G4VRW, G7DCT, G7DHM and G7EIX will be in Morokulien from 8 May 1990 until 11 May 1990 inclusive, using the callsigns LG5LG, SJ9WL and of course G0MFF with the appropriate prefix on h.f. and v.h.f. and probably packet. Hopefully they will be using the satellites as well.

A video of the expedition will be made and will be available for hire on the return of the expedition for a small charge to boost club funds. The shack is available to all amateurs so a video will give you a good idea of what to expect, should you decide to pay a visit.

Anyone wanting to hire the video should contact the club secretary at:
ELARC
2 Temple Walk
Leeds LS15 7SQ

International Marconi Day 1990

Following the tremendous success of the world-wide events held in recent years, the Cornwall Radio Amateur Club are once again co-ordinating International Marconi Day on April 21.

The event will run from 0001Z through to 2359Z and the stations participating are:

K1VV/IMD - Operation of this station is under the Direction of 'Whitey' and our other good friends in the Cape Cod area, where the first Europe to USA contact was made.

VE1IMD - Operation of this station is by our colleagues in Nova Scotia - at the Marconi site where the new Marconi Museum has been opened recently.

VO1IMD - This station will be operated from St Johns, Newfoundland, as this is the area where the first transatlantic contact was made.

I2IMD - No Marconi Day would be complete without our good friends working the official Marconi Club Station in Italy. This station is located in Villa Grifone, near the village of Pontecchio, and it was at this site that the very first transmission in the history of

Water Music?

Pioneer has launched a new wave of musical performance, with products specially designed to extend the range of Pioneer hi-fi sound enjoyment out onto the high seas.

The marine loudspeakers, available in two models 100 and 120W max. Both models have been especially designed to withstand the tough marine environment and feature gold-plated lead wire and connection terminals, stainless steel mountings and an injection-moulded water resistant polypropylene woofer, built to take even a direct jet of fresh or salt water.

Pioneer have also designed a Marine Cover made to fit any Pioneer car stereo cassette/tuner combination. The new cover protects your sound source by keeping it dry and safe from the rigours of the sea.

QTI-TNA

QTI is produced by the QTI Talking Newspaper Association, a voluntary organisation which is dedicated to helping visually handicapped radio amateurs and short wave listeners to enjoy radio and electronics magazines.

Each issue of QTI tape magazine is a compilation of technical articles selected from current radio magazines and recorded on tape by a team of readers from all parts of the United Kingdom. The magazine comprises two C90 cassettes and is sent out to more than a hundred members about every three weeks. Most of them are in the UK, there are some in Europe - Norway, West Germany, Southern Ireland - as well as India, Canada and California. Also, a copy of each issue is sent to Australia where it is copied and distributed to listeners in Australia-sia.

The service is available to all handicapped radio amateurs and short wave listeners for a voluntary subscription of just £3.50. Under the Post Office arrangements for the blind, postage is free. In other cases postage has to be paid.

An enterprise of this kind is always in need of funds to cover maintenance, replacements and the purchase of up-to-date recorders and fast-copiers in order to provide a first class service. Material and financial support has been given by the electronics industry, amateur radio dealers and the radio press. However, donation large or small, are gratefully accepted. A covenanted donation is worth one quarter as much again, because QTI-TNA, as a registered charity, can reclaim the income tax which has already been paid on the amount of the donation. There is also a 'Sponsor a Member' scheme which is designed to help those members who are on small incomes by paying their subscriptions. Volunteer helpers are also needed.

Harry Longley QTI TNA, 7 Anderson Close, Lancaster LA1 3JE. Tel: (0524) 33207.

Petrol Tokens

When you fill your car up with petrol, do you collect the vouchers that come each time or do you never seem to get enough for the 'gift' of your choice? Well the Belfast RAIBC are collecting BP petrol tokens to provide their members with equipment. So far they have had two TS-440 h.f. transceivers and accessories presented by BP last November. They are still collecting these BP petrol tokens. Send then off to:

RAIBC (NI), PO Box 87, Belfast BT12 5PU

YAGIS

The repeater run by the Young Amateur's Group In Scotland has been postponed and will now take place over the weekend of April 14/15. The objective is till to work all 27 Scottish voice repeaters. The group GM0MVZ would, as before, appreciate any help such as contacts on some of the quieter repeaters.

Newsdesk '90

radio was made by the Young Marconi in 1895.

GB0IMD - Under the direction of Vernon, a keen Marconi Historian, this station will operate from the area on the Isle of Wight where many early experimental transmissions were made by Marconi and his associates.

GB4IMD - This is the Cornish RAC station operating from the original Marconi site on the top of the Magnificent cliffs by Poldhu Cove on the Lizard Peninsula in Cornwall and very close to England's most southerly point. This was the European station site when the first transatlantic transmissions were made.

GB2IMD - The Marconi station for Northern Ireland will be under the direction of Ivor GI4WRI. The site is near Rathlin Island, the well-known Marconi experimental site in that area.

IY0TCI - Last year, Pat worked as a 'guest' only, but this year will operate as an official Marconi Day station in Civitavecchia. It was near this site that Marconi carried out his first experiments on 500MHz.

IY1TTM - Last year, this station worked as a guest only, but will participate fully in 1990 working from the Tigullio Tower, Marconi. The location of the tower is at Sestri Levante on the Italian Riviera near Genoa. It was from this tower that the early experiments on v.h.f. and u.h.f. for marine direction finding purposes and propagation studies were carried out.

ZS6RSA - This station is representing the South African influence of Marconi. It was from the site in Poldhu, Cornwall that the first transmissions to South Africa were made. During the event last year, special broadcasts were made on the radio station the Voice of South Africa and the SARL held a very successful open day to celebrate International Marconi Day.

DA0IMD - Greg DL1BFE actually came to visit Cornwall last year and this year will be in charge of this station on the North German coast. It is interesting to note that the first ever 'Marconigram' was sent from Borkum Island on 28 February 1900 and the German PTT officially opened the first wireless service of the world at this site on 15 May 1900.

GB2MDI - John and his colleagues in the Salisbury Radio Club will be operating from the area near Salisbury where in September 1896 and March 1897 Marconi conducted his early field experiments for the benefit of the British Army. This site is where the old roman road meets the A30, just south of Figsbury Rings.

GB4MDI - David and his friends hope to operate their station from Flatholm Island in the Bristol Channel, a famous Marconi experimental site. They will, in fact, be on the island for about five days using the call GB2FI and will change the call to GB4MDI for the 24 hour period of the International Marconi Day. If the weather prevents access to the island then the station will work from the Marconi site on the Welsh mainland, near Barry.

F(?)IMD - Associates in northern France will be in operation for the first time this year to represent their Marconi Contribution.

Operations this year will be voice only and the following table gives the various band segments on which to listen:

3.7 - 3.8MHz
7.05 - 7.1MHz
14.15 - 14.35MHz
18.1 - 18.168MHz
21.15 - 21.45MHz
24.93 - 24.99MHz
28.3 - 29.69MHz
28.3 - 29.69MHz (f.m. at top end of band)
50.1 - 50.5MHz

This year, to qualify for the Marconi Award, it will be necessary to work any 10 of the 15 special stations. QSL cards can be exchanged via the bureau, or if preferred directly (with stamps or a donation towards the costs please).

All official award claims must be accompanied by either $5(US), £2(UK) or 10 IRCs. The official award is for full two-way working only, but in addition there is a separate award for short wave listeners where claimants will have to record at least 10 of the Marconi Day stations together with the times heard (UTC). The s.w.l. award will cost $3(US), £1.50(UK) or 6 IRCs.

CRAC (or IMD)
PO Box 100
Truro
Cornwall TR1 1RX

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SEE US AT NEC STAND B4

NiCad Recycler

Construction

Many users of NiCad batteries don't get the most out of this useful power source and a large number of cells falter and are discarded long before their expected life of 1000 charges. Peter A. Lovelock describes a very useful NiCad recycler that can restore failed cells and prolong their active lives

Why do NiCads fail?

Chief causes for premature failure are:

1: Frequent shallow discharge before recharging resulting in 'memory phenomena' - apparent loss of Ampere-hour capacity.

2: Charging to less than 1.4V per cell (not replacing 30% more energy than discharged) also effects memory.

3: Shorted cells. The shorted condition is caused by chemical 'whiskers' growing inside discharged NiCads. Cells with this fault condition will, when tested, measure zero voltage and zero resistance across the terminals and will not accept a charge.

4: Reversed cell polarity. This occurs when a cell in a series string becomes fully discharged and is then reverse-charged by the current flow from the other, healthier cells.

Fortunately, as has been proved, these defects are usually curable with proper techniques and most NiCads can be restored to full health. However, it should be realised that 'dryout' caused by internal seals rupturing from overheating, with the resultant loss of fluid, is incurable. This fatal condition can be recognised by the presence of small crystals deposited around the cell terminals.

The NiCad Recycler was designed to overcome many everday problems for the NiCad user and includes in one unit, all the facilities needed for curing, maintaining and prolonging the active lives of NiCad cells. It has also been designed with options for individual constructors. These features are :

1: One-shot Charge Mode. This is a programmable charge rate and has shut-off voltages suitable for one to ten cells (1.4 to 14V).

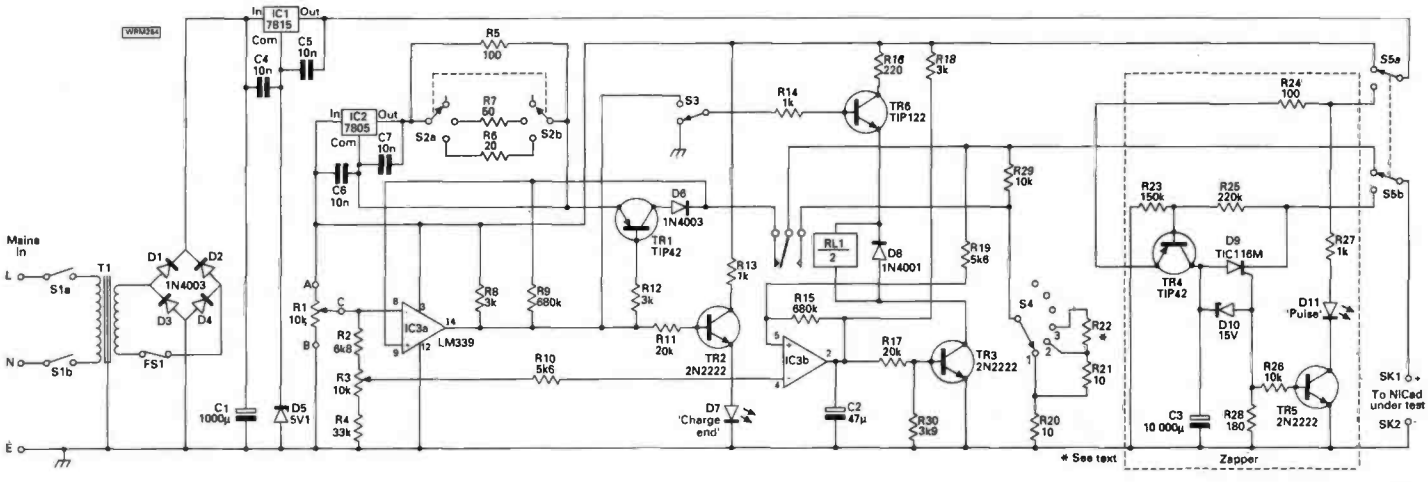
2: Continuous Cycle Mode. When full voltage (1.4V per cell) is reached, the battery is switched to a discharge load. When deep discharge is reached (1.0V per cell), the battery is switched back to charge. The battery will be cycled between charge and discharge over its full capacity range. Recycling can be done once, or periodically, to keep batteries healthy or as many times as needed to eliminate any memory condition.

3: Short 'Zapper'. This important and versatile facility on the unit applies high current pulses to shorted cells to burn out internal chemical 'whiskers' and /or repolarise reverse-charged cells.

How It Works

Now it's time to look at the circuit, Fig. 1, and see how it works. In my particular design, constant current charging is used, so as to avoid the initial high current and heating that can occur when the recharging of deeply-discharged cells is attempted. Overheating on recharging can be a common result of the constant voltage method and this problem is avoided in this design The circuit design, shown in Fig. 1, has evolved from a well-proven method

Fig. 1



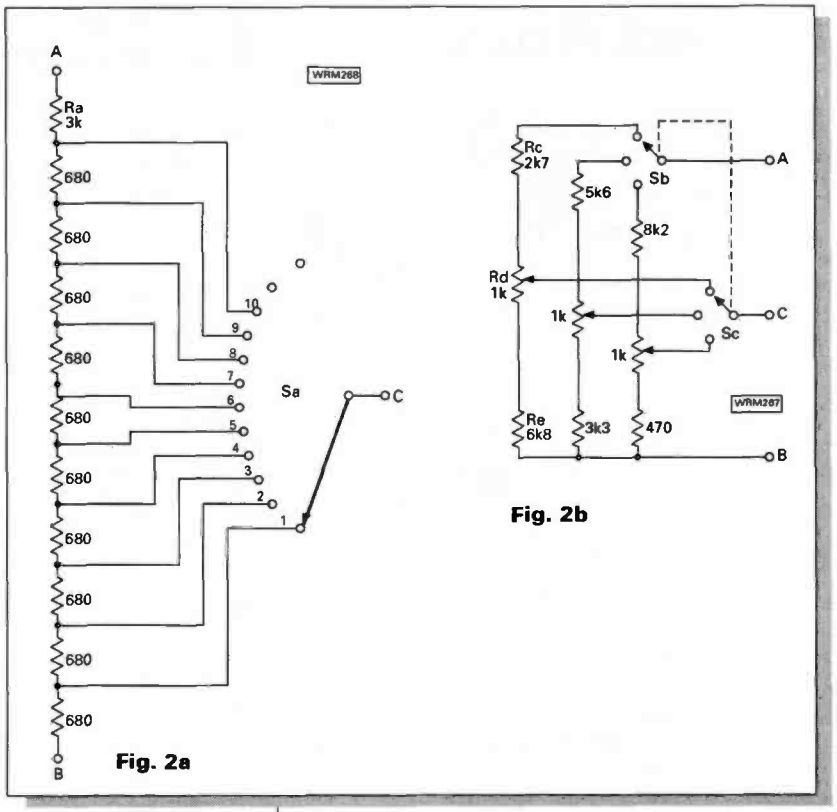


Fig. 2a

Fig. 2b

Fig. 2a & b: Two alternative methods of generating the reference voltage to pin 8 of the comparator IC3a

based on the familiar constant current charger using the 7805 regulator. This device is an ideal starting point for our purposes and has a current control resistor between the output and reference pins, the value of which sets the constant current rate. This resistor's value is determined by the simple equation;

R=5 ÷ I where I = required charge rate in amps.
e.g. for 50mA charge, R = 5 ÷ 0.05 = 100Ω.
When using the versatile 7805 device in this way, the designer has much of the work done for him, although it must be borne in mind that the supply voltage to the 7805 must be at least 5V more than the highest charge voltage required.

For the chosen charger design to work effeciently, it must be able to restore 30% more energy than has been discharged by the cell. While under charge, each cell voltage must increase, to 1.4V and when a 10 cell battery pack is connected to be recharged, the maximum charge voltage will have to be 14V. So, with all these considerations borne in mind, the designer must appreciate that the the minimum supply voltage to the 7805 input is therefore: 10 x 1.4 + 5V = 19V. However, to err on the safe side we should aim for it to be between 20 and 25V d.c.

The final design, in Fig. 1 has evolved after much testing and evaluation. As previously mentioned, the heart of the unit is based on the 7805 current regulator and this is fed with a regulated +20V d.c. supply by a 7815 voltage regulator with a 5.1V Zener diode ground reference. The supply also powers the associated control circuits. In the circuit in Fig. 1, only three control resistors are shown for obtaining the necessary 50, 150 or 300mA charge rates. However, any number of resistors may be selected by appropriate switching to provide the desired range of charge rates up to the 1A maximum of the regulators. For reliability in operation, care must be taken when considering power dissipation of the resistors. It's not a difficult task and the wattage ratings of the resistors can be calculated easily by multiplying voltage times current (V x I); thus the 100Ω resistor for 50mA = 0.25W (5 x 0.05). Bearing in mind the reliability factor, it makes common sense to up-rate these resistors to 1W types, especially when the unit will be in use for very many hours at a time.

I used a two-pole multiway switch to select the three current control resistors which are connected to the output of IC2. As can be seen in Fig 1, a 100Ω resistor (calculated to pass only 50mA) is in circuit at all times. The 100Ω resistor is shunted either by 50Ω (= 33Ω for 150mA) or 20Ω (= 16.6Ω for 300mA) resistors. These shunt resistors dissipate about 1.5W and to err on the generous side I used 2.5W wirewound resistors.

In the charge/discharge control circuit two sections of an LM339 quad comparator (IC3a and IC3b) sense and control the maximum charge and deep discharge voltage limits as follows:

Continuous or One-shot mode is selected by S3 (shown in One-shot mode) and R1 sets a reference voltage on the inverting input to IC3a, equal to to 1.4V x number of cells. The non-inverting input of IC3a monitors the charge output voltage across the battery under charge. When the charge voltage rises above the reference voltage the output of IC3a goes high, biasing off TR1 charge current and causes TR2 to illuminate the 'end of charge' l.e.d. as well as applying power to the top of relay RL1 (S3 in Continuous charge position).

Hysterisis is applied to IC3a by the 680kΩ resistor between the output and non-inverting input pins, so that when the uncharged battery terminal voltage drops approx 0.2V, IC3a output will again go low, TR1 turns on the charge current and the l.e.d. goes out. This on-off cycle repeats as the terminal voltage rises or falls relative to the reference voltage with the charge current being pulsed (rather than tapering down) and pulsation decreasing as the battery 'tops off'. The pulsating end charge is very effective in bringing the battery to the full charge of 1.4V per cell without forcing the cells into overcharge or heating. After several hours on pulsating charge, no discernible heating has been noted. With the Mode switch (S3) set on Continuous cycle, the l.e.d. D7 illuminates to signal that the charge cycle is complete.

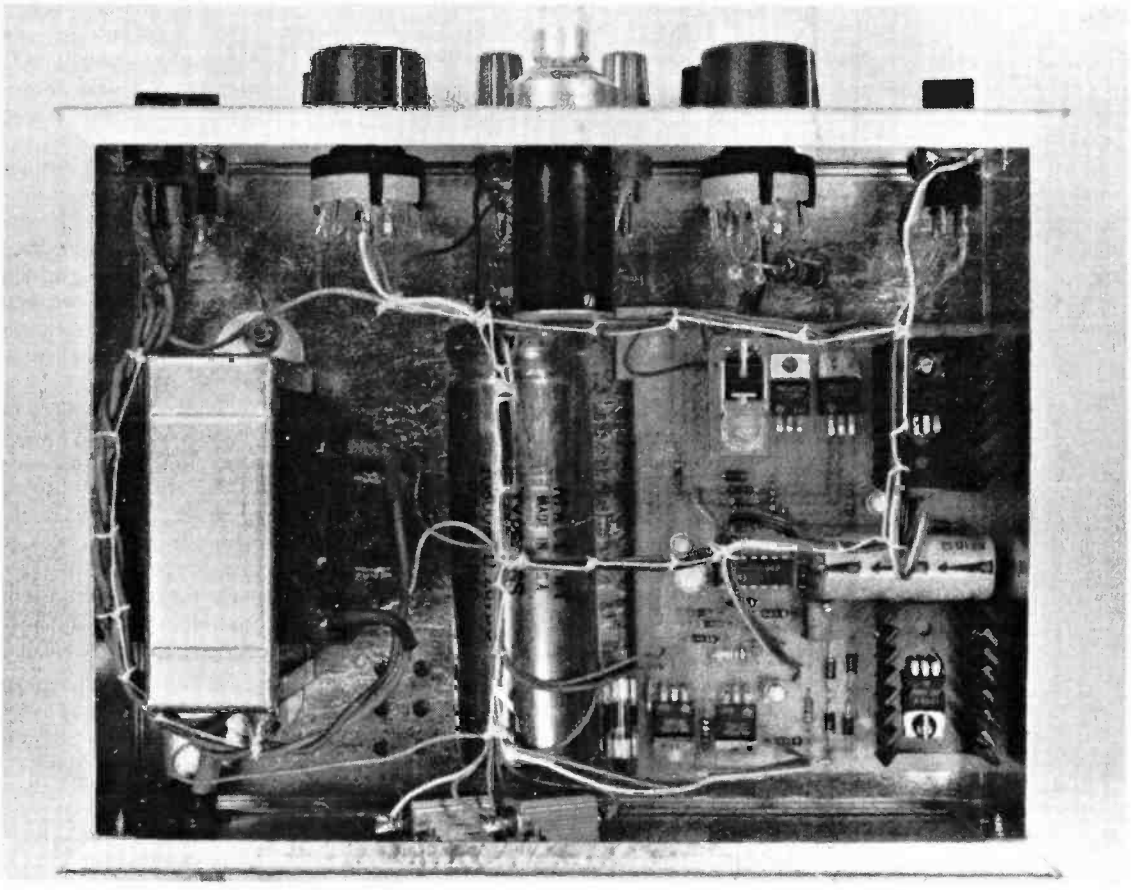
Recycle Mode

The first time that the battery terminal voltage rises above the charge reference voltage, IC3b output goes high, TR3 conducts and energises relay RL1 which switches the battery across a discharge load resistor shown as a switched (S4) value of resistance. Discharge continues until battery voltage drops below the deep discharge reference level, the level of which is set by R3 to the inverting input of IC3b (the reference level is equal to 1.0V x number of cells), IC3b output is then high, keeping TR3 in conduction. When the cell or battery voltage drops below the R3 reference, IC3b output goes low and de-energises the relay which switches the battery back over to the charging circuit. Interruption of the relay current causes the battery to be put back onto recharge.

The potentiometer R3, with external resistors, sets the discharge voltage limit to approximately 70% of the full-charge limit (1.0V x number of cells). Since the lower reference network is supplied from the wiper of R1, it will always track R1. Resistor R3 needs only to be adjusted once.

Setting the charge voltage is very dependent on the accuracy of R1, which has to be calibrated for

each combination of cells (i.e. 1, 2, 3 and up to 10 cells). A ten-turn potentiometer with a dial is recommended for ease of resetting. Suitable units may be obtained from one of the mail order suppliers. If this source of supply fails there are options for providing accurate reference voltages, and two methods are shown in Figs. 2a and 2b.



Internal view of the NiCad Recycler

Shorted Cell Zapper

Burning out internal NiCad shorts by discharging a large (10000µF) capacitor through the offending cell is not a new idea. While effective, it was found that many discharges were required to fully clear the shorts and the process was cumbersome using a clip-lead hook-up. Another method, connecting up one or more good cells across the shorted cell works well, but could result in excess heating and damage if the heavy current is sustained for too long.

The automatic zapper circuit in Fig. 1, shown within the area enclosed by the broken lines on the main circuit diagram, is simplicity itself. The zapper applies repeated short duration high current pulses to a shorted cell, which positively clears whisker shorts without potential damage to the cell under treatment. The zapper is included as part of the complete circuit, but may be built as a stand-alone unit permitting charge conditioning and short zapping of different cells at the same time. Only one cell at a time should be zapped however, as the effectiveness of the energy pulse is very much reduced when more than one cell is treated in this fashion.

How The Zapper Works

When the zapper section (Pulse) of the unit is selected, the regulated 20V d.c. charges the 10 000µF capacitor through TR4, which is in conduction. When the voltage across the capacitor reaches 15V, the Zener diode (D10) conducts, triggering the s.c.r., D9, which discharges the capacitor through the battery in a short burst of high energy.

Negative feedback to the base of TR4 through the 220kΩ resistor, causes the transistor to shut down the charging current until the capacitor is fully discharged and the s.c.r. becomes non-conducting. When TR4 conducts, the capacitor is again charged and the entire cycle is repeated continuously, applying short bursts of high current through the shorted cell.

The l.e.d, D11, across the output, which indicates the condition of the cell, is normally off since the battery is a direct short, but it flashes each time a pulse is applied. When the shorted battery is cleared, the l.e.d. lights continuously indicating that battery condition is good. To make sure it stays so, it is recommended that the battery be left on the zapper for 10 to 30 minutes after the l.e.d. comes on. (Depending on how long it initially takes to clear the short in the cell). This ensures that whisker shorts are thoroughly cleared before putting the cell back into service. Right after removal from the zapper, the cell may display a voltage of 1.25V BUT SHOULD IMMEDIATELY BE PUT ON A LOW CHARGE UNTIL A FULL 1.4V IS MEASURED UNDER CHARGE. This ensures that whisker shorts will not grow back within a few days, but will be cleared by the cell's full charge.

In addition to clearing shorts, the zapper will repolarise cells that have become reverse polarised. However, not all sick NiCads can be rejuvenated. Some are just worn out from use. Cells which have been subjected to severe overheating may have ruptured safety seals (a built-in protection to avoid explosion) and have leaked electrolytic fluid. This can be detected by looking at the insulator ring between the + terminal and the case. If this area contains small crystals, the cell should be discarded.

An Economic Variation

As already mentioned, there is an alternative to the somewhat expensive ten-turn potentiometer, R1 in the circuit diagram, Fig. 1. Two alternative methods of generating the reference voltage to pin 8 of the comparator IC3a are shown in Fig. 2a and Fig. 2b. The first alternative, shown in Fig. 2a, is a resistor chain consisting of ten 680Ω resistors and a 3kΩ resistor to make up the total resistance to

TABLE 1

Current	Other resistor
10mA	none
25mA	330Ω
50mA	120Ω
100mA	56Ω
150mA	36Ω
200mA	27Ω
250mA	22Ω
450mA	12Ω

around 10kΩ. The total current flowing in this chain is a nominal 2.05mA, this gives 1.395V across each of the 680Ω resistors. This figure is close enough to the required charge end point voltage for NiCad cells. The switch method allows the number of cells under charge to be chosen very quickly, but lacks the versatility of the multi-turn potentiometer. The switch, Sa, is a single-pole, 12-way switch with only ten positions utilised to select the appropriate setting for the number of cells to be charged.

Should there be no requirement to charge many differing battery types, then the variation shown in Fig. 2b, could also replace R1 in the main circuit diagram (Fig.1). Again, it is a resistor chain of around 10kΩ total resistance with a take-off voltage as required for the number of cells under charge. The configuration as shown, with a chain consisting of Rc, Rd and Re is that calculated to allow the end point charge limit for a 10 cell battery pack (nominal 14V) to be set. The actual value of voltage should be able to be set over the range of 13V to 15V. This voltage would be suitable for battery packs for the FT-290/690 series or the TR-2300 hand-held portable transceivers. The middle combination of resistors gives a range suitable for battery packs with a nominal voltage of 7.2V, which covers most of the newer palm-sized 'handy' transceivers. Shown on the right is a combination which is adequate to cover the charging of 1or 2 cells in series with the adjustment covering 1-3V.

Suiting Your Needs

If the constant current values are unsuitable for the cells under charge, that problem is easily overcome and may be changed by alteration of the resistor combination between the 'out' and the 'common' terminal of constant current generator IC2. This i.c. tries to maintain a constant 5V between these pins.

So, if for example, a 10mA setting were required for charging 9V (PP3 type) rechargable batteries, then you should change R5 to 510Ω, and alter the values of R6 and 7 to add the additional values. Although only three positions are shown, the switch recommended is a two-pole 6-way item, and so six current ranges could be included in the finished project and a table, Table 1, is provided, showing possible values of resistors, assuming a lowest charging current range of 10mA.

In Part 2 we will deal with the construction and the setting-up of the NiCad Recycler. The p.c.b. will also be included in Part 2.

HOW MUCH ?
£ 40.00
HOW DIFFICULT
Intermediate

Shopping List

Resistors
5% 0.5W Carbon film

100Ω	2	R5,24
180Ω	1	R28
220Ω	1	R16
1kΩ	3	R13,14,27
3kΩ	3	R8,12,18
3.9kΩ	1	R30
5.6kΩ	2	R10,19
6.8kΩ	1	R2
10kΩ	2	R26,29
20kΩ	2	R11,17
33kΩ	1	R4
150kΩ	1	R23
220kΩ	1	R25
680kΩ	2	R9,15

1.5W Wirewound

20Ω	1	R6
50	1	R7

5% 15W Wirewound

10Ω	2	R20,21

10-turn variable

10kΩ	1	R1

22-turn Cermet (vertical mount)

10kΩ	1	R3

Note: Values of R22 will vary according to the discharge load and voltage.

Capacitors
Monolithic ceramic

10nF	4	C4-7

Electrolytic axial lead

1000µF	1	C1

Electrolytic radial lead

47µF	1	C2

Electrolytic Computer Quality

10000µF	1	C3

This capacitor type normally has screw terminals and they are capable of very high ripple current. The efficiency of the zapper unit is very much dependent on this capacitor and it is recommended that the normal electrolytic capacitor be avoided

Semiconductors
Diodes

BZX61C5V1	1	D5 (1.3W Zener)
BZX61C15	1	D10 (1.3W Zener)
TIC116M	1	D9
1N4001	1	D8
1N4003	5	D1-4, 6
l.e.d.	1	D7 (Electromail 587-080)
l.e.d.	1	D11

Integrated Circuits

LM339	1	IC3
LM7805	1	IC2
LM7815	1	IC1

Transistors

TIP42	2	TR1,4
TIP122	1	TR6
2N2222	3	TR2,3,5

Miscellaneous
Relay 12V double-pole change-over (Electromail part no. 351-572), Transformer 24V 1A, fuse holder and fuse (1.5A), box to hold project was a Maplin type 2108, two off 2-pole 6-way switch, two pole change over switch, single pole change over switches, on/off switch plus knobs to suit, sockets for the battery connections, p.c.b. and interconnecting wire.
Electromail.
PO Box 33,
Corby,
Northants NN17 9EL.

REVIEW

Tokyo High Power Transverter HX-240

Do you want to increase the versatility of your 144MHz multi-mode transceiver? Is a separate h.f. transceiver out of the range of your budget? Or do you require a small, lightweight and efficient mobile rig for h.f.? If so, Rob Mannion G3XFD has the answer for you in the shape of the HX-240 transverter from Tokyo High Power Labs.

I was a little concerned when the chance to review the Tokyo HX-240 transverter came my way. What use would it be to me? Why would I want one in the first place? Well, I can assure you that I did find a use for it and feel very certain that any A licencensee owning a multi-mode 144MHz transceiver wanting to be active on the h.f. bands for a minimum outlay, would find it to be the cost effective answer.

At first sight when I opened the packaging the transverter looked extremely simple, so simple in fact that it appeared that it might not have been up to the exacting task demanded of it. How wrong those first impressions were, can now be seen by the many good contacts recorded in my log book on the bands from 3.5MHz to 28MHz.

The unit is so small and neat looking that at first glimpse it looks as if it is made up entirely of heat-sinking with a panel meter mounted on the front.

Looking at the front panel, the layout as I've already said is deceptively simple - but it works very well and Tokyo can be congratulated for their simplistic approach as the transverter equipment is very operator friendly.

Meter Calibration

The large power indicating meter which dominates the front panel is clearly calibrated. The operator can see immediately whether or not the automatic power-down safety control for antenna mismatching is operating. A warning lamp illuminates to tell the operator that a mismatch is ocurring, but I found in practice that this part of the warning system errs on the over-protective side. No doubt this is a good thing because p.a. transistors don't come cheap and can be awkward to replace. However, having said that, I consider that the almost constantly illuminated warning lamp could convince the operator that there was a problem with the antenna matching when in reality there isn't.

The other controls and indications on the control panel are simple and self-explanatory. Once you have connected the transverter to the 144MHz transceiver with the supplied coaxial lead and linked it to a power supply, you'll be ready to start. It really is as simple as that. I can honestly say that I think that the biggest possible cause for confusion when you're using the transverter will be from the orginating 144MHz transceiver.

Connecting up and Testing

The obvious thing to do when I first connected the equipment up, was to try it out for reception, and it proved to be first class in this respect. The transverter is equipped with a pre-amplifier operated by the appropriate button on the control panel, but it's very unlikely that you'll ever have to use it as the transverter seems to be very sensitive. In fact, I found that the r.f. gain control on the 144MHz multi-mode had to be backed off considerably to reduce overloading of the receive side. If the pre-amplifier does have to be used, it is automatically removed from circuit on transmit, so there's not much chance of it being damaged. As I said, the receive side of the transverter is very sensitive and there seemed to be no major problems other than some broadcast-band breakthrough effects on receive which I am fairly confident were being caused by overloading of the front end of the 144MHz rig.

Receiving Adjustments

The breakthrough - mostly apparent on 3.5MHz and 7MHz - seemed to be from short and medium wave broadcasting stations but they soon disappeared when the transceiver r.f. gain was turned down. For this same reason I also found that the pre-amplifier was not needed. When it was turned on, the 144MHz transceiver was very unhappy. But once the operator has adjusted the receiving controls on the 144MHz rig, there should be no problem. The only difficulty I ran across was with the tuning rate on the multi-mode as it was either very fast or incredibly slow and this could be very tedious on the h.f. bands although this problem cannot be blamed on the transverter.

On Air Testing

Transmitting with the transverter must be compared with the proverbial 'doddle'. It really is easy and there seems to be virtually nothing you can do to cause problems. The operator does have to ensure that the transverter is not over-driven, but by careful reading of the comprehensively prepared instruction book this problem should be avoided. The instruction book itself deserves more than a passing reference as it is clearly laid out and despite the sometimes quaintly chosen English, is very

readable and sometimes amusing. The wording, although perfectly understandable is sometimes a little odd. This is not meant to be a criticsm aimed at the Japanese author, but is only meant to warn the reader. In fact I found that the booklet 'grew on me' the more I read it. Normally instruction books are read once or twice before being mislaid. This one is like an old friend who chats away to you with a very slight foreign accent - but with a lot of interesting information to impart.

The relatively low transmit output power of the transverter would seem at first glance to be a disadvantage but I can assure you that it's definitely not. Having owned an h.f. mobile transceiver for many years (Yaesu FT-75) I know how effective lower power rigs can be when matched into a good antenna. The first tests with the transverter were carried out from my car as a static mobile. My G-Whip mobile antenna, suitably matched into the transverter allowed the unit to provide the maximum 40W p.e.p. With this combination I worked stations all over the UK and the only complaints from other operators were about the engine noise that was being heard over the air as the car 'ticked over' in our driveway.

Excellent DX

On 7MHz and 28MHz the unit provided excellent DX from the static mobile set-up using the base loaded antenna and from the trapped dipole above the house. The best DX was on 14MHz using the trapped dipole from the shack. On one particular evening I joined in a DX net and worked stations in Pennsylvania, California, Canada and Brazil. The transverter's output was obviously man enough to provide reliable communication and many stations expressed surprise when they heard about the relatively low power of the equipment.

Using 28MHz

This transverter is the first commercial 144MHz to h.f. bands type I've tried and it certainly doesn't have the design problems that I encountered when I built one for myself a few years back. Although I did come across one potential hazard that may or may not be common with this model of transverter. While using the equipment on 28MHz I found that breakthrough interference occurred around the Band II BBC Radio 4 channels. I listened for the effect on several different v.h.f. portable radio receivers plus the one fitted in my car. The effect was noticeable on all the receivers, although it was only likely to cause problems within 30 metres or so. My own KW2000A was fired up on 28MHz but the s.s.b. didn't seem to cause any problem whatsoever.

A friendly neighbour who just happens to be a radio listener and consequently values good reception as he doesn't own a TV, offered to help and listened out for me while I transmitted on 28MHz f.m.and s.s.b. As I'm a keen 28MHz operator I was pleased when he reported that everything was clear and there was no sign of b.c.i. After consulting the circuit manuals of the various v.h.f. radio receivers that had suffered from the breakthrough, I came to the conclusion that the problem was caused by the broadband front ends of the Band II tuner on the radios. This was confirmed to my satisfaction when I looked at my neighbour's radio and found that it boasted a properly designed and well tuned front end. His portable receiver even had an amplifier at Band II and it still didn't suffer from b.c.i. But be warned, if you do operate on 28MHz nowadays be aware of the possibility of this form of b.c.i.

Conclusions

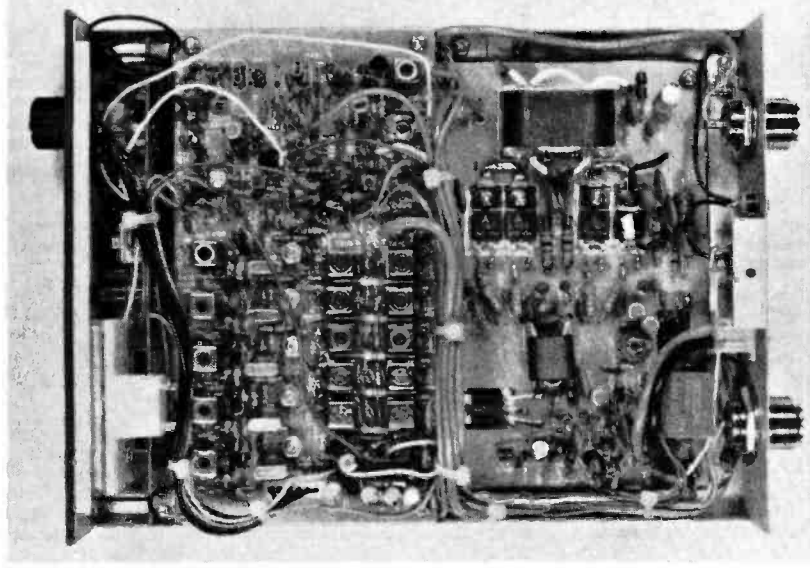
By now you will realise I liked the concept of using a transverter such as the Tokyo HX-240. Personally I feel that it will be of greatest use for any operator who is already active on 144MHz and wants to join the fray on the h.f. bands. The transverter will do this admirably and for a very reasonable cost. However, I do feel that the mobile operation capability is by far the most attractive aspect of the HX-240. Just think, if you've got already got a 144MHz multi-mode transceiver in the car, by purchasing this transverter you will have obtained a versatile and very compact transceiver for less than half the price of a separate mobile rig.

Specifications:

Frequency range:	3.5, 7, 14, 21 and 28MHz.
Output power:	30-40W p.e.p. (s.s.b./c.w.) f.m. 30W maximum (28MHz only)
R.F. Input Power:	2.5/10W selectable.
Spurious level:	-40dB or less
Receiver Pre-amplifier gain:	8-10dB
In-Out Connector:	M type (SO-239)
Supply Voltage:	13.8V d.c. 7A maximum.
Dimensions:	146mm wide, 50mm high, 192mm depth.

Features:
COX (Carrier Operated transmit/receive switching circuit).
Terminal for remote transmit/receive control.
Power level meter.
Receiver pre-amplifier.
Antenna mismatch protection circuit.
Reverse d.c. power polarity protection circuit.
Output high/low selection.

Summary:
The HX-240 is easy to use and would provide an ideal way for many operators - with a 144MHz multi-mode transceiver - to get them on to the h.f. bands for minimum cash outlay. The transverter also offers an ideal chance for the mobile operator and this point alone would certainly attract my attention and purse. I must thank South Midlands Communications of Chandlers Ford, Eastleigh, Hants. Tel: (0703) 255111, for the loan of the review model.



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Incorporating all of the Mark II mods above, the Mark V adds a short wave converter board to give continuous coverage from 150 KHz to 950 MHz, retaining all the modes of the standard unit. An elliptical filter in the input circuit, combined with a high dynamic range active mixer results in a unit which will copy Radio 4 or Stateside 10 metre SSB as easily as 900 MHz FM cellphones. **Please send S.A.E for an information leaflet.**

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FRG-9600 Mark V pack	£699.00
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Standard to Mark V upgrade	£149.00
Raycom Mark II to Mark V upgrade	£129.00

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Specifications:
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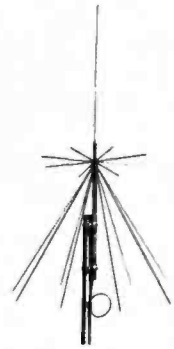
Transmit **50, 144, 430, 900, 1200 MHz**
Power **200 watts**
Connector type **'N'**
Cable supplied **RA519**
Type **Discone 8+8**
Length **1.7 metres**
Weight **1 Kg**



HR1300 discone £59.50

BB-145S
BROADBAND MAGMOUNT

Another exclusive Raycom import, the BB-145S ia a broadband ¼ wave mag mount antenna for mobile scanners and 2 metre transceivers. Supplied complete with 4 metres of quality co-ax and PL259 plug, this easily installed antenna is compact in size due to the integral loading coil and is specified for 138-172MHz, but often loads at 70 cms!

BB-145S magmount £14.95

Feature

From Wet to All Dry

Many readers will remember the 'all dry' portable with its 90V and 1.5V h.t. and l.t. batteries. Many of these receivers are still in use today and provide both good service and a source of spares for the valved-radio enthusiast. Ron Ham looks back at the early receivers and takes us right through to the 1950s, and the introduction of printed-circuits and ferrite-rod antennas.

Fig. 1

When a man's wages varied between 30 (£1.50) and 45 (£2.25) shillings per week or 60 (£3) shillings if he was well paid, his family had to be very selective as to the programmes they listened to on the household wireless receiver. Once the set was purchased and between 8 and 10 guineas (£8.40 - £10.50) had depleted the breadwinner's savings there was the running cost to consider and budget for. Yes lads and lasses, budget for because a great number of factory made sets from the 1930s to the early 1950s used a high tension battery, usually 120 volts, a grid bias battery tapped in progressive steps from 1.5 to 9 volts and a 2 volt wet accumulator, Fig. 1. A guide to the cost of these, which gradually increased as the years went by is 10s (50p) for the 'Winner' h.t., 1s/4d (8p) for the 'grid' and around 14s. (70p) to purchase one accumulator plus 6d (2.5p) to have it recharged at the local cycle-shop, garage or wireless dealer.


Fig. 2

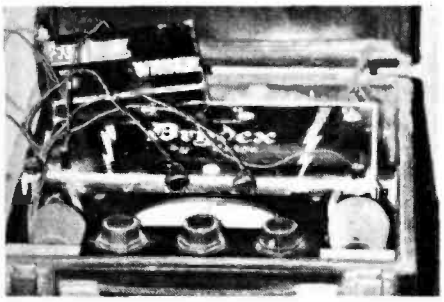


Fig. 3

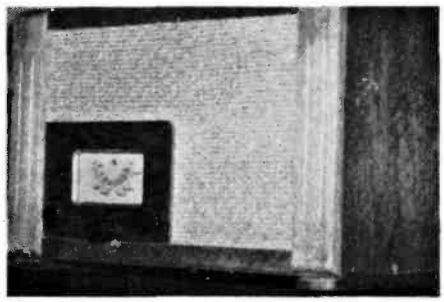


Fig.4

Fig. 5

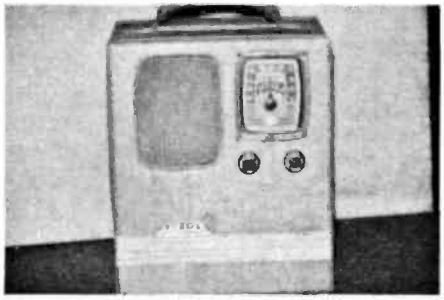


Fig. 6

Fig. 7

Accumulators

Despite being economical with set use, two accumulators were required so that one was being recharged while the other was in use. In most cases this meant two trips a week for someone in the family, in all weathers, to take one for recharging and collect the other for use. Apart from the cost of 1s (5p) per week this would mean a careful walk carrying the beast by its handle or cradle, because these wet cells were not permitted aboard a bus or train in case the sulphuric acid was spilt. I emphasised the word careful because if this acid touched clothing, holes would rapidly develop and the material would rot away. This also applied to the fabric on vehicle seats and of course, on arrival home, you never put it down on the carpet or the table-cloth and if the set was in the corner by the window, as many were, one had to mind the curtains while the set was revolved to allow the accumulator to be stood inside and connected. These wet cells had two large terminals, coloured black (negative) and red (positive) and a stopper on the top. The terminals each accepted a spade from a lead in the set and the stopper was removed during the approximate three-day recharging process to let the gasses escape. Unfortunately, the gassing deposited a fine liquid on the terminals and over the top of the accumulator which had to be wiped off and the terminals greased to prevent corrosion. A thoroughly messy job and all for a 'tanner' (6d or 2.5p). The normal accumulator, supplied by Ediswan, Ever Ready, Exide or Oldham appears on the right of Figs. 1 and 2 and 'portable' sets, like the very early Roberts, Fig. 3, used the small Exide LBJ3 'gel-cel' standing in front of the group in Fig. 2 and in service between the dial and the Drydex 108 volt h.t. in Fig. 3. The Pye LT2, price 12/9d (67p), on the left of Fig. 2 was designed to fit inside the 'portables' made by Pye and listed on the label. Larger capacity accumulators such as the Exide CZG3 and the hefty Ediswan which dominate the middle of Fig. 2, were purchased in order to get a longer low tension life and, depending on use, possibly confine recharging to once a week. Space was provided inside a set, usually to one side of the chassis, to accommodate the normal sized accumulator so one of the big 'wets' would have to stand outside of the cabinet and the l.t. leads extended to the required length. A

Fig. 8

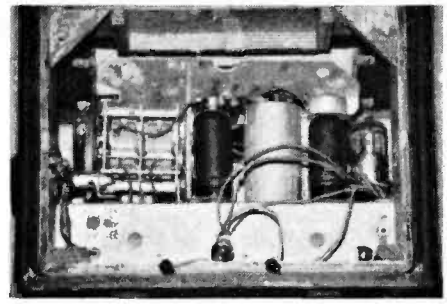


Fig. 9

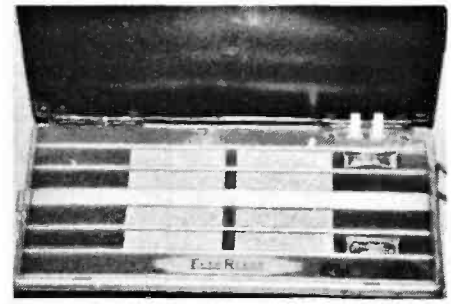


Fig. 10

Fig. 11

Fig. 12

Fig. 13

good example is the battery version of the medium-wave only Wartime Civilian Receiver, Fig. 4, where the h.t. sat on a shelf above the chassis with an accumulator by the side.

The Battery Set

A multitude of houses throughout the United Kingdom did not have mains electricity until the late 1940s and early 1950s, which meant that battery powered equipment was the only means of hearing the news and enjoying the entertainment at home provided by a wireless receiver. Please remember, I am talking about the days prior to the transistor revolution. The main current consumers inside a set were the valves, which also had a fragile glass envelope and a glowing filament and were expensive to replace if they were broken through mechanical shock or when the filament went open circuit through use. The group of valves in Fig. 5, were progressively used in battery sets throughout the period. The centre piece is one of the popular 4-pin 2 volt triodes, PM1LF, used by the home constructor and some manufacturers in the 1920s and 30s and to its left is the 7-pin, FC2, frequency changer used in the manufactured superheterodynes of the late 1930s. Both valves were made by Mullard and the envelope of the FC2 had a metallic coating which acted as a screen to prevent unwanted signals being picked up by the electrode assembly inside the valve.

So much for the accumulator era of which many of us share a love-hate relationship. However, in the late 1930s thoughts were already turning towards an 'all-dry' receiver.This meant that a new range of valves, with 1.5 volt filaments and good capacity dry batteries had to be designed, developed and manufactured at affordable prices because a wet cell can produce 2 volts and a dry cell only 1.5.

The All-dry Breakthrough

Among the early 'dry' valves were the Mullard DF1 with its side-contact base used in Philips portables, top right Fig. 5 and the Raytheon 1C5 with an international octal base, bottom left Fig. 5, used in the single-wave band sets made in the States by Detrola, Fig. 6 and brought to the UK by American troops during WWII. The power for the 4-valve Detrola was derived from a special h.t. battery, the ALLDRY No 6, which cost 13/3d (66p) and a heavy duty l.t., an ALLDRY 4 at 3/8d (18p), Fig. 7. Incidentally, for those of us who moan about modern value-added tax, a purchase tax of 25% was added to the marked price on all batteries until it was abolished in 1948/9. Batteries then remained tax free until the early 1970s when VAT was added to electrical goods.

The AD6 was a double 45 volt battery giving the 90 volts required for the h.t. on these valves and the supply for the filaments was derived from the AD4. In the immediate post-war years Bush produced their BP90, Fig. 8, using Mullard octal based valves, bottom right Fig. 5 and in position, Fig. 9, driven by a large 90 volt h.t. and an AD4 l.t., both fitting in the middle of the frame aerial, Fig. 9, at the back of the cabinet. Although the high tension drain was in the order of a few milliamps, the low tension consumption was another matter. For instance, the Bush BP90, Fig. 9, using a DK32 frequency changer, DF33 i.f. amplifier, DAC32 diode-triode and DL35 audio-output and the Detrola 282, Fig. 7, with a similar valve line up of 1A7, 1N5, 1H5 and 1C5 respectively each required a steady 0.25 amps from the AD4.

Miniaturisation

During WWII, the Canadian WS58 transciever and the Clandestine MCR1 miniature communications receiver were among the battery operated military equipment that used some of the new series of small, all glass, base-less valves. These new B7G base types included the 1T4, which proved popular with set manufacturers in the early post-war years. The Mullard version, DF91, is on the lower centre right of Fig. 5 and the Ever Ready range of these valves was used in their personal set, Model 'B', Fig. 10, with a special combined h.t./l.t. battery type B114 and their larger Models 'C' and 'K' each requiring the large capacity B103 which was similar to the later B136 in the centre of Fig. 11. In the 1950s the demand increased for really portable receivers and, to meet the need for a more economical l.t. drain, Mullard introduced their 96 series valves, DK96, DF96, DAF96, lower centre left Fig. 5 and DL96 which meant that sets like the Ever Ready 'Sky Queen', Fig. 12, powered by the B136 sitting inside its frame aerial, Fig. 13 and the casual Vidor 'Lady Margaret', seen among other portables in Fig. 14, used about 0.125 amps. This was very important for the the relatively small 'Lady Margaret' which was designed around the the B126, ('Baby 90') and AD35 (1.5 volt) batteries seen

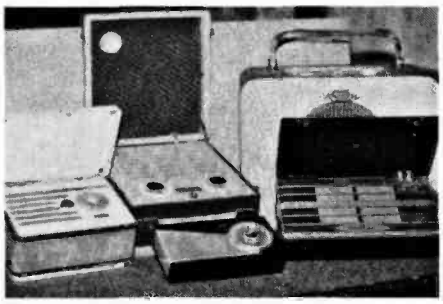


Fig. 14

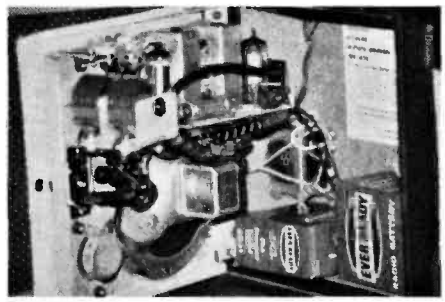


Fig. 15

Fig. 16

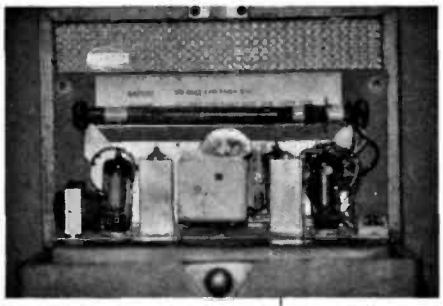


Fig. 17

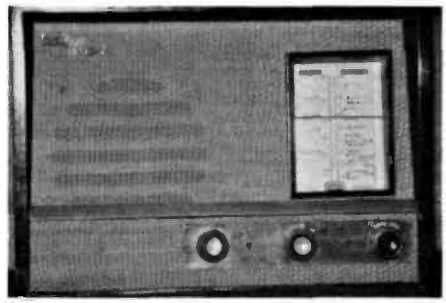


Fig. 18

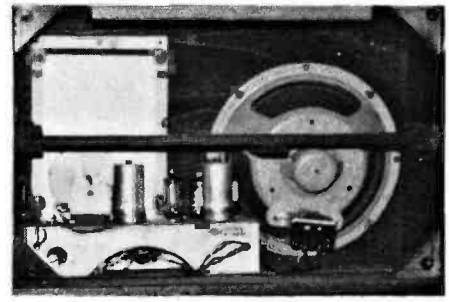


Fig. 19

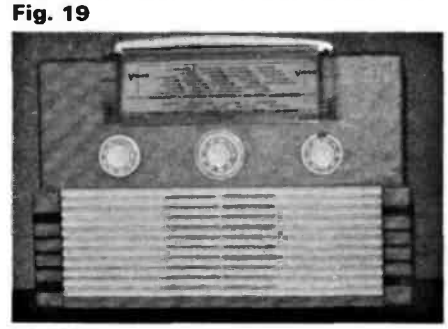


Fig. 20

individually in Fig. 11 and fitted to the 'Margaret' in Fig. 15. In those days those of us working 'in the trade' reckoned to sell roughly three AD35s at 1/6d(12.5p) to each B126 at 9 shillings (45p) per set in regular use. At the top of Fig. 11 is another special combined battery, the B141, made to fit snugly in side the cases of the Ever Ready 'Brief Case' and 'Sky Casket' , Fig. 16, long and medium wave-band receivers. From memory, the 'Sky Casket' was among the first of these portables to use a ferrite rod antenna, Fig. 17, instead of the wire frame aerial, sometimes wound in a flat pattern in the lids of earlier models.

Mains-Battery Operation

Among the stately battery sets for the living room was the Ever Ready 'Sky Lord', Fig. 18, with its 96 series valves, wire frame aerial, large loud speaker and a shelf for the B136, Fig. 19. In order to reduce battery costs still further, some set makers, like Decca, Murphy, Pye, Ultra, Vidor, Fig. 20 and no doubt others, introduced mains/battery portables which used a 7.5 volt low tension because, for convenient mains operation, the valve filaments were wired in series.

At this point I must warn collectors about the high voltages inside the mains operated sets. Do not touch the chassis or components unless you really know what you are doing because some of the mains-battery types that often turn up in 'jumble sales' and other bargain basements - are not 'isolated' from the mains. To ensure safety with any equipment operating from the 250V supply an isolating transformer is thoroughly recommended.

By the end of the 1960s portable radio sets were using the ultra low consumption transistors instead of those current hungry valves and, you've guessed it, yet another range of batteries, but that is recent history. The photographs in this article were taken by the author inside the vintage wireless building at the Chalk Pits Museum, Amberley, Sussex. **PW**

Wanna Swap!

Have 18m lattice tower, six triangular fully galvanised 3m sections, complete with base plate, rotator cage, guys and 8 turnbuckles. Delivery can be arranged. Would exchange for 144MHz mobile transceiver in g.w.o. or w.h.y? F. Jensen G1HQQ Tel: (0702) 617708.

Have 13.8V 40A p.s.u. worth £85, would exchange for w.h.y?, with cash adjustment. Mr G. L. White G0GLW. Tel: (0344) 52601.

Have a bench top d.v.m. unused multi-range includes frequency and transistor tests, data hold and memory, Plus TEAM TRX-404 UK c.e.p.t. transceiver with SWR-176 test meter +filter and p.s.u. Would exchange for PK232 intelligent terminal unit with cash adjustment. Mr S. Deacon G6HVS. Tel: (051-334) 6859.

Have Codar CR70A communications receiver covering 100kHz-30MHz, complete with pre-selector, external speaker and instruction book. Would exchange for w.h.y? Bryan. Tel: (0602) 640614.

Have complete Cine outfit, comprising: Bell & Howell Sportster IV, triple lens and zoom lens and Yashica 8 twin lens, both have fitted leather cases and handbooks. Plus Meopa editor complete in fitted oak case and six unused films. Would exchange for HRO with bandspread coils. R. G. Nicklin Tel: (0792) 89482.

Have D130N Super Discone antenna covering 25-1300MHz. Would exchange for an Microwave Modules MML144/30 linear with either 1 or 3 watts input to compliment an FT-290R. Mr G. B. Hayes. Tel: Northwich 44670

Practically Yours

Feature

Baffled by the various specification figures? Starting with this article, Glen Ross G8MWR helps you to compare and make sense of them.

A very confusing aspect of our hobby, is trying to make sense of the specifications that came with the new rig. Every manufacturer seems to specify these using a different system or reference level. Further to that, many people have difficulty understanding the specification, even when it is presented in a standardised way. To illustrate this, let us take as an example all those figures connected with receiver sensitivity.

How Sensitive?

The term sensitivity, in its basic form, indicates the lowest signal level that will produce an audio output. This figure assumes ideal test conditions and also that no other signals are present in the receiver passband, at the same time as the test signal.

In practice: the sensitivity is quoted as the amount of signal input that is required to give a certain signal to noise ratio at the loudspeaker. This is much more realistic, because it indicates a usable signal strength rather than one which is right on the noise level.

Signal Strength

The input signal which is required to produce the quoted signal to noise ratio, can itself be specified in more than one way. It is usually given in microvolts (μV), or alternatively in decibels with reference to 1mW (dBm). Remember that 0dBm is 1mW into 50Ω and is equivalent to 0.2236V r.m.s., so 1μV is equal to -107dBm, and -127dBm is equivalent to 0.1μV. The voltage input is normally specified as p.d., or potential difference, and is the voltage required at the input of the receiver.

Sometimes these figures are quoted as e.m.f., which is the open circuit output voltage of the signal generator. When the input impedance of the receiver is equal to the output impedance of the signal generator, then p.d. is exactly half e.m.f., but if they are other than equal then this relationship no longer holds true. As e.m.f. is always greater than p.d. it is normally avoided, as this makes the advertised sensitivity appear worse than an equally sensitive set, but whose sensitivity figures are quoted using the p.d. reference method.

As was mentioned earlier, signal to noise ratios are usually chosen to represent signals that would be fairly easily readable. The normal signal to noise specification for a.m. and s.s.b. is 10dB, whilst for f.m. 12dB is the figure most usually chosen. Why the difference in the standard ratios? It is because low level f.m. signals have more noise and distortion present, so the extra 2dB are thrown in for good measure and called signal to signal + noise + distortion (SINAD). So the figures are normally quoted as at 12dB SINAD which is similar to 12dB S/N but now includes the distortion products. If on a.m. or s.s.b., the SINAD figures were to be compared with the S/N ones the results would be virtually the same. So the simpler S/N figures are the ones normally quoted under these modes.

Minimum Signal

Sometimes the figure quoted are annotated m.d.s. this stands for minimum detectable signal. This is normally the signal quoted for 3dB S/N, in other words the signal has the same audio power as the noise. This represents the absolute lowest input level at which an a.m. or s.s.b. signal is just readable, though c.w. signals may be copied at levels much lower than this. Why 3dB?

The signal to noise ratio, S/N, should be actually described as signal + noise to noise (S+N/N). This value of 3dB represents a doubling of the audio power, and means that the signal and noise power are equal. Looked at another way, this represents the level of signal required to equal the noise generated in the receiver. This figure is sometimes described by the further term, noise floor.

Comparisons

Trying to compare the specifications at different signal to noise ratios is not too difficult, as long as certain points are borne in mind. For f.m., the simple answer is to compare the various figures quoted to produce the SINAD ratings specified for each receiver. For a.m. or s.s.b. however, much depends on which specification the manufacturer has used.

The most commonly found specification is at 10dB S/N, although m.d.s. or 3dB S/N are occasionally used. Provided that the rigs are specified using the same method, then direct comparisons may be made. If comparing the m.d.s. method with the 10dB S/N, then multiplying the m.d.s. signal voltage by three, again allows direct comparisons to be made.

Factors Affecting Sensitivity

There are three main factors governing a receiver's sensitivity. The first is noise generated in the first r.f. stage and, to a lesser extent, in the following stages through which the signal passes. The second factor affecting the receiver noise figures is the bandwidth of the receiver itself. Generally, the narrower the bandwidth, the less the noise level. From this idea it must be obvious that, for best S/N figures, the bandwidth used should only be wide enough for the mode of reception. **PW**

In the next part we will look further into this subject, and put some values to the actual sensitivity required in practice for everything from Top Band to u.h.f.

Have you had trouble getting your copy of Practical Wireless each month?

If so write or telephone Elaine Richards at the editorial office with all the details.

Feature

CQ Contest

Oh no, not another definitive article on how to do a contest. Well not really, more a diary of bungles, disasters and the other joys of a year's v.h.f. contesting says Rob Taylor G8ZHF.

We kick off the year in January (in the pub, of course) by trying to decide on the year's programme. The conversation goes like this

"OK, so we do the 144/432 in March."

"Hmm, it gets a bit cold in March, what do you think Rob?"

"Ah yes, well er, I might be going away that weekend, what about you Dave?"

"Well, I'm not sure, it can be cold in March."

"OK, we don't do March."

"The RSGB have incorporated the 432 and 1296 Trophies in the May DC to Light contest, what shall we do there?"

"How about doing the 432MHz Trophy section?"

"Yes that sounds good to me, everyone agree?"

"Yeah, at least it won't be so ****** cold as March."

"Fine, next is the May two metre bash."

"Sorry, we have a problem here, we're going to Scotland to check out some sites for a DXpedition."

"That's OK, the wife would go barmy if we did two contest in May anyway."

"In June, we've got the six metre Trophy and the *PW* effort."

"Nope, no problems here, everybody else OK?"

"That's settled then."

"I'm doing NFD with my club but that's no problem as we don't do it as a group anyway, do we!"

That sort of stuff goes on all evening until a programme is decided on. At last it's the week before the first contest. The pre-contest meeting (gosh, what a surprise, it's in the pub) convenes.

"Er, got a small problem."

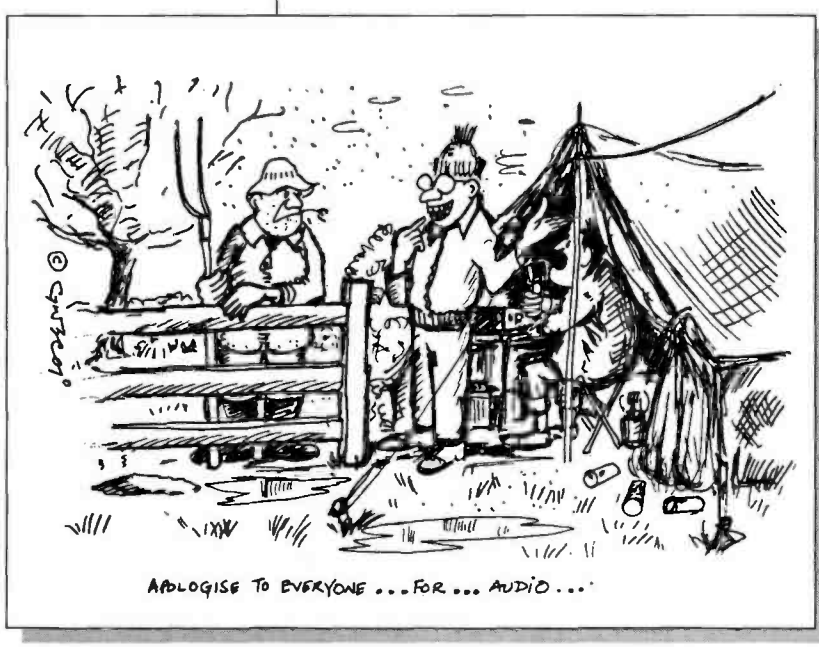
"What's that Dave?"

"Well, I tried the linear over the weekend and I was just giving it the final tweek and there was this loud crack and big blue flash!"

"Dave, you're trying to tell us something aren't you?"

"Yes, I'm afraid the valve died."

"What do you mean, died."



"I mean died as in not working, knackered, flashed over, U/S, OK."

"Can't we get another bottle?"

"You got eight hundred quid?"

"This is serious, we will have to use the K2RIW."

All together - "Oh no!"

"Just one other thing."

"You mean there's more?"

"Oh it's no real problem, I just had to pop the rig back for repair. Duff transmitted audio, should get it back on Friday night!"

Well, we did get the rig back and we did use the K2RIW and we apologise to everyone else taking part for our grotty audio.

As quick as a flash it's June and Six Metre Trophy time. No problems beforehand and the gear is ready to go in good time. "CQ contest, CQ contest" - four hours into the contest.

"Hmm, contacts a bit slow."

"Well, the s.w.r. meter's showing enough grunt going out."

"Oh dear, its looking at reflected power."

"You did test the antenna at home John?"

"It'll only take a minute to adjust the Gamma Match."

Half and hour later.

"I don't understand this, it just won't match."

"Anyone got a length of aluminium tube handy?"

As luck would have it, we found a length of tube and fixed it to the original tube with tape! As it was of smaller diameter than the original, the clamp had to be packed out with beer can ring-pulls which were in plentiful supply. After an hour it's back to "CQ contest, CQ contest".

Ah, the *PW* QRP. A bit of fun without the hassle of generators, tents, etc.

"Where are we going to do it from?"

"How about that place where I go to do a bit of portable from time to time."

"Sounds good to me, isn't there a pub near there?"

We enjoyed the contest, we had no equipment malfunctions and it was a nice hot day. So hot that Mark, Kris and Dave thought that some refreshment was required. I personally thought that one of the others should have told Mark that the prawns out on the bar as snacks looked a bit dodgy and mixing them with Guinness may give rise to problems in the very near future. To cut a long story short, Dave told me that the greenish tinge on Mark's face was all the encouragement he needed to beat his best time from the site to Mark's house!

I will gloss over VHF NFD as I am a committee member of my club and should be trying to keep morale high. Suffice to say that I advise members to check our position in the results from the bottom up, rather than the top down. It will save a lot of time!

Next on the agenda was the 144MHz Low Power. Very boring! Everyone turned up, nothing broke, nobody got ill and we seemed to do quite well. Could this be the spur to great success in the Two Metre Trophy? Certainly wasn't! With brilliant foresight, I managed to contract 'flu the day before the contest. This was probably a good move on my part as, as I quote, "nearly killed ourselves with the ****** generator, the antenna didn't work, so few operators that I had to take home twenty cans of Fosters and I only took twenty-four....."

The end is in sight. Only the Four Metre Trophy left. This is the stuff, the gentlemen's band. Not in our tent pal! End of 'season' depression setting in.

"What are we doing this stupid contest for?"

"Look, you didn't have to come."

"Thank God it's the last one."

"I'm sick to death of all this moaning."

"Are you going to operate or not?"

"No."

"Well clear off then, I can't hear."

"Neither can your rig."

We survived without coming to blows, which is probably the year's highest achievement.

There you have it, a year in the life of a v.h.f. contest group. Pretty bad, eh? What makes it worse is that we actually remain friends and we will do it all again this year. **PW**

PW QRP Contest

The 8th Annual *Practical Wireless* 144MHz QRP Contest will take place on Sunday 17 June 1990 from 0900-1700UTC.
Transmitter output power will be limited to three watts as usual. Full contest rules will be published in the June issue of PW, which will be on sale from May 10.
Contest adjudicator is Neill Taylor G4HLX.

Services

Queries
We will always try to help readers having dificulties 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.

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Limited stocks of many issues of PW for the past years are available at £1.80 each including post and packing.
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Send all orders to the Post Sales Department.

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Each constructional project is given a rating to guide readers as to its complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an experience constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP kits, both of who advertise in the magazine.
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Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 38p per minutes peak time and 25p per minute off-peak. The number to ring is: (0898) 654632.

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

This is the last in the series from Ray Fautley G3ASG, which has taken us from the simple d.c. series circuit to impedance matching and directional wattmeters.

It all began with a few circuit symbols, a d.c. circuit of a battery, switch and a resistor connected in series. This lead to Ohm's Law, then the a.c. series circuit with a brief description of phase, resonance and reactance. All this was in the March 1988 issue, in which a note to the effect that, Fig. 1.6 was a physical representation of Fig. 1.5, was omitted.

Next, d.c. and a.c. parallel circuits, resistors in parallel and the a.c. parallel tuned circuit were dealt with in April 1988, together with details of a simple crystal set. The references to the illustrations Fig. 2.4 and 2.5 were accidentally reversed.

Transistors were introduced in the May 1988 issue and their uses in common emitter, common base and common collector amplifiers was discussed. A sample printed circuit board layout was included.

Hartley, Colpitts and crystal oscillators were described, then an equivalent circuit of the piezo-electric crystal leading to a bit about Q appearing in June 1988.

In July 1988, half wave, full wave and bridge rectifiers together with the voltage doubler circuit were described in the part about power supplies. Unfortunately an over-simplification occurred here as the curve in Fig. 5.1 representing the current through the rectifier diode in the half wave reservoir capacitor (C in Fig. 5.2). The illustration Fig. 5.4 should have shown the diode current as high amplitude pulses of very much shorter duration than half a supply cycle and not as a half sine wave. Sorry if that mislead the reader!

Receivers

The section on receivers started in August 1988 with a description of an r.f. amplifier stage, non-regenerative and regenerative detectors for t.r.f. (tuned radio frequency) receivers, as well as some more about the 'goodness factor' Q with a description of selectivity.

A suitable a.f. amplifier for use with headphones in a t.r.f. receiver was in the September 1988 issue. There was also a note explaining how the performance of an amplifier was affected by bypass capacitors and therefore why their inclusion was so important. This was followed by a definition of the term 'superhet', 'beat frequencies' and 'intermodulation distortion', ending with a description of a mixer stage.

The h.f. oscillator, with the use of negative-temperature co-efficient capacitors to improve frequency stability was discussed in the October 1988 issue. The receiver i.f. amplifier, automatic gain control and the reason for screening some stages or components also appeared the same month.

The December 1988 copy included a description of a beat frequency oscillator (b.f.o.) with its use as a speech clarifier when resolving signal sideband (s.s.b.) telephony signals, as well as how it makes a Morse (c.w.) signal into an audible note. Demodulation of amplitude modulated signals by using an envelope detector and resolving s.s.b. signals with a product detector were also described of the operation of a push-pull amplifier concluded that article.

The various stages used in transmitters with a description of a fixed frequency r.f. generator, together with a chat about harmonic distortion and periodic waveforms appeared in the January 1989 issue. Frequency multipliers and Morse keying stages, with an explanation of 'key clicks' and how they can be avoided were also in the same issue.

In February 1989 the use of valves was discussed and the importance of the physical layout of valve amplifiers to prevent unwanted feedback was considered. Operation of valves in Class A mode was described showing the relationship between anode current and grid voltage. Low distortion with comparatively low efficiency was shown to be typical of Class A operation.

Modes and Stages

Other modes of operation for valves, viz Classes B, AB and C were described in the March 1989 issue. Meanings of 'fly-wheel' action in tuned amplifiers and 'intermodulation products' were also discussed.

How an r.f. power amplifier can be amplitude modulated was discussed in the April 1989 issue. A suitable Class B audio amplifier for use as a modulator was described and a method of preventing dangerous 'spikes' from ending the life of the modulation transformer whilst sending Morse instead of speech was included. Working out the ratio required for the modulation transformer ended the part about amplitude modulation (a.m.) Single sideband (s.s.b.) and its gain over a similar a.m. system lead to an explanation of 'decibels' or, as it's usually written, dB. A mention of 'peak envelope power' (p.e.p.) concluded the month's article.

The stages necessary in an s.s.b. transmitter were listed in the June 1989 issue and descriptions of the microphone amplifier, balanced modulator, sideband crystal filter and h.f. converter attempted. How the reactance of a piezo-electric crystal changes with frequency was also shown in this issue.

In the July 1989 copy of *PW* suitable h.f. oscillators, both fixed frequency and variable frequency (v.f.o.) were discussed. The Zener diode was introduced and its use as a voltage stabiliser described. The merit of using a high intermediate frequency over a low i.f. were discussed as were the meaning of the phrases 'image frequency' and 'second channel'.

Frequency modulation, in the August 1989 issue, was discussed and an attempt made to analyse a frequency modulated signal showing its propensity to provide a very large number of sidebands. 'Frequency deviation' and 'modulation index' were explained. How power is distributed between carrier and sidebands was discussed using a practical example. This showed that when the power levels of the various

individual sidebands and the carrier were added together, the **total** power did not change during changes of modulation, even when the modulation was zero. Phase modulation (p.m.), its similarity to, and differences of p.m.s 6dB/octave rise in audio frequency response mentioned.

The September 1989 issue contained circuits of a frequency modulator and phase modulator. An error crept in here on page 26 in the first column on line 30, where 'R1' was mentioned it should have been 'R2', otherwise the associated text was nonsense! Amplitude and phase changes with frequency for a parallel tuned circuit were shown here to assist in the description of the phase modulator. The reason for using limiter stages in f.m. receivers was mentioned and demodulators suitable for f.m. and p.m. signals were described. The phrase 'induces a voltage' was explained when referring to transformer action. On page 28 the last paragraph referred to 'vector addition' - it should have indicated that it is a method of adding (or for that matter, subtracting) quantities such as voltages or currents that are **not in phase** with each other.

Methods of identifying the different types of fillers, low pass, high pass, band pass and band stop were printed in the October 1989 issue. Both 'π' and 'T' versions of each type were described using 0Hz (zero frequency or d.c.) to represent low frequencies and ∞Hz (infinite frequency) to represent high frequencies. Components then became either dead shorts or open circuits at these extreme frequencies enabling the response of the filter being examined to be roughly assessed.

Frequency responses of filters, together with measuring methods, appeared in the November 1989 issue. Matching of measuring equipment to the alleged input impedance of the filter to be measured was discussed in detail.

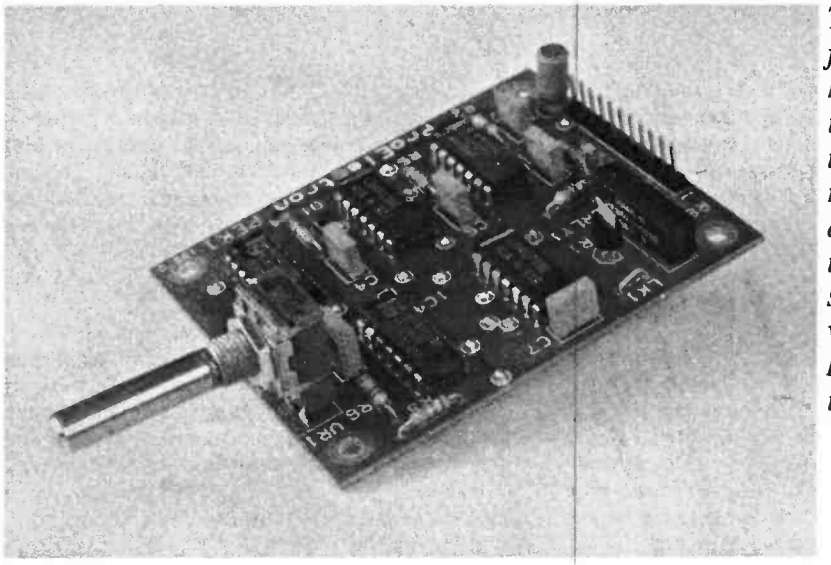
The issues of December 1989, January 1990 and February 1990 were concerned with the solving of impedance matching problems when both source and load were any combination of complex impedances, series or parallel connected. Formulae had been manipulated so that the final procedures appearing in print provided practical means of working out the required matching reactances. From these reactances, component values could be found for the frequency at which the network was intended to operate. There was a little bit left out of the Type 7 heading, it should have read = 'This is with one complex impedance comprising resistance and reactance in series and the other complex impedance comprising resistance and reactance in parallel.'

Finally, there was a description of the directional wattmeter and its use in indicating resonance and matching of an antenna system with an antenna tuning unit (a.t.u.). By varying the a.t.u. controls to obtain zero reflected power at the same time as maximum forward power the whole system is resonated and matched, providing maximum power to the antenna. This appeared in the March 1990 issue.

Sign-off

If this series of articles has answered just one question for a single reader, the author will be satisfied that his work has not been in vain. If it has inspired other to persist in their search for knowledge about radio - even better! **PW**

The ProElectron PEK-1 Keyer



This new keyer from ProElectron has been designed to interface with the many keyer mechanisms that are currently on the market and so should prove to be very popular, Mike Richards G4WNC tried the keyer out.

REVIEW

The PEK-1 is supplied as a ready assembled but uncased unit with an 11 pin in-line connector for the various external connections. The double sided glass fibre p.c.b. measured 74 x 61mm and was silk screen printed with the component overlay. Power economy was obviously clearly in mind when the PEK-1 was designed as the power requirements were extremely modest requiring 5V to 15V at a mere 0.1μA at standby and either 0.5mA for solid state keying or 12mA for relay keying. With such low power consumption the obvious choice was to use a PP3 size 9V battery.

The keyer had been well thought out in terms of the facilities provided, as in addition to both solid state and relay keying, it contained its own sidetone oscillator. The sidetone output was designed to directly drive one of the readily available piezo sounders which could subsequently be attached to any convenient flat surface once the keyer is boxed. The keying outputs should cope with pretty well every requirement with the solid state keying suiting 90% of applications. The device used for the solid state keying was a VN10 power v.f.e.t., which provided a low resistance between the keying line and ground when activated. This device is capable of keying lines with a maximum key-up voltage of 60V and conversely and maximum key-down current of 300mA (but not both together!!).

For occasional situations requiring the keying of a higher voltage, the v.f.e.t. could be set to drive an on-board relay which was capable of switching up to 200V, but in this case the maximum current was 150mA. With regard to the keying technique used, the PEK-1 featured full iambic operation which seems to be the accepted standard for use with paddle keyers. This enables high speeds to be attained with minimum effort on the pert of the operator. In addition, the PEK-1 includes dot and dash memories which allow the operator to key slightly in advance of the keyer output and so further aids higher speed operation. If you've never used dot and dash memories before you will find it takes a little getting used to, but once mastered is very useful. The connections to the operators paddle were very straightforward and comprised three connections - common, dash and dot wires.

Obviously with an electronic keyer a speed control is required so that the automatic dot and dash repeat times match your sending speed. The PEK-1 could be continuously adjusted between 8w.p.m. and 34w.p.m. which should prove adequate for most operators. The speed adjustment was achieved with a conventional rotary potentiometer which was mounted on the main p.c.b. For the on-air tests I connected the PEK-1 to the mechanism of my Spacemark keyer and the keying line to my trusty Icom IC-720A. The keying requirements of the Icom are not very demanding, so I opted to use the solid state keying option from the PEK-1. By using my favourite Spacemark mechanism I was able to get a good feel for the action of the PEK-1 without it being masked by an unfamiliar paddle. I was very pleased with the performance of the PEK-1 and the quality of the resultant output was very good. The dot to dash ratio was fine for the speed range provided, though some high speed operators would probably like to see the top speed increased slightly and a variable dot/dash ratio provided. However, the settings provided were fine for general operation.

Summary

The PEK-1 proved to be a very well built and effective keyer which should fit the bill well for most operators. The versatile keying options combined with its simple operation should ensure that the resultant c.w. is of a high quality.

The PEK-1 costs £22.00 and is available from **ProElectron, 35 Cromwell Road, Cheltenham, Glos GL52 5DN.**

Specification

Speed	34 words per minute
Dot/Dash Ratio	1:3
Keying Output	60V, 300mA (solid state) 200V, 150mA (relay)
Power Supply	5-15V d.c.
Supply Current	0.1μA (standby), 0.5mA (solid state keying), 12mA (relay keying)
Dimensions	L=74mm, W=61mm, H=21mm

Feature

Radiation Hazards

With the debate on nuclear radiation hazards raging in the press these days, Brian Dance takes an important look at the hazards from both r.f. and microwave radiation

Electromagnetic radiation of a very wide range of frequencies is always present in our environment. It is enormously increased in intensity near most r.f. or microwave equipment. The energy of such radiation can certainly produce heat in biological tissue by processes which seem to be relatively well understood. This heating effect has been put to good practical use by physiotherapists over many years and is now used to raise tissue temperature accurately for cancer therapy.

Can fairly low levels of non-ionising electromagnetic radiation produce significant effects in living organisms other than tissue heating, e.g. effect the cell nucleus or the cell membrane? Can it cause illness or result in a feeling of being unwell? Can it assist tissue healing? Questions of this type are proving very difficult to answer and are a subject of much controversy amongst world experts.

Cataracts

During World War II, there was considerable concern about the incidence of cataracts and internal burns amongst radar technicians. In the 1960s exposures to power densities of 10mW/cm^2 from 10MHz to 100GHz were regarded as permissible for microwave workers, partly because lens opacities in eyes of rabbits were not produced until the density reached at least ten times this value. Cataracts are a common effect, since the lack of a blood supply in the lens of the eye means that this cooling mechanism is absent. However, there is considerable conflict between various specialists on the biological effects of microwaves, some believing that a power density of under 1mW/cm^2 can produce reversible disturbances of the central nervous system which may result in headaches, EEG pattern changes, etc.

For many years, little work was done on the personal hazards resulting from exposure to various levels of electromagnetic radiation, exposure to 'reasonable' levels being regarded as constituting only a minor hazard. There has recently been a far greater interest in research on the possible hazards associated with exposure to electromagnetic radiation and the levels which may be regarded as safe. Daily newspapers have often asked questions about whether radiation from television receivers, from video display units or from microwave ovens can, for example, cause cancer. Microwave ovens when new must not leak a level of more than 1mW/cm^2 at 50mm from the door, nor more than 5mW/cm^2 during their working life.

The problems of potential hazards from microwave radiation have greatly increased during recent years due to the more widespread use of microwave diathermy in industry and in medicine, the increased power output from radar systems and the use of microwave ovens both in the home and elsewhere. The bombarding of the US embassy in Moscow by microwaves aroused much comment.

Power Lines

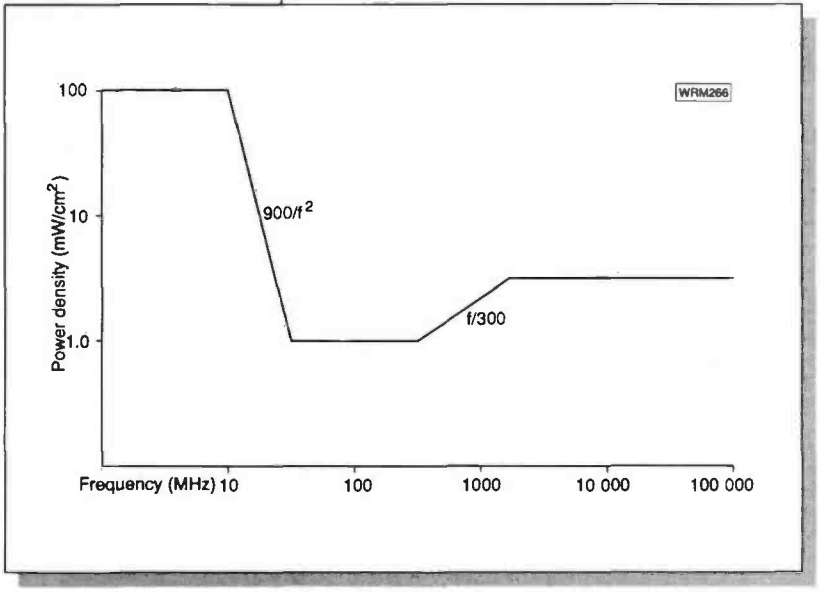
Does living under a high voltage power liner increase one's chances of developing any illness? According to work carried out by Dr Cyril Smith, Senior Lecturer in the Department of Electronic and Electrical Engineering of the University of Salford, it seems that proximity to power lines can affect certain people in a similar way to that in which food and other allergens may affect them. He feels the fields may produce irritability, headaches or sudden blackouts. As the fields get stronger, the effects do not seem to increase, but just get more complicated.

The British Central Electricity Generating Board (CEGB) has repeatedly denied that its cables have any effect on people's health. However, the electricity industry announced in 1988 that it would undertake major research to measure the exposure of people to magnetic fields from the distribution and use of electricity - the first such research in the UK. New remote monitoring techniques and innovative personal exposure meters were employed to help build an accurate picture of the magnetic fields to which people are subject in their everyday lives. Few studies have been carried out anywhere in the world which involve measurements of personal exposure to magnetic fields. The electricity industry is also financing two separate research projects at universities which will look for possible links between living near power lines and adult and childhood cancers. An independent programme of basic research into the key biological interactions is being funded to assess their significance, if any, for human health and welfare.

Cancer

There is some evidence from US research that the electromagnetic fields from power lines may be linked with cancer growth. It was found that low energy electromagnetic radiation increased the activity of the enzyme ornithine decarboxylase in human, rat and mouse cancer cells grown in culture. This enzyme produces a substance which stimulates cell growth and proliferation. The fields used were similar to those from power lines. The Veterans Administration Medical Centre found r.f. and microwave fields only influence cells if the fields are modulated at frequencies of less than 100Hz - which includes the mains system.

Fig. 1.



The Cancer Therapy Research Foundation, San Antonio, Texas, examined the electric and magnetic fields separately and found that the magnetic field seemed to be far more biologically active than the electric field. Human cancer cells exposed cells which were shielded from the fields. Unlike ionising nuclear radiation, the fields do not seem to make healthy cells cancerous, but may possibly help cancerous cells to grow more rapidly. In the past there has been much concern about possible interference with the operation of heart pacemakers, but it seems that modern pacemakers are unaffected by overhead power lines.

Work at the University of California, Riverside, also suggests that exposure to common sources of low energy electromagnetic radiation, including radiation from electric blankets and power lines, may promote the growth of cancerous tumours by increasing the activity of an enzyme essential to cell growth. However, it was stressed that the research is not yet definitive enough to establish a cause and effect relationship between exposure to a field and an increased cancer risk.

Other epidemiological studies have connected low frequency electromagnetic fields with leukaemia and brain tumours amongst children. A New York panel reported that children who live near overhead power lines are twice as likely to develop leukaemia as those raised away from magnetic fields associated with power lines.

Establishing the cause-and-effect relationship between electromagnetic radiation and cancer is extremely difficult because so many environmental factors may play a role in the cancer producing and growth processes. Between 1971 and 1980 a considerable number of soldiers in the Polish army were subjected to heavy doses of microwave or radio waves. It was concluded that this group was three times more likely to contract cancer than unexposed soldiers. The rate of lung cancer seemed unaffected by the exposure, but lymphatic cancers increased by 6.7 times, thyroid cancers by 4.3 times and stomach and skin cancers by 3 times in exposed people.

It seems impossible at the present time to give definite answers to many fundamental queries about the effect of electromagnetic, magnetic or electric fields on people, but a study of the recommendations of the large national laboratories can provide some understanding of current views on possible hazard levels. Ideally international agreement on the permissible levels is required.

Permissible Levels

The British National Radiological Protection Board made recommendations on acceptable levels of electromagnetic fields or non-ionising radiations at frequencies below 300GHz. They were applicable to those using radio and television broadcast equipment, the use of nuclear magnetic resonance diagnostic equipment in hospital, r.f. smelting and heat sealing equipment, short wave transmitters, power lines, microwave ovens and radar systems.

The human body tends to absorb more radiation at certain frequencies than at others, so the recommended limits vary with frequency. In the past a limit of 10mW/cm^2 (100W/m^2) was set, but resonance absorption of the human body between 30MHz and 100MHz led to a reduction in the recommended limit for workers to 1mW/cm^2 over this range. The limit for frequencies between 100MHz to 500MHz was fixed at f/1000W/cm^2 where f is the frequency in MHz. A level of 5mW/cm^2 was set for the 500MHz to 300GHz range. The maximum exposure times was two hours per day.

Lower levels were recommended for the general public than for those exposed to the radiation in their work. From 30 to 300MHz the limit for the general public was fixed at 0.4mW/cm^2, from 300MHz to 1.5GHz at f/750mW/cm^2 where f is frequency in MHz and at 2mW/cm^2 in the 1.5 to 300GHz range. The maximum exposure time for the general public was fixed at five hours per day.

US FCC Limits

In the USA the Federal Communications Commission (FCC) Report came into force in January 1986. This is the first federal regulation of its kind which requires all new or modified broadcast facilities to meet specified standards for human exposure to r.f. radiation. This ANSI (American National Standards Institute) C95.1-1982 standard, shown in Fig. 1., followed six years of study into the acceptable limits of r.f. exposure. The maximum values shown are those averaged over a six minute exposure time. They are based on the whole body average specific absorption rate (SAR) limited to 0.40W/kg of tissue, with a peak SAR value of 8W/kg. This is averaged over any 1g of tissue so as to prevent local hot spots. This standard is based on the absorption factor of human tissue and the level of r.f. at which thermal damage can occur. It is essentially the inverse of the absorption curve for the human body, but a ten fold factor of safety is included.

A relatively high power level is required to exceed the limits of Fig. 1 at a distance of more than a few metres. Broadcasting stations and radar installations form the majority of high power radio frequency sources to which members of the general

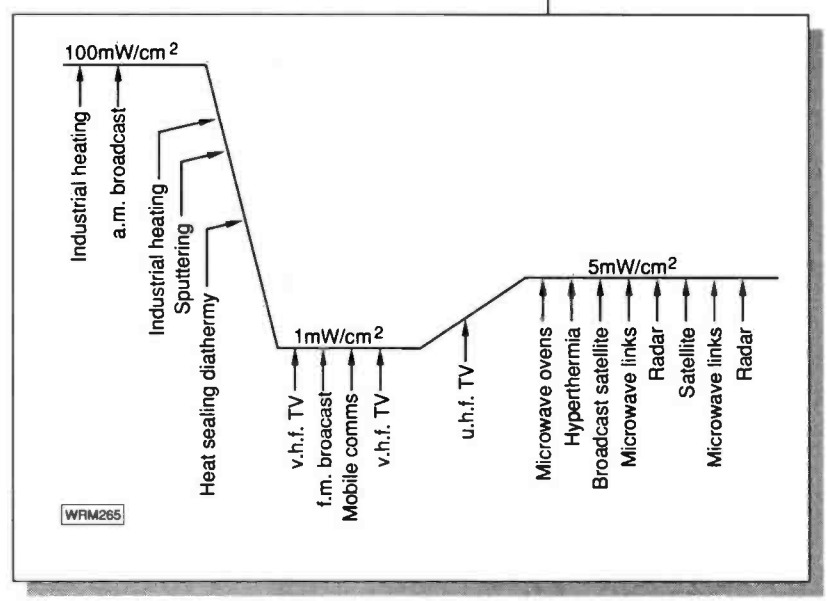


Fig. 2: Applications of frequencies in the 300kHz to 100GHz region which may lead to R.F. hazards.

public are likely to be exposed. Some services such as aviation, amateur radio and satellite uplinks may provide sufficient power densities to exceed the limits, but their location and/or intermittent operation normally prevent them from being a serious public hazard.

A study by the FCC and the Environmental Protection Agency (EPA) measured radiation levels around a multi-station broadcasting system in Washington. The station included ten f.m. transmitters and numerous two-way communications and microwave relay stations. The f.m. stations (each with an effective radiated power in the range 126kW to 200kW) provided by far the largest contributions to the maximum power densities in the area. In many localised regions the radiation limits were exceeded, so a person remaining in such a place for an adequate time would receive radiation in excess of the six-minute-average ANSI standard. However, if the measurements were averaged spatially rather than at a single point, no place accessible to the public exceeded the recommended limit.

The FCC report showed that vegetation, especially conifes, apparently provide good radio frequency shielding. On the other hand, metal objects and even household electrical wiring could produce local concentrated field regions. The radio masts of non-operating transmitters produced a considerable local increase in the field from other transmitters, necessitating care in working on the masts.

The EPA said that high levels of radio frequency radiation could be harmful to people, not only because it increases the body temperature, but also because it causes mild electric shocks and burns. In addition, the radiation has been linked with chemical changes in some animals, but whether this is a hazard for human beings has not yet been determined, according to the Agency.

For frequencies above 3MHz, the EPA initially suggested three options for SAR limits for absorbed power of 0.04, 0.08 or 0.40W/kg of tissue. The tenfold range of values shown the inexactness of our understanding of the electromagnetic radiations hazard. Apart from these SAR limits for absorbed power, the EPA suggested limits of electric field intensity (V/m) and magnetic field intensity (A/m) for frequencies below 3MHz. Under the three different options these limits are 87V/m and 0.23A/m, 275V/m and 0.73A/m and 614V/m and 1.63A/m.

The maximum permissible levels adopted by the Western countries are based on tolerable levels of tissue heating, whereas the Soviet and East European levels are based on neurological and psychological effects. This results in the Eastern countries having the far smaller limit of 0.01mW/cm^2 for continuous exposure, as non-thermal effects have been observed at levels lower than the Western limits.

It is interesting to note that the exposure of a person's head to microwave energy of high peak power (but of an average power well below the recommended limits) has produced an auditory effect in which clicks are heard. One suggestion is that the clicks are produced by abrupt, very small rises in the tissue temperature. This phenomenon is not considered to be a hazard at present.

Some workers believe that pulsed electrical or magnetic waveforms can produce an increased rate of bone healing by processes not properly understood, but other dispute this. Similarly the treatment of soft tissue injuries by electric or magnetic fields in the subject of much controversy. Results from a study funded by the CEGB at Manchester University to answer the question, "Can induced 50Hz body currents affect mental functioning?" could be interpreted in various ways.

Conclusion

One can only reach the very unsatisfactory conclusion that the effect of electric and magnetic fields on the human body remain very much in dispute. The rise in temperature due to exposure can be measured, but virtually all other effects are the subject of conflicting opinions. It really does seem that the human body is too complex for anyone to produce simple and definite answers or perhaps even to achieve similar results to those reported by others. Opinions of the world's experts on the safe exposure limits to electromagnetic radiation vary widely.

Nevertheless, in 1981 the first official recognition was made that a fatality resulted from exposure to electromagnetic radiation. The widow of Samuel Yannon, a radio technician who for 15 years worked on top of the Empire State Building, received a monetary award in respect of his death. In Britain the Department of Health and Social Security does not accept that there is a link between cancer generation and electromagnetic exposure. However, a DHSS tribunal accepted that an exposure to microwave radiation provided grounds for granting a special pension to a widow whose husband died of thyroid cancer after he worked on radar servicing.

Practical questions, such as to how far one should keep away from one's transmitting antenna whilst operating at a certain power level for a certain time, are obviously not easy to answer. A survey instrument (which must be suitable for the frequency or frequencies involved) can be used to measure the level in mW/cm^2 and this can be compared with the ANSI recommended levels. It seems sensible for everyone to keep as far away from strong fields as is conveniently possible until more is known about their possible effects on people. However, millions of humans have been working in such fields for many years, so the chances of serious hazards existing may be quite small. For those who seek extra protection, a microwave reflecting suit is offered by Lion Uniform Inc. (Dayton, Ohio, USA). It provides at least 20dB attenuation at 2450MHz by reflecting radiation **PW**

CB SPECIAL SUPPLEMENT

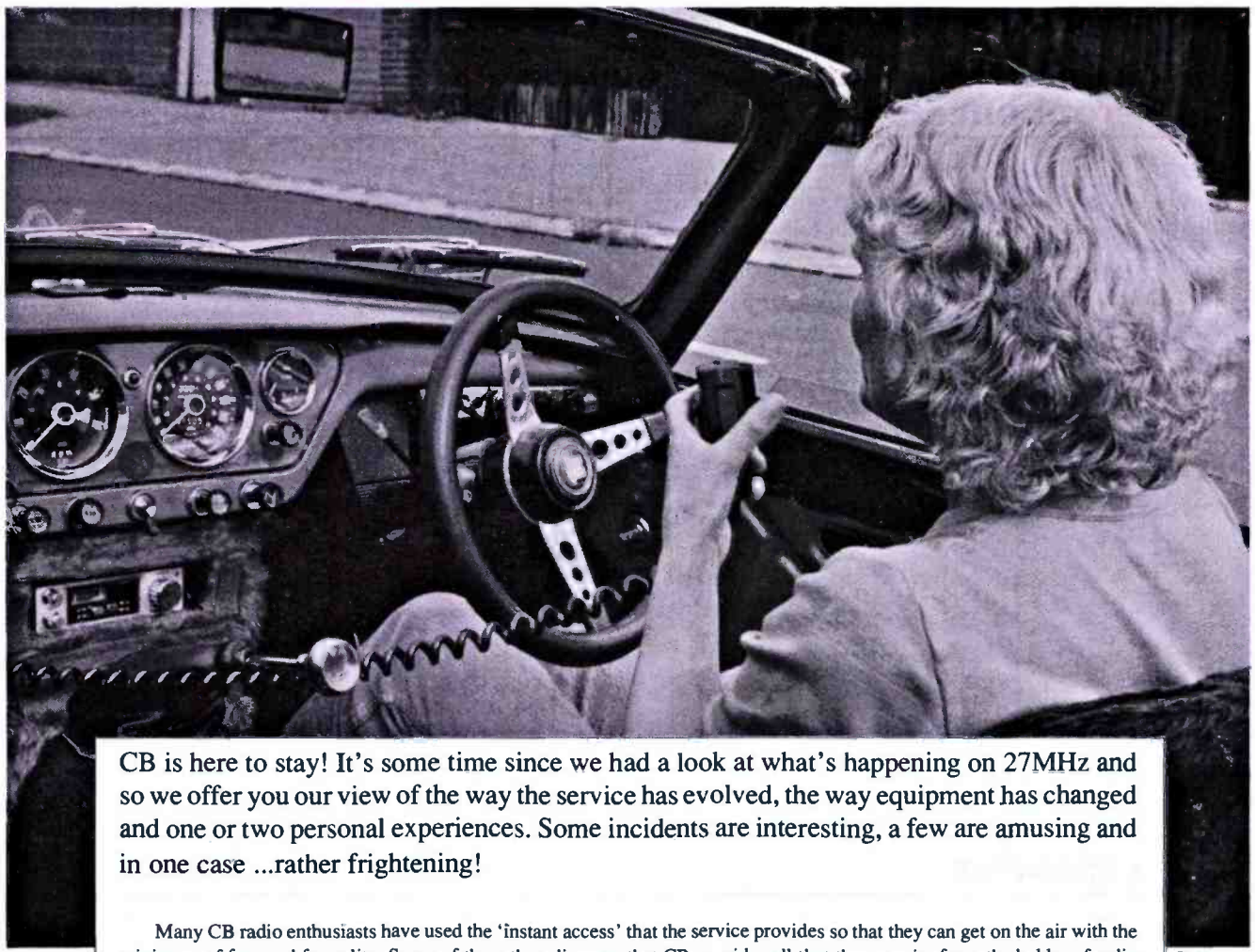


Photo courtesy Southern Evening Echo

CB is here to stay! It's some time since we had a look at what's happening on 27MHz and so we offer you our view of the way the service has evolved, the way equipment has changed and one or two personal experiences. Some incidents are interesting, a few are amusing and in one case ...rather frightening!

Many CB radio enthusiasts have used the 'instant access' that the service provides so that they can get on the air with the minimum of fuss and formality. Some of them then discover that CB provides all that they require from the hobby of radio communications. However, others find that they may want to go off in other directions and that could lead them into amateur radio.

For those who want to enter the world of the licensed radio amateur, there is what seems to be the long and tortuous path leading to the Radio Amateur Examination. This often, very long and difficult path can appear to be strewn with obstacles such as radio and electronics theory, mathematics, money hurdles, pride and prejudice before the coveted licence is obtained.

There is little we can do to avoid the theory hurdle apart from providing plenty of good technical reading and introductory articles. But we can lower the jumps a little for the money obstacle by producing good 'home-brew' circuits, so that even first time constructors can build their own equipment. However, where prejudice is involved we can 'knock that on the head' immediately and firmly state that as far as *PW* is involved - it doesn't exist.

To back this up we present our view of the CB scene and introduce at the same time our new, regular feature writer, Rick Maybury. Month by month Rick will report on the CB front and if 27MHz is where you enjoy radio communications - this is the page for you. Don't forget, we're not assuming that everyone on CB is a budding radio amateur. If you are , fine, we're here to help you in any way we can. However, if you're happy to enjoy CB for its own sake - you're sure to enjoy Rick's page every month.

Radio amateurs and CB enthusiasts are very near neighbours in every sense of the word, we've got to meet some time and that time has arrived. Welcome to *PW* and the wider world of radio construction and communications!

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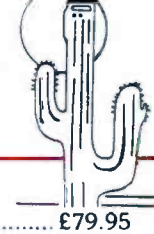

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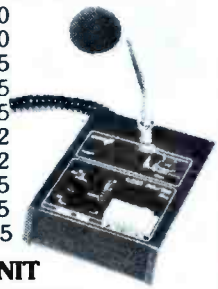

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CB CORNER

Rick Maybury begins his regular review of the UK CB scene, but this month, by way of an introduction he looks back at his own early experiences with two-way radio, before it became (almost) respectable.

Citizens' Band - Eleven Years On

Some people can tell you exactly what they were doing the day John F. Kennedy was assassinated. Neil Armstrong setting foot on the moon and the murder of John Lennon evoke equally strong memories. Whilst I can vaguely remember all of those events, I can tell you precisely where and when - almost to the minute - I first encountered Citizens' Band radio. It was eleven years ago, on 15 March 1979, around 10 o'clock in the morning and I was on a semi-regular trip to Colchester in a colleagues car. We were on the way to the printers, to sort out the usual last-minute problems on *Hobby Electronics Magazine*; long gone and much honoured.

Somewhere near Gant's Hill my colleague sheepishly opened the glove compartment to reveal a shiny new Midland CB rig - something I had only ever seen before in photographs. He had brought it a week earlier, along with a 'disguised' antenna, on a business trip to the USA. I hasten to add that his choice of antenna was not influenced by any need to maintain secrecy - he wasn't even aware that CB was illegal then - but simply because it would double up as a normal car antenna, and he wouldn't have to drill any extra holes.

He hadn't had much luck with it and was about to give up but after five minutes knob twiddling we finally came across a truck driver, somewhere on the Southend Arterial road, chatting to a fellow CBer. It sounded like a foreign language - a mixture of American slang, spoken with a phoney accent, interspersed with more familiar references to last night's TV, his sexual prowess and capacity to consume alcohol. After a few minutes we plucked up enough courage to have a go - we soon picked up the jargon - and the fake accent - and by the time we turned on to the A12 to go North we had two new friends and I was hooked.

Smuggled In

At that time CB rigs were virtually unobtainable - there were probably only a few hundred American a.m. units in the country, mostly brought in by truckers from the Continent where they were readily available. Fortunately I was due to go to Holland a couple of weeks later, to visit one of our sister magazines. With a little help from the staff I managed to track down an American rig - it was a fairly basic design, called Otron, and it cost around £30. By then I was dimly aware of the illegality of CB so I disassembled it and smuggled it back into the country in several pieces, spread throughout my luggage. I learned then and there that I was not cut out for life of crime - I can only assume the Customs officer took my pallid complexion, shaking and stuttering to be a bad case of food poisoning.

Suitability equipped with a mission to inform I first put pen to paper on the subject of CB in early 1979, in a five-page feature that appeared in the June edition of Hobby *Electronics Magazine*.

Fan Mail

In a good month we reckoned to get around 50 letters; a week after that issue hit the bookstalls we had received over two thousand letters! They all wanted the same things; more information and where they could get their hands on a CB rig. Being a fairly perceptive fellow I cannot think why I didn't immediately hire a Transit van for a day-trip to Holland and fill it to the roof with rigs. I know quite a few that did just that and some of them are millionaires now! (I should also say one or two of them ended up as unwilling guests of Her Majesty...). There was a time, back in those early days, when the importation and sale of CB rigs was not strictly illegal - Customs and Excise apparently treated them in the same way as ordinary transistor radios and provided the duty was paid, they were allowed in. For a few short months there were fortunes to be made.

Not me. I spent the next two years doing my bit to get the archaic Wireless Telegraphy Act changed - I was there on the regular Hyde Park marches, Parliamentary lobbies; I even served on GLC Committees. Free speech, the right to communicate, two-way radio for the masses. High ideals, but sad to say, some low opinions of the way the illegal network was rapidly developing.

There are more than enough stories from those pre-legalisation to fill *Practical Wireless* ten times over but suffice it to say that after much dithering and posturing the British Government finally realised that it would be easier to legalise CB, and make money out of it, than spend a small fortune chasing illicit CBers around the country. Their solution was for the Home Office to come up with the daft name 'Open Channel', draft a Green Paper discussion document, and finally publish the historic MPT1320 and MPT1321 specifications which set out proposals for a unique UK FM CB service on the 27MHz and 934MHz bands. On 2 November 1981 the Post Office monopoly on all forms of long-distance communications, - which other than shouting required passing an examination, was finally broken. The rest, as is customary to say at this point, is history.

CB RIG REVIEW

Satcom SCAN40-F

The last CB reviewed in PW *stirred up lots of comment, some from the minority dyed-in-the-wool 'it shouldn't happen in* PW' *camp, to a very resounding 'thank you' from our SWL and newcomers to the hobby. So on the encouragement of the latter, Richard Ayley G6AKG reviews the latest CEPT approved CB to join the the Nevada stable.*

After the unfavourable reaction of most of my fellow amateurs regarding the last CB review, I was a little apprehensive on the subject of doing another. But as I pointed out to them at the time, CB is still the only easy way for most people to get access to the field of radio communications. Indeed, I also pointed out that some of our radio clubs most enthusiastic award chasing members, cut their DXing teeth via CB. Still, why should I have to make excuses? I know the value of CB and its role in propping up the somewhat ailing hobby of amateur radio.

I must say that since I last reviewed one of the new CEPT27 rigs back in May 1989, the band noise has increased alarmingly due to transatlantic propagation caused by the current sunspot cycle peak. It has, of course, increased the chances of working some interesting DX if you're patient and can stand the din. As far more European stations seem to be using the band; you will no doubt remember the new CEPT frequencies have been accepted throughout the EEC. Having said that, there still seems to be very few UK CBers in evidence, which is good I suppose for those more serious band users.

Having reviewed one of the first CEPT rigs to grace Nevada's emporium I found myself quite unconsciously comparing the two rigs. The Satcom SCAN40-F seems to have gone the same way of most amateur equipment, it has quite a few bells and whistles than its more simplistic predecessor the Team TRX 404.

Unpacking

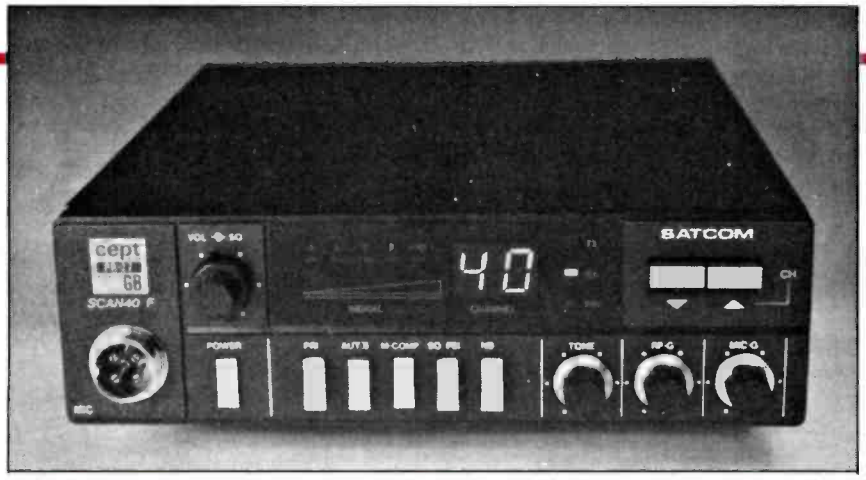
On unpacking the Satcom I was surprised to see such a busy looking rig and a little disappointed at the lack of technical information enclosed. No interesting schematics, not even a functional block diagram. Still most people don't want to know how it works. Anyway, the rig comes with a users manual and a bag of assorted installation hardware. To complement this, there are some quite useful hints and tips in the manual on the installation of the rig and its antenna (not supplied).

The power lead supplied with transceiver was at least a metre long including an in-line 2 amp fuse, long enough for most installations! The microphone supplied with the rig is a fairly ordinary 500Ω dynamic type with a 500mm curly lead, terminated in a Japanese standard 4-pin screw collet plug. This particular item gave me a little trouble when I first aired the rig, as it had an intermittent short circuit on the mic. The fault had been caused by the misassembly of the microphone shell and was easily put right, but was a little annoying. It's a shame that this seemingly minor assembly fault crept past Satcom's QA person, as I was amazed at the high standards of construction used within the rig itself. The back panel of the rig is quite ordinary. Here sockets are provided for the optional selective calling unit, d.c. power, extension speaker (3.5mm jack) and antenna (SO239 type).

High Standards

All the rigs sub-assembles are connected to the the main p.c.b. by multiway plugs and sockets; even the speaker had its own spade type connectors. In fact, I would go as far as saying that the transceiver's internal construction far outshone some of the more expensive amateur gear I've poked around in.

Unfortunately, I can't tell you a lot technically about the internal working of the rig, only that it has a phase locked loop synthesiser to produce the 40 channels and has a



dual-conversion superhet receiver (10.695MHz first i.f. and a 455kHz second). The transceiver's receive selectivity is provided in the main by two ceramic filters.

Good Looks

The front panel of the transceiver is well laid out and has all the good looks of a thoroughbred, as does the whole transceiver which is finished in a rather nice gunmetal grey metallic paint. As mentioned earlier, the rig is endowed with a surprising number of knobs and switches; just the thing for those compulsive twiddlers like myself. On the far right of the front panel is the microphone socket above and to the right of this are the VOLUME and SQUELCH controls, of the dual-concentric type. Below this rotary control is a push-on/push-off type switch which controls the rig's d.c. power. In fact the next five switches to the right of this, have exactly the same type of switch action.

The d.c. POWER switch seems to have a strange effect on the transceiver, as it doesn't seem to fully disconnect the rig from the vehicle supply. When in the off position, the rig displays faintly in the channel window the letters PA. As the rig doesn't seem to have a public address function, this display remains a mystery and leaves a quiescent current drain of 17mA. Although this is not mentioned in the manual, I can only assume that this function may be part of the rig's selcall option. However, I can only guess as the rig's selective calling working as this is only vaguely mentioned in the back of the operating manual. The operation of selective calling is explained in the Team 404 review, in the May 1989 issue of *PW*. One thing is for sure, when you install the transceiver in your vehicle, I should make sure that it is connected through the car's ignition switch. So when the vehicle is left unattended the rig does not flatten the battery.

Scanning

The other switches on the front panel, going right from the power switch, are marked, PRI, AUT.S, M-COMP, SQ FIX and NB. The switch marked PRI when pushed automatically switches the rig to Channel 9, which for those who don't know, is recognised as a distress channel.

The next switch along to the right, works in league with the transceiver's rather over complex means of changing channel. Instead of the more usual rotary channel switch, two buttons are provided, one marked with an 'up' arrow and the other with a 'down' arrow. Both switches have a press-to-make action and will either change the rig's operating frequency up or down as required. If either of the buttons, which are located on the right hand side of the channel display, are kept depressed the rig will continuously cycle through all 40 channels.

The AUT.S button when locked in sends the rig in search of a busy channel, stopping only when the rig's squelch is lifted. This scanning mode, for which the rig is obviously named after, I feel is a little wasted. As paging systems operated by some UK manufacturing plants work in this band and issue long and often noisy strings of tones, they constantly lock up the receiver's scanning function. If a delayed hold had been provided, so that every time the rig encountered a constant carrier it locked on the channel for 6 seconds and then continued scanning, then this function might have been relegated from being just a novelty.

The obvious use for such a channel change system, would be to put the UP and DOWN buttons on the microphone, as is the case with some amateur mobile equipment. However, this was probably left off in the interest of keeping the equipment's price in the competitive range. The next switch marked M.COMP, gives the rig a very useful and unusual feature. Gone are the days of power mics, as this switch increases the microphone sensitivity by a quoted 20dB. When I used the facility on marginal contacts it gave me at least one extra point on the readability scale. A very worthwhile improvement to include, as I'm sure you will agree.

Fixed Squelch

Next on the list is the button marked SQ.FIX. This I must admit had me rattled as the manual just said the button fixed the squelch on? At a wild guess I think it must be some kind of pre-set squelch. So I left it on, thinking that it would probably work like that very same function on the Team 404. I'm sad to say that yes, it is a pre-set squelch, but it takes quite a beefy signal to lift it. Unlike the Team rig which looked for a well modulated f.m. carrier as well as a pre-set level of r.f signal, the Satcom's I feel, must be operated by r.f. signal strength alone. This function is only useful if you're expecting a call from a very local station.

The last button, marked NB, enables a noise blanker to be activated on the receiver. This is quite handy for cutting back some of the vicious ignition interference experienced in the mobile environment. I must admit though, it only reduced some of the noise which is all that can be expected in equipment of this type. However, it is a nice touch as well as being marginally useful and a rarely found feature on CB equipment.

Twiddley Bits

The rig is also endowed with a tone control, a simple but useful means of rounding off some of the sharp edges on the harsh audio some people transmit. Poor audio is caused mainly by people holding their microphones far too close to their mouths when speaking, especially in a mobile environment.

The next rotary control enables the r.f gain of receiver to be adjusted and is the one feature I used the most. At times, I wound this control down to nearly half its maximum setting just to give the rig a fighting chance of selecting some of the stronger signals from what seemed like a solid wall of hash. Knowing how much power some continental stations use, I think all CB rigs should be provided with an r.f. gain control.

The last knob in this trio provides a means of adjusting microphone gain. This particular control I left at maximum for most of the time, as even with the microphone compressor running it seemed that without it, you just weren't heard. This is bad operating practice I know, but when you're trying to get a contact in all that noise you need to pull out all the stops. This reminds me of one poor Italian station I heard, he must have shouted himself hoarse trying to

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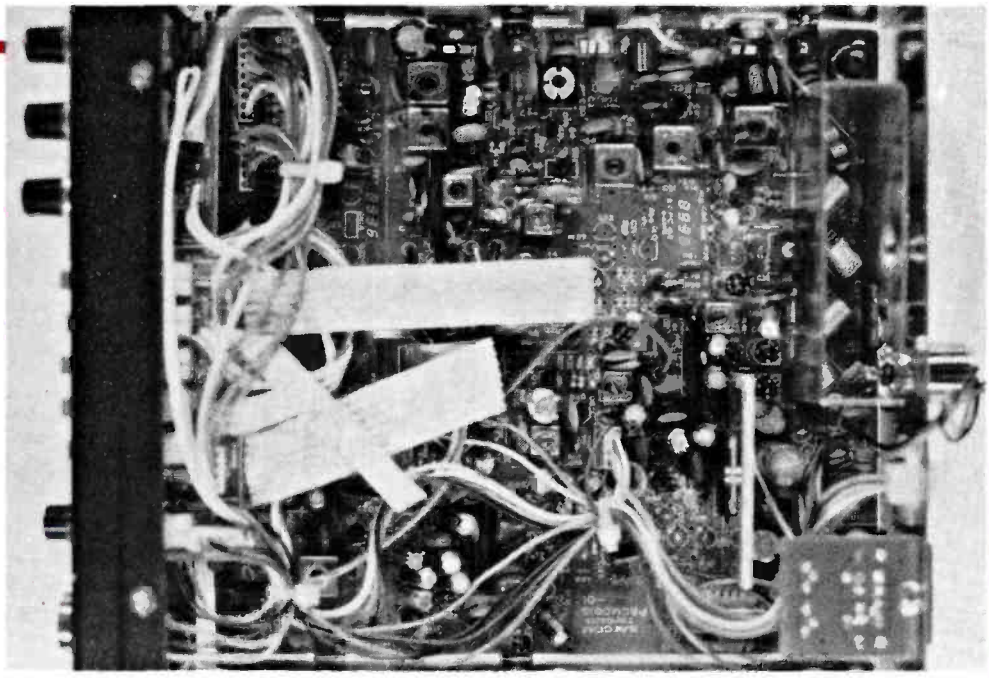


work a Spanish station. He shouted louder and louder, till I was worried that he might either explode or have a fit of the vapours. Still he managed it in the end, but I should think he had to go and lie down in a darkened room for a while to recover!

Display

The Satcom has a very striking display with two eight-segment green l.e.d.s to show the number of the channel in use, and five separate l.e.d.s to provide a bargraph type Signal/power meter. Another three l.e.d.s mounted vertically to the right of the channel display, show the state of the transceiver, red for TX and green for RX. The third l.e.d. comes on when the rig is set on the priority channel. The whole display window is covered in a smart, smoked effect panel, which I might add, helps to lessen the glare from the display when the rig is used in the car at night.

In Use

I quite enjoyed using the rig, as it gave me a chance to make some new friends outside amateur radio and look up some old ones from the last time I was on the band. However, if I was going to become a permanent resident on 27MHz, I don't think I would rush out and buy this particular transceiver. The rig, for all its gadgets and goodies didn't come up to my expectation, particularly on receive. In particular I found the preset squelch very insensitive and the volume control a little abrupt in its action.

Although most of my comments about the receiver's performance were based on gut reaction rather than measurement, I got the distinct impression that the rig needed an r.f. gain control as it seemed overwhelmed at times by high band noise and strong signals. On-air reports of the quality of modulation were good, even with the microphone compressor running. The received audio from European stations using what sounded like CEPT spec. equipment, weren't too bad either, although crushing s.s.b. splatter and a.m. heterodyning at times completely obliterated the narrow band f.m. used by the CEPT breakers. The means of setting a channel 1 also found frustrating rather than useful, but then I've always liked rotary tuning dials. Perhaps it's a hang-up from using old valved comms. receivers!

Summary

I couldn't help myself comparing the Satcom rig with the Team and although the Team looks rather utilitarian up against the Satcom, it does work remarkably well. Having said such harsh things about the Satcom, I feel that this rig will appeal to lots of breakers mainly because of its good looks and on reflection I think it will also take a lot more physical punishment than the Team. The Satcom SCAN40-F has a quality feel and look about it and wouldn't be out of place in any new vehicle, particularly those with the more futuristic looking dashboard.

In the end, 'you pay your money and take your choice!' My thanks go to Nevada for the loan of the reviewed unit. For further details, current price and availability, phone (0705) 662145.

SCAN40-F Manufacturers Specification

General

Channels	40 channels p.l.l. synthesised
Channel Control	Via UP/DOWN switch
Frequency Coverage	26.965MHz to 27.405MHz
Power Supply	12 volts d.c. (positive or negative earth)
Operating Temperature	-10 to 55°C
Microphone	500Ω dynamic type with p.t.t. switch
Internal Speaker	8Ω 77mm dia.
Connectors	EXT. SP. Jack 3.5mm (8Ω). Antenna SO239 chassis mounted. DC power socket 2 pin type.

Transmitter

RF Output Power	4W maximum into 50Ω. 13.2V d.c. for 3.4W to 4W
Frequency Tolerance	0.002% nominal
Type of Modulation	F3
TX Audio Response	400Hz to 2.5kHz
Harmonic Radiation	4 x 10-9W (-90dB ref 4W)
Spurious Radiation	2.5 x 10-7W (-72dB ref 4W)
Current drain	1.8A Max. at 13.2V d.c.

Receiver

Sensitivity	Less than 1µV, 20dB (S+N)/N
	Adjacent Channel
Selectivity	Better than 60dB
Spurious Rejection	Better than 60dB
	Inter Modulation
Rejection	Better than 60dB
IF Frequencies	10.695MHz (1st), 455kHz (2nd)
Audio Output Power	2W at 10% distortion
Squelch Range	0.5 to 500µV

CB IN THE HIGHLANDS & ISLANDS

Radio communication plays an important part in the life of many communities, especially those which are remote. Rob Mannion G3XFD looks at the uses that the now well-established CB radio plays in the north-west of Scotland.

CB radio was not new to my family and I when we went to live alongside the beautiful and remote Little Loch Broom in Ross-Shire. Situated as we were, some 120km north-west of Inverness, we had many hours of empty roads to traverse for the regular shopping trips that are required for young families.

While we were living in the Hampshire countryside we had used CB to link our house and car and it had proved very useful - when we had been able to find a clear channel that is. In our Hampshire village, dominated by a very large farming company, the biggest users of CB were undoubtedly the tractor drivers. Every farm vehicle seemed to be equipped with a 40-channel transceiver so that the driver could keep in touch with home. Even the potato picking machine had a rig fitted.

Once we had settled into our new way of life in the Highlands I quickly found out that, for my own use, CB radio was not just going to be a way of keeping in touch with the family but also a very essential safety aid. Fitting a 40-channel rig into the car for anyone who was on the road a great deal was a forgone conclusion, but many people who had to leave their vehicles also carried walkie-talkies.

Ever since the CB service was introduced legally into the UK, pressure has been placed on hill-walkers and climbers to carry CB walkie-talkies. Many people do carry the equipment and from experience I can report that they have more than proved their worth.

For people like myself who were likely to be literally anywhere in the Highlands and Islands, mobile amateur radio equipment and CB gear were useful although at times propagation could play some odd tricks during an otherwise run-of-the-mill conversation. I can remember one occasion when a friend and I were busy trying to locate a fault on a very long cable TV system when someone from Cornwall joined in the conversation.

A very effective way of working with walkie-talkies is to operate them in conjunction with a vehicle mounted transceiver. The more efficiently matched vehicle antenna and (usually) higher output transmitter fitted in the car can greatly extend the range of the hand-held portable.

Hill-Billy Eyeball

It was while using CB equipment in this fashion to help in the location of a fault on a 2km u.h.f. and v.h.f. TV and radio cable system, that my friend and I were joined by the other hand-held user who was located in the mining town of Redruth. The relatively short skip conditions on 27MHz were so good that our friend in Cornwall was able to pass on his own advice to where the fault could be!

If, by chance, the Redruth CB operator reads this piece and remembers the incident, he may be interested to know that the problem was located in a stretch of cable that passed above a path frequented by the local wild goat population. These magnificent animals have impressive long shaggy coats and their regal appearance is topped off by an impressive set of horns. A legacy of the Highland crofting clearances, they have returned to the wild and apart from rubbing their horns on low-slung coaxial cable and the occasional nibble at low voltage supply lines, do no harm to anybody.

However, it must be said that there was one gigantic goat that had to be avoided at one location for he allowed no trespassers on his territory. I'm not particularly fit and have never been an athlete, but when my Labrador and I were attacked by this unfriendly beast one afternoon - we both managed a very creditable gallop up the very steep hillside. The sight of a very large bearded engineer with an even larger rucksack filled with test equipment, being chased by the bearded monster would have been funny I've no doubt if anyone had been able to see the incident.

As it happened, the only witness was my friend who was about 400 metres below me waiting for instructions via the CB in my car. Although Murdo only heard what was happening just before and after the chase - he was able to picture the scenario accurately because in my panic I ran to safety holding the transmit button in at the same time. I dropped the walkie-talkie at one point and the animal stopped to sniff and nibble at the shoulder strap. This gave me time to abandon my rucksack and climb up on a steep sided rock. There was just room enough for my dog Mandy and I to stay clear while the goat sniffed and nibbled

around my rucksack before he lost interest and wandered away.

Unfortunately for me, my troubles had not departed with Billy. For he had left his calling card behind and it was certainly unforgettable. In fact, both the hand-held and the rucksack were radiating very strong goat signals and it was only the anxious voice of Murdo emanating from the smelly radio that gave me courage to pick it up and use it. It took a long time for the smell to vanish from the radio and even longer for story to lose its appeal in local bars but I shall never forget my encounter with Badralloch Billy.

Popular Festival

Hand-helds were often a useful aid when small boats were being used and remote communities such as Scoraig, on the other side of Little Loch Broom found many uses for CB radio. Scoraig has featured in various TV programmes and has attracted some unusual and talented people. There's no mains electricity and there are only two practical ways of getting over there from the 'mainland'. Although this remote stretch of land is not physically an island, to all intents and travel purposes it is.

Visitors have the choice of a two kilometre boat trip across the seaward end of the Loch or face an eight kilometre walk from the end of the road at Badralloch. In either case walkie-talkies provide a very helpful link for possible emergency use and for pop festivals! It may seem a little odd that people who choose to live in such a remote area want to have pop festivals, but they did and CB radio played an important part in the organisation.

Transporting the many hundreds of visitors down to the ferry pier at Badluarach via the narrow road and steep hill, took much effort and close co-operation. The main car park (just off the main A832) was also the point where the 'Westerbus' dropped people off as they arrived from Inverness. With the aid of several sets of hand-held transceivers and a fleet of mini-buses, the hordes of visitors were driven to the pier to complete their journey by boat. Once over the other side they still had two kilometres or so to walk but they all seemed to think it was worth it. It was no small tribute to the equipment in use that by the end of the event (spread over several days) none of the transceivers had failed.

A trip to the main hospital in Inverness, or a shopping visit to the 'Highland Capital' would easily take up a day. Travelling back late at night or even in the late afternoon had its own hazards as we often found out. One dark evening when my family and I were half way home from Dingwall - the county town of Ross-Shire which was 86km and a good hour's journey away, we struck a 'cat's eye' that had been dislodged by one of the huge fish lorries that ply between Ullapool and virtually all over Europe. A quick call on the CB soon had someone along to help us change the wheel. The most useful help they could offer was the light from their headlamps and we were soon on our way home again.

K9 Control

Sheep abound in the Highlands and you learn to live with the hazard of sheep 'exhaust' and road manners. Sheep have diabolical road-sense and the phrase to remember is 'woolly minds wander' in every sense of the word. Where sheep are involved, in an odd way, life has come full circle because the very crofters who were evicted in the last century so that sheep could be grazed where their cattle and goats browsed now keep sheep in a big way.

Many sheep farmers use the specially designed rough-terrain three-wheeled motor bikes to round up their flocks and some enterprising individuals have latched on to a modern approach to rounding up the huge flocks of sheep by equipping their dogs with walkie-talkies! Normally the Collies can work to many hundreds of yards away from the shepherd, but high wind noise can drown the loudest whistle. To get over this problem and allow the dogs to work at greater ranges a small hand-held rig is strapped to the animal's back. The shepherd can then work the dogs from a vantage point and direct them with simple commands. As can be imagined, this approach can be a great help in mountainous countryside.

Working with two dogs is not a problem either, as two-channel transceivers will enable both animals to receive their instructions. At this point I must state categorically that despite my widespread travels in the Highlands and Islands and extensive enquiries - I cannot confirm the rumour that one clever crofter has managed to train his dog to reply and query instructions via the CB, although many are trying!

Comradely CB

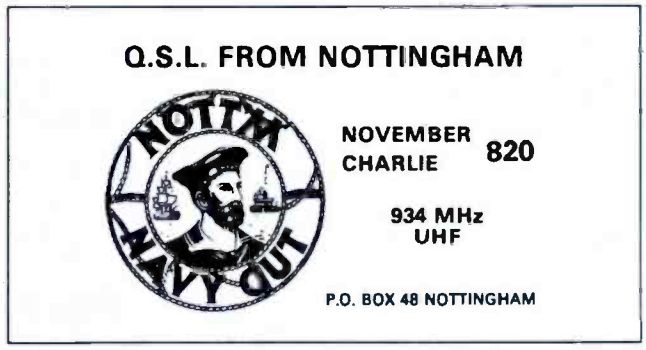
There were many foreign CB users in the Highlands, and although I've no doubt that they were breaking British law, they certainly did no harm. For example, it was not uncommon to see two or three French or German motor-caravans in convoy, keeping in touch via their own CB gear while they enjoyed their Highland holidays. But the prizewinners for the most enterprising use of CB radio must surely go to the many hundreds of Eastern European visitors to the picturesque fishing and ferry port of Ullapool.

Ullapool, which is situated half way down Loch Broom, plays host to very many 'Klondyking' fish processing ships every year. The biggest customers for the locally caught fish are the Russians, East Germans and Bulgarian ships. For a large part of the year the waters of the loch are jammed with closely anchored ships and the air immediately around the factory ships is permeated with the smell of cooking fish and tomato sauce. The small town is often completely overwhelmed with visitors from the ships who are often ferried in fleets of lifeboats from the anchored fleet. Relations with local people are on the whole very good and the visitors are always especially kind to any children they see...perhaps reminding them of their own families who are so far away.

Fleets of coaches take the 'Klondykers' to Inverness where they seem to buy up virtually any consumer electronic item they can afford. Particularly popular are radio-cassette recorders and colour TV sets. The latter seem to be in most demand by the crew members from the Russian ships - despite the fact that they are fully aware that the equipment they are buying is for the PAL standard rather than the SECAM system adopted by Russia.

Back in Ullapool the CB walkie-talkies are put to good use and those ashore can keep in contact with friends on board. Demand for fresh food - especially vegetables - can be so high that telescopic whips seem to sprout from everywhere when yet another delivery van arrives from Inverness at the local shops. At times in the Highlands and Islands - PP3 and HP7 batteries can seem to be as difficult to find as Haggis. Oh yes - the visitors buy them in great quantity too. So, heed my advice when you go to the Highlands and Islands, take your CB rig with you and before you go...learn some Gaelic, you could find out where the best bargains are. Math Turas! (Good Journey)

CB 934



No doubt there are a few 934MHz clubs throughout the UK, but the 934MHz Club UK have come to our notice over the past few years as they send regular reports in to the Propagation column in Backscatter each month.

They are a very active group publishing a quarterly newsletter, organising awards and contests and runing a QSL bureau between members. Another service they supply to members is that of 'club items'. These are log books, QSL cards and two different types of badges.

The Club aims to "encourage and further the use of 934MHz throughout the country and to represent the users of the frequency in connection with representations to the various government bodies concerned with radio communication". From their newsletter, it is obvious they meet with the Department of Trade and Industry to discuss matters affecting 934MHz users.

Awards & Contests

The 934MHz Club UK run four awards, all of which require QSL confirmation of contacts.

Five Counties: For this award members need two confirmed contacts from two different stations in each of five counties.

Ten Counties: Two confirmed contacts from two different stations in each of ten counties.

Twenty-five Counties: One confirmed contact from twenty-five different counties.

Worked All Counties: One confirmed contact with one station in all counties.

The 934MHz Club UK organises two contests each year for club members. The National Field Day is held on the third Sunday in May from 1200 to 2000. The Annual Contest is held on the second Sunday in October from 1000 to 1800. Logs must reach the contest manager not later than 30 days after the contest has taken place.

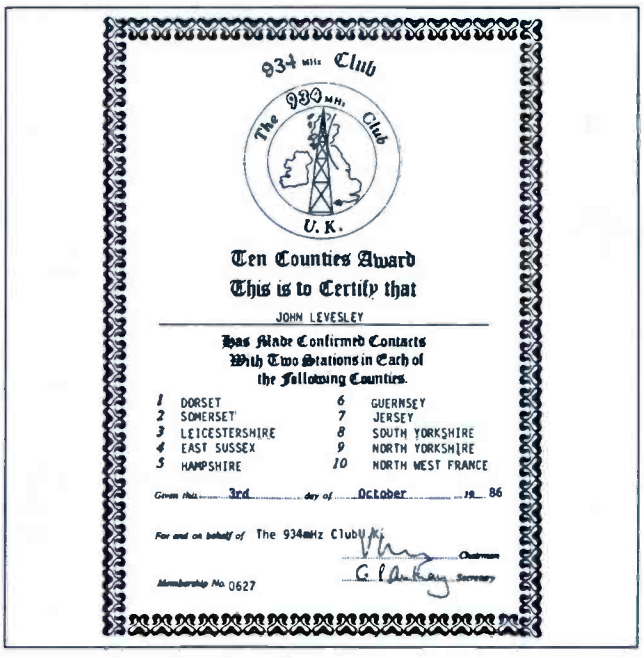
National Field Day: All Contestants must operate as mobile or portable stations. There are two classes in the contest, restricted and unrestricted. Unrestricted means that the station is unrestricted as to the antenna system and antenna height used. Restricted means the station may only use a single omni-directional antenna. If used from a vehicle, vessel or caravan the antenna should be mounted directly onto the vehicle, vessel or caravan without additional masting. If operating from a tent or using a hand-held, the mast should not exceed a height of 2m above the ground.

Prizes for the longest distance contact, the most points and the most contacts are awarded in each of the two categories, so there is plenty of opportunity for prize gathering. If stations are not entering the contest but wish to participate, then those stations may use their home base.

The scoring and logging systems is very simple and easy to use. One point per contact, plus one point for each 20 miles range of the contact. For example a 60 mile contact equates to 4 points. The log must show the name, callsigns and UK number of the contestant, plus their precise location during the contest. The log sheet must also state whether the operator was operating in the restricted or unrestricted class. Contacts in the log should be numbered consecutively and show the other stations callsign, location, range and, if applicable, the UK number and contact number.

Annual Contest: The UK and its surrounds have been divided up into regions and counties. Regions are denoted by a letter and counties by a number. The region and county codes quoted together are called a location code. The contest manager can supply a complete list of these codes to participants. In additions, each contact exceeding 49 miles needs a distance code: A = 50 - 99 miles, B = 100 - 149 miles and C = 150 or more miles.

Obviously if you are interested in joining the 934MHz Club UK, then you can ask for details of such things as the awards scheme and the contest rules to get the full details.


934 MHz Club

The 934 MHz Club U.K.

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JOHN LEVESLEY

Has Made Confirmed Contacts With Two Stations in Each of the Following Counties.

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2	SOMERSET	7	JERSEY
3	LEICESTERSHIRE	8	SOUTH YORKSHIRE
4	EAST SUSSEX	9	NORTH YORKSHIRE
5	HAMPSHIRE	10	NORTH WEST FRANCE

Given this 3rd day of October 19 86

For and on behalf of The 934MHz Club U.K.

Chairman

G. L. [illegible] Secretary

Membership No. 0627

Contacts

For those that think 934MHz means only very short distance contacts, you could not be more wrong. There are plenty of short distance contacts, ideal for local chats, but from a couple of borrowed logbooks another story emerges. Contacts of 100 miles (New Forest to Guernsey) are possible, or 60 miles between the Isle of Wight to Beachy Head, or 70 miles from the North Yorkshire Moors to Huddersfield. Even good mobile contacts are not unknown, travelling along the M62 one station worked stations in Stoke some 40 miles away. Of course, in the contests even better distances are worked when people go out to local hill tops, the longest contact in the last National Field Day was 164 miles. There's more to 934MHz than meets the eye!

More Details

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WATERS & STANTON

Construction

Power Supply for Battery Radio

Stefan Niewiadomski needed a high voltage p.s.u. to power a valve receiver he was renovating. Unable to find a suitable transformer, he wound his own. Here he tells you how he did it.

Having recently renovated a Curry's Westminster TAD6, which is a 1940s battery operated valve radio (or is it a wireless?), the requirement was to replace the h.t. and l.t. battery (90V and 1.5V) with a mains power supply. The valves used are one each of DK91, DF91, DAF91 and DL92. The initial D signifying that the valves are 1.4V heater filaments. When operated from a battery the nominal 1.5V would drop to around 1.4V, operating the valves at the correct voltage. The current consumption of this particular radio is some 10mA from the 90V h.t. at full volume, and a constant 275mA from the heater supply

It was soon realised that a suitable mains transformer would be difficult, if not impossible, to obtain (most surplus ones having a rather higher secondary voltage than desired). Using one of those would have meant dropping the excess voltage somehow, and the resulting heat would have had to be dissipated.

The solution arrived at was to wind a mains transformer specific to this application, a task which these days constructors seem to avoid if at all possible. In fact the use of a transformer kit , where the primary mains winding is already wound, greatly simplifies the work to be done. What could have been a rather daunting task now becomes straight forward.

As well as describing the design and construction of the power supply for the Westminster, this article gives more general information on transformer design using a kit, and details of how other output voltages can be obtained.

The Circuit

Shown in Fig. 1 is the circuit diagram of the power supply. Transformer T1 has two secondary windings, one for the l.t. and one supplying the h.t. The voltage values were arrived at by the following method. Neglecting rectifier losses, a rectifier and smoothing capacitor would give an output voltage of 1.414 times the r.m.s. value of the input voltage, so the input voltage is the desired output voltage divide by 1.414. From this the required voltage is 90 + 1.414V, which is 63.64V to which we may add the odd one volt to account for rectifier losses, then round it up to 65V for good measure. It was decided to use a bridge rectifier configuration for two reasons: the regulation and smoothing are better, and no centre tap is required on the winding.

Heater Supply

Calculating the voltage for the the heater supply is a little more complicated. To operate correctly the integrated circuit IC1 needs an input voltage at least 3V higher than the regulated output voltage. For an output of say 1.4V say we set its of load input voltage to about 5V so that as the load increases the input voltage is maintained across the regulator input. Because the l.t. voltage supply is fairly low, rectifier losses will be significant, so a couple of volts are added to compensate. The l.t. winding thus has to be (5 + 1.414)+2V, or some 5.5V r.m.s.

The high voltage secondary feeds diodes D1-4 connected in bridge formation, these four 1200V p.i.v. diodes are cheaper than one suitable high voltage bridge rectifier. The rectified output is smoothed by capacitor C1 before being passed to the filter circuit R1 C1, supplying further smoothing by way of a.c. potential divider action. This method does result in some voltage drop as current is drawn from the rail. At 10mA load the nominal 90V is reduced to around 85V across C2. This drop in voltage is perfectly acceptable to the radio being powered, it being more important to reduce the hum and ripple on the h.t. rail.

The low voltage output from T1 is rectified in the bridge rectifier D5 before filtering in capacitor C3. This filtered supply is fed to regulator IC1, which is an LM317T adjustable positive voltage regulator. The output voltage of IC1 is governed by the values of R3 and R4, which have been chosen to give an output of 1.4V. The LM317 range of regulators are eminently suitable for this application, being capable of producing

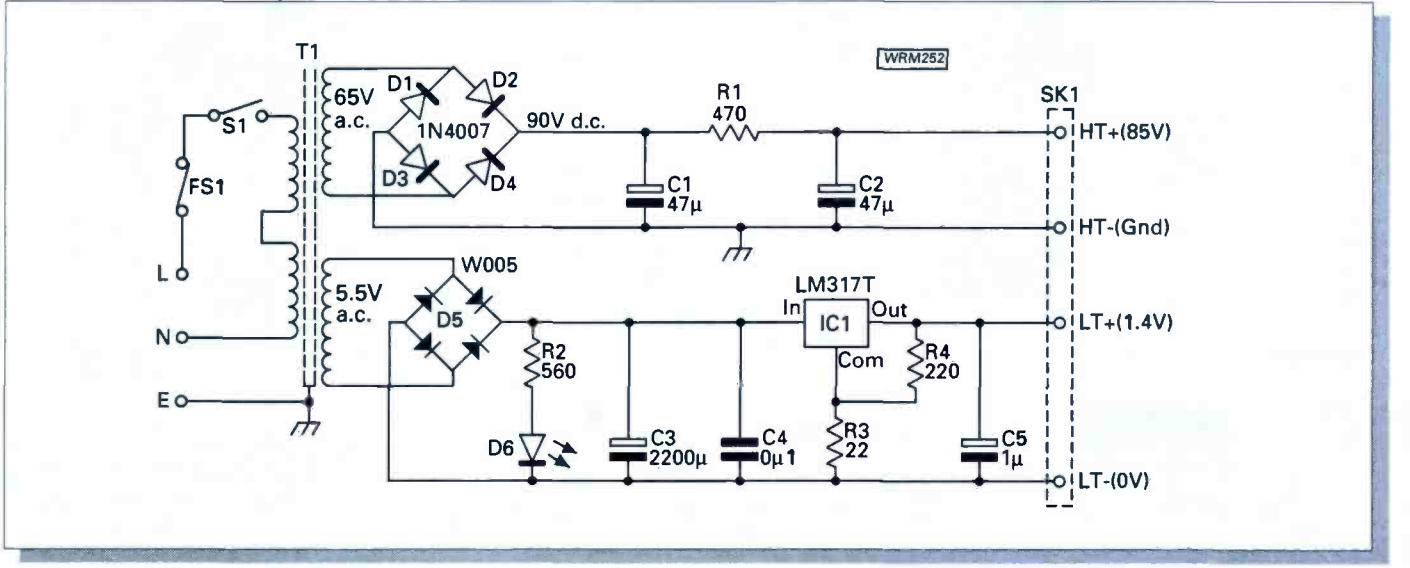


Fig. 1: The overall circuit diagram of the valve radio h.t. and l.t. power supply

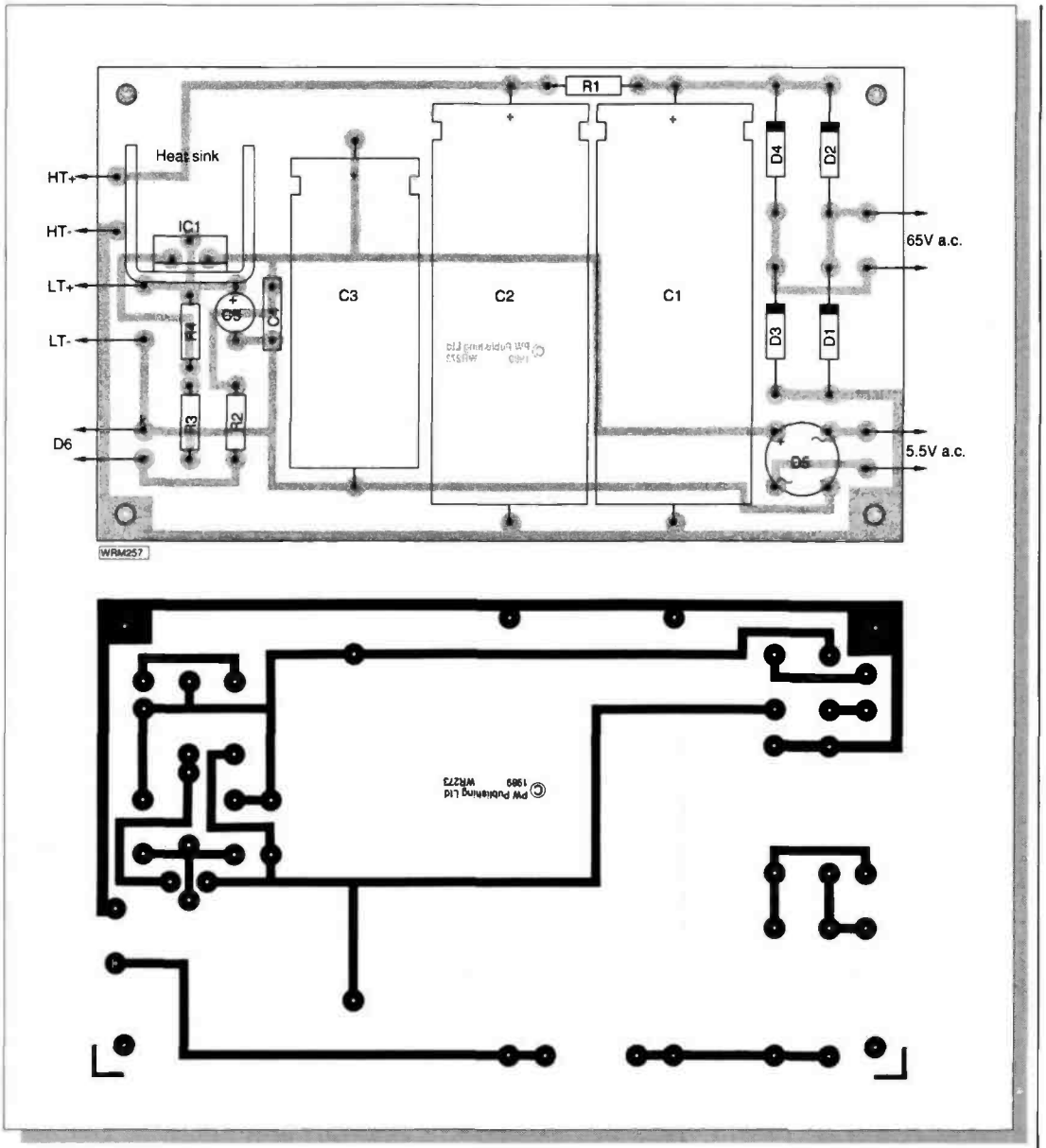


Fig. 2: Shown here is the track pattern and component overlay of the p.c.b. (Note: do not be tempted to use low voltage items for capacitors C1 and C2)

a regulated output as low as 1.2V at a current up to 1.2A. Capacitors C4 and 5 decouple the regulator to ensure r.f. stability.

The light emitting diode D6 gives a visual indication of power on, but may be omitted if not required. If this is the case then its associated current limiting resistor R2 may also be left out. This l.e.d. may be mounted on the front panel if the unit is being used as a cased stand-alone unit, or left on the board if being fitted inside the radio to be powered.

In common with many other battery sets the Westminster requires a floating l.t. supply as it generates a grid bias via an internal resistor between the h.t.- and the l.t.- supplies. The h.t.- output has therefore been connected to mains earth, and the other three terminals have been allowed to float with respect to this connection.

Transformer Design and Construction

When designing a transformer the first thing to do is to determine the total power or VA rating required so that the correct core/primary winding assembly made be selected. To do this total up all the products of the supply voltages multiplied by that supply's current. For our project this equates to 65V x 10mA, or 0.65VA, plus 5.5V x 0.275mA. This equates to about 2.2VA which is well within the capability of the smallest available transformer kit, which has a 20VA rating. In fact the secondaries will supply considerably more current than needed for this project.

Then to work out the number of turns required for each secondary winding, the number of turns per volt output must be known. The stipulated transformer kit (Maplin YJ61R 20VA) has a quoted figure of 6.04 turns per volt. This translates to 392.6 (393) turns and 33 turns for the 5.5V winding. Theoretically the wire sizes chosen should be as heavy as possible to fully fill the available secondary windings space. This results in the smallest losses for the completed transformer. The problem with this approach is the difficulty in predicting how much room will be taken up by the secondary

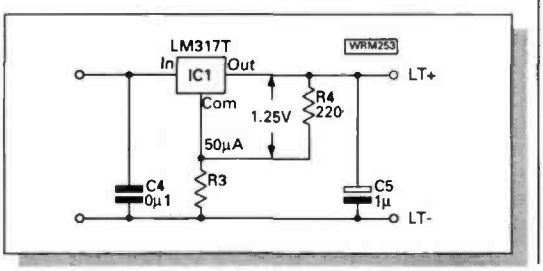


Fig. 3: Skeleton drawing of the regulator. Refer to the formulae within the text if you intend changing the l.t. output voltage to other than the designed value

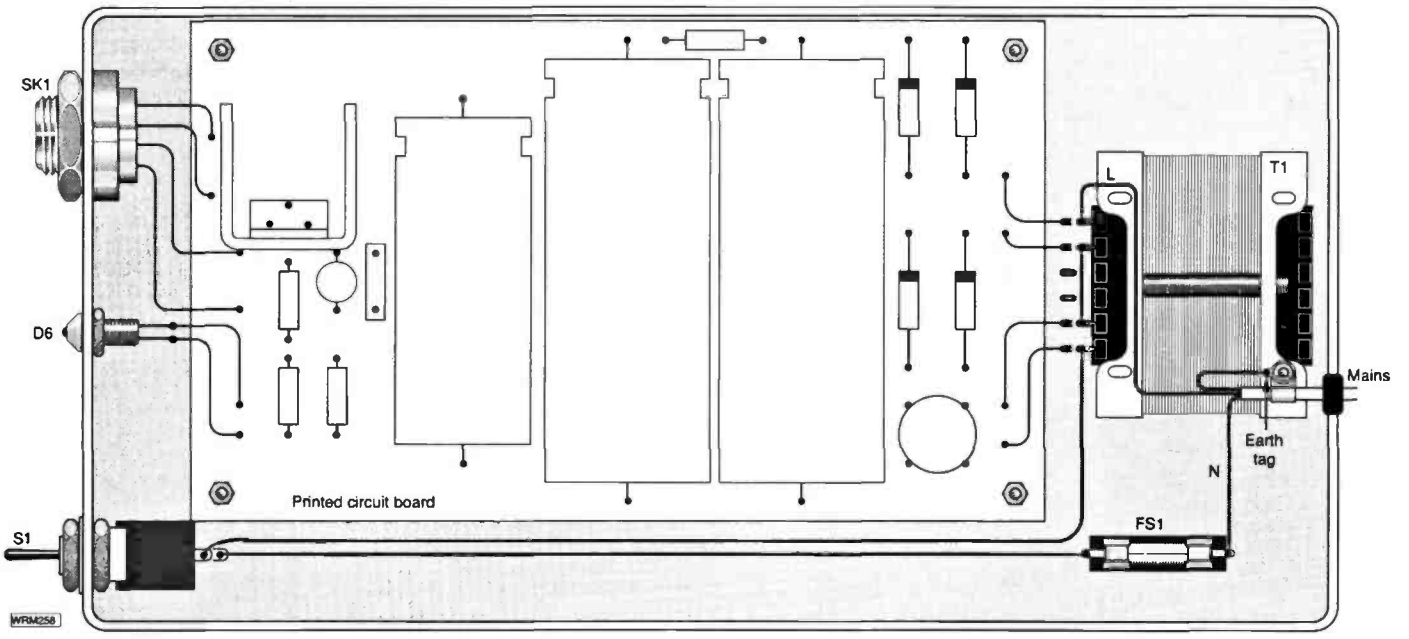


Fig. 4: This is the recommended box layout for the project if not to be fitted inside a valved radio

windings. This is especially true when wound by hand, as each person will wind the turns with a different tension and tidyness. For this project therefore the wire gauges were chosen to to be a reasonable compromise for low resistance, easy handling and safety margin in the size of winding. Enamelled wire of 0.22mm (34/35s.w.g.) was chosen for the h.t. winding and 0.56mm(24s.w.g) for the l.t. winding. One 250g reel of each gauge should prove adequate for the project. Don't forget that you must use enameled wire, not bare tinned wire for this application.

As supplied the transformer kit consists of 'E' and 'I' form core laminations, two frame ends and all screws nuts and fibre washers to hold the completed transformer together. The former, on which the primary winding is already wound, is supplied with plastic clip-on covers.

The Windings

Ignoring all but the former at present, the h.t. winding is to be wound first. Solder the free end of the 0.22mm wire to one of the terminal pins away from the row of pins to which the primary winding is already connected. With most enamelled wire there is no need to scrape the insulation away before soldering, the action of heating with a soldering iron causes the enamel to peel back out of the way. The winding can now commence. Try to do this away from inquisitive people, as answering the 'what are you doing?' question frequently leads to losing count, (usually very near the last few turns too). The secondary windings are wound in a channel in parallel to the already wound primary. Do not attempt to modify the primary winding or alter it in any way.

Several layers will be required for the h.t. winding, so neatness is essential. Be careful to avoid kinking the wire as it comes of the reel. Try to be as accurate as possible in counting the turns, but in practice within 10 turns of the 393 calculated will be perfectly adequate. On completion of the last turn cut the wire to length and solder it to the terminal adjacent to the start connection.

Before starting the l.t. winding The h.t. winding must be insulated by covering the whole of the winding with several layers of good quality insulating tape. Using the 0.56mm, and as before, solder the start of the l.t. winding onto a new terminal. Wind the 33 turns as evenly as possibly over the top of the h.t. winding and finish up by soldering the end of the winding to a fourth terminal on the secondary side. There is no need to wind the l.t. windings in the same direction as the h.t. ones, so don't worry if you think you might have got it wrong.

The windings can be impregnated with a varnish if protection against moisture and chemicals is required. Varnishing the completely assembled cores also can reduce the amount of mechanical hum in use. The prototype was not varnished as future modifications would prove difficult to make, and also the shack was not felt to be a hostile environment.

Transformer Assembly

Clip the plastics covers around the former, these give abrasion protection to the windings in use. This is the time to start stacking the 'E' and 'I' laminations into the hole in the centre of the former. Assume that an 'E' is inserted from the left hand side, then a second one is placed on top of it, but inserted from the right hand side, an 'I' is laid flat on top of the original 'E' butting up against the open legs of the second 'E'. The a further 'E' is inserted again from the left and the 'I' is laid on top of the second 'E' to butt up against the open legs of the third 'E'. One continues in this manner inserting the laminations in from opposite sides until there is insufficient room to insert another one. Carefully tap the core until the laminations are all flush and the mounting holes are all lined up. It is worth packing the core as tightly as possible at this stage. as it will help to minimise hum when mains is applied. place the two end-plates onto the core and using the fibre washers tighten up the bolts to complete the job.

Testing the Transformer

I found it was best to test the transformer at this stage. The transformer kit is supplied with two 120V windings which **must** be connected in series for the UK mains voltage of 240V. Identify the primary side and connect the inner two terminals together. Solder the mains connections to the outer terminals and make fast the earth wire from the plug to the body of the transformer. Apply the 240V mains to the transformer and switch on. Should the transformer make a great deal of noise the switch off and disconnect from the

mains before attempting to found out the reason for it.

Assuming all is well measure the output voltages to verify they are within tolerance: 63-67V for the h.t. winding and 5-6V for the l.t. winding.

General Construction

All the components with the exception of the transformer are mounted on p.c.b. as shown in Fig. 2, the track and overlay diagram. The majority of components are polarised, not only the capacitors, but also the various diodes. Take care to place them onto the board with the correct orientation before soldering them in.

The LM317T is the correct variant of this device which is suitable for p.c.b. mounting. The LM317K version has a TO3 case and requires a differing mounting method. The Low power version LM317M in a similar case could also be used, but note that in all cases the body or mounting flat is internally connected to the output pin, and should be insulated from other potentials. Whilst on the prototype C1 and C2 were in one metal can the p.c.b. has been laid out for two separate items. Connections to and from the board are made via 1mm diameter solder terminals. On completion of the soldering, make sure all soldered joints are clean and well made, and that all components are in their respective places.

On the author's prototype the transformer and p.c.b. were both mounted on an 'L' shaped aluminium plate, with the socket SK1 on the vertical panel. This allowed the original plug from the radio to be plugged into the new power supply. The more recommended layout is shown in Fig. 3 in which the whole unit is mounted in a preferably metal box.

Power Supply Testing

It is advisable to test the p.s.u. before connecting it to the radio, if only to ensure that the voltages are correct. After carefully checking that the p.c.b. and associated wiring are correct check using a suitable voltmeter the two outputs. The l.t. output should be very close to the nominal 1.4V (between 1.35 and 1.5V) off load. A resistor of 4.7Ω 1W resistor will simulate the design loading of the l.t. supply. There should be no discernible drop in voltage on full load of 300mA. Turning to the high voltage output, measure it off load, it should also be close to the nominal level of 90V (90- 95V). If this turns out to be correct then using an 8.2kΩ 1W resistor connected as a load, measure again at the designed loading 10mA, the output should have fallen to around 85V. The voltage across C1 should however remain fairly constant up to around 40mA drain, as the drop in output is almost entirely due to the resistor R1.

Leave the l.t. load on for a few minutes and check, every so often by touch, that IC1 does not become more than warm to touch. The i.c. dissipates around 800mW on the designed load, and so will become warm but not unbearably hot.

Differing Output Voltages

Using the principles outlined in the article, other output voltages and currents may be obtained. Some valved radios operate from 120V h.t. and with a 2V l.t. (originally supplied from a 2V accumulator or lead-acid cell). For the h.t. windings there should be no problems, as it is merely a case of recalculating the number of turns to use. For the l.t. supply this becomes a two part answer. If the resistor R3 is reduced to zero then the output is 1.2V so the output voltage is approximately:

$$V_{out} \approx 1.2(1 + \frac{R3}{R4}) \text{ volts}$$

The quiescent current of the i.c. itself will add to this voltage, but only slightly about a few percent of the output. Rearranging the formula above gives the following approximate calculation for R3:

$$R3 \approx 220(\frac{V_{out} - 1.2}{1.2}) \ \Omega$$

Then the number of turns may need to be recalculated in line with the method suggested earlier. The design principles described here can still be applied when no h.t. supply is required. For example, several relatively low voltages, which cannot be obtained from a standard transformer, may be required and these could be obtained from a number of secondary windings.

Conclusions

The design and construction of a mains power supply suitable for use with battery portable radio has been described. Because of the voltages required for this radio, no off-the-shelf mains transformer could be found. Design and construction methods of a suitable transformer were given using a suitable transformer kit. The principles used in the design can be applied to other designs where the output required cannot easily be obtained from standard transformers.

Bibliography

Two useful books dealing with older radios are:
Radio! Radio! by Jonathon Hill. Published by Sunrise Books, 2-4 Brook Street, Bampton, Devon EX16 9LY.This book contains over 1000 photographs and individual descriptions of vintage radios.
Practical Handbook of Radio Repair by Chas Miller. Published by Newnes Technical Books. Contains useful information on the repair of valved radios of all types.

PW

HOW MUCH ?
£17.00
HOW DIFFICULT
Intermediate

Shopping List

Semiconductors

LM317T	1	IC1
W005	1	D5
1N4007	4	D1-4
l.e.d.	1	D6 Colour to suit

Resistor
0.5W 5% Carbon film

22Ω	1	R3
220Ω	1	R4
470Ω	1	R1
560Ω	1	R2

Capacitors
Electrolytic 150V working (min) axial leads

47µF	2	C1,2

Electrolytic 16V working axial leads

2200µF	1	C3

Tanatalum resin dipped bead 16V working

1µF	1	C5

Disc ceramic

0.1µF	1	C4

Miscellaneous
20W transformer kit (Maplin kit YJ61R), p.c.b. (see services), 250g of 0.56mm(24s.w.g.) enamelled wire, 250g 0.24mm(34s.w.g.) enamelled wire, interconnecting wire, suitable plug and socket for the output, box or aluminium plate to mount the finished project.

Maplin Electronics plc.
PO Box 3,
Rayleigh,
Essex SS6 8LR.

What Is Propagation

Feature

In this issue, Ron Ham turns his attention to interference and atmospheric noise.

Let us pretend that we have one of the very latest super sensitive 'IcoKenYae' communications receivers and with it, we are whisked back in time to 1790 and able to connect it to a random length wire antenna and a suitable mains supply. Unfortunately, I can only guess what would be heard, but, as we intend to discuss the practical side of propagation during the monthly progress of this column then we must begin by thinking about the time before any terrestrial radio waves were being generated.

Interference

Before connecting the antenna let's switch on the set and hear the gentle 'twitter' of the receiver's background noise coming through the loudspeaker. This is caused by the movement of electrons within the horde of components which make up the set. There would be no mains born interference adding to the set noise because, with no other electrical appliances in existence, our supply would be 'clean'. Just imagine the luxury of a world without computer hash, d.c. motors, ignition, thermo-stats, time-base whistles and any of the other switching nuisances that you can think of.

Atmospheric Noise

Next we connect the antenna and find that noise from natural sources, such as celestial bodies or from within the earth's atmosphere, would be blending with our background noise and if strong enough, would be clearly identifiable through the speaker. A typical example of this is the multitude of continual 'cracks' from electrical discharges which manifest as 'sheet', 'streak', Fig. 1, or 'fork' lightning while thunder storms are in progress. The intensity of the 'cracks' depends on whether the prevailing storm is at a distance or nearby or, like Fig. 1 to me at 0130 last July 7, right over my head.

The Earth's Atmosphere

Perhaps when the earth was formed it gathered the complex atmosphere which we talk so much about today. This gaseous cloud, engulfing the earth like smoke around a tiny ball, is made up of several well defined layers, Fig. 2, the condition of which can vary between night and day and with the attitude and position of our planet on its annual orbit around the sun. Briefly, immediately above us is the troposphere which is the home of the earth's weather and not too far above that are several layers known collectively as the ionosphere, but more about these and how they were discovered next time. For the benefit of the many computer buffs among our readers, I produced the illustration of our atmosphere, Fig. 2, with the Trojan Cadmaster light pen connected to my Amstrad PCW 8512.

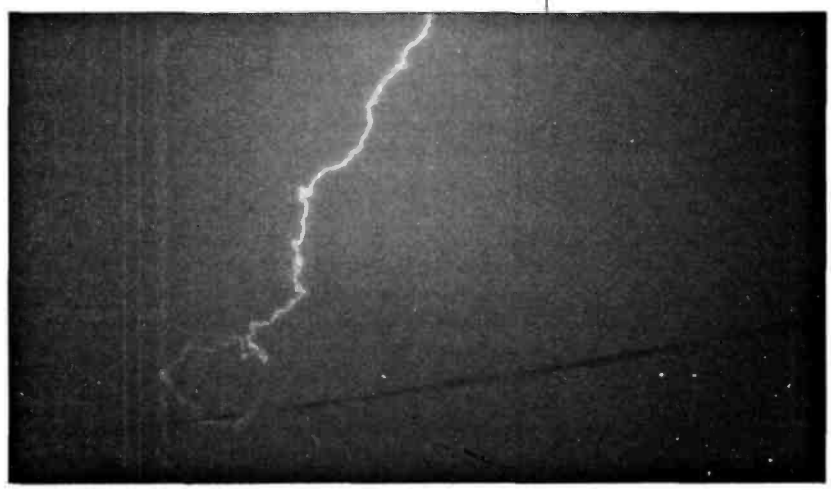
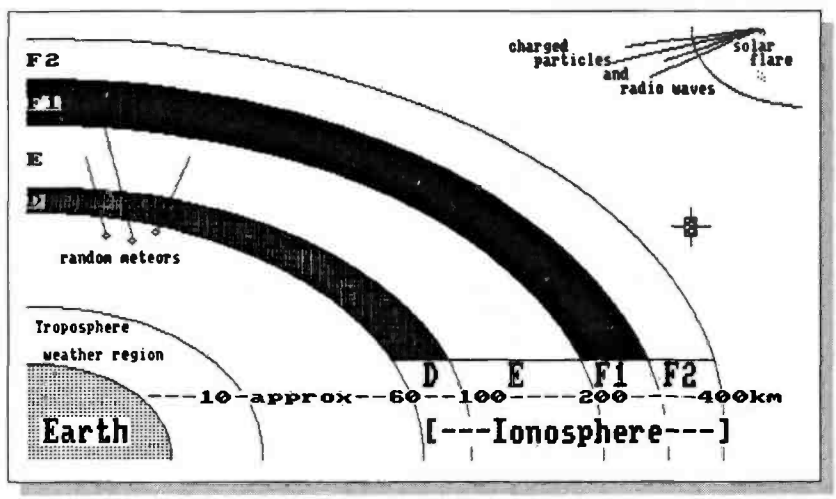


Fig: 1.

Fig: 2.



Feature

Packet Update 10

Roger Cooke G3LDI moves on to look at British Software available for the packet radio enthusiast

It is very nearly five years since the first packet activity in Norwich, time flies when you're having fun! However, in that short time we have seen packet develop from a few devotees trying out their first parameter set on their home constructed TNC-1. Solving the problems of hooking the gear together, to the vast international network of inter-connected BBS, Nodes and Gateways handling hundreds of messages per week flying about between well over 150 different countries. And, talking about flying, the recent successful launch of the latest series of PACSATS from Kourou proves how sophisticated this mode has become. Extensive monitoring will take place for a few weeks before satellite use can take place. However, listening to Dove, the future looks bright, end-stop signals being reported with perfect copy. Full details of how to decode and use all six satellites can be found in the satellite column by Pat Gowen G3IOR, but basically DOVE is the easiest to copy, being f.m. a.f.s.k. 1200 baud. A list of all six is given in Fig 1.

British Software

During the last five years of packet there has been some evidence that there are talented people in this country too! Among the most recent programs which have been rapidly gaining in popularity are two which work very well together. In fact, the second piece of software discussed here will not run without this first one.

The G8BPQ AX25 Networking Package.

John Wiseman has spent many a happy (?) hour writing, debugging and up-grading the G8BPQ node software to arrive at the present 3.51 version. The BPQCODE is a multi-port, NetRom Compatible node in software which runs on an IBM or compatible PC. In addition to working as a NetRom compatible Node, the program also performs the functions of MBBIOS or COMBIOS when used with the W0RLI or WA7MBL BBS software. In other words, BPQCODE is loaded instead of the present COM-port driver. You have multi-connect with just one TNC and radio. If you have multiple ports/TNC's, you can access any port you wish.

As an example, suppose you have a PK-232 on h.f. (port 1) and a TNC-2 on v.h.f. (port 2). To call W3TMZ on h.f. just enter C 1 W3TMZ and then call C 2 G4VLS on v.h.f.. The same holds true if you have a dozen TNCs. For example, C 12 PACSAT.

Any station connecting to your Node can do several things. A question-mark (?) will provide a help menu and a 'P' provides a list of all 12 ports. Connection can then be made to another station in the same way as NetRom, or to the BBS, or to the Sysop. If Sysop is selected, then the BBS can be kept running independently of chatting via a terminal program. In fact, 8 separate applications are supported in this way.

There is a terminal program with BPQCODE called PAC2 which is adequate for this application. Several different contacts can be carried on simultaneously in this manner with separation of the incoming and outgoing texts! All this on one radio and one TNC!

In order to accomplish all this what is needed? The TNC must have KISS-mode capability. In KISS-mode, all operations are carried out by the computer. The TNC becomes just a packet assembler/disassembler. Luckily, most TNCs support KISS-mode, the PK232 HOST-mode is also supported. It is compatible with most of the major BBS software programs, W0RLI, WA7MBL, AA4RE, G4YFB, G8UFQ and the latest one from G1NNA.

The system is written in 8086 assembler and is currently only available for the MSDOS/PCDOS environment, although once loaded it makes no use of operating system facilities. John does say however, that he intends writing a version for use with CP/M machines. It has been tested on IBM XT and AT PC machines. The software needs about 40 - 80K RAM, varying with the number of buffers, comms links and COMBIOS ports configured. It is NOT public domain but may be used by licensed Radio Amateurs in Amateur Packet Radio Systems.

Documentation is more than adequate and help is given with examples of how to set it up. Once running it is invisible to the Sysop, is memory resident and has very few bugs. John is open to suggestions, in fact he welcomes them, and also would like feedback and views of users. At present there are about 70 users in the UK alone, and, judging by the amount of traffic passing through my h.f. gateway for John, there are more than that world- wide. It has become very popular and very well-received in the USA. John is writing a new version and by the time this gets into print, it will probably be available. He envisages an on-going situation and has several enhancements in mind, the latest being a remote sysop facility. Johns' photograph is shown in Fig. 2. If you contemplate a copy of the software, or write via snail-mail to John, please don't forget the customary return mailer, postage, s.a.s.e. or whatever.

The G1NNA Multi-user, Multi-port BBS, 1.05

A couple of years ago, Brian Lloyd gained his B.Sc.(Hon) degree at the University of East Anglia. It is almost superfluous to say that his degree is in Computer Science, because writing this software helped him attain it. During his stay in East Anglia, Brian visited locally and asked for suggestions or a "wish-list" for the most needed facilities on any BBS system. The result is the G1NNA BBS, now up to version 1.05.

This software is not public domain. It is intended for the use of licensed amateurs only, who run licensed BBS systems. This software will only be distributed by the author and his agents and only to licensed BBS. Any other form of distribution will be

Fig: 1.

Satellite	Oscar	Freq	Mode
Uosat D	UO-14	435.070MHz	9600baud a.f.s.k. AX25
Uosat E	UO-15	435.120MHz	9600baud a.f.s.k. AX25
PACSAT	PO-16	437.025MHz	1200baud p.s.k. AX25
DOVE	DO-17	145.825MHz	1200baud a.f.s.k. AX25
WEBERSAT	WO-18	437.075MHz	1200baud p.s.k. AX25
LUSAT	LO-19	437.150MHz	1200baud p.s.k. AX25

unauthorised and will not receive the support of the author. The software must not be tampered with in any way.

You are strongly advised to register as a user so you can receive notice of updates and additions. Registration can be sent to G1NNA @ GB7ESX. The manual, which is extremely comprehensive, is written by George Lloyd, who happens to be Brian's father. It is also indexed, the first time I have seen this!

One of the main features of this BBS is the use of mail compression, which I think will have to be adopted as a standard facility in any re-write of major BBS systems. The only pre-condition to this, is, of course that the BBS accepting the compressed mail must be compatible. It also supports Hierarchical forwarding, quite a bone of contention at present, but again, standardisation is needed and it seems that this system is gaining in the popularity polls world-wide.

Overview of the BBS software.

This software was written to run with the G8BPQ node software V3.22 or later. It will not run with earlier versions. The software allows for a total of sixteen connects via as many RS232 ports as you like (up to 16). You will require at least a fast 286 to run 16 ports but a normal 8MHz PC should be quite capable of handling 8 or maybe 10 connects without too noticeable a drop in speed.

When this software was written there were several paramount priorities:

1: Must be easy to set up.
2: Need the minimum of maintenance.
3: Cut down the time to forward mail.
4: Must be fast.
5: Cut the use of the hard disk to a minimum.
6: Easy for users to use.
7: Easy for the BBS sysop to use.

Comments on these pre-requisites

1: The BBS could not be simpler to set up provided the manual is followed. There are no complicated files to set up. Several of the files used by present BBS software can be used, e.g. the SWAP.BBS and ATBBS.BBS files.

2: The software requires very little maintenance as all forwarding and auto-killing of messages are taken care of.

3: This software uses mail compression before forwarding to another BBS using the same software, saving up to 50% of the time taken to forward mail. Forwarding to BBS using other software is done in the normal way. You do not need to know what software the other BBS is running.

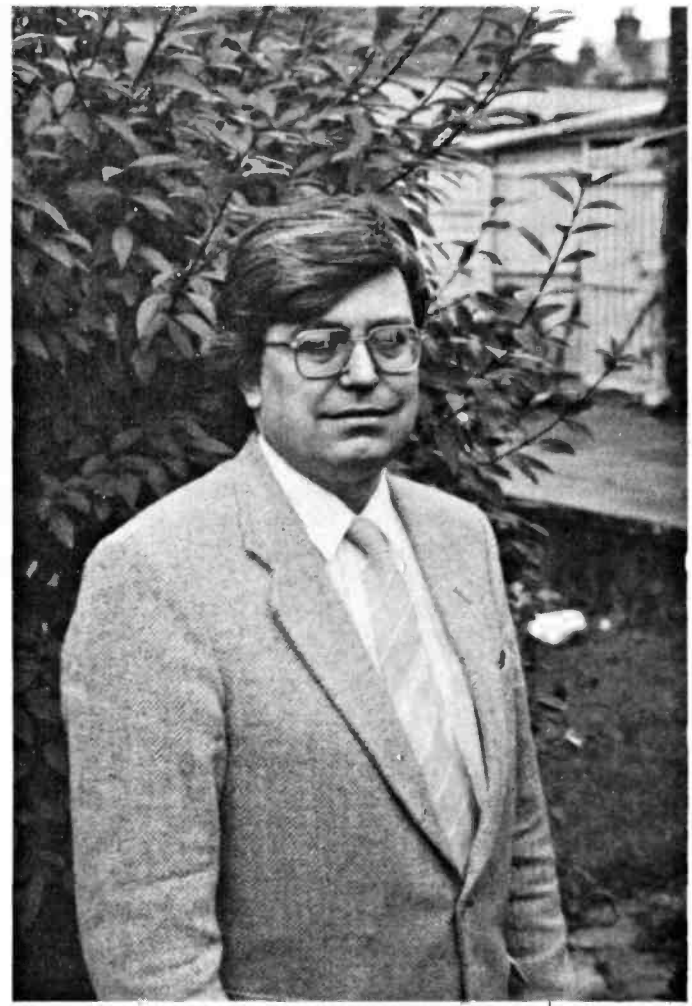
4: This software is very fast. For instance, it can tell in an instant if there is any mail to be forwarded to a BBS. LM, L< and L> will take a few seconds.

5: All message headers are kept in memory as well as on hard disk so L, LL, L<, L>, LM etc., do not use the hard disk at all.

6: The menu and the commands used by MBL etc., have been retained and a few added. An example is the 'F' command which will search a self-building data file for a users home BBS.

7: Once set up there is very little for the sysop to do except read the mail.

This BBS will also run under Desqview,



John Wiseman G8BPQ

supports Hierarchical Forwarding and features import and export facilities. It also has a remote sysop facility which can be used via a password. All types of Personal Mail Box forwarding are allowed.

At the back of the user manual there is a registration form which you are encouraged to fill in and return. By so doing, enclosing a disk mailer plus return postage, you will automatically receive the latest up-date. Telephone support (advice) is also offered (reasonable hours!).

Brian certainly has paved the way toward mail compression techniques in this country, it has proved quite a success in the Pacific Net with the VK/JA BBS stations forwarding on h.f. using 1200 baud PSK with mail compression for quite some time now.

Any further enquiries: G8BPQ @ GB7DAD. G1NNA @ GB7ESX.

That's just about it for this month. Next article DXCluster, Lan-Link and some discussion and views about HF packet band-planning. Some people seem to think its declining!! Your views appreciated. G3LDI @ GB7LDI, or Tel: (0508) 70278 24hr answering.

73 and happy packeting.

C.M.HOWES COMMUNICATIONS

Mail order to: EYDON, DAVENTRY
NORTHANTS NN11 6PT
Tel: 0327 60178

"Thanks for the nice signal report, OM.
The station here is home-brew."

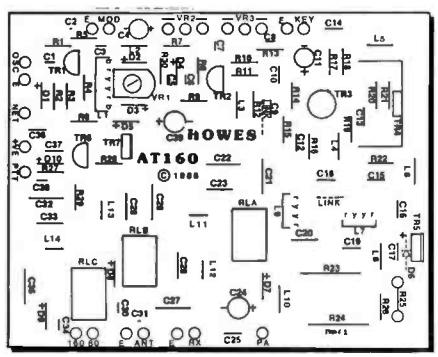
It's a great feeling to be able to say you built the equipment yourself, not to mention the enjoyment you gain from doing the construction. You can feel sorry for the guy, who spent over three grand on his new set, and isn't enjoying his radio as much as you are. Sure his set seems to have knobs for everything, but somewhere along the black box production line, they took the fun out. How many extra QSOs do you get with 1000 memories, and fifty less than essential functions?

May we suggest a rig that offers the challenge and pleasures of low power communication, combined with the fun of building it yourself?

SINGLE BAND CW TRANSMITTERS

These little rigs are simple to build, but offer a nice sounding CW note that you can be proud of. Key shaping and output filtering are provided, as is one crystal to get you on the air. RF output power is adjustable with an onboard control. Provision is made for connecting a VFO (HOWES CVF range) for full band coverage, and you can also add a DcRx Direct Conversion receiver for transceive operation if you wish.

CTX80	(80M 5W)	Kit: **£13.80**	Assembled PCB: **£19.90**
CTX40	(40M 3W)	Kit: **£13.80**	Assembled PCB: **£19.90**
MTX20	(20M 10W)	Kit: **£22.90**	Assembled PCB: **£29.90**
CVF VFO	(80, 40 or 20M)	Kit: **£10.40**	Assembled PCB: **£16.90**
50pF	Tuning capacitor to suit VFOs:		**£1.50**



Parts Location overlay on AT160 PCB

DUAL BAND AM/DSB/CW TRANSMITTER

The *HOWES AT160* transmitter is great for the 160M club net, local nattering on AM, and long distance working on CW. 10W PEP output is available on both 80 and 160M bands. Front panel controls are provided for output power and carrier level. Excellent modulation quality is provided by a low level balanced modulator, class A driver stages, and plenty of RF negative feedback. Full key shaping is provided. The transmitter is broadband with no tuned circuits to align. Harmonics are -40dB or better with relay switched output filters. One crystal (80M) is provided, as is PTT switching (including antenna relay).

Matching microphone amplifier and dual band VFO kits are available.

AT160	(Dual Band TX)	Kit: **£34.90**	Assembled PCB: **£53.90**
VF160	(Dual Band VFO)	Kit: **£19.90**	Assembled PCB: **£34.20**
MA4	(Mic Amp for TX)	Kit: **£ 5.60**	Assembled PCB: **£ 9.90**

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVERS

These receivers make a great introduction to amateur radio for the novice, besides being widely used by experienced QRP (low power) operators as part of a transceiver. Modes are SSB and CW, with up to 1W of audio output for 'speaker or 'phones. These are straightforward, single band receivers, and give amazingly good results. A "hardware" package to suit (case, dial, tuning caps, knobs, sockets etc) is available. There are versions for 20/30M, 40M and 80M amateur bands.

DcRx		Kit: **£15.60**	Assembled PCB: **£21.50**
DcRx	Hardware:		**£15.50**

DXR10 10, 12 & 15M COMMUNICATIONS RECEIVER

This three band receiver gives SSB and CW reception on the three highest frequency shortwave amateur bands. These are commonly known as "DX" bands, and you can hear stations from all over the World. You don't need a big antenna for these frequencies, and this set will give great results with a simple wire dipole (details in the kit instructions). Performance is excellent.

DXR10		Kit: **£24.90**	Assembled PCB: **£36.90**
DXR10	Hardware:		**£14.00**

ACCESSORY KITS

We have lots of add-on goodies to tempt you with. Could you fancy extra filters, or perhaps a digital frequency display? Need a good quality ATU?

CTU30	All HF Bands ATU 30W	Kit: **£27.90**	Assembled PCB: **£33.90**
CM2	Quality Mic with VOGAD	Kit: **£11.90**	Assembled PCB: **£15.90**
CSL4	SSB & CW Dual B/W Filter	Kit: **£9.90**	Assembled PCB: **£15.90**
DCS2	"S meter" for receiver	Kit: **£7.90**	Assembled PCB: **£11.90**
DFD5	Digital Counter/Display	Kit: **£39.90**	Assembled PCB: **£59.90**
SWB30	SWR/Power Indicator	Kit: **£12.50**	Assembled PCB: **£17.30**

All **HOWES** kits come with a good quality Printed Circuit Board, full clear instructions, and all board mounted components. If you would like more information, please send an SAE for a free catalogue or information sheets on any specific products. Technical help and Sales are available by 'phone during office hours.

PLEASE ADD £1.00 P&P to your order total.

73 from Dave G4KQH, Technical Manager.

Radio Diary

***Practical Wireless & Short Wave Magazine in attendance.**

April 15: The Centre of England Amateur Radio Rally will be held at the Motorcycle Museum, Bickenhill, near the NEC Birmingham. It's being held in three large exhibition halls and free ample parking. **Frank Martin G4UMF. Tel: (0952) 598173**.

***April 21-22**: The RSGB are holding their Convention and Exhibition at the NEC, Birmingham.

April 22: The Marske rally will be held in the Marske Leisure Centre, Marske-by-the-sea. Doors open 10am. **Mr Phoenix G7CBR, 1 Conway Road, Redcar, Cleveland. Tel: (0642) 48005**.

April 29: The Bury Radio Society will be holding its annual Hamfeast at the Castle Leisure Centre, Bolton Street, Bury. Doors open at 11am (disabled at 10.30am). Talk-in on S22 and SU8. Catering facilities and a licensed bar are available as well as the giant Bring & Buy. **C. Marcroft G4JAG, Mosses Community Centre, Cecil Street, Bury**.

May 6: The 7th Anglo-Scottish Rally will be held in the Tait Hall, Kelso. Doors open 11am. All the usual facilities will be avaiable, hot and cold food, bar, Farmer John's ice cream, etc. **Bruce GM4UIB, QTHR**.

***May 12**: The VHF Convention will take place at Sandown Park Racecourse, Esher, Surrey.

***May 13**: The Yeovil Amateur Radio Club will be holding its 6th QRP Convention in the Preston Centre, Monks Dale, Yeovil. **D.J. Bailey G1MNM, 7 Thatcham Close, Yeovil, Somerset BA21 3BS**.

May 19: The Swindon Radio Rally will be held in the Oasis Centre, Swindon. **J Broadfoot. Tel: (0793) 611859**.

***May 20**: The 33rd Northern Mobile Rally will be held at the Great Yorkshire Show Ground, Harrogate. **Mike G0MKK. Tel: (0423) 564353/ 507653**.

May 20: The 7th National Amateur Radio Car Boot Sale will be held at the new venue of Stockwood Park, Luton. This is easier to get to (not far from junction 10 on the M1). Private sellers £7 in advance or £9 on the day, traders £20. **Clive G4ENB. Tel: Luton 27907**.

May 20: The Parkanaur Amateur Radio Rally will be held at the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. There will be the usual trade stands, Bring & Buy, bookstand, QSL bureau, etc., Talk-in on S22. The proceeds of this rally go to the Stanley Eakins Memorial Fund at Parkanaur near Dungannon. **Jim Lappin GI1YGS. Tel :(0762) 851179**.

May 20: The Cambridge & District ARC are holding their 5th Annual Rally & Radio Car Boot Sale at Coleridge Community Centre, Radegund Road, Cambridge. Doors open at 10.30pm. **Brian G4TRO. Tel: (0223) 353664**.

May 27: The 14th annual East Suffolk Wireless Revival will be held at the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. There will be a Bring & Buy, Car Boot Sale, a transceiver clinic, 50MHz demo station, all the usual traders and lots more including a children's play area. **Paul Whiting G4YQC. Tel: (0473) 642595**.

May 28: The 1990 Bircotes Radio Rally will be held near Bawtry, Doncaster. Doors open at 11am (10.30am for the disabled). Talk-in on S22. Details and or boking forms from: **Pat Smith, 23 Florence Avenue, Balby, Doncaster. Tel: (0302) 857526**.

June 2: The first Belfast Amateur Radio Convention, organised by the RAIBC (Northern Ireland Area), is being held in the Ormeau Park Recreation Centre, Ormeau Embankment, Belfast. All the usual convention attractions will be there plus demonstrations and talks on the hobby by local well-known amateurs. They are also trying to cater for the XYLs by having demonstrations on microwave cookery, crafts and first aid. The special event station operating on the day will be GB2BRC.**David Caldwell GI0HOW. Tel: (0232) 471370**.

June 3: The Southend & District Radio Rally and Boot Sale will be held at the Rocheway Centre, Rocheway, Rochford, Essex. There will be the usual trade stands plus a Bring & Buy, licensed bar and coffee bar. Doors open 10am with talk-in on S22. **John Stone G0OFE. Tel: (0702) 202216**.

***June 10**: The Royal Naval Amateur Radio Society Annual Mobile Rally will be held in the Sports Field, HMS Mercury, near Petersfield, Hants from 1000-1700.

***June 24**: The Annual Longleat Mobile Rally will be, as usual, held at Longleat near Warminster, Wilts. **Shaun O'Sullivan G8VPG. Tel: (0225) 873098**.

July 1: The Worcester & District Droitwich Strawberry Rally will be held at the High School, Droitwich. There will be the usual trade stands, Bring &Buy, family entertainment and strawberry fields (weather permitting). Gates open at 11am with free car parking and entrance. **Tony G4OPD. Tel Worcester 620507 or Derek G4RBD. Tel: Worcester 641733**.

July 1: The York Radio Rally will be in the Tattersall Building, York Race Course, The Knavesmire, York. Doors open at 11am with an entrance fee of 50p (children admitted free). There is ample free parking. On show will be amateur radio, electronics and computing, arts and crafts, there's a grand Bring & Buy, Morse tests, lectures on various aspects of amateur radio, a raffle and talk-in on S22. A licensed bar and cafe will be available for refreshments. The Knavesmire is well signposted and there will additional RAC signs round the main approaches to York. **Frank Webb G3ZKS. Tel: (0904) 625798**.

July 1: Newport ARS are holding their 3rd Grand Surplus Equipment and Junk Sale at the Brynglas Community Education Centre, Brynglas Road, Newport. The Sale is open from 10.30am to 4pm (10am for the disabled). **Kevin GW7BSC. Tel: (0633) 262488**.

July 6, 7 & 8: The Popular Flying Association Rally is again being held at Cranfield Aerodrome, Bedfordshire. All activities related to flying, including airband radio will have a place there.

***July 14**: The Cornish Radio Amateur Club Rally will be held in the Richard Lander Scholl, Truro. There will be the usual trade stands, Bring & Buy, a computer display/demo and a weather satellite demo. There will be refreshments, good free parking and the doors open at 10am (9.30am for the disabled). **Rolf Little G7FKR. Tel: (0872) 72554**.

***July 15**: The Sussex Amateur Radio and Computer Fair will be held at Brighton Racecourse. All the usual traders and other attractions will be there. Doors open from 10.30am to 4.30pm, with entrance at £1. **Ron Bray G8VEH (QTHR). Tel: (0273) 415654 office hourse or (0903) 763978 other times**.

July 22: The Burnham Beeches and the Maidenhead & District Amateur Radio Clubs are staging the 7th McMicheal Rally at the Haymill Centre, Burnham, near Slough. Doors open to the public at 10.30am (10.15am for the disabled). Admission is £1, the car boot sale pitches cost £5.There will be the usual trade stands, packet radio demo, refreshments, (tea and coffee on the RAIBC stand this year - honestly!), bar as well as the GB4MR special event station.

***July 29**: The Scarborough ARS Rally will be held at the Spa, Scarborough. Doors open at 11am. Many trade stands, large Bring & Buy, Morse exam and demonstration for the Morse examiners, refreshments and bar. Details from **Ian G4UQP (QTHR). Tel: (0723) 376847**.

***August 12**: Hamfest '90 will be held at the Flight Refuelling Sports Grounds, Wimborne, Dorset, The event will feature Radio and Electronics Trade Stands, Craft and Gift Fair, Bring & Buy, a vintage wireless exhibition and full family entertainment. Talk-in on S22. The event opens at 10am. Free parking and overnight camping on the Saturday night by prior arrangement. **John G0API. Tel: (0202) 691649 or Rob G6DUN. Tel: (0202) 479038**.

August 12: The 1990 Derby Mobile Rally will take place once again at Lower Bemrose School, St Albans Road, Derby, just off the A511 Derby Ring Road. Gates open at 10.30am with all the usual attractions including the Giant Junk Sale. **Kevin Jones G4FPY, 20 Pinecroft Court, Oakwood, Derby DE2 2LL. Tel: (0332) 669157**.

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Construction

A Constant Impedance Receiver Attenuator

Excessive signal levels in a receiver can generate many problems and one particularly annoying result can be the appearance of persistent and troublesome spurious signals. A. Langton describes how you can help reduce the effect by constructing a constant impedance receiver attenuator while combining the project with a familiarisation exercise using binary encoding and switching techniques

Spurious signals can be generated in a receiver mixer by excessive signal levels and some means of reducing the signal can be very advantageous. This attenuator was originally built to work with a regenerative detector, a type of receiver which is particularly prone to overload.

My laboratory style attenuator circuit comprises of a row of pads, each one selected by its own double-pole switch. For receiving, I wanted something that could be worked with one knob only. As the attenuator pads follow a binary sequence it seemed sensible to use a binary encoder, Fig. 1a, as an eight to three line device will give 0 to 42dB attenuation with 6dB steps or 0 to 21dB in 3dB steps. Eight to three: means eight single input lines are translated into a combination of three output lines as a binary representation of the active line number,

The outputs of IC1 in Fig. 1a, assume a condition determined by the switch and will change from 000 to 111 in a binary sequence as the switch is rotated. These outputs operate the relays via the driver IC2. The fourth relay in Fig. 1a is not part of the attenuator but is used to select one of two converters by the changeover line. It can be omitted if it is not required or perhaps a fourth attenuator might be included instead.

The circuit is built on double sided circuit board, Fig. 2, with the top side being used as a ground plane only. Having produced the etched circuit on the underside, turn the board over and remove the copper from around each hole with a small drill or spot-face cutter. Leave the six through ground-plane connections to facilitate soldering. These holes are marked appropriately on the component placement illustration, Fig. 2.

The unit is built into a small diecast aluminium box with the supply and changeover lines filtered to keep stray signals at bay. The s.i.l.(single in line) resistor package (R1 to R8) pulls the encoder inputs down in the absence of the selecting voltage. Values shown for the attenuators are for 50Ω working, but equations and pre-worked examples, shown in Table 1 and Fig. 3, are provided for calculating any

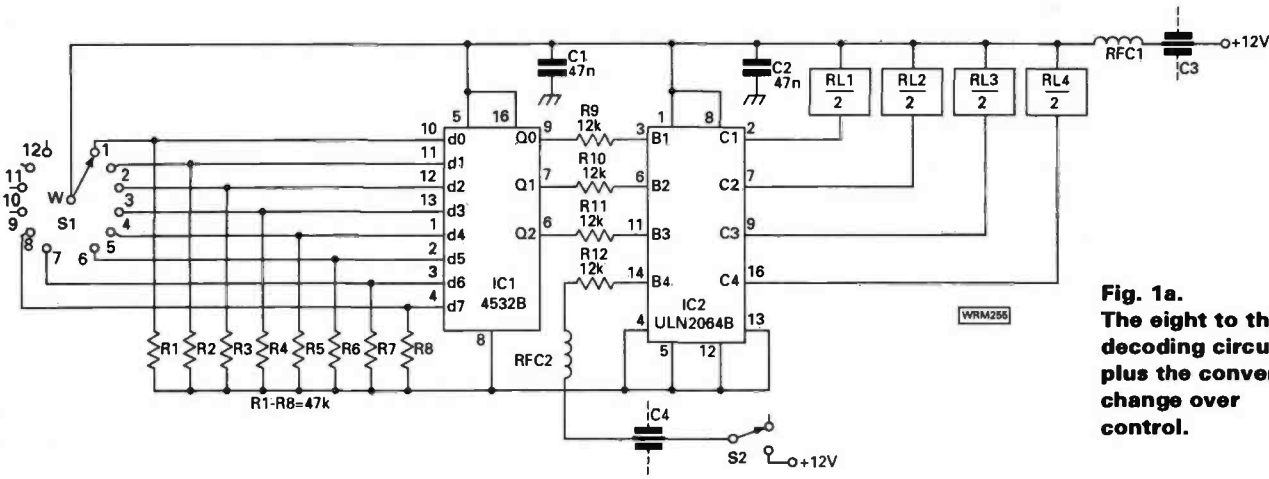

Fig. 1a. The eight to three decoding circuit, plus the converter change over control.

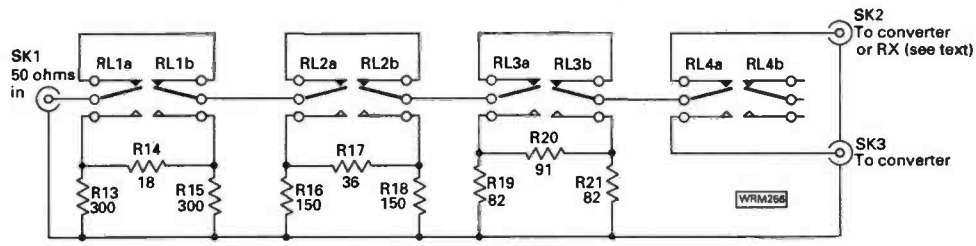

Fig. 1b. The relay controlled attenuators of the 50Ω impedance circuit.

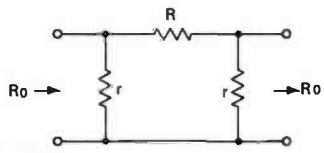

Fig. 3. Skeleton attenuator circuit.

Attenuation in dB	Termination value			
	50Ω		75Ω	
	r	R	r	R
3	292.4	17.6	438.6	26.4
6	150.4	37.3	225.7	56
12	83.5	93.2	125.3	139.8
24	56.7	394.6	85.1	591.9

Table 1. Pi Attenuators.

attenuation steps or for working with different impedances. Some of the resistor values might have to be made up from parallel pairs, especially if you require greater accuracy. For those of you who also own a Spectrum computer I have included a listing of a program in Fig.4.

In use, this attenuator will prove to be a useful aid to reception along with providing the builder with some practice in binary coding techniques. However, bear in mind that if you use this unit with a transceiver, make sure that the transmitter output does not go through it as it will not handle more than 0.5W! **PW**

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82Ω	2	R19, 21
91Ω	1	R20
150Ω	2	R16, 18
300Ω	2	R13, 15
12kΩ	4	R9-12
47kΩ	1	R1-8 (s.i.l. package)

Capacitors
Close tolerance polystyrene

47nF	2	C1, C2
(Feed through type)		
1nF	2	C3,4

Inductors

100μH	2	RFC1,2

Semiconductors

ULN2064B	1	IC2	Maplin FF73Q
4532B	1	IC1	Maplin QW89W

Relays

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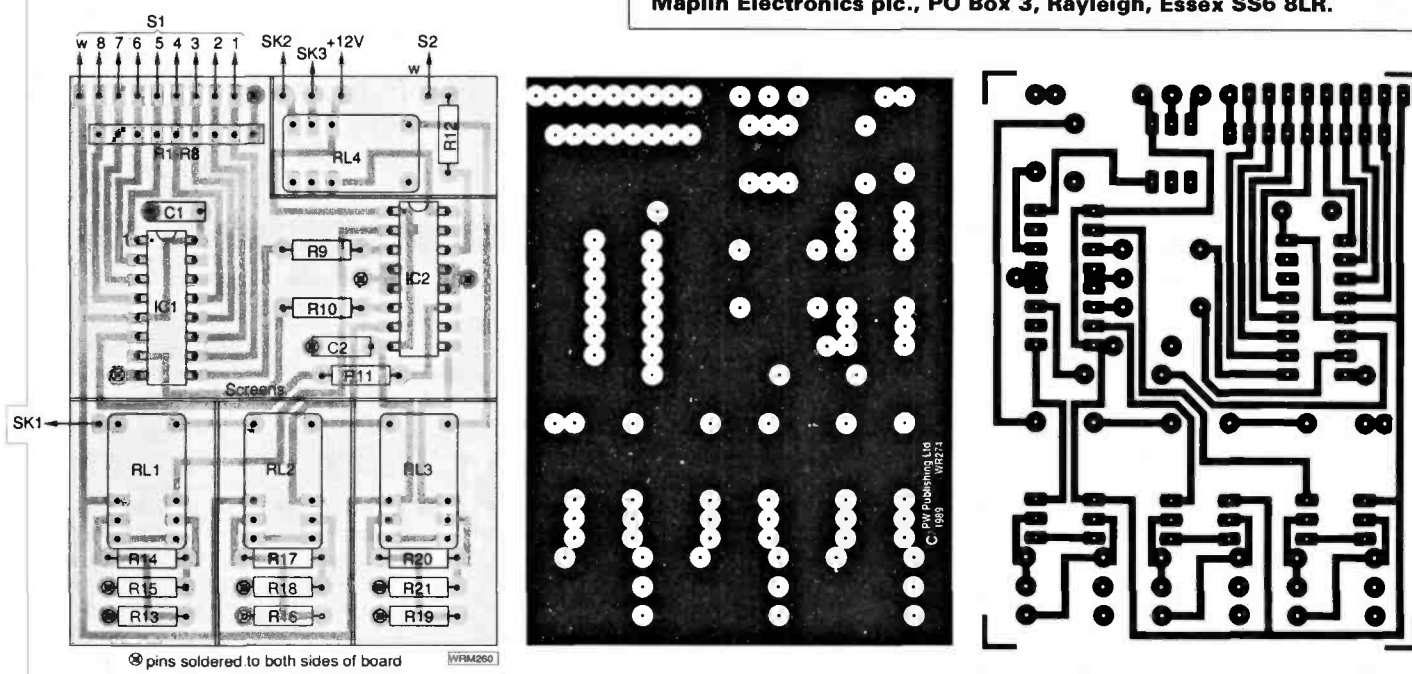

Fig. 2. Overlay and track pattern.

```
10 REM PI ATTENUATORS
20 INPUT "WORKING IMPEDANCE? ";Ro
30 PRINT "PI ATTENUATOR ";Ro;" OHMS": PRINT
35 LPRINT "PI ATTENUATOR ";Ro;" OHMS": LPRINT
40 INPUT "ATTENUATION?";A
50 PRINT "ATTENUATION = ";A;" dB"
60 IF A=0 THEN STOP
65 LPRINT "ATTENUATION =";A;" dB"
70 LET E = 10^(-A/20)
80 LET r=Ro*(1+E)/(1-E)
90 LET r1=INT (10*r)/10
100 PRINT "r=";r1
105 LPRINT "r=";r1
110 LET R=(2*r*Ro^2)/(r^2-Ro^2)
120 LET R1=INT (10*R)/10
130 PRINT "R=";R1
135 LPRINT "R=";R1
140 PRINT
145 LPRINT
150 GO TO 40
```

Ro = line impedance
A = attenuation in dB

$$E = 10^{-A/20}$$

$$r = \frac{Ro(1 + E)}{(1 - E)}$$

$$R = \frac{2r \times Ro^2}{r^2 - Ro^2}$$

Fig. 4.

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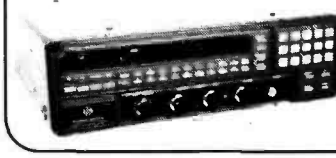

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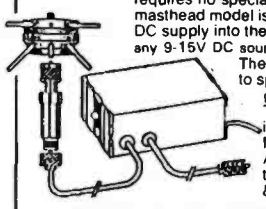

The PA3I finds application in instrument work, e.g. input to spectrum analysers, boosting the output from signal generators to give a low-power TX.
The standard version of the PA3I has BNC sockets and is designated "PA3I/B"; available to special order N-type sockets ("PA3I/N") or SO239 ("PA3I/S").
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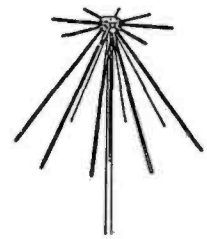

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Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

During the period of 'putting-together' of the column, I had to make a fast visit to London; while there I received word of a postal strike, and this, I believe accounts for the absence this time of so many regular correspondents.

For many readers, and certainly for this column, February was a month of wailing and gnashing of teeth, of tearing of hair and - definitely - of foaming at the mouth, as Boreas did his mighty best. After the beam here broke a load-bearing pad in the second gale, I chose that lovely warm and still final Friday in February to put it back up; GW0JAI and his wife Irene, GW3RJY and yours truly being the party. Alas for our handiwork; the next gale, on the Sunday night, while it didn't damage anything of the beam, did manage to pull the coaxial feeder tight down over over the rotator body so until I can convene another antenna party, I am confined to beaming 315 degrees. Woe is me indeed! However, being a decent sort, the column won't let on who it was who didn't use enough turns of tape on that feedline.....!

Events

All this of course, has tended to inhibit the Mark One ears, so I am doubly indebted to you contributors out there, to *DX News Sheet*, to *The DX Bulletin*, *The DX Magazine*, *The Canadian Amateur*, and of course K1AR's *Contest Calendar* galleys.

First, K1AR. *The Contest Calendar* preamble this time is most interesting, comparing as it does the logs of 5A1TW, in the 1963 CQ WW CW contest, with the P40GD log for the same contest in 1989. Interestingly the peak rate in 1963 was 62 QSOs/hour, with twelve hours showing under 15 contacts an hour; 31.6 hours operating for a winning single op all band score. P40GD is a comparable 1989 log, though not at the moment confirmed as a winner; nonetheless I see scoring rates of a different order; only for 11 hours did P40GD drop as low as 5A1TW's peak rate, while the P40GD log lost some QSOs when the computer filled the hard disc! As to scores, the 1963 winner knocked up 871 750 points, and the 1989 log shows 7 945 619 points. Makes you think, doesn't it!

As for the contests for the upcoming period, I see the YLs having their private shindig over the weekends April 11/13 (c.w.), and 18/20 (s.s.b.); one for we poor downtrodden males to keep out of!

April 4-28 sees activity from Ogasawara, signing JG6CVO/JD1; all bands 160-6 metres, c.w., s.s.b. and RTTY. QSL to JG6CVO, at 511 Funajima, Ueki-Machi, Kamoto, Kumamoto 861-02, Japan, or via the Bureau.

Jan Mayen Is. activity will be noted in the next few weeks from JX7DFA; this is LA7DFA, between April 1 and July 27. This will be a mainly c.w. job.

Mats SM7PKK is at the time of writing in KH8-land; but he hopes to visit Tuvalu and Nauru, always given that the difficult transport problems can be solved.

ST operation: the planned start for the DXpedition is currently at April 14, signing PA3CXC/ST0. Local operators are to be trained.

Jim Smith has, we understand, got the requisite permissions for an expedition to Bhutan, and we understand he hopes to arrive in the first week of April. He also hopes to progress some way towards amateur licensing in Bangladesh, S2.

More rumours covering Spratly; rumour hath it that an expedition including operators from JA, XV and USSR, accompanied by soldiers and a doctor will appear soon on Spratly, alternatives given were March 15 or April 15. Additionally, ZL1AMO is said to be planning a trip to a Philippine-held island in this group later in the year. We only hope no one else gets hurt - this one is in political danger-country! (Later: March 26 was being touted as a date!)

There are always people looking for Pacific DX, and they will be pleased to hear that AA6LF will start, in April a swing-around covering FO, ZK1, T32 (Christmas), KH5, and possibly Kingman Reef, during a seven-month trip.

VP8 South Georgia and VP8 South Sandwich; the American DXpedition leave VP8 Falkland around November 24, drop off eight at S. Georgia, carry on to S.Sandwich for one week, return to S. Georgia to pick up; thus S. Georgia will get two weeks, S. Sandwich one week's activity.

Lord Howe, VK9 activity by N6AMG, is down for April 5-12, concentrating on 6; but he will, we understand be noted on HF also.

Ex-G Club

Many amateurs who were born in UK are now domiciled elsewhere. The UK contact for the Ex-G Club is C. K. Haswell GM2CWL, 6 Cameron Avenue, Balloch by Inverness, Scotland IV1 2JT. G stations having amateur friends overseas who are ex-G may care to pass on the contact address given. The Club has been in existence now since 1959 - quite a long time!

QSL Addresses

There are a couple of useful sources of this information to mention; G4PEOs QSL Manager List, covering addresses published in OXNS during the past year is obtainable for £3.50, or $5 or 12 IRCs, from J. Pitty G4PEO, Little Orchard, 12 St Leonards Road, Horsham RH13 6EJ, England. Foreign currency cheques are not acceptable.

Secondly the W6GO/K6HHD QSL manager List, based at PO Box 700, Rio Linda, CA 95673, USA. This is a computerised and continuously updated listing of World QSL Managers, obtainable for $3 or 6 IRCs, overseas airmail; if you settle for twelve issues that will cost you a mere $30.

The Bands

Clearly, in the absence of useful antennas for either h.f. or l.f. bands, I cannot comment with certitude on conditions; but most people seem to agree that things haven't been as good as one would have hoped - though of course, far and away better than one would experience at the bottom of the cycle. By the time you get to read this, things should be better.

All that having been said, it does feel as though the last few days before we sat down to write the column, the bands did seem to have picked up, even though we didn't dare crank the beam round to check.

WARC Bands

Somewhere different to make our start this month. **Rod G0BXQ/M** (Woodley), commenting on the QRO gales, notes that it is a comforting feeling to know that one's antenna is safely locked away in the car. This in fact is a home-brew quarter-wave, fed from an FT-707 to about 80W; everything is worked from the car, either on the move or occasionally while static. There is a tight-knit group of stations on the band, including such as VK6RO, VK4CEK, K1ZFE, W1DW, WD8KVF, N9DEO, N9EGI, W9FPE, W7ZJ, 9H1IP, ZS6GG, ZB2IT, 9Y4OWB, WB8IGV and VU2ZAP. KH6SSB is noted as very active with QRO and twelve-element (yes, twelve!) monoband quad. Gotaways noted include BY and 9Q5.

G0FTD (Whitstable) notes that he has worked Phil G0JBA a few times and been thus encouraged to put in his penn'orth. Andy tried s.s.b. on 10MHz during the day, to raise GM0HIG, GI4WHR, GW3MSY, GW4WAN, OZ1LYD, SM6LUX, ON9CBF, FE6FAI, F3PD, loads of Gs and G0BBM/TF. In the evenings around 2200Z, c.w. was used to hook UT4UM, UW4AY, CT1DQI, UA3AOE, SM3CIQ, DL9ID and W1PZY. On 18MHz, s.s.b. yielded UA2WJ, OE6JCD/6, SM0OWX, ES1AR, KA1PE; with 24MHz showing IV3PRK, plus loads of W, VK, and JA heard.

Now **G0JBA** (Sittingbourne) who says he looked at 18 and 24MHz, but couldn't scare up any contacts despite several minutes-worth of CQ calls on 18 - but at least, he says philosophically it's activity of a sort!

G3NOF (Yeovil) says he hasn't noticed a great deal of activity on this band, and what there is has been the same crowd every time.

Turning to **G4ITL** (Harlow), Bernard says in some ways he prefers 24MHz to 28MHz; for him it meant c.w. to WB0THC, KA1OFN, NW0M, KB0FHS, W1JSM and PJ2AM, while s.s.b. netted W6SAI, W2JGD/M, and W8STL. The antenna now in use for all bands is some 49m long, this length having been settled upon after a long series of experiments as being best for all bands; it is of course fed through an a.t.u.

Top Band

G0FTD says that on Top Band he and his Icom 735 had a nice long s.s.b. yak with SM6EHY, DJ0EC, PA0IJM and on c.w. ON7QK.

G4ITL indicates that he is now able to at least put some r.f. on the band, and so far has managed to hook G0EAT, OY3QN, LA5UF, G4AKY and G0AMY.

G0HGA (Stevenage) lost the vertical in the Big Storm, but on Top Band the end-fed manged contacts with G, GM, GW, GD4BEG, PA0DIN, PA3BAS, PAERA, DK5WL, DK1NO/A, DL1YD, F6BEE, F3AT, OK1KQJ, PA3ACA, DL8OH, OK5TOP, SP1PEA in a contest, plus PA0WDW, G4HTD, G4BJM and G3KEV.

The 3.5MHz Band

G3NOF (Yeovil) indicates that from about 2200Z there have been strong N. American signals on the band, so that he exchanged notes with KE1Y, KS2Y, VE1DU, VO1GK, VP2EXX, W2IRY and YI1BGD.

G0HGA knocked off a string of G stations on the band, plus DJ4IY, DL6MAA, DJ1SJ (QRP both ways), DL3XO, DF9ZV, DL9PR, DL0HSC, LA2YE, LA5RBA, LA4ZI, SP3DG, Y44NK and ON4IM.

Our other reporter on this band **ON7PQ** (Kortrijk) indicates that his c.w. got over to N7BG, FP5DX, T77C, U24FWD/UH0Y, PZ1AV, JH1RES, 5T5CK, KP2J, GW6JX, JP1DMX/HI8, CO1HJ, VP2EXX, 6W1QB, ZF2KE, T0AA, A61AC, UM8NG and SV9BAI.

The 7MHz Band

Let's start with ON7PQ; Pat sticks to c.w. and this mode found him FW/SM7PKK, FK8GJ, V73AS, FP5DX, N2IOE/J3, HC5AI, FY5YE, YC6KHZ, 3W3RR, PZ1DV, FR4FD, JP1DMX/HI8, ZL2NP, ZS9/DK7PE, ZD8Z, 9K2BCA, PZ1DV again, A61AC, HI3JH, 4S7WP, AP2TN, UB5MAL/UA10 (Franz Josef), KE9A/DU3, J6LSN, and FH5EJ.

Obviously, G0HGA loves this band; Angie mentions c.w. with K3ATO, K1RU, W1YT, K1ZZI, W4COG, W1CFZ at 0910Z, W1QK, W4XJ, W4GCW, NF2L, VE1BTT, VE3DXR/W4, VO1TK, K8VIX, N4ND, WA1KWA, UA9WKA, RV9CFA, UT7J/UB4JIW, UA9ADO, UA9FJZ, UZ0AB, UA0ALQ, UA9MJA, EA6ZY, CM7FR, SV1CU, CT1EBD, LY2BRF, FM/F6FWU and VP2V/W2GUP. That should encourage those with less-than good antennas for this band.

The 28MHz Band

G3NOF (Yeovil) reckons that conditions, particularly to the Pacific, were not as good as in 1988. In the mornings around 0900 the short path openings to JA and Asia were noted, with a few VKs around 1000. North America came in from noon to close, and a few S. Americans around 1800-2000. Contacts using s.s.b. were made with ES1RRM, JAs, K1CCK/M,

Back-Scatter

K6YRA, KC7WP, KW6J, KP4GY, N7LDR (Montana), NOJDP (N Dakota), TA2AU, TZ6FIC, UZ4FWD/UH0I, VR6JR, VY2BR, W6DLY, W6TQX/M, WY7Q, 5U7NU and 9Y4NED.

Turning to ON7PQ, Pat mentions c.w. with HS0B, XX9TDM, FP5DX, J28KY, P29PL, 3W3RR, VQ9LW, 8Q7DG, PJ2/W1WEF, HK0/N3JT, ZS9/DK7PE, TG0AA, 9S5G, TL8PS, G4WYG/ST2, ZF2KE, A61AC, AP2TN and AG3DX.

Now to **G0MFR**; Gareth runs five watts or less into a tribander antenna; most operating is done in afternoons or evenings, due to school work. On 28MHz, the c.w. went out to PP5IW/PT9, G3UUV/J6L, 9J2BO, VK2BT, VS6AG, VK6ZH, HB0/DL2MEH/P, TG0AA, J6LSN, V31BB, A61AC, J34P, VP2E/KT8Y, SM0OIG/YN, ZB2/F2JD and SV9BAI (Crete).

G0KRT is also QRP; although restricted to 3.5MHz for the moment, Eric will be on the other bands when he has something cooked up.

Turning to G0HGA, she raised W1OT, W1EOA, K2NJ, KA2CWH, W3TV, KA3GEA, K3NWD, NU3Q, N3JO, N3EJO, N3JT, K4MJ, W4IYU, K4FU, K4XZ, W4VC, W5SJL, NF5Z, W5BOS, KI6SV, W6ETL, W6DU, W6TS, W8IQ, NA8G, W8FDX, WA9LGC, NS9G, K4XU/9, KB9CW, WA9TMM KE0DR - and then the antenna blew down. Falling back on the end-fed wire used with a 10m counterpoise, she then found 20W enough to key with W8SEY/J3, WB4FVX and LU6UO.

On 28MHz, G4ITL (Harlow) used c.w. for N4IBG and PY4PZ, while 'phone netted KI1K, KB8OF, WC0A, and KB2JAB.

A brief note from an old contributor, namely **G2DHV** (Sidcup) who notes that he is now running f.m. Packet on 29.250MHz; so far conditions haven't been too favourable, but OE7HRI-F, OH2NJR-1, OH5RM, YU3HX-4, IK1JWS-2, DK9GY, and 9K2EC have all been successfully copied.

Turning to Phil, G0JBA, we find him this time enjoying a bit more activity, by way of c.w. to W8POS, plus s.s.b. to deal with A92EV (Box 833 Bahrain), CT3FT, JH1UAH, JR6UEE, KA0BBU, W1, 2, 3, 4, 9, EUs, RH7Y/P/RA4PF, TF3CW, UI8BBU, UW9UWB, UZ0AWS, VK2PJN, VK6ADP, VK6PAZ, VK6PWC, ZS6JR, 9H8B, 9K2IC, all s.s.b., plus f.m. to AC1T, NB4K and VE3NGO.

Finally for 28MHz, we turn to G0FTD: Andy has a regular sked with KD4MN, and in addition raised WA4ETN before moving on to pastures new.

The 21MHz Band

G3NOF reports the short path 0900-1200 was open to JA-VK-ZL-Asia; but the Pacific stations were only noted weakly on one occasion. North Americans came in between 1200 and 2100, S Americans 1800-2100. Africans appeared during the mornings and afternoon. Don 'rang the bell' on s.s.b. with A61AC, CM7HG, CY2CQ, FY4FC, FY/KD3FK, GU4XGG, HB0LL, HH2BN, HL5FBT, HL9HH, JAs, JW5NM, JX9CAA, K2KNC/M/3, K80NL (N Dakota), KW2P/4 (Dry Tortugas), KP2BH, LY2BIM, OY2J, SV1AJN/8, TP2CE, V290A, VK2JU, W0CD/J3, WB7CHS, XX9JN, ZB2AZ, ZL4AS, ZL0AKH (Yasme) and 4K2OT (Franz Josef Land).

A relatively short list on this band from Pat ON7PQ; the keyer did the trick with contacts with ZM7VS, HK0/N3JT, JY9MO, TG0AA, A61AC, BZ10K and 3D2QB.

G0JBA (Sittingbourne) said that his antenna farm rode out the gale fairly well, but a tribander trap has developed a bad connection so work will have to be done. Meanwhile he managed to sort out W3PHV, VK4KWB, ZL3RK, and ZM2AUB a 'special' from New Zealand.

G0FTD says all he found on this band were some Europeans on short-skip.

The 14MHz Band

Where it all happens at a sunspot minimum, and where all the funny noises keep a holiday home as well! Firstly, G0FTD whose letter provoked this thought; Andy is a mite hot under the collar at all the VKs, ZLs and things being seen off by packet QRM so he couldn't work the DX! Certainly this is a problem, both for packet and users of other modes. Perhaps the answer is to take the line that packet radio is a matter of computers talking to each other while master is at work, and hence to allocate them a small segment worldwide just outside our bands. The writer has no objection to packet radio as such, but he cannot see how a packet set-up left running while the operator is away from home on his lawful occasions can be able to cope with the arising of QRM or indeed malfunction of the equipment.

The antenna difficulties at G0HGA resulted in contacts on 14MHz with just the odd European at low power; GM3GKJ, OY7JR, DL6ZBA, OH2BDA and UB5JG. However, we understand that a different antenna system has been put up while the problems are resolved.

Now to G3NOF; Don only appeared on this band between 1500-1700, when he found the short path open to VK-ZL-JA-Asia and Africa. Don chatted with AL7BL, JY5IN, KL7XD, S42LK, TJ1SR, TL8PS, VK2GDD, VK6RI, VQ9HB, VU2GUY, VU2SMN, ZB2AZ, ZM7VS (Chatham Is), 3B8FV and 5H3GN.

Turning to Pat, ON7PQ, we see his key in action with FK8GJ, FW/SM7PKK, 3W3RR, FO5FO, ZK1BW, 4K2OIL, UA0QBO/A, U1ZA/A, 4K4AFM (these three 'counters' for IOTA), YJ0ABF, T5YO, A61AC, KH8/SM7PKK, T32BNT, DK1CE/H44, J34LTA and KH3C.

Gareth at G0MFR offers just one QRP contact on 14MHz in the shape of 4K4BAN (QSL via RB5FO) - but Gareth wouldn't mine knowing just where this one was! Any offers?

Finally G0JBA, who mentions his s.s.b. contacts with EA3/PA3BON, W1IDP, WA4WTG and W3HGV/F/MM.

Finale

That's it for another month; deadlines for the next few months are May 28, June 25, and July 30, addressed to me at the usual address at the head of the piece. And now - to the small matter of the antenna!

Back-Scatter

VHF Up

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

Solar Data for February 1990

Following numerous small flares, which caused some auroral events in the last few days of January and the beginning of February, the solar conditions have been very quiet. Solar flux levels declined from 229 units on January 29, down to 160 units by February 4. There was a flare on February 3 of 540 flux units but it only lasted for 7 minutes. The period between February 5 to 18 saw a major decline in solar activity. The sunspot count was down to 62 on February 17 and no flare reports were issued during this time. The period through to the end of February saw very little change in solar activity. The mean sunspot number for February was 128.4, reaching a maximum of 249 on February 24, and a minimum of 57 on February 17. Since December 1989 the flux levels have dropped about 100 units, which was totally unexpected and may indicate that we have gone past solar maximum. Although this news may appear to be depressing to 50MHz operators it should be borne in mind that the decline from sunspot maximum will take a number of years and that conditions will wax and wane depending on the time of year and the prevailing solar activity.

Radio conditions during February were pretty similar to those of January, which I had previously described as gloomy. There were some exceptions though, with a glimmer of renewed trans-equatorial propagation (t.e.p.) openings on 50MHz and a number of small auroras on 144MHz.

Reporting of propagation events on the v.h.f. and u.h.f. bands hasn't been helped by the demise of my 50MHz and 144MHz antenna systems and heavy duty rotator during the January gales and the loss of the tower supporting the 70MHz and 432MHz antennas last October. I have always felt that it is very difficult to report about band conditions if the writer is not active on any of them, which is the case at the moment. However all is not doom and gloom. The replacement tower and associated hardware has recently been delivered and I reckon that I shall be active again about the time this magazine hits the news-stands. In the meantime, this months column is being written with only your letters to guide me.

The 50MHz Band

Band conditions during February were not as had been generally expected. The were a number of Sporadic-E openings, noticeably more than have occurred in recent years. The beginning of the t.e.p. season was experienced by stations situated mainly on the south coast of England. It was noticeable however that the band was starting to wake itself up for the forthcoming season.

Although **Stephen Daniels G0DKM** (AVN) has been restricted to weekend operation he still managed to work a number of stations when the band was open to North America. During openings in December and January, Stephen used the f.m. mode to make many contacts in call areas W1, W2, W3 and W4. The best contact was with VE3KKL (FN25) at 59+ bothways. On January 5, at 1415UTC, TI2HL was worked on s.s.b. Since that date very little else had been worked, the situation becoming terminal following the gale on January 25 when the top section of the tower was severely damaged.

Geoff Brown GJ4ICD (JER) sent in a very detailed list of activity during February. Readers should note that 50MHz operation from the Channel Islands is in no way typical of what is happening in the rest of the UK but it makes interesting reading anyway. From 1630UTC, on February 1, the band was open to North America, giving a number of contacts in the W1 call area. Trans Equatorial Propagation returned to the Channel Islands on February 3, allowing QSOs to be made into Southern Africa. At 1500UTC, ZS6XJ was worked for the first ZS of the season. The ZS6PW beacon was

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ECC35	4.50	KT61	7.50	R18	3.00	6BQ7A	3.50
ECC81	1.75	KT66	16.00	R19	9.24	6BR7	6.00
ECC82	1.75	KT66 GEC	30.00	SP41	8.00	6BR8A	3.50
ECC83 Siemens	2.25	KT77 Gold Lion	12.00	SP61	4.00	6BS7	8.00
ECC85	3.50	KT88	15.00	U19	13.75	6BW6	8.00
ECC88	3.50	N78	15.00	U25	2.50	6BW7	1.50
ECC91	8.93	OA2	3.25	U26	2.50	6BZ6	2.75
ECF80	1.50	OB2	4.36	U37	9.00	6C4	1.25
ECH35	3.00	OC3	2.50	UABC80	1.25	6C6	3.50
ECH42	3.50	OD3	2.50	UBF89	1.50	6CB6A	2.50
ECH81	3.00	PC86	2.50	UCH42	4.00	6CD6GA	5.00
ECL80	1.50	PC88	2.50	UCH81	2.50	6CL6	3.75
ECL82	1.50	PC92	1.75	UCL82	1.75	6CG7 GE	5.25
ECL83	3.00	PC97	1.75	UCL83	2.75	6CH6	13.00
ECL86	1.75	PCC89	1.75	UF89	2.00	6CW4	6.00
EF37A	5.00	PCF80	2.00	UL41	10.00	6D6	3.50
EF39	2.75	PCF82	1.80	UL84	1.75	6DQ5 GE	12.00
EF41	3.50	PCF86	2.50	UY41	4.00	6DQ6B	4.75
EF42	4.50	PCF801	2.50	UY85	2.25	6EA8	3.00
EF50	2.50	PCF802	2.50	VR105/30	2.50	6EH5	1.85
EF54	5.00	PCF805	1.70	VR150/30	2.50	6F6	3.00
EF55	3.50	PCF808	1.70	Z759	25.00	6GK6	3.50
EF80	1.75	PCH200	3.00	Z803U	25.00	6H6	3.00
EF86	5.00	PCL82	2.00	2D21	3.25	6HS6	3.77
EF91	2.95	PCL83	3.00	3B28	15.00	6J5	4.50
EF92	8.37	PCL84	2.00	4CX250B	81.00	6J6	2.00
EF183	2.00	PCL85	2.50	5R4GY	5.50	6J7	4.75
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EH90	1.75	PCL805	2.50	5V4G	2.50	6JE6C	8.50
EL32	2.50	PD500	4.00	5Y3GT	3.50	6JS6C GE	11.25
EL33	7.50	PFL200	2.50	5Z3	4.00	6K6GT	2.75
EL34 Mullard	10.00	PL36	2.50	5Z4GT	2.50	6K7	3.00
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EL91	7.39	PL509	6.00	6AN5	4.75	6L7	2.50
EL95	2.00	PL519	6.00	6AN8A	4.50	6L06	8.50
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Back-Scatter

QTH Locator Squares Table

Station	50	70	144	430	1296	Total
GJ4ICD	3440	—	263	119	59	785
G3IMV	94	—	429	124	48	695
G6HKM	187	—	217	109	46	559
G4KUX	—	—	372	120	—	492
G3UVR	—	—	257	140	83	480
G1KDF	140	—	180	102	37	459
G4RGK	—	—	284	124	50	458
G3XDY	—	—	206	148	91	445
G0DAZ	—	—	277	128	27	432
G4DEZ	55	—	249	49	49	402
G3JXN	—	—	179	134	87	400
G6DER	—	22	183	110	78	393
G0LBK	—	—	257	89	46	392
G8LHT	79	19	185	93	14	390
G1EZF	—	—	263	93	—	388
G4XEN	—	—	274	111	—	385
G4MUT	82	22	153	93	31	381
G1SWH	143	25	149	53	—	370
G1LSB	44	—	172	143	—	359
G0EVT	88	—	209	57	—	354
ON1CAK	—	—	277	53	7	337
G4RRA	—	—	255	80	—	335
G3COJ	—	—	186	103	44	333
G4SSD	—	—	229	93	—	322
G4FRE	—	—	102	146	72	320
G1DWQ	171	—	142	—	—	313
DN1CDQ	—	—	251	54	7	312
G4TIF	—	—	200	110	—	310
G4DHF	—	—	307	—	—	307
G1EGC	—	—	198	80	23	302
G8HHI	—	—	148	110	38	296
G8PNN	—	—	129	99	64	292
G6MGL	—	—	141	89	59	289
G4NBS	—	—	119	105	63	287
DL8FBD	—	—	280	—	—	280
G8ATK	—	—	143	91	45	279
GW6VZW	118	—	143	6	—	267
G4PCS	—	—	258	3	—	261
G4ZTR	58	26	97	50	30	261
G1GEY	—	—	168	77	11	256
G3NAQ	—	—	175	80	—	255
G8PYP	118	—	105	31	—	254
G6STI	—	—	152	69	24	245
G6DZH	—	—	154	87	—	241
G3FPK	—	—	241	—	—	241
G4IGD	—	—	238	—	—	238
G0EHV	—	—	160	75	—	235
GM4CXP	—	—	198	31	—	229
EI5FK	—	—	172	56	—	228
G1SMD	115	—	106	—	—	221
G4MEJ	—	—	213	—	—	213
G8LFB	—	—	209	—	—	209
GW4FRX	—	—	204	—	—	204
G8MKD	—	—	150	49	—	199
GJ6TMM	—	—	151	48	—	199
G4YCD	—	—	197	—	—	197
GI1JUS	—	—	192	—	—	192
G4DDL	—	—	186	—	—	186
G1DOX	54	26	73	16	8	177
G6DZH	—	—	156	—	—	156
G7ANV	—	—	153	—	—	153
G6MXL	—	—	91	45	16	152
G4FVK	—	—	78	49	21	148
G4AGQ	—	—	104	42	1	147
G8XTJ	29	—	116	—	—	145
G0FYD	1	—	142	1	—	144
G6MEN	41	2	63	26	4	136
GW1MVL	—	—	109	22	—	131
G1WPF	—	—	97	29	—	126
G0FEH	—	—	101	24	—	125
G0ISW	45	—	59	17	—	121
G1IMM	—	—	98	17	—	115
G7CFK	109	—	—	—	—	109
G1CEI	11	—	77	18	—	106
GW1MVL	—	—	106	—	—	106
GM0HBK	—	—	107	—	—	107
GI4DWA	—	—	103	—	—	103
GM0GDL	—	—	81	22	—	103
G7CLY	—	—	100	2	—	102
G1TCH	—	—	95	6	—	101
G1SWH	—	—	148	53	—	101
G7ENF	—	—	70	19	—	89
G4WHZ	—	—	76	—	7	83
G0GTF	76	—	—	—	—	76
G0HEE	—	—	73	—	—	73
GU4HUY	—	—	73	—	—	73
G1NVB	—	—	73	—	—	73
G0HDZ	—	—	64	—	—	64
GM1ZVJ	6	—	48	—	—	54
GM0JDL	—	—	47	—	—	47
G2DHV	—	—	33	7	2	42
G7AHQ	—	—	34	—	—	34

No satellite or repeater QSOs
Starting date 1 January 1975

heard 5 minutes later, peaking at S5. From 1515UTC, contacts were then made with ZS6WB, ZR6A and ZS3E. At 1818UTC, Geoff worked OE6AHD, for a first GJ-OE contact, presumably via Sporadic-E. The Southern African t.e.p. opening continued with the ZS3VHF beacon being copied for over an hour, disappearing at 1900UTC. Meteor scatter propagation courtesy of some unidentified minor stream was prevalent on February 4.

During the morning, contacts were made with SM7FJE, OE6AHD (twice), PA2VST and PA3BFM. In a late afternoon t.e.p. opening, at 1633UTC, 9L1SL was worked for another GJ first. This was J52US operating the Sierra Leone club station. More on him later. Auroral propagation was detected in the early evening, from 1800UTC, giving contacts with GM3WOJ and GM0GEI. Perhaps by now you are beginning to believe what I said about the Channel Islands being a unique location! Sporadic meteors, on February 5, allowed OZ3ZW to be worked at 1530UTC. Staying with this mode, Geoff worked his 80th country on the band when HB9CRQ (JN47) was contacted at 2320UTC on February 8. TEP openings continued to be prevalent during many afternoons but pressure of work did not allow full use to be made of them. 9L1US (ex-J52US) was heard for over an hour, from 1600UTC, on February 17, at S9+. This opening to the south was followed by an auroral opening to the north with a number of stations being heard.

All was quiet during the next day, apart from a brief scatter opening in the afternoon, in which OZ4VV was worked. Geoff comments that he seems to have a very good path to OZ, HB9 and OE. Signals are consistently heard at very good strengths, with Dan HB9CRQ being copied nearly every evening from around 2300UTC. In a t.e.p. opening, at 1330UTC, on February 21, TR8CA was heard operating on 50.115MHz. He also has a beacon running on 50.091MHz, not good news, as 9L1US is also operating a beacon on the same frequency. Locator square No 344 was worked on February 22, when ON4PS replied to a CQ DX call! More t.e.p. openings continued to be heard. The 9L1US beacon was heard at 1120UTC, on February 23, followed 30 minutes later by reception of the ZD8VHF beacon on Ascension Island. Propagation was very interesting on February 25. The band was open, at 0945UTC to 9L1US who was putting in a tremendously strong signal. Whilst beaming in a southerly direction many French stations were worked via backscatter.

At 1022UTC, SV1OE was worked via the same mode. The FY7THF beacon in French Guiana was heard at 1035UTC, again on the non great-circle path, via backscatter, as was the Portuguese beacon CT0WW. Contact was made on s.s.b. with TR8CA at 1105UTC and immediately afterwards both the TR8CA and 9L1US beacons were heard co-channel on 50.091MHz. From mid-day the ZS3VHF beacon became audible and the FY7THF beacon started to come in on the correct beam-heading. Contacts were then made with ZS3DM, at 1240UTC, and with 9L1US, at 1310UTC. He had been heard calling cq for some time but with no replies. The 9L1US beacon was still being copied at 1400UTC. Geoff hears this beacon every day, between 0900 to 1400UTC. In the early morning it is very strong with no flutter but around 1200UTC the propagation mode appears to change and the note of the beacon sounds quite echoey, very much like a multi-path signal. This change takes place within 20 minutes but the signals are never lost. Geoff wonders whether this other mode is pure t.e.p. or is it another form of propagation?

Various openings were recorded throughout the month, mainly restricted to the Southern African continent but on February 28 the real DX returned. At 0930UTC the band opened up to Australia with VK6YU being heard weakly. As the opening progressed signals became stronger allowing contacts to be made with VK6HK, VK6ZKO, VK6KXW and VK6ZFY. The signals from VK6HK were very strong, S9+. A very weak VK8 station was heard but not worked. Adrian ZC4MK was worked via backscatter at 1020UTC after the Australian stations had faded out. The FY7THF, 9L1US and GB3SIX beacons then became audible, all via backscatter. Certainly a very interesting month from Geoff's point of view but very frustrating for the rest of the UK operators on the mainland. Our turn will come soon.

As mentioned in the report from GJ4ICD, **Dave Heil K8MN** (ex-J52US) is now on the air from Sierra Leone. Whilst waiting for his permanent call, **9L1US**, he operated from the club station 9L1SL for a few weeks. Dave will be in 9L for 2 years and plans to activate other African countries such as Guinea (3X), Mali (TZ) and Burkina Faso (XT) whilst on his tour of duty. Dave asks that stations working him on 50MHz do so in "contest style" so that more stations will have a chance to work him. He also requests that stations work him only once unless he is getting no takers while calling CQ. He runs about 60 watts output so stations should only call him if they are hearing him well enough for a quick contact. When operating as J52US, stations continually called when conditions were marginal and this practice resulted in the loss of many contacts. Dave generally prefers to operate c.w. around 50.091MHz. QSL cards go via his manager, **Kenneth Scheper WA8JOC**, 5875 Cedaridge Drive, Cincinnati, Ohio 45247, USA.

The 70MHz Band

From *QSB The Newsletter for Four Metres*, edited by **Roger Banks G4WND**, comes news of what may prove to be the first two-way s.s.t.v. contact on the band. **Geoff Grayer G3NAQ** worked G1LXI for over two hours, exchanging pictures bothways. Geoff was using all home constructed equipment, apart from the camera and TS820S, whilst Ralph G1LXI used all commercial gear including a Robot 1200 scan converter.

Eamonn Phelan EI9GO located in Waterford, County Cork is now active on

144MHz QRB Table

Distance in kilometres

Station	Tropo	Aurora	Meteors	Sporadic-E
G0CUZ	2943	1758	1996	2943
G0DAZ	1251	876	2026	2249
G0DKM	2811	1488	——	2203
G0EVT	3080	1640	1808	3080
G0FYD	1315	1624	——	2019
G0ISW	1059	566	——	2057
G0LBK	3060	1755	1876	2350
G1DWQ	1454	1812	——	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	——	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	——	2372
G3FPK	1835	1686	——	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2068
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	——	1978
G6DER	1834	997	1957	2068
G6DZH	2924	711	——	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	——	2265
G6LEU	2620	910	——	2430
G8HHI	1742	——	——	2058
G8JDX	2667	1368	——	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1083	1451	——	2318
GD4XTT	3053	——	——	1700
GI1JUS	3067	1614	1507	2216
GI8YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW6VZW	2830	1473	——	2236
ON1CAK	1420	1166	1948	2725
ON1CDQ	1420	1166	1948	2124

Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G4ASR	7	-	46	—	53
G4OUT	-	2	49	—	51

Number of different stations worked since 1 January 1990

the band. He is running a Microwave Modules transverter and Yagi antenna.

Victor Mitchell GI4ONL passes on the information that he regularly leaves a beacon running from his shack between 70.190 to 70.195MHz, so it may be worth beaming in his direction from time to time.

Ian Kyle GI8AYZ is also active on the band. Although he has a poor take-off into the UK, virtually ruling out tropo contacts, Ian can usually be found whenever there is a sniff of an aurora.

Another station that is normally heard via aurora is **Tony Ritchie GM3WYL** (IO75). He has been operating with an indoor HB9CV antenna but will shortly be putting a 4-element Yagi on the mast.

The 144MHz Band

Although tropo conditions were virtually non-existent during February there were a number of minor auroral openings to liven up the band.

John Lincoln GM0JOL reports a good event on January 30, collecting a new square, IO95, when G1RST was worked. Contacts were also made with DL, LA, GM and G. John describes the recent winds in the north as being normal for the time of the year, with only one director being lost from the antennas.

Back-Scatter

Staying in the wind-swept north, comes a rebuke from **Peter Bates GM4BYF**. He mentions the aurora on December 1 which I had described previously as 'not very spectacular'. Peter didn't think so either, having worked a string of PA stations, but at 2032UTC he was called by **RB5CCO**, both stations exchanging reports of 55A. Peter was surprised when the Ukrainian station gave his locator as KN59XG, putting the contact at 2450km.

The signals were definitely auroral, rather than auroral-E, so either the event was not well reported or there was some other mode involved. I think that this only proves that when an aurora is being described it relates only to the geographical location of the reporter! Peter wonders if anyone else heard RB5CCO or could confirm his location. My listing of USSR v.h.f. operators, based on information from RB5AL and UA6LU, certainly confirms RB5CCO as being in KN59. He is also quite well known as a 144MHz DXer, mainly cropping up in UK log books during the Sporadic-E season.

He can usually be found on the v.h.f. net around 14.345MHz and if Peter were to call on this frequency during the weekends he should unearth the Ukrainian operator. GM4BYF also reports on other auroras which occurred last year. In an event on October 20, contacts between 1850 to 1913UTC, were made with OE3XUA (JN77), OL6BZR/P (JN89), SP6BST (JO81) and Y22ME (JO72). Auroral conditions continued during the following day, from 1245 to 2131UTC, although the contacts were not quite as noteworthy as the previous evening. Another event, during the evening of November 17, allowed contacts with F6DCD (JN38), HB9QQ (JN47) and OK2DW/P (JN99). During this session, Auroral-E contacts were made on 50MHz, at 1822UTC with OH3EX (KP22) and at 2143UTC with OH5NQ (KP30).

I didn't have much success in the recent auroras as the antenna direction was literally at the whim of the prevailing winds. Around 1800UTC, on February 1, contacts were only made with GM0CLN/P and GM0GTU. It was marginally better on February 4, when contacts were made with GM4JJJ, SM5DCX (JO89) and SM6DWF (JO57) before the wind changed direction!

John Lemay G4ZTR (ESX) mentions the storm damage affecting nearby property but reports that his modest antennas consisting of two stacked 9-element Yagis survived the onslaught. The aurora on January 30, produced a new county for Jóhn when GM0CLN/P was worked. Contacts during February included GM4JJJ in the aurora on the 1st and GM4IPK & GI4OWA for a new county, in the event on the 4th.

Similar contacts were made from the south coast of England. **Jim Smith G1DWQ** (DOR) worked GM4AFF on January 30, GM0CLN on February 1 and GM0HBK on February 4. He also reports that weak auroras were observed on February 18/19. Jim mentions that he usually listens for the 1800UTC K-indices, broadcast on various bands, and if the value reaches 5 it is usually enough to provide auroral propagation to Northern Scotland. Anything over this figure is a bonus and can give some very good results, especially if using c.w.

Ian Wright GW1MVL (CWD) remarks that conditions during February reached an all time low. Very few contacts were made via tropo the best being GW4ZQV (GWT) and GW8ELR (DFD) on February 1. During the Girl Guides Thinking Day on the Air, Ian operated on 144MHz s.s.b. with the callsign GB1CPG. Despite the inclement weather ten other special event stations were contacted. Other activities in the month included operating mobile, with Ron G1OIB, from various WAB areas in Clwyd, Cheshire and Shropshire. The operation started off with an 8-element Yagi but due to the high winds an HB9CV antenna was used instead.

The 430MHz Band

Ian GW1MVL made a quick 30 minute excursion to the band on February 4 to work G7DDT, GW1ATZ (CWD), G3OLX (SRY) and G4JLG (MCH) in the 430MHz contest.

In the last two columns I have mentioned the e.m.e. planning software compiled by **Doug McArthur VK3UM**. Doug has written to give details of his involvement in 430MHz e.m.e. He has recently rebuilt his 24 Yagi array using a modified DL6WU design with open wire feeders. The use of this type of feed system reduces the losses and hence the antenna noise temperature so important for e.m.e. work. Doug is also planning to combine 2 amplifiers together to increase the transmit power by another 3dB.

Another station active on 430MHz e.m.e. is **Peter Blair G3LTF**. During the month of June, he will be celebrating the 26th anniversary of his first e.m.e. contact! Peter always strives to get the utmost performance out of his system. He is considering expanding his dish from 6 to 7m and is rebuilding the 430MHz feed and reducing his interconnecting cables to get rid of the last bit of ohmic losses.

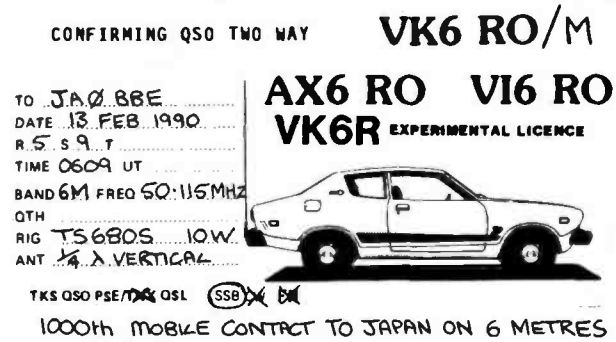
The Microwave Bands

News has reached me of a 10GHz e.m.e. contact, after several unsuccessful attempts, between **Allen Katz K2UYH** and **Jim WA7CJO**. The antenna system at K2UYH consisted of a 3m glass fibre t.v.r.o. dish, illuminated with a Cassegrain feed using an approximate hyperbolic sub-reflector and a dual mode horn developed by W2IMU and K2TKN from standard plumbing hardware. The horn was attached to a length of 7/8 copper pipe which passed through the centre of the dish and supported the horn and sub-reflector, as well as functioning as waveguide for the horn. At the rear of the dish the copper pipe was tapered to fit a standard rectangular 10GHz waveguide flange. This was connected to an X-Band waveguide switch to enable either the transmit or receive paths to be connected. The r.f. equipment consisted of an SSB Electronics 10GHz transverter driving a Hughes travelling wave tube giving 37W output. A dish mounted, GaAsf.e.t. low noise amplifier was connected through a bandpass filter into a 2-stage WB5LUA type preamplifier, using AFT10135s, into the 10GHz transverter.

The dish was mounted on a simple tripod and used visual sighting of the moon with the aid of a bore sight tube. This works ok providing there are no clouds obscuring the moon. Unfortunately the first two schedules had to be abandoned because of poor visibility. At the beginning of the third schedule nothing was heard from WA7CJO. This was a bit worrying as Jim was running a 300W amplifier and should have been quite readable. It was then decided to check steering accuracy by looking for moon noise with a wideband receiver. It was quickly discovered that the bore sighting tube had slightly moved and the dish was a few degrees off track. Once the dish had been properly aligned on the moon the signal from WA7CJO was copied immediately. Using 5 minute transmit/receive periods, the contact was completed in less than 30 minutes. The signal from WA7CJO had a strong auroral quality, 44A, with a little hint of pure tone and was not very difficult to copy. Future plans at K2UYH, include improving the receive system by using a h.e.m.t. preamplifier and getting a new 5m dish installed.

VHF Mobile

Graham Rogers VK6RO reports that on February 13 he worked from his mobile station, JA0BBE on 50MHz. Maybe nothing remarkable about that but this QSO notched up Graham's 1000th contact with Japan from the car. Graham runs a TS-680S giving 10W output to a quarter wavelength vertical antenna. The first QSO with Japan, over a path length in excess of 8000km, was made during October 1979, whilst mobile with 2.5W output. Various modes, a.m. f.m. s.s.b. and c.w. have been used during the past 11 years to work 1000 JA contacts but all were made whilst mobile. I wonder if that type of feat could be emulated in the UK if we were to be granted permission to operate mobile?



VHF News

Last month I said that there were now 29 DXCC countries in Europe available on 50MHz. A number have written in to query this. The available countries in Europe are as follows, but please note that some of them have no resident 50MHz operators. In total I now make it no less than 31 DXCC countries which are CT, CU2, EI, F, G, GD, GI, GJ, GM, GU, GW, HB9, JW, JX, LA, LX, OE, OH, OH0, OJ0, ON, OY, OZ, PA, SM, SV, TF, T77, ZB2, 4U1 and 9H. I have not counted the various operations from C30, DL, EA, I and TK that have taken place in the last few years as some, if not all, are distinctly illegal.

The RSGB VHF National Convention will take place on Saturday May 12 and not on the 13th as unfortunately was incorrectly advised to the the various magazines. The venue for the one day exhibition and lecture programme is Sandown Racecourse, Esher. The convention, organised by members of the RSGB VHF Committee, opens at 10.30am. A comprehensive trade exhibition will last until the close of play, at 6pm. A detailed lecture programme will commence from 2.15pm. Subjects include Transverter optimisation, DX and the Solar Cycle, Amateur Satellites, Laser Communications and Microwave Construction. There will also be forums by the VHF Contests Committee, Microwave Committee and the Morse Test Group. Annual General Meetings of the UK Six Metre Group and the Remote Imaging Group will also be held in the Conference Centre. Most of the RSGB Specialist Committees and the Spectrum Managers will be in attendance. I will be willing to accept bands reports, letters, table entries, etc at the convention. You will find me on the VHF Committee stand on the upper floor. *Practical Wireless* will also be in attendance. You can find them in the main trade exhibition. A reminder of the date again, Saturday May 12. It is on the same day as the FA Cup Final. Come on the Reds!

Jo LA1BEA has provided details of the annual Nordic v.h.f./u.h.f. meeting taking place in Geilo, Norway during the weekend of June 8-10. Participants in previous years have included enthusiasts from the UK and many other European countries. The Akademisk Radioklubb LA1K are responsible for the technical arrangements whilst Leif LA9BM is co-ordinating the accommodation, localities and food. In addition to social activities there will be facilities for measurement of 430 and 1296MHz antennas, noise figure measurements and a flea market. Lectures include Microwave technologies, air cooling of amplifiers, Aurora/Auroral-E and 50MHz. Accommodation is available for

Back-Scatter

230 persons in cabins and apartments on-site. On the Saturday evening there will be a Ham-dinner, with seating for nearly 200 people. Contact me if you want further details. See you there?

Beacon and Repeater News

Terry Cooper G4XOP, Secretary of the Mid Cornwall Beacon and Repeater Group reports that all GB3CTC beacons are off the air and that it will be some considerable time before they are re-activated. The storms during late January caused the roof of the beacon building to be completely blown off causing much damage. The group are awaiting repairs to the building and suspect that all feeder cables may requires checking. If you want further information you can telephone G4XOP on (0726) 63048.

Meteor Showers

During the next few weeks there are a number of useful meteor showers which can be utilised to increase your country or squares totals. The following data will help you determine in which direction to beam at specific times and when the shower will not be visible.

The Lyrids shower, between April 18-25 will have maximum activity on April 21. Between 0100-0300 beam s.w. or n.e., 0300-0600 beam west or east, 0600-0700 beam n.w. or s.e., 0700-0900 beam north or south. This shower is below the horizon from 1300-0100UTC and therefore is not workable between these times.

The Eta Aquarids shower runs between April 21 to May 12 with maximum activity occurring on May 5. This is a very complex stream and predicting the precise peak is very difficult. Between 0300-0500 beam s.w. or n.e., 0500-0900 beam west or east, 0900-1100 beam n.w. or s.e. This shower does not produce results on a northerly or southerly beam-heading. The shower is below the horizon between 1600-0300UTC.

The Piscids shower occurs between May 5-10, peaking on May 6. Between 0400-0500 beam north or south, 0600-0800 beam s.w. or n.e., 0800-1200 beam west or east, 1200-1400 beam n.w. or s.e. The shower is below the horizon between 1700-0400UTC.

The Nu Piscids shower runs between May 6-14 peaking on May 8. Beam-headings and times are very similar to the Piscids shower, occurring one hour earlier. The shower is below the horizon between 1600-0300UTC.

Expeditions

Andy Adams GW0KZG/MM has sent me further news regarding his North Sea Wet Squares activity. Although the Royal Research Ship *Challenger* was scheduled to leave Barry, South Wales on February 26, the ship was delayed for two days by the bad weather. Andy should have started the first leg of the North Sea cruise, leaving Dundee, on April 3. RRS *Challenger* was then scheduled to sail eastwards towards Denmark and then sail in a northerly direction following the Norwegian coast up as far as Stavanger. The track then continues in a south-westerly direction to Aberdeen, north to the Orkney Islands, around the Faroe Islands, across to Bergen, Norway and then sail in a southerly direction to arrive in Den Helder, Holland on April 17. The second leg of the journey will commence on April 18 and includes the area covered by locator squares JO00, 01, 02, 03, 04, 11, 12, 13, 14, 21, 22, 23, 24, 33, 34, 44 to arrive in Great Yarmouth on May 3. I can supply, on receipt of a stamped addressed envelope, the latest cruise track giving details of North Sea activities between April 3 to May 3.

A 50MHz permit has been issued for two frequencies, 50.105 and 50.110MHz, for use by the communications team accompanying the Anglo/Soviet North Pole Expedition. The UK communications officers will be Lawrence GM4DMA and Morag Howells GM0MUV. Other operators will be Leonid Labutin UA3CR and Dimitri Shparo UA3AJH. In addition to the commercial side of the operation the team will be active on most amateur bands, including 50MHz. This is the first permit to be issued for use in the USSR, and it is expected that permission will also be granted to use the callsigns GB4MSS/UA0 from the main base camp (NQ59CN) and GB4ICE/UA0 from the forward base camp, located at 86 degrees north. Base camp will be operational from 1.8 through to 50MHz and via Oscar 10/13 and RS10/11. For 50MHz operation an FT-690, 100W amplifier and a 4-element Yagi will be used. The liaison frequency, 28.885MHz, will also be monitored. The base camp became active during the first week of March and is expected to remain for approximately 2 months. A special QSL card will be available via Ian Crockford GM1AUZ. The card will contain information about the expedition and the fund raising for the Multiple Sclerosis Society.

A group of amateurs, including G1SWW, are now operating from the Island of Harris, Outer Hebrides (IO67MX), for 2 weeks until April 21. Operation is on 50MHz, 144MHz and h.f. They are running 100W e.r.p. on 50MHz from a 5-element Yagi, whilst on 144MHz the equipment consists of a 100W amplifier into a 9-element Yagi.

Operators of the 50MHz band wanting to work the Island of Herm should listen out for GB2HI operational between May 1-8. The team, consisting of members of the Northants Expedition Group, will include G5LP, G4TTX, G4VID, G0AGE, G0EKD and G0HBA. Please note that QSL cards should NOT be sent to the GU bureau.

A joint American/Russian expedition will operate from the Kaukasian mountain from May 20. They will use the callsigns 4J6X on h.f. and 144MHz from locator LN13. The group will also be active on c.w. meteor scatter.

A note from **Nigel Wilson G4VVZ** gives prior notification of the Derbyshire Hills Contest Group expedition to the Republic of Ireland, between August 5 to 16. Using the callsign EI2VPX/P they will be active from IO61DW on 70, 144, 430 and 1296MHz. Further details nearer the date.

QRZ Contest!

The Scandinavian activity contests, mentioned in last month's column, will be run on the following dates. Microwave activity on May 1, 144MHz on May 3 and 430MHz activity on May 7.

Operators with u.h.f. and microwave capabilities may care to note that two contests catering for their needs will be run concurrently on May 5-6. In addition to the 430MHz Trophy contest, the 430MHz to 24GHz multi-band contest will also be run.

Two weeks later, May 19-20, 144MHz operators get their chance, in a contest lasting 24 hours. There will be two sections, for single operator and all other classes.

The adjudicator of the PW 144MHz QRP Contest, Neill Taylor G4HLX, has reminded me that this year's event will be run between 0900 to 1700UTC on Sunday June 17. Transmitter output power will be limited to 3W as usual. Full contest rules will be published in due course.

Help Required

David Law G0LBK has heard about a 144MHz 9-element Yagi on a 4M boom, designed by OZ5HF, but does not know the source of any published information. If you have any knowledge of this antenna then please pass it on.

Deadlines

With the possibility of improving conditions on the v.h.f. bands I am expecting a bumper mailbag. Please send your letters to me to arrive by April 30. The other two deadlines are May 28 and June 25.

Back-Scatter

RTTY

Reports to
Mike Richards G4WNC
200 Christchurch Road,
Ringwood, Hants BH24 3AS

The review for this month is the new terminal unit from Johnny Melvin G3LIV. Johnny has gained a good reputation for producing effective terminal units over a number of years, so it was with great interest that I took delivery of the latest model.

G3LIV Data Compact

As the name implies, one of the striking features of this new unit is its small physical size which measured 153 x 93 x 38mm. The styling was very neat and simple and complimented the BBC computer, for which it was primarily designed, very well. Although it is most likely to be used with the BBC, there is no reason why it cannot be used with any computer that uses a t.t.l. data interface. One advantage of designing a terminal unit around the BBC computer is that the connections can be simplified, which is a boon to the newcomer and gives the station a much neater appearance.

With the G3LIV unit all connections to the computer, including the power, were carried on a twenty way ribbon cable which linked the user port on the BBC to the twenty way i.d.c. connector on the rear of the terminal unit. An extra bonus with this system was that the power for the terminal unit was also supplied via this connection. The connections to the transceiver comprised the p.t.t., audio in and audio out. These were carried on a pair of jack sockets on the rear panel - one 2.5mm mono for p.t.t. line and a 3.5mm stereo jack for audio in and audio out. One point to note here is that the unit as standard does not include its own transmit tone oscillator, but relies on the tones generated within the computer, under control of the RTTY software package, such as the programs from G3WHO and G4BMK.

However, if you need a transmit tone generator, G3LIV can supply an optional plug-in board with this facility which fits where the AMTOR clock and timing board normally sits. The front panel layout was very straight forward with just three push buttons and five l.e.d.s. One of these buttons acted as a power switch, whilst the other two controlled the shift options. In addition to the normal amateur shift of 170Hz, a 425Hz shift could be selected. This will be of particular interest to those

Back-Scatter

keen on utility monitoring, as 425Hz is probably the most common shift for commercial RTTY transmissions. The other button on the front panel provided the facility to invert the data, which is again essential as it is quite common to find a mixture of erect and inverted signals on the bands these days. Three of the five l.e.d.s were used to indicate power, transmit and receive, whilst the remaining two were used as a simple tuning indicator.

The system employed was quite basic in that one l.e.d. was used to indicate the presence of a mark tone whilst the other dealt with a space. Despite its simplicity many users find the twin l.e.d.s to be a very effective tuning system. The standard of construction was very good with all components mounted on a glass fibre p.c.b. which fitted neatly into the plastics case.

Moving on to the demodulation technique, there are a number of design options available and the one chosen for this unit was the two tone filter type. This type of unit employs a limiter and two band-pass filters at the front end - one tuned to the mark frequency and the other to the space frequency. The number of filters cascaded varies from design to design but the most common is two op-amps per filter. The output of each filter is then combined using an op-amp chopper which, with a 5V supply rail produces a t.t.l. compatible output.

The -5V rail for the op-amps is internally generated using a 7660 integrated circuit, so the only external supply needed is +5V. From past experience this type of terminal unit is particularly effective for h.f. operation where conditions can be very difficult. Users of the G3WHO and G4BMK software packages will of course be aware that these programs require the provision of a 1kHz clock external to the BBC and an optional timing board for AMTOR operation. This has been catered for in the Data Compact by means of an additional p.c.b. which plugs into the motherboard. This provides the 1kHz clock and enables the timing adjustment.

There was one other plug-in p.c.b. available and this comprised a pre-limiter audio filter unit. This reduces out-of-band interference and improves the overall operation of the terminal unit when operating under poor conditions. With all these facilities built-in the final result was a very neat installation - ideal for the amateur who either needs or enjoys a neat station. Incidentally these additional boards were all supplied ready assembled.

Air Tests

I installed the G3LIV Data Compact in the shack, connecting it between my BBC B and Icom IC-720A transceiver. The interfacing with the BBC B was simplicity itself, requiring the construction of just one ribbon cable with standard 20 way i.d.c. connectors at each end. The radio side of the terminal unit was also very simple to interface and I chose to use a.f.s.k. employing the tones generated within the BBC. However I normally operate using true f.s.k. and this is also easily supported, providing of course your transceiver has the facility.

The G3LIV Data Compact

Although I used the terminal to make contacts on both RTTY and AMTOR, it's really the receive side that is under test. I must say I was very pleased with the results, all strong signals were handled with, as expected, no difficulties at all. Signals that were close to the noise floor also copied well, even in the presence of some selective fading. Performance in amongst the QRM was also good and the unit was at least on a par with many other terminal units of this type.

Summary

The Data Compact from G3LIV performed very well throughout the review period, living-up well to the high quality of previous terminal units from this source. If you own a BBC B and are looking for a terminal unit this must be one of the front runners both in terms of performance and neat appearance. The cased basic unit for RTTY is available at a fully inclusive price of £59.00. If you need the optional boards they are priced at £12.50 for the AMTOR/timing board and £10.00 for the pre-limiter audio filter, both prices again fully inclusive. The contact address is **Mr J. Melvin G3LIV, 2 Salters Court, Gosforth, Newcastle, Tyne and Wear NE3 5BH**. My thanks to Johnny for the loan of the review model.

Spectrum Software

Some good news for Spectrum computer owners - J & P Electronics are launching an e.p.r.o.m. loader for this computer at Spring RSGB Rally at the N.E.C. Birmingham. One of the common moans from Spectrum users is the time it takes to load software from tape, well J & P now have an answer to this in the form of their new e.p.r.o.m. loader. This unit can be set-up with up to four programs from the J & P range, any of which can be loaded in a matter of seconds as opposed to lengthy wait associated with tape loading. As an additional bonus the unit can be supplied with the hardware associated with the program built in. For example the top of the range unit will include the FAX hardware and audio filters with a.g.c. So not only do you get faster load times but a neater station as well!

The Spectrum models supported at present are as follows: Spectrum, Spectrum Plus, Spectrum 128 and Spectrum 128 + 2. Users of other Spectrum models have not been forgotten and work is still in progress on these units. The prices have yet to be finalised, but a basic receive only unit with one program installed is likely to be around £47.50 while the top of the range with FAX, RTTY, SSTV and Morse software complete with all hardware will be less than £200.00. So if you're interested why not visit the NEC or write direct to **J & P Electronics, Unit 45, Meadowmill Est., Dixon St., Kidderminster DY10 1HH**.

Commodore Radio User Group

I have just received the latest news letter from this active group. It would seem that Simon Lewis GM4PLM and his wife Lyn are doing a sterling job against all the odds. What this really comes down to is that they need some help, in the form of Commodore users who are prepared to make a contribution to the running of a lively user group. At present the club provides specialist support to Commodore users with their activities specialising in radio items. They have a very good range of C-64 software on disk (seventeen disks at the last count) and even provide very valuable support to the older machines. They even have e.p.r.o.m. based RTTY and AMTOR software for the Commodore PET 3000 and 4000 series machines. For more information on the group and how you can help please send a s.a.e. to **Simon Lewis, Commodore Radio Users Group, 66 Camperdown Court, Helensburgh, Strathclyde G84 9HJ**.

BARTG Changes

Regular readers will remember that I recently announced that Pat and John Beedie were stepping down from the job of membership secretary for BARTG and that G6TZF would be taking over. Sadly ill-health has hit G6TZF's family and she has had to pull out. So I hope that situation improves quickly and I'm sure all readers wish her well. The new arrangements are that Pat and John take the membership secretary job back until the BARTG A.G.M. in November. So to summarise, all membership and general enquiries about BARTG should be directed to: **Pat & John Beedie, Ffynnonlas, Salem, Llandeilo, Dyfed SA19 7NP, Phone (0558) 822286**. Incidentally the subs rates for 1990 are £10.00 UK, £14.00 Europe & Eire, £14.00 Overseas surface, £22.00 Overseas air mail.

Atari Software

I have had many letters in the past from readers asking for information on sources of radio software for Atari 800 series computers. I have managed to locate a few sources, but nothing very spectacular. However a recent letter from Nick Ashby of Wembly identifies what looks like a very good source of software in the States. The company is called **Electrosoft** and the address is **1656 South California Street, Loveland, CO 80537 USA**. The software they advertise is designed to work on the following Atari models: 400, 800, 600XL, 800XL, 1200XL,65XE and 130XE. All programs are available on disk, tape or in cartridge form which should suit virtually all users. There are a total of four programs available to cover c.w., RTTY, ASCII and Packet - all have a transceive capability. Of course the usual warnings apply, i.e. buyer beware, particularly as I have no direct experience of this company. My thanks to **Nick Ashby** for taking the trouble to write.

Rally Programme

For those of you who would like to meet me and have a chat about the hobby, I will be attending a number of rallies during the year, helping out on the PW & SWM stand. The schedule is as follows:

RSGB VHF Convention Sandown Park, May 12.
Harrogate, May 20.
Elvaston Castle, Derby, June 10.
Cornish Rally, Truro, July 14.
BARTG Rally, September 16.
Llandudno, October 20/21.
Leicester, October 26/27.

If you can make any of these dates, I would be delighted to see you.

Back-Scatter

Amateur Satellites

Reports to
Pat Gowen G3IOR
17 Heath Crescent
Hellesdon, Norwich, Norfolk NR6 6DX

Welcome JO-20

The new Japanese satellite is now up, on, and fully active. It is operating to the best intentions of JARL and JAMSAT, and to everyones' complete delight and satisfaction.

Shozo Hara JA1AN, President of the Japan Amateur Radio League wrote on 7 February to announce the successful launch and send an early set of Keplerian elements. He said that the H-1 No.6 launch vehicle lifted off from the Tanegashima Space Centre at 0133UTC on 7 February, carrying not only the main MOS-1-B and JAS-1-B, but another very similar satellite in shape and weight to JAS-1-B called 'DEBUT', standing for DEployable Boom and Umbrella Test. Separation of JAS-1-B from the launch vehicle was at 0233, and the first signals from the 100 mW 435.795MHz telemetry beacon were heard in Tokyo at 0309. "The condition of the bird seems good, and the beacon signal with c.w. telemetry can be heard well" says Shozo. "JAS-1-B was named 'FUJI no.2' in Japanese, and may also be called 'FUJI-OSCAR-20'. Information will be distributed through mail and CompuServe net hereafter".

Whilst the analogue downlink signals and the beacon are not quite so strong as the new microsats, the distance from the observer being far greater, they can nevertheless be copied by using a simple ground plane antenna to the receiver. A 13-element crossed az-el steered Yagi with a GaAsf.e.t. pre-amplifier gives strong S8-9 signals, with remarkable freedom from the signal variations that were to be expected from the satellite due to toppling and tumbling prior to attaining magnetic stabilisation.

The orbit that it has been placed into by using up the spare fuel from the launch vehicle for extra boost has placed the satellite, as planned, into a 0.054 eccentricity elliptical orbit, with a perigee of 938km and an apogee of 1715km. This is highly advantageous, and not only provides for far longer periods out of earth's shadow to give additional solar power, but permits some very long range real time satellite QSOs to take place.

According to the position of the apogee, it brings into mutual range of the UK stations from Northern Japan, JA7 and 8, all of the West Indies, coastal South American prefixes such as 8R, YV, FY7, PZ, PY8, etc. and North American call areas such as W5, 6, 7 and 0. This apogee point moves quite rapidly and regularly between 80 degrees north and 80 degrees south, which rate has been calculated for us by **David Rowan G4CUO**.

On 19 February 1990 it was at 044 degrees north, giving extensive west and east coverage. 12 March 1990 places the 1745km apogee point at 080 degrees north, so giving maximum DX possibilities to semi-polar paths such as W6, W7, UA0, JA, etc. After hovering here for some 2-3 days, from then on it goes south bound, reaching the equator on 19 April 1990. It gets to the furthest point of 080 degrees south on 28 May 1990 for a further 2-3 days, so leaving the northern hemisphere operators with the 948km perigee, and hence the shorter haul contacts, but the strongest signals. From then on FO-20 will be north bound again, crossing the equator on 5 July, and reaching 080 degrees north again on 12 August 1990, to then repeat the cycle. The shift forms a sine wave of a mean intermediate latitude rate some 2.1 degrees per day, and this knowledge can be put to good use by path planning to give optimum range QSOs.

From NASDA come the following set of elements for the new JAS-1-B satellite,

Satellite	OSCAR-20 / FUJI-2
Catalogue Number	Not yet available
Element Set Number	NASDA 1
Epoch Year	90
Epoch Day	040.13586675
Inclination	99.0584
Right Asc. of Asc.Node	110.7308
Eccentricity	0.0540749
Argument of Perigee	338.5863
Mean Anomaly	19.3368
Mean Motion	12.83127298
Acc. Decay rate or Drag	0.00019574 (1.96E-04)
Epoch Orbit Number	32
Beacon Frequencies	435.895MHz (Analogue c.w.) 435.910MHz (Digital Packet)
Semi-Major Axis	7704.9996km

A good equator crossing reference for FO-20 is orbit 125 on 16 February 1990 at 0917.43UTC when EQX was at 168.84 degrees west. The nodal period is 112.282235 minutes and the increment 28.083757 degrees west per orbit.

A set of UK passes for the week end of 14 April appear as Fig.1 showing acquisition of signal, loss of signal, time of closest approach and maximum elevation. As the set used above has yet to be refined, accuracy is limited, and it is likely that passes may occur a little later than suggested.

As a reminder to that already published in this column, the analogue 'JA' transponder inverts from an uplink passband from 145.900 to 146.000MHz to give a downlink from 435.900 to 435.800MHz. Stations operating with c.w. use the lower half of the downlink, s.s.b. the upper, and mixed mode the centre.

AMSAT AMS-81 TRACKING

ACCESS SKED FROM: 14APR90

>>G3IOR VIA OSCAR 20

DAY	AOS	LOS	MAX	EL
14APR	0032	0039	0036	01
14APR	0629	0635	0632	01
14APR	0817	0834	0825	24
14APR	1007	1026	1017	65
14APR	1158	1215	1206	23
14APR	1347	1401	1354	09
14APR	1534	1547	1541	08
14APR	1718	1737	1728	18
14APR	1904	1927	1916	46
14APR	2054	2118	2106	62
14APR	2248	2308	2258	18
15APR	0645	0653	0649	03
15APR	0833	0851	0842	30
15APR	1024	1043	1033	58
15APR	1214	1231	1222	19
15APR	1403	1416	1410	08
15APR	1549	1604	1557	09
15APR	1734	1753	1744	20
15APR	1920	1944	1932	53
15APR	2110	2134	2122	52
15APR	2306	2324	2315	14

Fig. 1

SATELLITE (DOVE-1) TELEMETRY ORB. N. 00311

time mon feb 12 20:34:42 1990 - uptime 060/06:05:48

N.	PART	VAL	U. MIS
00	Rx E/F Audio (Wide)	2.1894	V(p-p)
01	Rx E/F Audio (Narr)	2.1894	V(p-p)
02	Mixer Bias Volt	1.3668	Volts
03	Oscillat. Bias Volt	.4896	Volts
04	Rx A Audio (Wide)	2.1648	V(p-p)
05	Rx A Audio (Narrow)	2.1648	V(p-p)
06	Rx A DISC	.411079999	Khz
07	Rx A S-Meter	70	Counts
08	Rx E/F DISC	-1.08047999	Khz
09	Rx E/F S-Meter	102	Counts
10	+5 Volt Bus	4.941	Volts
11	+5V Rx Current	.0218	Amps
12	+2.5V VREF	2.5056	Volts
13	8.5V REF	8.4065	Volts
14	IR Detector	0	Counts
15	LO Monitor I	1.258e-03	Amps
16	+10V Bus	10.4545	Volts
17	GASFET Bias I	4.446e-03	Amps
18	Ground REF	0	Volts
19	+Z Array	.1023	Volts
20	Rx Temperature	-1.81699994	Deg. C
21	+X (Rx) Temperature	9.07480005	Deg. C
22	Battery 1	1.2921652	Volts
23	Battery 2	1.2892496	Volts
24	Battery 3	1.2830442	Volts
25	Battery 4	1.273186	Volts
26	Battery 5	1.288688	Volts
27	Battery 6	1.311335	Volts
28	Battery 7	1.290445	Volts
29	Battery 8	1.2825936	Volts
30	Array	9.797	Volts
31	+5V Bus	4.8648	Volts
32	+8.5V Bus	8.552	Volts
33	+10V Bus	10.9514	Volts
34	BCR Set Point	130.318	Counts
35	BCR Load Current	.19908	Amps
36	+8.5V Bus Current	.059164	Amps
37	+5V Bus Current	.20328	Amps
38	-X Array Current	-8.6e-03	Amps
39	+X Array Current	-.01349	Amps
40	-Y Array Current	-.01196	Amps
41	+Y Array Current	-.01141	Amps
42	-Z Array Current	-.01653	Amps
43	+Z Array Current	-.01137	Amps
44	Ext Power Current	-.02	Amps
45	BCR Input Current	.19119	Amps
46	BCR Output Current	-.01724	Amps
47	Battery 1 Temperat.	6.04930005	Deg. C
48	Battery 2 Temperat.	-21.1802	Deg. C
49	Baseplt Temperature	5.44420001	Deg. C
50	FM TX-1 RF OUT	.0367744	Watts
51	FM TX-2 RF OUT	4.395546	Watts
52	PSK TX HPA Temper.	-15.1292	Deg. C
53	+Y Array Temper.	11.4952	Deg. C
54	RC PSK HPA Temper.	1.81360003	Deg. C
55	RC PSK BP Temper.	3.02380005	Deg. C
56	+Z Array Temper.	-6.65779999	Deg. C
57	TX Band-S OUT	.57552	Watts
58	HPA Band-S Temper.	101.05	Deg. C

Fig. 2

Back-Scatter

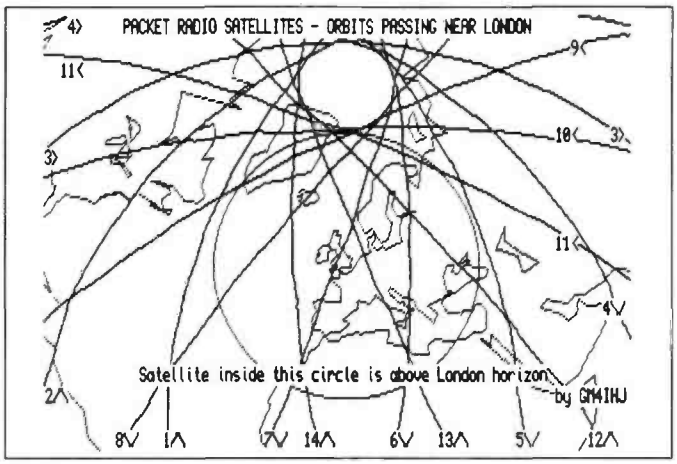


Fig. 3

Don't forget that to get u.s.b. on the downlink, you will need to transmit l.s.b. on the uplink.

In the first week of mode 'JA' analogue transponder s.s.b. operation, Dave Rowan G4CUO worked 10 states, 11 countries, and as well as many Europeans, had s.s.b. QSOs with AB4SF, VE1MR, VE2LI, VE6LQ and VE7DOX. He states "I am absolutely delighted with the new satellite, and just hope that it stays as much as possible on the 'JA' transponder for c.w. and s.s.b. QSOs, as the packet radio 'JD' mode enthusiasts are already well endowed with ample opportunities with the new microsats". Dave's comments are echoed by many other satellite enthusiasts!

One of these is **George Elliott VE2LI**, who is ex-G5LI in Quebec. He has been licensed for 50 years now, and really enjoys the challenges presented by new satellites with readily accessible modes. George writes that he is rather disappointed with Mode 'B' on OSCAR-13, due to high levels of power now in use by DX chasers coupled with s.s.b. trespass below 145.900MHz into the c.w. band. "It reminds me of 14MHz" writes George. "Some signals are 20dB over the beacon, and out of band. I shall be active on OSCAR-20 for sure.".

Art Davies G4JY of Stourbridge made a really long haul QSO by working Dave N7ZL, who has retired to an island at the extreme north west tip of Washington state.

I had a spell with the satellite, and worked a few old European friends last heard on FUJI-OSCAR-12. My 20W c.w. uplink from a GP antenna was adequate, providing a RST539 downlink using a simple dual vertical on 435MHz. Even a 1.5W hand-held rubber duck antenna produced a RST417 downlink signal, so evidencing the excellent 'JA' mode transponder sensitivity. The one regret was that several French speaking terrestrial f.m. users illegally using the exclusive space only allocated 145.800 - 146.000MHz band could be heard causing wide band QRM upsetting the otherwise quiet downlink passband. They were 'fully quieting', thus giving an opportunity for monitor stations to address them with a memorandum on their obligations.

After a week of continuous mode 'JA', FO-20 came on with mode 'JD' packet mailbox mode, with the 435.910MHz 1W digital downlink and beacon some 9dB stronger than the 'JA' counterpart. David Sylvester, G2BFO of Denmead near Portsmouth said "The digital mailbox is going like a bomb, 847 messages were loaded in the first 3 days of digital operation, and the decoding is excellent." Even with simultaneous transponder mode 'JA' plus 'JD' operation, no battery depletion could be detected, so bearing out the statement of JA1AN that "..the signal is strong and stable, and the power generation seems enough too.".

As a further reminder, the single 435.910MHz downlink is fed by uplinks on 145.850, 145.870, 145.890 and 145.910MHz.

The Microsats

It is just as well that the SPOT-II launch carrying the six amateur radio microsatellites was not postponed to the following Ariane mission, as two minutes into mission after an offset main stage thruster succeeded in burning the launch gantry on take off, the rocket exploded, losing the cargo of two very valuable Japanese satellites. As it is, all seems to be well with the exception of UoSAT-E alias OSCAR-15, and good progress is now being made with the arduous task of loading each of the remaining five new mini-satellites.

OSCAR-14, UoSAT-D on 435.070MHz a.f.s.k. and 435.250MHz appears to be very healthy, and is now up and running on the Forth Diary, so permitting WOD telemetry storage on the whole orbit. The control software to magnetically arrest the complex toppling and tumbling has been loaded up, with the detector magnetometer deployed just 300mm out on an arm so as to avoid the fields generated from the satellite itself. As soon as the satellite is stabilised, the gravity gradient boom will be deployed, and a stable signal will result. The same system as that used for OSCARs 9 and 11 will be employed, and no difficulties with decoding are foreseen.

OSCAR-15, UoSAT-E, is distinctly unwell at the time of writing. After two days of good 435.120MHz 9600b.p.s. a.f.s.k. signals, nothing more was heard after 0500UTC on 23 January, despite continuous attempts by the University of Surrey command to activate the redundant on-board systems. Some listeners have reported weak signals on 435.100MHz, but, with so many mystery satellites now being discovered on the 700mm band, these cannot definitely be related as coming from U-o-15. There are rumours, backed up by the rather different than expected set of Keplerian elements discovered for this satellite, of a possible collision, the terminal results of which were delayed. Such slow death might have occurred if the solar panels were impacted, resulting in a drainage of battery power, or the failure of the panels to permit battery re-charge.

The services of the giant radio telescope at Stanford, California, are being enlisted to seek for the 136MHz band - 60dB receiver local oscillator signals, which, according to the findings, will confirm or deny the continuity of the power systems. Similarly, any ultra-weak beacon driver signals might be detectable on the nominal downlink frequency, this telling if the final amplifier is out or if antenna damage has been sustained. Martin **Sweeting G3YJO** appeals to anyone with such listening capability to attempt this exercise. "If anyone heard signals after the 0500 January 23 last detection and 1000 on the same day when first missed, please let us know at the UoS, as this will help to narrow the window" writes Martin.

OSCAR-16, PACSAT, transmitting normal psk on on 437.02625MHz and raised cosine modulation on 437.05130MHz is now working as a repeater, and will be ready for use by early April. The 2401.142MHz beacon was heard at by K0RZ at 30dB over noise using a 4 foot dish and a 0.8 dB NF pre-amplifier. All the telemetry readings look good, showing this satellite to be in excellent health.

DOVE, OSCAR-17, will be the last to be loaded, as a vast amount of information needs to be beamed up to its memory before full operation and 145.82516MHz speech f.m. messages result. It has a secondary transmitter on 145.82438MHz. Until it is finalised, probably by mid April if all goes smoothly, it will continue to transmit packet telemetry with the continued excellent copy that many listeners have noted. A plea is made to those who have brought their 144.650MHz packet systems up to the space band - please - remember to turn off your c.w. identifiers, as many callsigns are being transmitted on the satellite frequency and ruining the efforts of those trying to follow the telemetry values.

A complete set of DOVE telemetry taken on orbit 311 has been provided by **Gianni IT9UJY** on Sicily. This is seen as our Fig. 2. Apologies for the truncation of the DOVE TLM last month - this is in hand and will be completed as soon as space permits.

WEBERSAT OSCAR-18 is almost loaded up now, and should be fully functional by April. WEBERSAT, like DOVE and LUSAT, has been heard dumping up to 65K of packet in one go. This does not occur on PACSAT, and is a mystery at this time. It transmits normal p.s.k. on 437.07510MHz, and raised cosine on 437.10200MHz.

OSCAR-19, LU-SAT transmits normal p.s.k. on 437.15355MHz and raised cosine on 437.12580MHz. It will be loaded and made functional as soon as WEBERSAT and PACSAT are finalised.

Microsat Keplerian Elements

Whilst early NORAD location gave good discrimination between the eight different objects placed in orbit by the ARIANE launch, only successive AOS, LOS and Doppler TCA curves could be used to determine which object was which. It was not too difficult to eliminate the SPOT-II satellite and the ARIANE third stage, but the AMSAT cluster were very tightly packed in the first week following launch. The enigma of unravelling the bunch to discreet satellites was performed after the first few days of flight by Ray Soifer W2RS, Bob McGwier N4HY, Phil Karn KA9Q and many others, who plugged in the supplied NASA/NORAD set of personal Keplerian elements, and then watched the individual satellites for close fits to attempt to match the assigned object numbers. It could not be stated categorically that the OSCAR satellite number to the found object number was absolute, as these were early indications.

The set of Keplerian elements and the assignments given were as follows:

Satellite	U-o-14	U-o-15
Catalogue Number	20439	20443
Element Set Number	8	7
Epoch Year	90	90
Epoch Day	024.31223425	023.82219061
Inclination	98.7121	98.7165
RAAN	100.7773	100.2885
Eccentricity	0.0011029	0.0010048
Argument of Perigee	209.0952	210.8523
Mean Anomaly	150.9520	149.2068
Mean Motion	14.28443513	14.28223237
Acc. Decay rate/Drag	1.5545E-04	3.0107E-04
Epoch Orbit Number	32	25
Beacon Frequencies	435.070, 435.120,	428.010 & 429.985MHz

Satellite	AO-16	DO-17
Catalogue Number	20438	20440
Element Set Number	3	3
Epoch Year	90	90
Epoch Day	024.38214443	024.38209160
Inclination	98.7174	98.7160
RAAN	100.8496	100.8517
Eccentricity	0.0011059	0.0011276
Argument of Perigee	210.2871	211.1319
Mean Anomaly	149.7737	148.8824
Mean Motion	14.28586878	14.28569390
Acc. Decay rate/Drag	3.8261E-04	2.3136E-04
Epoch Orbit Number	33	33
Beacon Frequencies	437.050, 145.825, (May also be switched to. 437.025MHz)	

Satellite	WO-18	LO-19
Catalogue Number	20441	20442
Element Set Number.	2	4
Epoch Year	90	90
Epoch Day	024.31185946	024.38180079
Inclination	98.7168	98.7167
RAAN	100.7824	100.8503
Eccentricity	0.0011162	0.0012258

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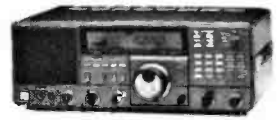

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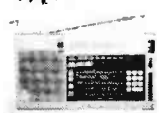

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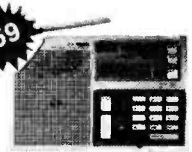

Back-Scatter

Argument of Perigee	214.17778	210.6580
Mean Anomaly	145.7732	149.3875
Mean Motion	14.28705650	14.28756933
Acc. Decay rate/Drag	1.3144E-04	1.7243E-04
Epoch Orbit Number	32	33
Beacon Frequencies	437.100, 437.150, (May also be switched to. 437.075MHz) 437.125MHz	

Sat. Name	Nodal Period in minutes	Increment in deg W	Date EQX	Orbit No.	UTC EQX	Deg. W EQX
UO-14	100.863378	25.214710	16/2	361	0833.85	150.76
UO-15	100.878996	25.218588	16/2	361	0839.46	152.16
PO-16	100.857114	25.213066	16/2	361	0831.65	150.19
DO-17	100.854802	25.212496	16/2	361	0830.84	149.99
WO-18	100.846797	25.210488	16/2	361	0827.92	149.26
LO-19	100.842013	25.209280	16/2	361	0826.20	148.82

The SPOT-II satellite was well defined, as object 90-05-A, whilst the third stage of the launcher was 90-05-H, both of which are visible to the eye and are high profile RADAR reflectors. These are well separated from the microsat pack now, and can be eliminated from the group identification matchings.

In the third week of February, NORAD and NASA shed further light by assigning the object numbers and different catalogue numbers, which were then further identified with the still closely packed amateur satellite stream. The latest information is that object number 90-05-B is catalogue number 20437, OSCAR-14, UoSAT-D; Object 90-05-C, catalogue number 20438 is OSCAR-15, UoSAT-E; Object 90-05-D is catalogue number 20439, PACSAT OSCAR-16. Object 90-05-E is catalogue number 20440 is DOVE, OSCAR-17; Object 90-05-F is catalogue number 20441, WEBERSAT, OSCAR-18, and that object number 90-05-G is catalogue number 20442, LU-SAT, OSCAR-19.

By the time you apply these elements, the tightly packed bunch will have spread out, so permitting defined AOS, TCA and LOS times. You will then know if your findings agree or otherwise with the calculated passes for your location, and will be able to adjust if this is necessary. Next month we will publish the full and latest set, by when all will be definite.

For those using plotters or calculators for tracking, here follows the information on the period and westerly increment per orbit, plus a reference equator crossing giving date, orbit number,UTCt ime of crossing and the degrees west of that crossing. Note how the missing UO-15 is way out ahead of the others. See Table above.

John Branegan GM4IHJ has sent in Fig. 3, his computer graphics derived plot of ground tracks for the average microsats, showing those passing in range of the UK, based on London. He gives the approximate UTC pass times, plus or minus 50 minutes as pass 1, 0040; 2, 0220; 3, 0400; 4, 0540; 5, 0720; 6, 0900; 7, 1040; 8, 1220; 9, 1400; 10, 1540; 11, 1720; 12, 1900; 13, 2040, and pass 14 2220. The arrow on the track indicates the direction of the pass. It can be seen that the UK is well served by abundant opportunities. John finds that so far PACSAT is 50% printable on the 437.050MHz primary frequency, but is too weak on 437.025MHz. "LUSAT on 437.150MHz is stronger, giving 45% copy even on the low angle polar passes, whilst LUSAT on 437.125MHz is good copy" writes John. "Both PACSAT and LUSAT signals flutter at some 5kHz when the satellites are near the poles in the afternoons, but LUSAT is strong enough to override and still print - PACSAT is not.".

OSCAR-10

A-O-10 was out of sunlight for several weeks in February, when no transponder use was permitted. If it has again, as expected, overcome the rigours of the dead period, it should be up, and running and capable of good mode 'B' transponding by the time you read this column. The attitude for the future is as follows: April, ALON 28/ -11 ALAT; July, 17/-5; October, 5/2; January 1991, 353/9. Remember that with the IHU gone bust, no magnotorquer re-orientation of the satellite attitude is possible.

OSCAR-13

AO-13 users will be well aware that the best communications are provided when the main lobes of the satellite are pointing directly at the user station on earth, so providing the best possible uplink transponding and the strongest and least spin modulated downlink. This ideal condition cannot always be maintained, as the power charge storage of the battery has to be considered by ensuring that the solar cells see the most direct sunlight. The antenna pointing attitude of OSCAR-13, as at March 19 is ALAT 207, ALON 1.7 degrees. On April 6 it goes to 207.6 and 1.1, on April 16 207.8 and 0.6, and on April 30 208 and 0.1. Until the next ground commanded change to provide optimum solar cell charge relative to the best antenna pointing the schedule, the OSCAR-13 operational transponder schedule until 9 May 1990 is:

Mode 'B' transponder on from MA 0 to MA 165.

Mode 'JL' transponder on from MA 165 to MA 190.

Mode 'LS' transponder on from MA 190 to MA 195.

('S' beacon plus 'L' transponder on).

Mode 'S' transponder on from from MA 195 to MA 200.

Mode 'BS' on from Mean Anomaly 200 to MA 205.

Mode 'B' transponder on again from MA 205 to MA 256.

The omni-directional antennas are employed around perigee between MA 240 and MA 060, and only the 'S' mode transponder plus the 'B' beacon will be on from MA 195 to MA 200.

Back-Scatter

Propagation

Reports to
Ron Ham
Faraday
Greyfriars, Storrington, West Sussex RH20 4HE

In January, **Ron Livesey** (Edinburgh), using 1.5 and 2.5in refractor telescopes to ***project*** the solar image on to a 2.5 or 4in screen, located five active areas on the sun's disc on days 5, 10, 18 and 24, six on the 31st, seven on days 12, 13, 19 and 26, eight on the 14th and nine on the 28th. "The mean sunspot number for January was 179.4," wrote **Neil Clarke G0CAS** (Ferrybridge) and kindly prepared a graph, Fig. 6a, showing the high number of solar flux units during the second half of the month.

No doubt the cause of this massive increase was the progress of the large sunspot group, seen and drawn by **Patrick Moore** at his observatory in Selsey, between the 24th and 28th, Figs. 1, 2 and 3. Despite cloud interruptions, **Cmdr Henry Hatfield** (Sevenoaks), observing the sun with his spectrohelioscope, located four spot groups, 13 filaments, 10 quiescent prominences and the remains of an eruptive prominence, with a greater than 4-Angstroms bandwidth, at 1240 on February 2, three doubles and one large spots, 24 fils and 9 small QPs at 1100 on the 9th, two groups, 28 fils and 16 QPs at 1332 on the 12th, one group, 29 fils and 1 large, 4 medium and 4 small QPs at 1115 on the 16th four groups, 22 fils and 9 QPs at 1045 on the 21st and 22nd and four groups, 26 fils, 15 QPs and a small sub-flare subsiding, at 1210 on the 23rd. A couple of massive filaments can be seen dominating the area of the sun in Fig. 7 which Henry photographed, via his special instrument, at 0956 last August 28.

Henry's radio-telescope recorded periods of continuous solar radio noise at 136MHz on February 2, 11, 12, 13 and 27 and a few individual bursts on days 11, 12 and 27. In Plymouth, **Ern Warwick** heard variations in the receiver background on 28MHz at 1130 on January 21 and around noon on February 11 and in Bristol, **Ted Waring** counted 15 sunspots on the 2nd and 40 on the 21st.

Auroral

Ron Livesy, the auroral coordinator for the British Astronomical Association, received reports of auroral 'glow' from the Ocean Weather Ship *Cumulus* on January 5 and observers in Kirkwall on days 6, 17, 26 and 28; 'arcs or bands', from Kirkwall and Alness on the 2nd and 30th respectively; 'rayed arcs', from Machrihanish and the Isle of Man on the 1st and 14th; 'rays' and 'active, flaming and flickering' from Alness and Kirkwall on the 24th and 30th.

Tony Hopwood (Upton on Severn) and **Doug Smillie** heard the auroral influence on some radio signals on the 29th and 30th respectively. Ern Warwick noted strong echos on signals about 500km away and weaker on signals around 2000km away at 1300 on January 28, slight echos on the beacons WA4DJS (28MHz) on the 26th and KH6O/B (14MHz) on the 29th and February 1. He also reports that signals from the German beacon DK0WCY (10MHz) was influenced by "weak aurora" at 1840 on February 23 and 1825 on the 24th. Many of you, unfamiliar with this effect may remember hearing the normal sharp note of a c.w. signal become horribly 'raspy' and/or a single side-band transmission change to a 'ghostly' whisper and not realised that this was being caused by an auroral manifestation. Conditions like this are simply described as tone-A.

Magnetic

The 'jam jar' magnetometer, operated by Ron Livesey, detected 'storm thresholds' on January 5, 14, 20, 22, 23, 27 and 29. Ron received additional reports of 'pulses' from Doug Smillie (Wishaw), using a Hall effect

Back-Scatter

unit, on days 8, 13, 21, 22, 24, 29 and 30, 'large pulses' from **Garry Hawkins** (Bristol) on days 2, 22, 24 and 30 and 'very unsettled' from **Karl Lewis** (Saltash) on days 16, 20, 23, 24, 25, 29 and 30. Both Garry and Karl use fluxgate instruments. "The Ap index for January was quiet to unsettled," wrote Neil Clarke whose computer print out showing the daily index variations can be seen in Fig. 6b.

Sporadic-E and 'F2'

John Woodcock (Basingstoke) received unlockable pictures in Band I on January 11 and heard very strong Middle East type music and similar pictures at noon on the 23rd, **Simon Hamer** (New Radnor) logged smeary 'F2' pictures at 1230 on the 17th, 18th and 30th on Ch. E2 (48.25MHz) and **David Glenday** (Arbroath) logged weak 'F2' activity on Chs. E2 and R1 (49.75MHz) at 1215 on the 21st. Between them, David and Simon received televison signals from Finland, Iceland, Italy, Scandinavia and the USSR in Band I during outbreaks of Sporadic-E on January 5, 11, 12, 15, 16, 19 and 23. Ern Warwick found 28MHz almost dead on February 16 and reports a fade-out followed by a dead band during the afternoon of the 21st.

Propagation Beacons

First, my thanks to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Henry Hatfield, **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Ted Waring and Ern Warwick for all the 'extra' information they pack into their 28MHz beacon logs.

Although I cannot use all of it I can compile the monthly chart of when the beacons were heard, Fig. 5 and include some of the additional gen under the appropriate headings elsewhere in this column. Among the new beacons heard this time, Mark Appleby logged HG5GEW on 28.222MHz, "on the same spot as HG2BHA was before" and Ern Warwick copied 5B4ZL on 28.216MHz sending "QTH KM64 LX 2000m ASL 10 WATTS PSE QSL VIA ZC4EPI." Both Mark and Ern heard KC4DUK/B (28.220MHz) around 1620 on February 11 keying, "QSL PO BOX 5391 WILMINGTON/NC28403," most watchers logged KE5GY (28.202MHz) and a "new one from Nairobi just come up," said Ted Owen after he found 5Z4ERR on 28.245MHz on February 25. Ern Warwick has also received signals, almost daily, from IK6BAK on 24.915MHz and PY2AMI on 24.931MHz; OH2B, ZS6DN/B and 4X6TU/B on 14.100MHz and DK0WCY on 10.144MHz.

Tropospheric

The slightly rounded atmospheric pressure readings, Fig. 4, for the period January 26 to February 25 were taken at noon and midnight from the Short and Mason barograph which I have used continually since 1962. The graph in Fig. 8 shows extremes ranging from 29.1in

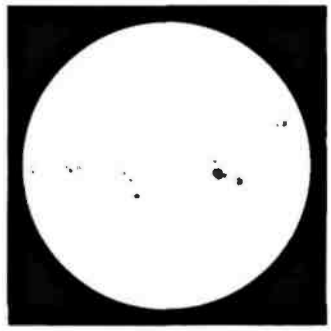

Fig. 1

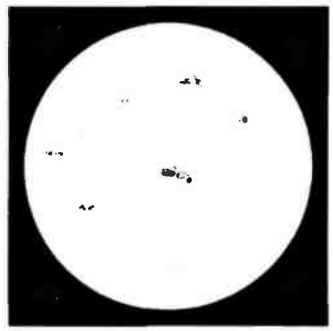

Fig. 2

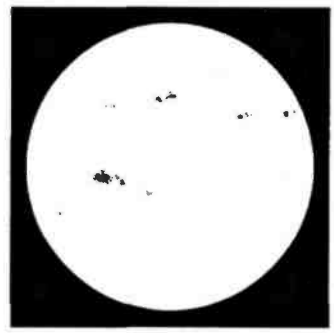

Fig. 3

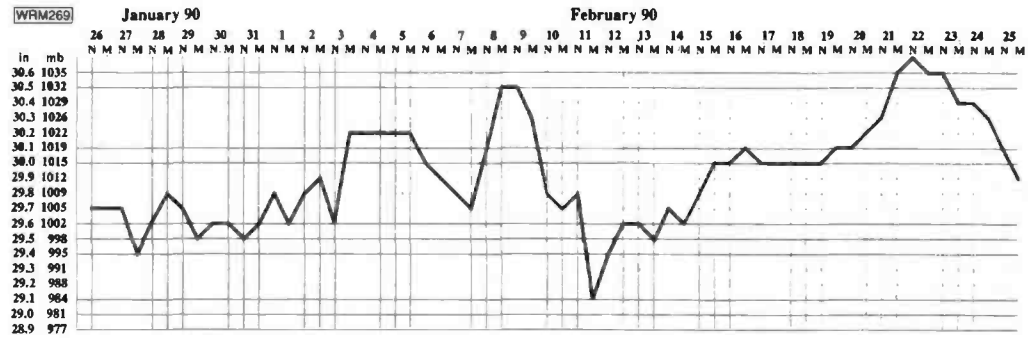

Fig. 4

Beacon	January 26	27	28	29	30	31	February 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
DF0AAB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X			X
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X
EA3JA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X
EA6RCM	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X			X							
HG5GEW		X		X	X	X	X	X	X			X	X	X		X	X	X	X					X			X		X	X	
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
KA1NSV																	X	X	X	X											
KB4UPI	X	X	X	X	X	X				X		X			X	X	X	X	X	X					X						X
KC4DPC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
KD4EC		X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X
KE2DI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X
KE5GY		X	X	X	X	X		X	X	X		X		X	X	X	X	X	X	X	X			X	X	X		X		X	
KF4MS		X	X	X	X	X	X	X	X	X		X			X		X	X	X	X	X				X	X	X	X	X	X	X
KJ4X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
KM4MY																X															
KW7Y		X	X									X						X	X									X			
LA5TEN	X	X		X	X									X	X	X	X	X	X									X			
LU1UG	X	X		X	X	X		X	X	X		X	X	X	X	X	X	X		X	X				X	X	X	X	X	X	X
NX20/B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X
N8CGY																		X			X										
OK0EG				X			X																								
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
PY2AMI	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	X
SK5TEN			X		X		X	X	X	X		X		X		X	X		X									X	X		
VE1MUF	X			X	X												X		X					X				X			
VE2HOT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X			X	X	X	X	X
VE3TEN				X			X	X	X	X	X	X	X		X	X	X	X	X	X	X			X			X	X	X	X	X
VE6YF	X	X	X	X	X														X												
VK2RSY			X							X		X	X		X	X	X	X	X	X	X			X	X	X		X			
VK5WI			X							X			X		X		X		X	X	X			X							
VK6RWA			X	X								X	X				X	X		X	X							X			
VS6TEN																X															
WA4DJS	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X
WB4JHS				X	X	X										X		X		X	X				X						
WC8E	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
W3VD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
W3SV/B																								X	X			X			X
W7JPI		X	X	X		X												X	X		X							X			
W8UR		X	X	X	X	X	X			X					X	X	X	X	X		X			X							
W9UXO	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
YO2KHP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X	
ZD8HF	X	X	X	X	X	X	X	X	X	X	X	X	XX	X	X	X	X	X			X	X	X	X	X		X				
ZL2MHF			X	X								X			X				X	X	X						X				
ZS1LA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X
ZS5VHF							X									X								X							
ZS6PW	X	X	X	X	X	X	X		X	X	X	X												X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4N3ZHK				X			X		X							X	X							X				X	X		
5B4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5B4ZL			X	X	X	X	X	X	X	X		X	X																		
5Z4ERR																							X	X		X		X	X		X

Fig. 5

Back-Scatter

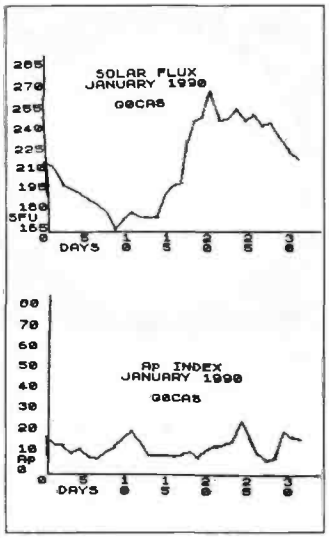

Fig. 6a & b: (top) graph supplied by Neil Clarke G0CAS shows the high number of solar flux units during the second half of January, (lower) daily variations of the Ap index in graph form also supplied by Neil Clarke G0CAS

(985mb) on February 11 to 30.7in (1039mb) on the 22nd and among these erratic changes was a sharp climb in pressure from 29.6in (1002mb) to 30.2in (1022mb) in a matter of 12 hours on the 3rd. However, the 'jackpot' came later when a gradual climb from 29.5in (998mb) at 1800 began on a windy February 28 and reached a record 31.0in (1050mb) at 1000 on a frosty, but bright, March 3, Fig. 8. The barometer gauge on the ex-RAF altimeter installed in my car, parked at 320m a.s.l., also indicated 1050mb and the BBC Radio 4 weather programme, at 1255 on the 3rd, referred to this as a record high for March so far this century.

Joan and I saw those 'warning' wispy clouds building up as the pressure was falling from 30.7in to 30.6in on the 22nd and, true to form, a short lived tropospheric opening occured and, around 1800, I received some very strong German stations in Band II and television pictures from Belgium (BRT) and CANAL+, on the French System 'L', in Band III.

Later that evening the Editor, **Rob Mannion** (Dorset) heard French and Spanish stations in Band II and observed heavy co-channel interference and at times total signal absorption in Bands IV and V and while the 'super' high was beginning to decline, Fig. 8, during the afternoon of March 4, there was another opening when Rob's wife heard an Arabic station and also identified programmes for the Canary Is., south-west France and Spain in Band II while Rob heard a Spanish amateur station, on 144MHz, using hand-held equipment! John Woodcock received pictures at varying strengths from CANAL+ mainly between 1000 and 1500 on February 6, 16, 19 and 24.

934MHz

"Whenever tropospheric conditions are good, very long ranges can be achieved with the legal 12-element beam antenna," wrote John Levesley UK-627, the contest manager for the 934MHz Club UK and added, "Even with a simple vertical aerial you can work well over 150 miles under lift conditions." John's best vertical to vertical contact was from his home in south-west Hampshire to a merchant vessel off Ushant, about 265km with 4 watts f.m. During February, John received signals from Guernsey on the 4th, 6th and 7th.

Fig. 7: A couple of massive filaments dominating the area of the sun photographed by Cmdr Henry Hatfield on 28 August 1989 at 0956UTC. Please note you should NEVER try to photograph the sun DIRECT, Henry Hatfield uses special scientific equipment to achieve these results. Looking directly at the sun could damage your sight permanently

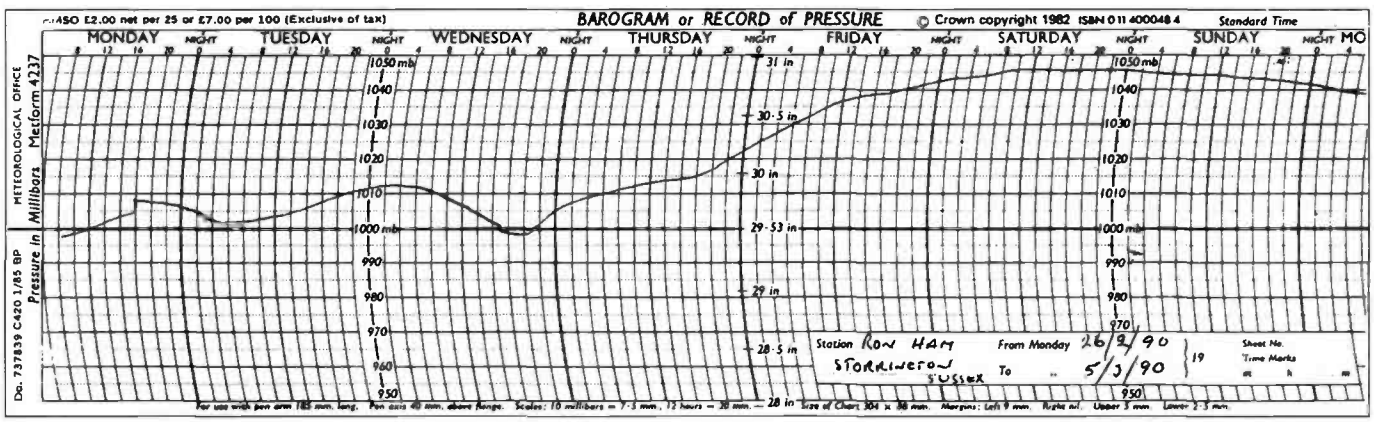

Fig. 8

Back-Scatter

Broadcast Round-up

Reports to
Peter Shaw

I reported in last month's column that a clandestine station had been heard in the Soviet Union, transmitting in the Azeri language, on frequencies used by the Soviet domestic second, or 'Mayak', programme. The Soviet government responded to this 'Freedom' station by broadcasting a new unidentified station, also in Azeri, giving the Soviet government view of the Azerbaijani situation, intersperse with reports from the international media and classical music from the West. No identification was made by the station and by making it sound a little like Western broadcasts, may have been intended to work against the 'counter-revolutionaries' in the trans-Caucasian region. The station was heard for a week or two starting in late January on numerous short wave frequencies.

Elsewhere in the East, Mr Frantisek Pavlicek, Czechoslovak Radio's new director, has apologised for twenty years of "knowingly giving precedence to lies over the truth" in Czech Radio's broadcasts. A group of radio journalists from Prague visited the Czechoslovak section of Radio Free Europe in mid February for the first time, and discussed co-operation between RFE and Czech Radio.

The Voice of the GDR [Stimme der DDR] has been renamed Deutschlandsender, and has transmitted under this title since February 12.

The external services of West and East Germany [Deutsche Welle and R Berlin International] have agreed to co-operate in some fields, whilst maintaining full independence. The Directors of the two organisations are particularly keen to work more closely together in technological matters, such as frequency co-ordination and study of listener and reception analyses. Last month in this column I asked what will happen to DW and RBI on completion of German unification later this year, and this agreement between the Directors may well be a precursor to a merger.

Radio Budapest has introduced four new language services heard twice a day for fifteen minutes, in Russian, Romanian, Serbo-Croat and Slovak. The programmes are heard in the morning and evening [see European News for further details].

Radio Sweden has announced proposals to increase priority to Russian, German and English broadcasts, whilst some other languages, including Spanish and French, may have to suffer cutbacks. The station also wishes to increase its transmissions in Estonian and Latvian, and

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to start Polish language broadcasts.

Meanwhile a Danish politician has suggested at the Nordic Council session held recently in Iceland that the Nordic countries should establish a joint radio station to broadcast all over the world. The proposal suggests that the programmes could be produced by journalists in the different Scandinavian countries, and then put together in a joint main broadcasting office.

A Swedish commercial station has commenced test transmissions from facilities in Poland twice daily. Based in Malmo, Radio Scandinavia was last heard of when it broadcast from Radio Andorra's h.f. transmitter in the late 1970s.

A new station beaming to Cuba in Spanish has started using the facilities of WHRI in the United States and Radio Clarin in the Dominican Republic. The Voice of the Foundation is put together by the Cuban American National Foundation in Miami, claiming that it is an integral and important part of the Cuban society in the United States.

A new 500kW transmitter has been inaugurated at Africa No 1 in Libreville, Gabon.

Radio Canada International's German language broadcasts were heard for the last time on February 23. Attempts to secure financing for the service were unsuccessful.

The Voice of America is to cease services in six languages during the summer, including Greek, Turkish, Slovene and Laotian from April 1, and Uzbek and Swahili on June 1. The decision to close the Uzbek language section may perhaps be reversed in view of the current situation in parts of the Soviet Union where unrest continues and nationalist fervour continues to make the news. More than 200 jobs have been cut from the Voice since December 1987, and this reduction has gone hand in hand with reductions in advertising, promotion and foreign travel for staff.

European Stations

All time GMT/UTC

Radio Tirana has announced its current English language schedule:

To Europe
0630 on 9.50 & 7.205MHz
1830 on 9.48, 7.12 & 1.395MHz
2230 on 9.48, 7.215 & 1.395MHz

To North America
0230 on 11.825 & 9.76MHz
0330 on 11.825 & 9.76MHz
2330 on 11.825, 9.76 & 6.12MHz

To Asia and Australasia
0700 on 11.835 & 9.50MHz
1300 on 11.855 & 9.50MHz

To Africa
0430 on 11.835 & 9.50MHz
1530 on 11.835 & 9.50MHz

Radio Prague's English transmissions to all areas are:
0100-0200 on 13.715, 11.99, 11.68, 9.54, 7.345 & 5.93MHz
0300-0400 on 13.715, 11.99, 11.68, 9.54, 7.345 & 5.93MHz
0730-0800 on 21.705, 17.84 & 11.685MHz
0830-0900 on 21.705, 17.84 & 11.685MHz [to 0930 Sat/Sun]
1430-1500 on 21.505, 17.84, 15.155, 15.11, 13.715 & 11.685MHz
1530-1625 on 21.505, 17.84, 17.64, 15.155, 15.11, 13.715, 11.99, 11.685, 7.345 & 5.90MHz (inc European TX)
1730-1825 on 21.505, 17.84, 15.11, 13.715, 11.99, 11.685 & 9.605MHz
1800-1830 on 7.345 & 5.93MHz (to Europe)
1900-2000 on 7.345 & 5.93MHz (to Europe)
2200-2230 on 6.055 & 1.287MHz (to Europe)

Radio Denmark is presently being relayed by transmitters belonging to Radio Norway International. European transmissions are:
0630-0655 on 15.16 & 5.98MHz
0730-0755 on 21.73 & 15.165MHz
1730-1755 on 21.705, 15.22 & 9.655MHz

Radio Budapest's new transmissions to Eastern Europe may be heard on 6.11MHz as per:
0400-0415 in Russian
0415-0430 in Romanian
0500-0515 in Slovak
0515-0530 in Serbo-Croat

Evening transmissions in these four new languages start at 1700, but are inaudible in the United Kingdom since 6.11MHz carries Budapest in Turkish at that time. It is assumed that the same frequency is used from two different transmitter sites at that hour.

Radio Mediterranean from Malta has not been heard for some weeks. The station, which used the facilities of the Deutsche Welle relay station on the island, transmitted in English, French and Arabic on 6.11 and 1.557MHz during the evening at 1800 and again at 2130.

Radio Bucharest in Romania has English broadcasts:
0200-0300 on 11.94, 11.83, 9.57, 9.51, 6.155 & 5.99MHz
0400-0430 on 11.94, 11.83, 9.57, 9.51, 6.155 & 5.99MHz
0530-0600 on 17.745, 17.72 & 15.38MHz
0645-0715 on 21.55, 17.805, 17.72, 15.335, 15.25 & 11.94MHz
1200-1230 on 17.72 & 15.34MHz
1300-1400 on 21.55, 17.85, 15.365 & 11.94MHz
1500-1530 on 17.745, 17.72, 15.335, 15.25 & 11.94MHz
1730-1800 on 17.72, 15.365, 15.34 & 11.94MHz
1930-2030 on 9.69, 7.195, 7.105 & 6.105MHz
2100-2130 on 9.69, 7.195, 7.105, 6.105 & 5.99MHz

Radio Exterior de Espana is asking for listeners' help in assembling a profile of the station's audience and what they want from the station. Questionnaires, in Spanish, have been sent out to listeners on their mailing list, and further copies are available by writing to REE, Apartado 156.202, 28080 Madrid, Spain. There is a reward for one lucky listener: a week's holiday in the area of Spain of their choice - all expenses paid, naturally.

The test transmissions of Radio Scandinavia by Radio Polonia are heard between 1000 and 1100 on 9.675MHz, with a repeat at 2000 on 1.503MHz. The address of the station is PO Box 14006, 20024 Malmo, Sweden.

Middle Eastern and African Stations

Domestic programmes from the Sierra Leone Broadcasting Service open at 0600 in the morning on 3.316MHz, continuing until 0810 when the frequency changes to 5.98 (which is generally inaudible in Europe), returning to 3.316MHz at 1730 or thereabouts. Closedown is at 2315. English news is broadcast throughout the day.

Radio Mogadishu from Somalia appears to have closed down. Previously heard on 6.095 or 9.585 with 50kW the external service has been unheard for more than a year.

Capital Radio from Transkei broadcasts in English on 3.927MHz from 0230 daily until frequency change at 0440 or thereabouts to 7.15MHz. At 1530, the frequency reverts to 3.927MHz. Closedown is at 2300.

Asian and Pacific Stations

Radio Afghanistan in Kabul which is run by the Soviet backed government has English transmissions beamed to Europe daily at 1830 until 1930 on 6.02, 7.215 and 9.635MHz. English to Asia is transmitted at 0930 until 1030 on 17.72, 15.35, 9.635 and 4.94MHz. The 4MHz frequency is a relay within the Soviet Union.

Radio Japan's English language broadcasts in its General Service are beamed to Europe at:
0700-0800 on 21.69, 21.50, 17.89, 17.81 & 17.765MHz
1500-1600 on 21.70, 11.865 & 11.815MHz
2100-2130 on 17.89, 17.81, 15.27, 15.23, 11.835 & 11.815MHz
2300-2400 on 21.61, 17.81, 17.765, 15.195 & 11.835MHz

North, Central and South American Stations

The World Service of the Christian Science Monitor continues to put in good signals to the United Kingdom, with specific transmissions to the European continent:
0000-0400 on 9.58 & 13.76MHz (not Monday)
0400-0600 on 9.84 & 13.76MHz (not Monday)
0600-1000 on 9.84MHz
1400-1600 on 21.78MHz
1600-2000 on 21.64MHz
2000-2200 on 13.77 & 15.16MHz

Listeners to Christian Science Monitor may get the latest frequency information by calling 617-450 2060 in the United States. Ring the 'Shortwave Hotline' on 617-450 2000 for other questions.

The Voice of the Foundation mentioned at the beginning of this article is beamed to Cuba and Latin America in Spanish between 1500 and 1600 on 21.84MHz, and from 0100 until 0200 on 9.495MHz, and to Europe at the same time on 7.315MHz.

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ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN28PH

Slow Scan TV & FAX on the Amiga

I know from the feedback I get that there are a lot of people with Amigas who would like to put them to use in amateur television: there are probably even more who are sitting on the brink and might be swayed if they knew there was some decent software around. In these pages we have already reviewed VideoStudio and mentioned some other so-called desktop video programs, but only made passing mention of slow-scan applications.

This time I shall make amends and bring you details of a comprehensive SSTV and FAX package. Please bear in mind that this is all based on the manufacturer's information: as no-one has this package in use here yet I can't give you any personal assessment (that should get someone writing!!!).

The program is called AVT Master, from Black Belt Systems; it was written by Ben Blish N4EJI and is distributed in the USA on behalf of Black Belt by Advanced Electronic Applications Inc. of Lynnwood, Washington. I believe it is available here from ICS Electronics Ltd, Unit V, Rudford Industrial Estate, Ford, Arundel, Sussex BN18 0NX. The price is $300 in the USA and £299.95 in the UK (including VAT, post

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and packing). My advice is to order it from the States. (*Don't forget the import charges, duty on duty and other hidden costs, Ed*). I'd love to know why importers always get such a bad exchange rate - surely with all their dealings, they ought to be able to get an even better one than us mere members of the public! Back to the software, though.

AVT stands for Amiga Video Transceiver and comprises a software system, associated hardware and a cable which connects to your Amiga's parallel port. The supplier makes great play of the system's versatility and claims that even if you do not already own a computer and monitor and have to buy these new, the complete system will be cheaper than a stand-alone scan-converter and monitor and that setup does not allow you to add text captions to your pictures nor save them on disk. If you already have an Amiga computer the decision is virtually made for you, but bear in mind you will need the memory expansion to bring the total to 1 Mbyte.

Full FAX capability

What does the AVT do? If we start with facsimile, it handles news and all the other broadcasts heard on short wave radio, which are f.m. FAX AM FAX, as sent by the NOAA and GEOS satellites, is not directly supported by the system, although they say you can make an a.m. to f.m. converter or you can buy one ready made specially for this application. The supplier is Overview Systems, P.O. Box 130014, Sunrise, FL 33313 USA, telephone (305) 748 8315.

Full transceive is available on FAX, including start signal and phasing on transmit, as well as autostart and autophase on receive. It has the capability to start operating at a particular time, so you can set it to receive a particular image at that time, even if you're not there to control it. Rates of 60, 120 and 240 lines per minute are supported, and you can set the system to receive 400, 800 or 1200 lines. Each line is received in 1024 pixel resolution, and all pixels are 16-step grey level. The received images can be printed with the computer's standard printer, and the fax images can be saved as standard Amiga IFF records, usable by virtually any Amiga software which handles images.

New modes!

AEA claims that their slow-scan system surpasses any other system currently available, commercial or otherwise. If a SSTV mode is used commercially, then AVT can handle it. Less assuringly, they say they have invented a completely new set of SSTV modes (oh dear!) that go far beyond all other modes ... Interestingly these AVT-only modes can be run in a narrower bandwidth (400Hz) than normal SSTV (1100 or 1200Hz), which means that sharper tuning should increase signal-to-noise ratios and help reject interference. They even suggest that because of this narrower bandwidth the possibility is open to run SSTV in the RTTY/c.w. portions of the amateur bands - I'm sure that would make you really popular!

Features galore

Here are some of the features of the AVT system. In SSTV you can convert from high to low resolution and vice versa, also from any one SSTV format to any other. Contrast, brightness and tint can be adjusted after receiving images, which can also be turned negative. In fax mode you can rotate images by 90 degrees, also flip them vertically or horizontally. Any image can have text added - or removed with an 'undo' command if you don't like the result. You can preview text before adding it permanently and you can use any solid colour for text.

Miscellaneous features include a simulated on-screen oscilloscope for tuning in signals. You can grab any Amiga screen image for transmission, and full or part-screen colour bars can be generated, also c.w. and speech IDs.

All cables are supplied, also a mains adapter; in the USA you can connect the setup to a phone line but the system is not approved for this over here. Any model of Amiga can be used but they must have the memory expansion: 1 Mbyte is adequate but 1.5Mbyte or more will speed operations.

More than 35 SSTV modes supported, excluding the AVT-only ones. Among these are 96 x 96 Visitel, 128 x 128 (American and European), both Microcraft modes, European 256 x 256, all Robot 400, 450 and 1200C modes, all in black and white. In colour the WA7WOD mods to the Robot 400 are supported, as are the Robot 400C, 450C and 1200C RGB colour modes. In line sequential colour the Robot, WA7WOD, 'Scotty' and Volker-Wraase modes are covered, also the Robot composite colour systems.

If this interests you I suggest you get in touch with ICS in Arundel; and if you buy one please let me know what you think of it!

Satellite Pirates Clobbered

Many people, especially in the USA, take the attitude that they never asked for satellite signals to be showered into their properties, but if they are there, then folk should be allowed to do what they please with them. Even, that is, if the signals are scrambled.

Notwithstanding some quite explicit laws, people here in Britain also indulge in unauthorised viewing, using mainly 'signal stabilisers' and 'filters' or plain pirate descramblers which are openly advertised in magazines. It is interesting, therefore, that a judge in the USA has set a precedent which should strike fear into satellite pirates!

The trade paper *AudioVideo International* reports that four Oklahoma home satellite dish owners were caught in the act of using illegally modified decoders to intercept scrambled pay-TV signals. And here's the rub. Not only must the four compensate the pay-TV suppliers for theft of services, but each also will be required to pay $2625 to the Satellite Broadcasting and Communications Association (SBCA) to defray the costs of the SBCA's Anti-Piracy Task Force. These costs include the expenses of a local private investigator who was hired by the SCBA to track down the pirates.

The four viewers were given five years probation and another pirate viewer was ordered to pay $455 restitution to the SCBA for 'lost programming revenue'. In addition, three other pirate viewers were fined $5,000 for tampering with decoders after having been found guilty on a previous occasion. At the moment satellite piracy is treated here rather like computer program copying was in the early days, as something a little bizarre but more or less harmless. It will be interesting to see how rapidly this changes.

For the latest news of special event stations, rallies, what's on the bands - ring Wireless-Line on 0898 654632. Calls charged at 38p peak, 25p off peak.

If you have news for inclusion on Wireless-Line ring (0202) 678558 in the evenings and leave a message on the answering machine

Errors & Updates

A Simple Transistor & FET Tester, February 1990

Two small errors crept into the project on pages 27 to 33 of the February issue of Practical Wireless.

The diode, D11, has been reversed in the drawing Fig. 1. The cathode should have been connected to the point 1C on the printed circuit board (the anode being conected to capacitor C4 in Fig. 1).

Along with this reversal of diode polarity, the legends for *p*-type f.e.t.s and *n*-type f.e.t.s must now be reversed. This may be achieved by swapping the connections to 26D with the one on 26E and changing 26H with the line to 26G on the circuit board.

A further problem appeared in that, to read the correct polarity of transistor on the meter, the connection to the meter must also be reversed so that p.n.p. transistors cause a deflection to the right.

We apologise to any of our readers for whom these mistakes may have caused difficulties. Thanks to those readers who pointed out the changes that needed to be made when they spoke to staff on the Practical Wireless stand at the London Amateur Radio Show.

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5cm). Please add 15% VAT to the total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent by registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 676033.

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Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine

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TRIO R-2000, mint condition, log books, world map, etc. £350 Boxed. (0902) 866344.

B.F.O. KITS, resolves single-side band on almost any radio, £11.95. Also Steepletone FM/AIR/MW £9.95. CORRIGAN RADIOWATCH, 7 York Street, Ayr KA8 8AR.

G3LLL FOR ICOM & YAESU CW Filters FT101ZD, FT902, FT707, FT102 £40 P.P. - Valves & Mod kits FT101MK1-E, PX commission sales. HOLDINGS AMATEUR ELECTRONICS,45 Johnston Street, Blackburn BB2 1EF. (0254) 59595.

RECEIVERS EX-M.O.D. 1-20MHz with lead and manual £60.00, oscilloscopes EX-M.O.D. double beam with lead and manual £50.00, A 41 VHF PXRH back-pack sets £50.00, Bradley Electronic Multimeters £45.00, new Larkspur Morse Keys £12.00. All prices include P&P. Tel: Wolverhampton 20315.

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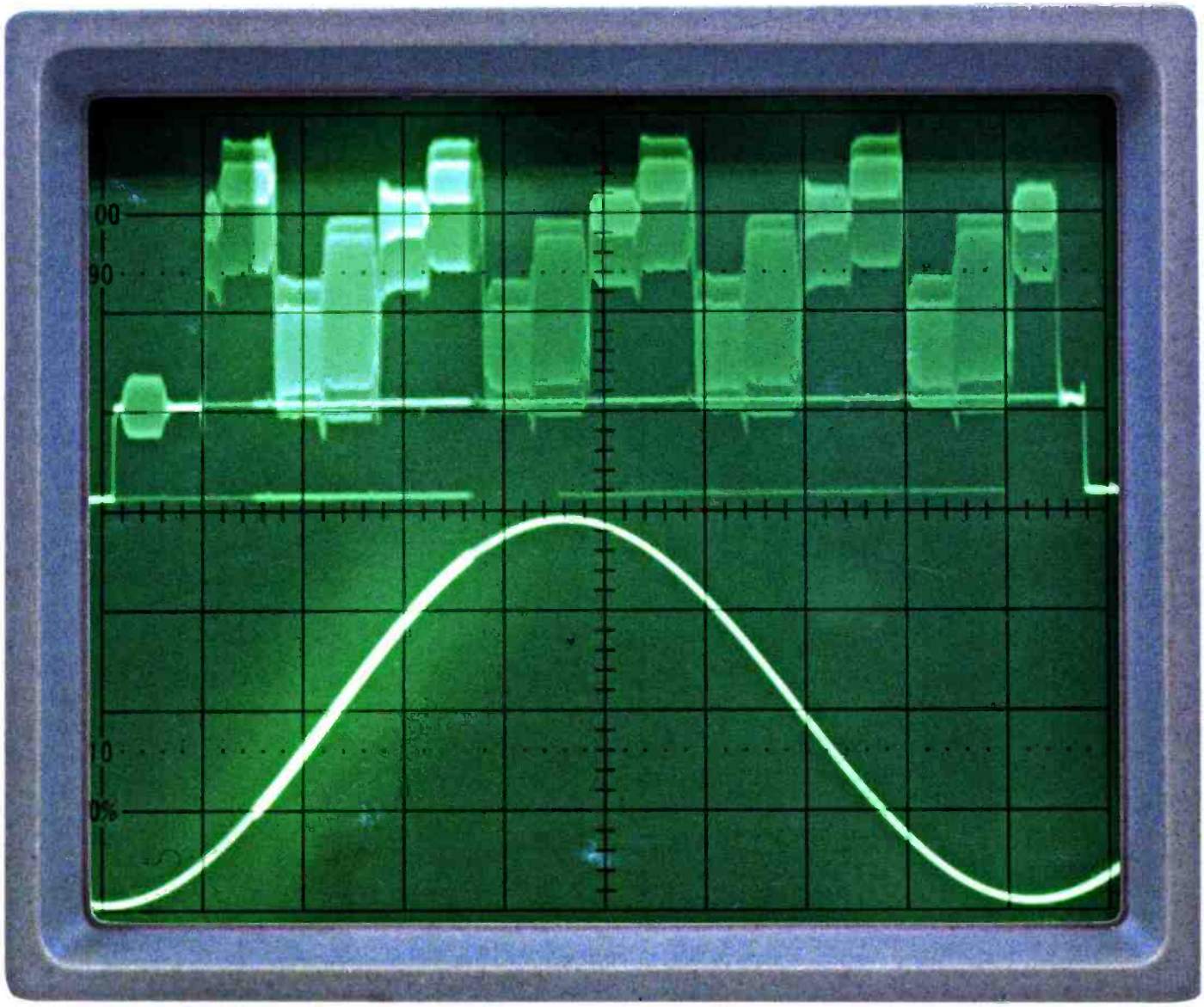

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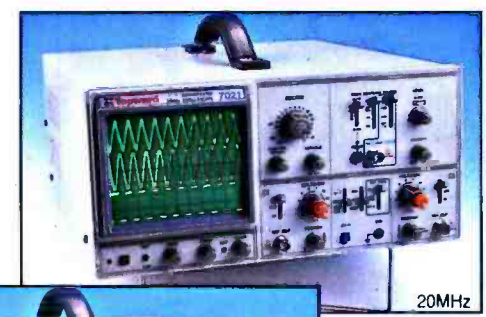

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