

# HAM

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JUNE 1990 £1.50

**FREE**  
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SUPPLEMENT  
INSIDE

# RADIO

# TODAY

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**QRP CW TRANSCEIVER**  
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**REVIEW:**  
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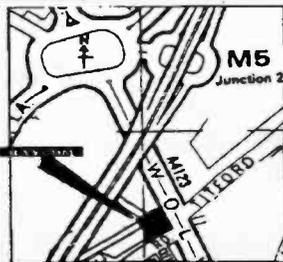


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VOLUME 8 NO 6 JUNE 1990

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# LETTERS

## Letter Of The Month

The reply by A Skaife of York to a reader's quite sensible suggestion in this column of HRT February 1990) is the most offputting I have ever seen from one radio enthusiast to another.

My introduction to amateur radio was, as has been the case no doubt with numerous amateurs (most won't admit it) through CB, albeit short-lived. I lasted three months, and then some of the more discerning ex-CBers introduced me to 11 meters and I became a member of a local sidebander's club which gave me the number Kilo Victor 38. We operated QRP in the main, talking locally to our friends/club members between 26.500MHz and 27.500MHz. How nice it was to leave the radio on, listening to a QSO instead of suffering the tirade of bad language, abuse and embarrassment which had been the case on CB FM. We certainly never encroached onto the amateur bands. Eventually I and many many others of the Kilo Victor group took and passed the RAE, most of whom are now GOs.

However, one or two of the club have tried and tried to pass the RAE and unfortunately for academic reasons they keep failing the second paper. I really feel for them, because they are very good radio operators, and have worked stations all over the world on 11 meters, but would dearly like to obtain an amateur licence. Nothing wrong with my roots, old man, not when I look at the number of "fellow amateurs" in this area who started on

CB, moved on to eleven meters, and eventually sat the RAE and became A licensees.

To me 11 metres was somewhat of a joy while it lasted, certainly much better than 2m, which in my opinion is used more like a glorified telephone system.

Incidentally, A Skaife, I failed the second paper first time and may I say that as a somewhat "thick" self-employed professional photographer, I would class the second paper as anything but a "simple test", but then again we are not all electronics or radio technicians, are we?

I do not wish to enter into the controversy of novice licenses, but drastic responses to sensible suggestions do nothing to promote interest in amateur radio. This particular ex-CBer is now a fervent user of CW on the HF bands.

— D L Gorden, ex-Kilo Victor 38, and proud of it, South Wirral.

This is but one response to Tony Skaife's reply to Whiskey Sierra, which gave rise to even more flying fur than the Darwin Six. Mr. Skaife justifies his to international diplomacy partly by the anti-social operating practices of some CBers and ex-CBers (which have, we gather, hit central Yorkshire harder than most) and partly (I'm reading between the lines here) by the fact that the Yorkies took their bit with fire and the sword back in the 9th century and the rest of the UK is still reeling from

the shock, so why change tactics?

Anyway, he is now doing his bit for amateur radio by writing up some constructional articles.

I have never been involved with CB but I DID join the hobby press at the time when CBers were fighting for legalisation in the UK. This was at a time when 2m, especially in London, suffered badly from the anti-social licensed and unlicensed "abusers".

The CBers won their band, found that it was too limited, and so they turned to amateur radio. The rest is history. It is a shame that many of them were driven "underground" onto 11m just to get a taste of real radio; if the Novice Licence fulfils its function, aspiring operators won't be tempted to move outside the lines this way.

Since the end of the World Wars, amateur radio has gradually lost the attention of the UK government, which no longer "needs" it to train up radio operators. There are no signs that they "need" it again, to train up commercial technicians, and the Novice Licence is one symptom of this.

But CB got the attention of thousands of new proto-amateurs at a time when radio was not attracting much new blood.

The trouble with new blood, as one wag said, is that you have to clean it off the carpet... and dredge up some dust and dead moths in the process, no doubt. But the end result should be a brighter carpet. If we keep on about good operating practices, and keep the doors open, everyone will benefit in the long run.

## Catch 22 In Greece

I am a British citizen living and working in Greece since 1977. After toying with the idea of applying for an amateur radio license for several years, I finally decided to do so last autumn, only to find out that I would have to pass an examination in fundamental electronics, since Greek law does not recognise my engineering degree in electronics.

After I agreed to undergo this test, I was told that I would also have to take a morse code test (sending and receiving 40 characters a minute), although I only wanted to operate packet radio on the 2m band. After two weeks of hard training, I am proud

to say I can receive and send 50 characters a minute. So you can imagine my surprise (and disgust) when I went to hand in my application only to be told that because I am a British citizen I am not allowed an amateur licence in Greece.

I tried several approaches (such as reminding them that Greece is a member of the EEC and as such must comply with the community's communications laws) but with no result.

I am in despair. Am I doomed never to have an amateur radio license as long as I live in Greece?

— Memnon Emmanuel, Thessaloniki, Greece.

Greece does not cooperate in the matter of reciprocal licensing. We checked with the RSGB to see if there were any loopholes for somebody in your position, both their verdict is 'no chance', unless you can persuade someone, personally, that your position is different. "We advise travellers to Greece to leave their radios at home and just go and get a sun tan," said the man at the RSGB. Italy, as well, is usually a hopeless case, although "more from inefficiency than lack of cooperation."

It does seem particularly futile to ban somebody living in Greece, who has passed the necessary tests, from holding a Greek licence, just because

We regret that Ham Radio Today cannot reply to queries individually. Every month we publish a section of the most interesting. We will endeavour to answer straightforward queries about the back issues index if readers enclose an SAE and much patience. It helps if letters and back issue enquiries arrive on separate sheets of paper, although the same envelope can be used.

he holds a British passport. You could try writing to somebody more senior in the relevant ministry, stating your case, or getting a friend, relation or senior colleague who perhaps knows how the government departments work to write to them arguing your case and vouching for your long period of residency. But it may simply that, while you hold a British passport, they will not allow you to hold a Greek licence.

### Continental Convoying

Later this year I intend to be a driver in a two-car convoy through the countries listed below in a space of eight weeks. The countries are France, Yugoslavia, Turkey, Hungary, East Germany, Switzerland, Austria, Rumania, Czechoslovakia, West Germany, Italy, Bulgaria, USSR, Poland and Luxembourg.

I would be extremely grateful if you could advise me of a legal type walkie-talkie/radio system (for all the countries) and its likely cost, that we could use to facilitate communications between the two cars while on the road. I envisage that a range of half a mile would be more than adequate.

Could you also inform me whether we would need some form of licence?

Any advice you can give me would be very much appreciated, to help with my once-in-a-lifetime holiday.

— Andrew Mills, Doncaster.

I would guess from this letter that Andrew is neither an amateur nor a CBer. I have made some enquiries, and

### £10 FOR THE LETTER OF THE MONTH

You've got a gripe about the bandplans, or your're sick of being wiped out by next door's microwave. Or maybe you've been bowled over by the excellent service from your local radio shop.

Whatever you've got to say about amateur radio say it here in the letters column and you could win yourself £10 for writing the letter of the month.

Sent your epistles to: Letters Column, Ham Radio Today, ASP Ltd, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST.



the answer is a little more encouraging than the one given to Memnon Emmanuel in Thessaloniki, but not much.

The only reasonably sure way he has of discovering whether he can legally use a two-way radio in these countries, and what the licensing conditions are, is to contact each embassy in the UK separately with the question, and also to ask the DTI if they can suggest a plan of action.

If he was a licenced amateur, of course, he would be able to arrange reciprocal licensing for all or most of these countries with the assistance of the RSGB.

Even so, two-way radio on the road is no substitute for a few sessions with a map and a prearranged point of contact. Some acquaintances of ours set out for Europe, admittedly only with low power rigs (no suitable mobile linear to hand, apparently), lost each

other before they reached Dover and didn't meet again till they got to Austria. One mutually-agreed phone contact in the UK would have worked wonders.

And leave the attention free for QSOs with the locals. Much more interesting than "turn left at Dusseldorf..."

### Covers Story

On receiving my February 1990 copy of HRT, I was pleasantly surprised to find that it had got thicker!!

A quick scan through it, but I could see no obvious editions. Until I got to the "Free Issues" subscription end page. I turned it, and lo and behold — "Free Issues — I turned it — "Free Issues" — I turned it — "Free Issues" — SIX end pages and six covers! Surely this must be a record? At least a collector's item. But I'd rather see more articles than covers, please!

Yours sincerely for a great mag.  
— David P. Bull G6PJE, Wisbech, Cambs

So would we! Next time they do this, perhaps we can get them to print some tech tips on the extra covers. The trouble is, they don't tell us! You could be right about a collector's item, though: We have a disappointingly large number of twos, threes, and fours, but so far you are the only reported six.

# RADIO TODAY

## Gift Ideas Floated

Grundig has produced a series of marine leisure radios called Grundig Yacht Boys (not to be confused with yacht buoys. You can throw a 70cm handheld, but not, presumably, float a marine shortwaver).

The Studio Line Yacht Boy 225, 14 by 9 by 3cm receives long wave, medium wave, FM and nine shortwave bands, with pushbutton selectors and led indicators. Boxed in a hard carrying case with lightweight stereo headphones, a shortwave guide and retracting pencil of jotting down preferred stations, Grundig recommends the 225 as a gift for £59.95.

The portable Tacht Boys 220 and 230 with headphones, soft carry case and battery or mains operation are designed for home or travel use. The 230, 10.9 by 18 by 3.5 cm has the usual broadcast bands plus 13 shortwave bands, last station and volume memory, world timer with time scanning, lcd information panel, digital quartz clock, sleep timer and summer/standard time changeover. The 230 costs £69 and also has a snooze alarm.

The 220, 14 by 9 by 3.5 cm weighs 340g, has 9 shortwave bands and a swivel mounted support for easy positioning. It costs £49.95.

Finally, the Satellit 500 International for land and sea can store up to 42 user programmed stations, has a multi-functon lcd display, rotatable or lockable telescopic aerial and has a reception frequency range of 1.6 to 30MHz. It includes headphones, dual time zone timer/clock and dual station time switch, a threaded socket for on-board mounting and weather-protective cover. It costs £299.95.

See all these Grundigs at Grundig dealers in the UK.



## Doncaster Rally

The Doncaster Rally and District Raynet group will be holding a radio rally and electronics fair at Bircotes Sports Centre, near Bawtry, on 28 May 1990. Further details and booking forms for stall-holding are available from **P. Smith, 23 Florence Ave., Baldby, Doncaster. Tel. 0302 857526.**

## Booking In

We have had a flyer from the Out of Print Book Service, a business which tracks down out of print books to order. We haven't used them ourselves (preferring to rely on serendipity and Oxfam Shops) but they quote well-known publishers Thorsons and W H Allen as referees. For some mysterious reason, South Wales seems to be a Mecca for old book collectors (collectors of old books).

**More information from Out of Print Book Service, 13 Pantbach Road, Birchgrove, Cardiff CF4 1TU. Tel: 0222 627703.**

## A Match for VHF

Empcom Systems Ltd, has produced a VHF antenna tuning unit (atu) for the amateur radio market. The rationale behind Empcom's VTZ-45 is to allow VHF users the same accuracy for impedance matching as that enjoyed by HF users, where the match provided by the antenna system and coax in use is less than 100% perfect.

Aimed at providing a good compromise between perfection and operator convenience in a station-end atu, the VTZ-145 is designed, say the company, to optimise eirp and received signals, improve the system vswr and avoid automatic power reduction/shutdown, operate fixed or mobile (good for field days), using 70 ohm antennas and feeder with

50 ohm equipment, HF antenna and rhombics, long-wire experimentation, and loading up concealed or conventional car antennas, anywhere, in fact, that a good VHF match cannot be taken for granted.

The atu handles up to 500W CW/1000W SSB, 0.25dB through loss, 30 to 100 ohm input impedance, 20 to 300 ohm output impedance, and covers a  $\pm 10\%$  frequency range. The standard connector is SO239 — other types may be ordered.

The VTZ-145 for 2 metres costs £37.95 all inclusive. Versions for 4, 6 and 10m are planned shortly. Contact **Empcom Systems Ltd., 7 Robins Close, Waterlooville, Portsmouth PO7 8HF.**



## Activating Hebrides

Alan GIEUU and Colin GIJME will be operating from the Inner and Outer Hebrides during May and June 1990 as GMIWAB/M. The itinerary is roughly as follows:

Sat 26 May Grantham to Androssan May 27 Arran, Gigha, arriving late at Islay May 28 Islay, Jura, Luing May 29 Mull, maybe Iona (probably not mobile), South Uist, May 30 South Uist, Benbecula, North Uist, Baleshare, Grimsay, Bernae May 31 Skye, Harris Friday June 1 Harris, Lewis, Gt. Bornae Sat/Sun 2/3 June activate NB, NC, ND, NH, NJ, NO, NT, NS, NX, NY on 144.440 and 50.200 MHz. 70cm by arrangement on 144 MHz. QSL via GIEUU, 68 Aire Rd., Grantham NG31 7QP with SAE.

## Reductile Receiver

Icom UK were taking orders for their new communications receiver, the IC-R1, at the London Amateur Radio Show on 9/10 March. One of the smallest communications receivers yet produced, the 49 by 102.5 by 35mm, 280 gm scanner fits into a pocket and cover 2 to 905 MHz, with 100 memory channels. It features several different scan and clock functions, choice of keyboard or manual tuning, and electronic keyboard lock to prevent accidental tuning changes. More information from **Icom UK at Unit 9, Sea St., Herne Bay, Kent CT6 8LD** or from **Arrow Radio, 5 The Street, Hatfield Peveral, Chelmsford, Essex CM3 2EJ**, who provided this information.

## Books for Sony and VHF

User Steve Whitt has written a book, *Getting the Best from your Sony ICF-2001D*, dedicated to a receiver which is arguably the most popular world-band receiver of all time. The book covers all aspects of operation, modification and repair of the ICF2001D and its American versions the ICF2010.

The book also looks in detail at the weaknesses of the 2001D and offers practical improvements which have been tried and tested by users. All are low-cost and offer performance benefits, and it is made clear whether or not internal mods are needed.

A general introduction to communications receivers is included, along with chapters on hotrodding the 2001D, hints and tips and questions and answers. There is a bibliography or articles and index of useful addresses. The book also presents the rarely-seen Sony specifications for the receiver.

The 32-page illustrated book is available from the author for the following rates: UK £4; Europe and Eire £5 or 13IRCs; Rest of world (surface mail) £5 or 13 IRCS, Rest of world (airmail) £6 or 15 IRCS, post paid for single copies. Write for details if ordering larger quantities. All payments in pounds sterling, in cash or reputable draft, made out to S. Whitt. Contact Steve Whitt, 21 Cauldwell Ave., Ipswich IP4 4EM, UK.

Another book now in publication is *An Introduction to VHF/UHF for Radio Amateurs* by Ian Poole, well-known author of many magazine articles and last year's *An Introduction to Amateur Radio*. The book is aimed mainly at the newcomer and outlines the essentials of VHF/UHF operation; it can also function as a reference work for more experienced operators. The nine chapters cover propagation, aerials, transmitters and receivers, bands and bandplans, DXing, mobile and repeater operation, data modes, scanners and an appendix of abbreviations and codes.

An introduction to VHF/UHF for Radio Amateurs costs £3.50 from Bernard Babani (publishers) Ltd, The Grampians, Shepherds Bush Rd., London W6 7NF.

## Maplin Miracle

Maplin Electronics gave away their biggest ever prize, a Vauxhall Astra GTE 16V, on St Valentine's Day. Winners Robert and Pat Vieira of Chigwell, Essex, bought a handheld digital meter back in November 1989, and registered for the draw. By a labyrinthine twist of fate, Pat Vieira had written off her Porsche 924 a few weeks earlier, so it is confidently predicted that she will be driving the Vauxhall.

Robert G8 AJF is among other things a keen radio amateur and electronics hobbyist who buys his kits and test equipment from Maplin.

Recent additions to Maplin's lists include "Professional Monitor Headphones" with double HF and

LF drivers, and enclosed, washable earpads, designed for high quality stereo listening, at £49.95 Vat inclusive.

Of special interest to amateurs whose partners keep complaining about the noise made by their morse QSOs, QRM, SSB reception, squelch, etc.: several new guitar amps, including a high-quality 15W for £54.95, a new 10W practice amp design for £44.95 and 75W stage amp with master volume and bright switches for £169.95. Also for stage use, a 40W bass amp for £119.95. For the less rebellious, a belt-portable practice amp with headphone socket costs £9.95.

**Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel. 0702 552911**, or catalogue from larger news-agents.

## Border Awards Back

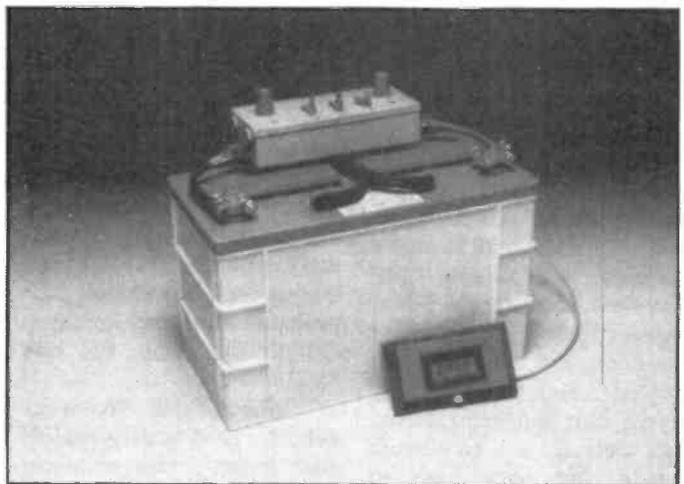
Oswestry DARC have revised their Border Awards in the light of "new trends in contacts made after 1st Jan 1990".

The HF Award include counties on the Welsh/English border. Amateurs and swls on 1.8 MHz to 30 MHz, work/hear a club member, or club callsign G4TTZO, or any club special event station, plus (UK/Eire) three stations in each border county or (Overseas ops) two stations in each border county. Border counties are Cheshire, Clwyd, Gloucestershire, Gwent, Powys, Hereford-and-Worcester, Shropshire.

The VHF/UHF Award in-

cludes counties bordering Shropshire. Amateurs and swls on 50 MHz and above, work/hear a club member or club callsign GIORA or any club special event station, plus ten stations in Shropshire and five stations in each bordering county, all on a single band and mode (total 36 stations). Counties are Cheshire, Bleyd, Hereford-and-Worcester, Staffordshire, Powys, Shropshire.

To apply for either certificate, write to the Awards manager, PO Box 73, Oswestry, Shropshire SY11 1ZZ with date, time, frequency, mode, certified correct by two other ops/swls, with £1.75 or ten IRCS per award.



## Lead Battery Monitor

A company called Smart Power has launched a product which will be of interest to amateurs who rely on lead acid batteries for power in situations where they cannot be readily recharged.

The Smart Power device is a digital monitor and readout which connects to the top of the battery and continuously computes the percentage power left in the battery and the hours of use remaining. The large-figure lcd display can be mounted up to 50 feet from the batteries.

Smart Power can be used to monitor a single battery or a group of batteries connected in serial or parallel. There is an option to have two 25A load shedding switches, which can be used to automatically turn off less important loads as the battery reduces in capacity.

The device is designed for use with vented lead acid batteries with terminal voltages 12 or 24V, and is said to give an accuracy of better than 5%. It can also be used with sealed lead acid batteries, with lower accuracy. Versions for sealed batteries, and also for 6V and 48V batteries are planned for the future.

For more information contact Smart Power UK Ltd., Gordon Rd., Curdridge, Hants SO3 2BE. Tel. 0489 784219.

# Break



# THROUGH

January 1990

## Paper Round

Here we have **Break-through**, Jan 1990, from the Aberdeen ARS. Articles include Simple DC supplies, Radio masts and plumbing permission in Scotland, Repeater Jamming and misuse, QRP notebook, local events. Editor Stewart Cooper thanks us for our comments about editorial contract, and I can reliably report, after another good look, that there is . . . no address inside, but copy goes to GM4AFF QTHR, so presumably enquiries do also. Classy A5 production, 20pp.

Bandspread, Special London Amateur Radio Show Edition, March 1990, is produced by the Southgate AFC. Articles include Checklogging for AFS, field day report, introduction to the committee for new members, club news, and how to turn down a request for a day off. A 12pp A4, Editors Les Fox G0GLF, 41 Hadley Way, Winchmore Hill, London N21 1AL. Peter Tuck O8YNC, 30 Brownlow Road, New Southgate, London N11 2DE.

Airwave 325, Spring 1990, the Anomalous Magazine of the Wirral DARC, includes an introduction to the Club,

Building the BSX2, a literary discussion of the computing term "PC" (and others), including a well-known illustration, a checklist on the club bulletin board and its functions, and various other local reports and information sheets. Entertaining and informative. Info probably from Paul Robinson G0JZP, Chairman, 051 648 5892.

Wirral ARS Newsletter Feb/Mar 1990. Mainly detailed club reports, plus technical hints and article Radio Wave to Protect the Ozone Layer. Also information: South American cactus *Cereus Peruvians* thrives on radiation emitted by vdu, also helps vdu operators to live happier and fuller lives. Also poetry. Entertaining and informative. 8pp A4 dtp and staple. Editor Brian Jordan G4EWJ, presumably QTHR.

Vital Spark Feb 90 from the Hastings ERS. Contains several short technical hints, I was a signaller in Dad's Army (the War, not the tv program), Balanced emitter transistors and VHF linear amps (with diagrams), RF Feedback, club news and diary. A4, 18pp stapled, needs new printer ribbon. Editor Tim Anderson G0GTF, 2 Burry Rd., St. Leonards on Sea.

## Changes to Callsigns

In consultation with the Radio Society of Great Britain, the DTI have revealed to the Society their plan to introduce UK callsigns with the prefix M as soon as either the current class B (G7) or the current class A (G0) callsigns run out. At present there is no indication as to when this will happen, other than that the G callsigns are being used up "rapidly". Any G callsigns left over when either G0 or G7 runs out will remain unallocated.

The M callsigns are expected to differ further from the present system, in that the callsign may contain a second prefix letter to indicate a B or A licence, and a number to indicate the country of operation.

Under the system, for instance, MK2XYZ might be a B licensee operating in England, and MD8XYZ might be an A licensee operating in Guernsey. It is also suggested that MB may be used for special event stations, and MC for radio club stations.

The intention is to provide a system which gives a greater number of potential callsigns.

The DTI has as in many other cases asked for reaction from the amateur radio community via the RSGB, and comments can be sent to the Secretary of at the **RSGB headquarters, Lambda House, Cranbourne Road, Potters Bar, Herts EN6 3JE**. It is not surprising that an overhaul is due after such a long historical period; a callsign is an important part of an amateur's identity, so contact the RSGB if you want to put a point.

We must stress that it has not been suggested that any existing G callsigns should be replaced by M ones.

Novice license callsigns may be prefixed with the number 2 to make them distinctive, which virtually all parties concerned, including individual amateurs, have expressed as desirable.

As has been mooted before, radio clubs stations are likely to be allowed to transmit greetings messages at any time and not only at special events. This move is designed to give Novices the opportunity to get on the air as early as possible. One approach would be to leave club callsigns as they stand, but to add a further letter to the G prefix only while greetings messages are being sent and received. A secondary consideration is that this would allow clubs to demonstrate their station to the public in many cases without having to apply for a GB allocation.

## Navy Day

The Royal Naval ARS are holding their 29th annual mobile rally on Sunday 10 June at HMS Victory, near Petersfield in Hampshire.

The rally is billed very much as a whole-family affair, with attractions that include toy, jewellery and plant stalls, children's rides and amusements, handcraft demonstrations, vintage steam and fire engines, radio-controlled models, a tv

detector van (on display, we hope!) and a fly-past by a vintage Swordfish aircraft from the RN Historic Flight. There will — of course — also be amateur radio trade stands and demonstrations to keep you occupied while the family are enjoying themselves. Talk-in on 2m and 70cm, free parking and children, refreshments available throughout the day, adult admission £1.

C. Harper G4UJR  
QTHR for more information.

## Navico Packet

Navico, the marine radio manufacturers who also produce the British-made 2m transceiver AMR1000/s, have carried out a series of tests to show that the AMR1000 is fully compatible with all the commercially available packet radio equipment in the UK. TNCs and multimodes tested include the Paccomm Tiny 2, Micro-power 2, TNC200, TNC220 and TNC320, Kantronics KAM, KPC4, KPC2 and KPC2400, and AEA PK80 and PK232. All connections to the tncs can be made via the microphone connector on the front panel.

Receive and transmit audio levels at the mic connector function independently of the set's main volume control, so the only adjustment needed will be to the the squelch control. Headphones or another suitable audio load placed in the EXT socket will mute the loudspeaker if desired.

Tests were carried out with the assistance of leading packet radio retailer Siskin Electronics.

For more information contact Navico Ltd., Star Lane, Margate, Kent CT9 4NP. Tel. 0843 290290.

## Guides on the Air

A station was set up by the Isle of Man Scout and Guide Association for Thinking Day on the Air 1990 at Ardwhallen, Baldwin, IOM, callsign GB4 MGR, on the HF bands. Local DoE communications skills adviser Denys Hall GD4OEL assisted. Guides visiting Ardwhallen on a Guide Holiday on the theme of communications, as well as other Scout and Guide visitors, could go on the air for two minutes to pass greetings messages to Scout and Guide stations in 30 countries. The station was also visited by Kathleen Berry, the Island Commissioner for Guides, who also passed on a greetings message to a Guide station in Kidderminster. The two-day event was a success despite bad weather in the UK and elsewhere.

GB4MGR would like to thank IOM Civil Defence Corps and the IOM Post Office for help with furniture and postage, Nevada of Portsmouth for the 10m vertical which got through to Brazil, Scott Kewley GD0LQL for assisting with the station, swls Steve Crowe and Martin Campbell for help with erecting the mast, and guides and volunteers who helped to make the day a success.

## Eddystone Group, Please

SWL and long-time Eddystone receiver user W E Moore has obtained permission from the Eddystone factory to use facts and data from Eddystone manuals in setting up and running on Eddystone User Group newsletter. Mr Moore intends to operate the group on a non-profit-making, postage and costs-only basis, and would like to hear from any Eddystone users who would be interested in joining in such a group.

Write to **W E Moore, 112 Edgeside Lane, Waterford, Rossendale BB4 9TR**. An sae would probably be appreciated. Get in touch if you can — user groups benefit everyone.

## Satellite Software

As mentioned in *Introducing Moonbounce* in last month's issue, Amsat UK produces a list of items of satellite tracking software and similar programs. A price list/order form is available from Amsat UK for an SAE. For a list or further information, write to **Amsat UK., HQ, 94 Herongate Road, Wanstead Park, London E12 5EQ**.

## Greenweld New Address

Greenweld Engineering's 1990 Spring Supplement is now out. It has 32 pages of products and offers, including a free 15W miniature soldering iron

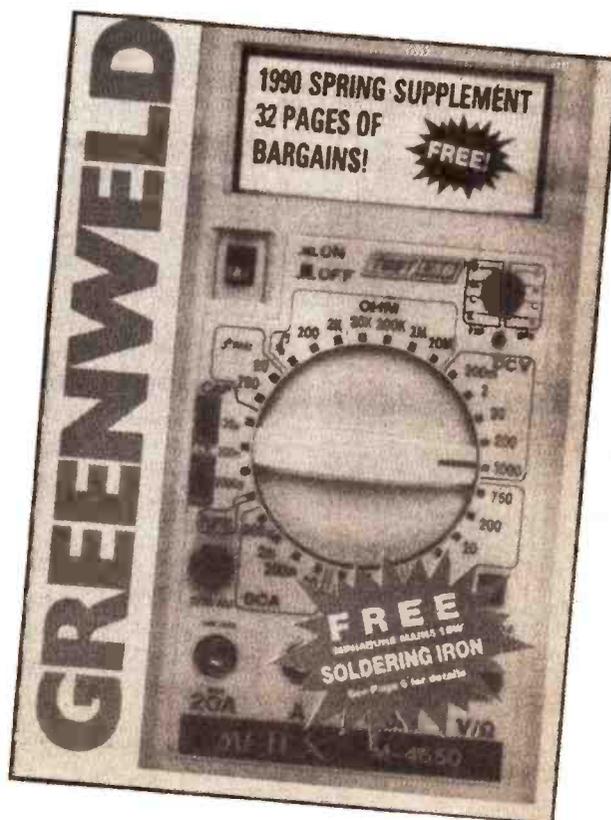
when you order over £20-worth of goods. Greenweld have also increased their warehouse space and changed their address, which is **Greenweld Electronics Ltd., 27 Park Road, Southampton SO1 3TB**. Tel. 0703 236363.

## Cancer Fund

Following selection of his letter as Ham Radio Today's Letter of the Month in the October 1989 issue of *Ham Radio Today*, Ian Oliver of the CB-orientated Monitoring Service of Great Britain (not to be confused with any similarly-named organisation) chose a current appeal in favour of the Middlesex Hospital, London as the recipient of the £10 awarded to LOM writers.

The organisation running this appeal, the Sportsman's Aid Society, have written to express their thanks to Ian Oliver and *Ham Radio Today*, and also to draw everyone's attention to the units they are opening for teenage cancer victims.

The first unit opens at the Middlesex in the autumn of 1990, followed by a unit at St Bartholomews'; units in other parts of the country are being planned. Donations towards these units can be sent to the **Sportsman's Aid Society, Kirkman House, Kirkman Place, 54a Tottenham Court Road, London W1P 9RF**.



# ICOM

## IC-751A HF ALL-BAND TRANSCEIVER



- **Amateur Bands 160m - 10m.**
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- **105db Dynamic Range.**
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- **32 Memories.**
- **Electronic Keyer.**
- **CW Semi/Full Break-in.**
- **HM36 Microphone.**

The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attenuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 desk microphone and SP3 external loudspeaker.

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The new ICOM IC-726 is a compact, easy to use transceiver which covers the amateur bands from 1.8 to 50MHz. It can be used in your home, car and in portable locations on SSB, CW, AM and FM modes.

With minimal switches and controls enjoy uncomplicated operating for beginners or veterans alike. And ICOM have incorporated their superior DDS (Direct Digital Synthesizer) system, a feature that enhances PLL lock up times. The same feature is built into ICOM's state-of-the-art IC-781 advanced H.F. Transceiver.

Other features include a general coverage receiver, dual VFO's, band stacking registers, attenuator, pre-amp, noise blanker, RIT, memories and much more. R.F. output is 100W on the H.F. band and 10W on 50MHz band from separate antenna sockets.

An optional AH-3 H.F. Automatic Tuner will allow you to operate on the H.F. bands in any location. Just push the tuner switch on the IC-726 and the tuner automatically adjusts for a minimum VSWR. The tuner can match a 12M longwire across the 160-10M bands. Use the weather resistant AH-3

in your car (with AH-2b mount and whip) boat, at home or in the field.

### Options and Accessories:

<b>AH-3</b>	H.F. Automatic tuner
<b>AT-150</b>	A.F. Automatic matching tuner
<b>PS-55</b>	AC power supply
<b>CR-64</b>	High stability crystal
<b>FL-100</b>	CW narrow filter 500Hz
<b>FL-101</b>	CW narrow filter 250Hz
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# Packet Radio

## Roundup

Feel like having a packet QSO with an astronaut on the USA space shuttle? WA4SIR is planning to be operational on 2m on shuttle flight STS-35, planned lift off on the 9th May — almost as you are reading this, in fact. A window-mounted aerial and laptop terminal is the expected set-up, with a tnc using modified software with a 'robot' mode.

This will be an updated version of the SAREX (Shuttle Amateur Radio EXperiment) robot, which is, in effect, an automatic QSO machine. When you connect to the robot, it

and FM speech channel by simply using the microphone and speaker connections — no internal rig modifications required.

The future of digital communications is unfolding at a rapid rate, Henry Spencer of the University of Toronto tells us "... digital modulation techniques have vast advantages over Morse when it comes to punching signals through noise and congestion. If you want an example, consider the Telebit Trailblazer modem, which can push 14Kbits/s of clean error-corrected

### *Bulletin boards in the sky and digipeaters in orbit are what G4HCL sees when he looks up.*

gives you a serial number, and as soon as you acknowledge the number the robot disconnects and puts the QSO into its log. Up to nine simultaneous connects are possible, and as long as the robot hears you, your information is placed in a second log.

As well as this, a tnc beacon with the destination field of QST> is carried. This can store up to seven frames of up to 255 characters each, and is intended to be used as a general message beacon to greet us lesser mortals on the ground. Let your local scout group know and maybe we'll get some more youngsters interested in amateur radio. At the time of writing it has been reported that this flight will not be within range of our UK readers, but future flights are planned with the same equipment. Thanks to Richard G3RWL for this information.

#### **Rapid Data**

High speed packet is now becoming quite popular, with several stations using 9600 baud and others experimenting with other ways of getting high message rates across a noisy channel. The mass production of 9600 baud fax modem ics is one potentially interesting way of running high speed packet data over a stand-

ard FM speech channel by simply using the microphone and speaker connections — no internal rig modifications required. The future of digital communications is unfolding at a rapid rate, Henry Spencer of the University of Toronto tells us "... digital modulation techniques have vast advantages over Morse when it comes to punching signals through noise and congestion. If you want an example, consider the Telebit Trailblazer modem, which can push 14Kbits/s of clean error-corrected data through a few kilohertz of bandwidth on a good phone line, and 5-6Kb/s through lines to South America and India that are almost unusable for anything else. 14Kb/s, with something like Lempel-Ziv compression, is two typewritten pages of text per second, or about 35000 wpm. Take the 5-6kb/s rate for a very noisy channel, cut it by 10 for a few hundred Hz bandwidth, and it's still 1250 wpm. That's absolutely clean data, zero errors. Admittedly, this is a high-tech example with some serious digital signal processing hardware involved ... but you can buy the phone-line version over the counter for about £1,000, and cutting the bandwidth by that factor of ten should cut the processing requirements the same way. When even Morse is ruled out by noise and congestion, good new digital is still going strong."

Detelf DK4EK tells us that recent experiments have successfully been completed with a transmit power level of only 100W, coupled with digital modulation schemes, to accomplish moonbounce communication with receive signal strengths of such a low level that a normal rig hears only noise. Could this be the communication mode of the future!

#### **Digipeaters in Space**

We may need to wait for a while until we get a moon based digipeater (yes, a moon based amateur transponder has been proposed) or an astronaut QSO, but right now we've a choice of orbiting digipeaters and even a flying bbs. The Lusat Oscar-19 Microsat and Amsat Oscar-16 digipeaters are currently enabled, and even when these are at the horizon around 10W and an Oscar-13 style 10 to 13dBi gain aerial are all that's needed for access. Remember you'll need a 1200 baud psk modem on your tnc rather than the usual internal fsk modem, and your downlink receiver used in SSB mode. The current frequencies used are:

Already several European amateurs have successfully used LO-19 to connect to each other, using its digipeater id of Lusat-1.

If you'd like to decode the packet telemetry from the Microsats, then sending a REQDIR request (check the Help file on your local bbs for this) to the GB7NEW mailbox for one or more of the following files will bring them to you through the bbs network:

MICROSAT.TLM: Documentation file giving details of decoding and the frequencies of each satellite's telemetry

DOVE.TLM: Dove Telemetry

WEBER.TLM: Webersat Telemetry

PACSAT.TLM: Pacsat Telemetry

LUSAT.TLM: Lusat Telemetry

On the orbiting bbs side, JK1VXJ reports that the Fuji-Oscar-20 satellite is working well. This has a packet mailbox on mode JD with now a full 1 Mbyte of memory available, although this is causing an additional battery current drain. One problem is users who have not sent a 'Disconnect' message to the bbs before they lose it over the horizon. After 16 users are registered as connected, no-one else can get in. The message is, before LOS (Loss Of Signal).

#### **Packet Group News South**

On a more down-to-earth level, Vince G1FBH has been in touch to keep us up to date with the latest happenings in the South West area of the UK. He tells us the South Hams Group intend to have a network of 4m nodes to supplement their existing 2m and 70cm network, the nodes in

AO-16	Downlink	437.025	437.050		
	Uplink	145.90	145.92	145.94	145.96
LO-19	Downlink	437.150	437.125		
	Uplink	145.84	145.86	145.88	145.90

question being CORN4 at Redruth, TAMAR4 at Plymouth, and GB7KB-4/SDN4 at Kingsbridge, all operating on the common frequency of 70.4875. SDN4 was in fact due to be installed during the weekend of the 'big blow' back in January, so this had to be put off for a while.

All the tncs used at the SDN (South Devon Nodes) units are GOBSX Mk2s, and the group is mourning the loss of Pieter GOBSX, who is moving QTH. As well as being the Sysop of PLYBBS in Plymouth, he is the designer of the BSX Mk1 and Mk2 tncs which have helped many amateurs get on to packet by building their own tncs with the pcb that he produced and distributed. Pieter is taking up a new position in Sheffield, and we at HRT wish him.

Finally, Vince reports that members of the Brixham Radio Club intend to set up a chain of weather stations on AX25 that can be accessed by end users in the area. This involves a main computer at Brixham College of Further Education gathering in the

data from remote weather stations, and the South Hams Packet Group were pleased to be able to supply a couple of S/H tncs for this project.

### Packet Beginners' Guides

A common question asked is 'How do I get started?'. 1988's HRT *Beginner's Guide to Packet Radio* carried over four issues has proved to be very popular, with many requests for back copies, and the South Hams packet guide, *Your Gateway to a Basic Understanding of AX25 Packet Radio* is reportedly selling well at the current price of £4.50 plus £1.50 p/p (available from G1FBH QTHR or from Siskin Electronics who stock it).

### End of Message — CTRL-Z

Remember how we told you about Dosgate, the pc packet radio gateway? Mike G7DRG plans to set his PC running the multi-user Xenix (a version of Unix) up with Dosgate for the use of amateurs in his local area of Swindon. He tells us he's currently working on writing the code, but

when it's up and running, DTI regulations permitting, local packeteers should have access to a powerful operating system. You can get the latest from Mike himself via a message to G7DRG @ GB7SDN, and if you've had experience of putting Xenix/Unix on to AX25 packet I know he'd like to hear about it.

Finally, the latest eeprom-based software for TNC-2 clones is now available from Pac-Comm, in the shape of version 3.0 (1.1.6.C1 to be precise). As well as improving the clock operation, this actually keeps time now instead of running slow, and better PMS editing functions give the facility of forwarding personal messages between individual tncs as well as the usual auto-downloading from network bbss. The contact man is Phil Bridges at Siskin Electronics (0703 207155).

Until next month, happy packeting, do keep the messages and news coming, every packet message received gets a reply. Packet club newsletters are always appreciated, and can be sent to me via the HRT editorial address, but please note my callbook address isn't correct. 73s for now from Chris G4HCL @ GB7XJZ.



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# Frequency Readout Add-on

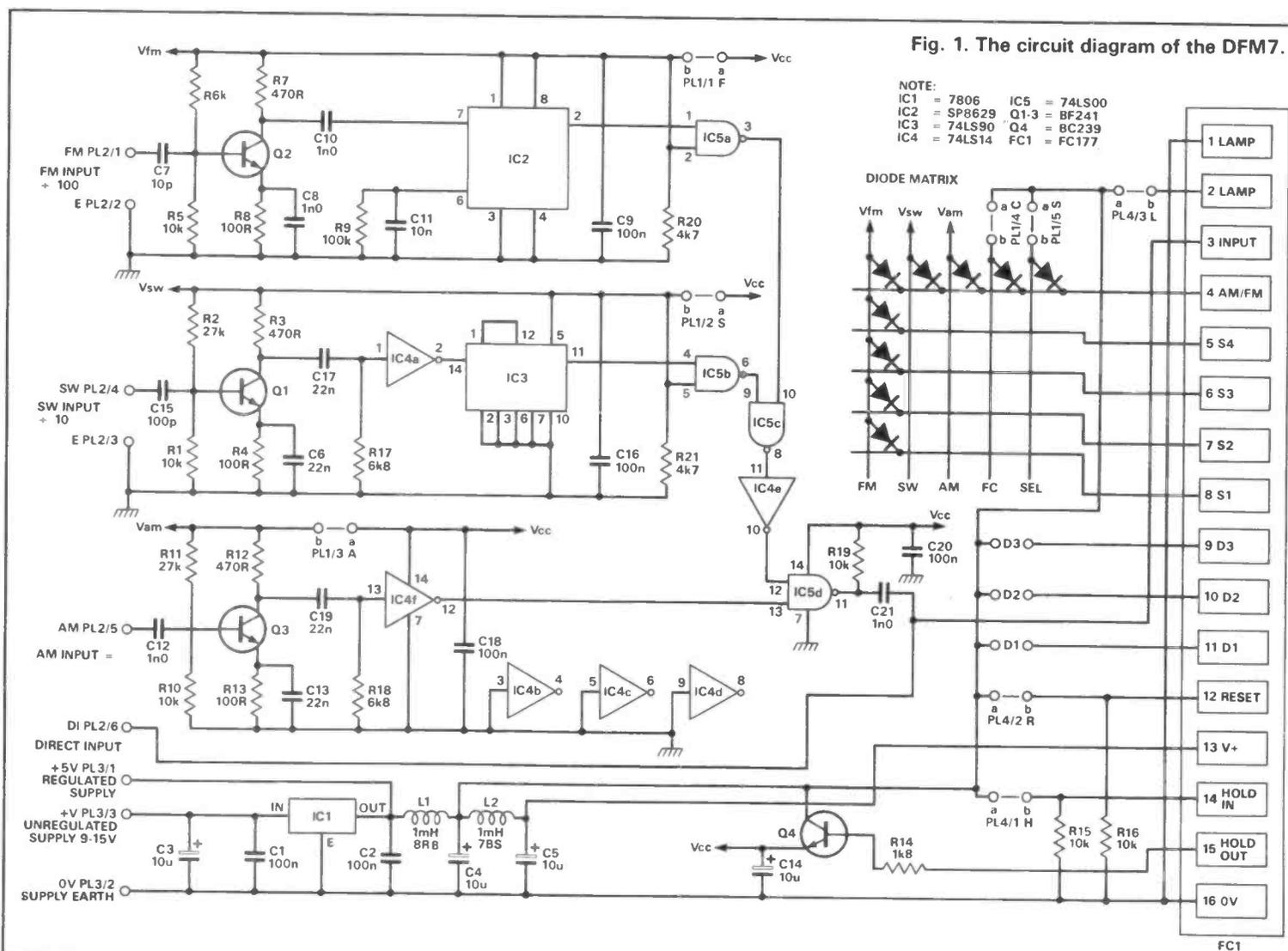
Cirkit feature in their regular components and kits catalogue a low cost frequency meter intended for use as the frequency readout in a broadcast AM/FM receiver. The fre-

quency meter can also be applied to amateur radio receivers, and Cirkit have agreed to make it available as a kit, as well as ready built, for Ham Radio Today readers. The central

FC177 frequency readout module is available separately for homebrewers who want to make up their own board and gather components from their own sources.

*This frequency meter module can function as an add-on readout or a piece of test equipment. Andrew Armstrong G3YZW tries it out.*

This frequency meter is suitable as an add-on unit for HF and broadcast VHF receivers, as well as a piece of test equipment in its own right. It is based on the standard frequency readout module, type FC177, which has a liquid crystal display mounted on one side of a thin double-sided printed circuit board,



and a surface-mount frequency counter chip on the opposite side. The module itself has a maximum frequency range of 5MHz, and displays five digits. It is because the display only extends to five digits that the module is unfortunately NOT suitable for use with a 2m receiver.

The frequency meter module has program inputs which set frequency offsets to take account of the intermediate frequency of a receiver, as well as pins to switch on annunciators showing FM, SW, MW and MHz or kHz. The AM mode has six available offset frequencies, the SW mode has four, and FM has sixteen, so this should cope with almost any receiver's IF offset.

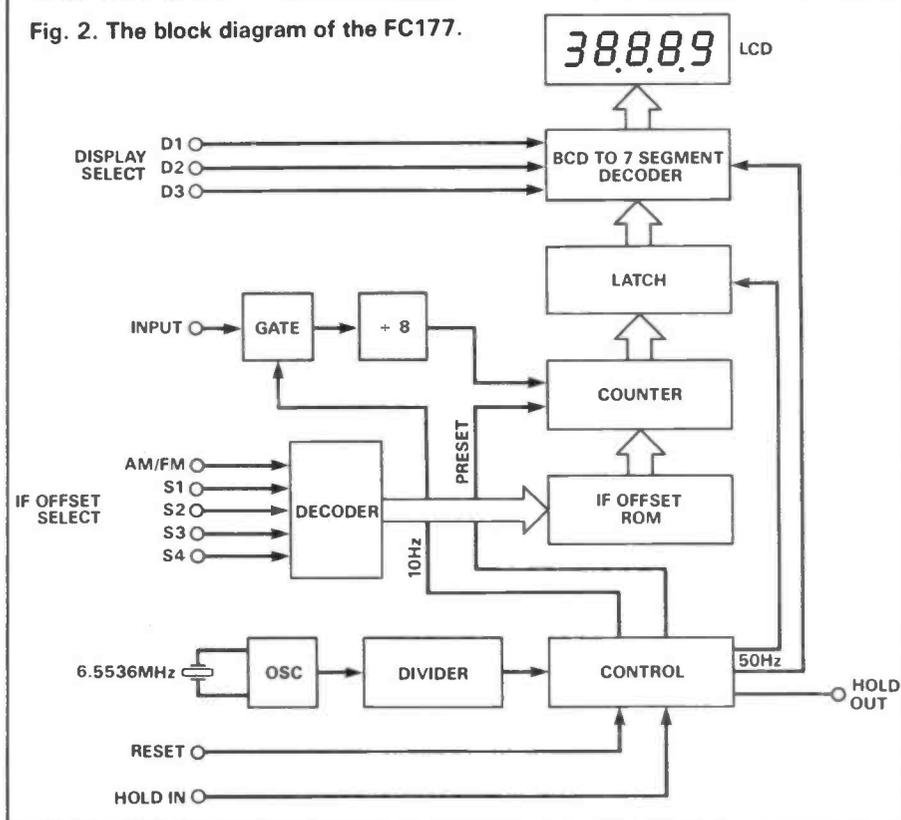
The built-in illumination of the liquid crystal readout makes the display readable under all lighting conditions, which is helpful for mobile equipment.

### Additional Functions

The FC177 can also, of course, display the input frequency directly. What it cannot do is respond directly to HR and VHF signals. To make a frequency meter capable of responding to such signals, prescalers are required, and in order to select the correct annunciator and offset for a given application, some reasonable means of energising the correct combination of programming pins is needed.

Finally, of course, a power supply is necessary. The kit project here includes all these items, with a 7806 regulator providing power for the whole project, transistor input buffers to permit measurement of low signal levels, a straight-through ttl buffered signal path for low frequencies, a divide-by-ten input using a 74LS90 for HF signals and a divide by 100 input for VHF measurements. The SP8629 divide-by-100 chip is specifically designed for use as a prescaler. The circuit diagram is shown in Fig. 1. and the block diagram of the frequency meter module is shown in Fig. 2. The programming of annunciators, IF offsets, etc. is handled in this kit by a diode matrix, with its inputs selected by a movable plug-in link of the type used to select interrupt vectors and the like in a computer. A switch can easily be substituted for the links if the IF offsets need to be switched for different receiver ranges, and so on.

Fig. 2. The block diagram of the FC177.



### Circuit Description

Each input is buffered by an inverting transistor stage designed for maximum gain. This will clip on any significant signal level, providing a signal suitable for digital circuits. The two lower frequency inputs are then fed via ttl Schmitt triggers to provide a really clean signal. The divide-by-100 input does not use a ttl circuit, because ttl-type devices are too slow, but the input of the SP8629 is designed to accept analogue type signals.

The circuit typically needs only a few mV to count at most frequencies, and should respond to 20mV under all circumstances.

The outputs of the buffered, divide-by-10, and divide-by-100 input stages are gated together so that the selected input is fed to the counter module. The active input is selected by a movable link which only applies power to the chosen stages. This reduces the total power consumption.

A further reduction is possible by using the Hold input. When this is pulled to logic 1, the module finishes the measurement, holds the number on display, and switches its Hold output to logic 0. This switches off the power to the prescaler circuitry via Q4, further reducing the power

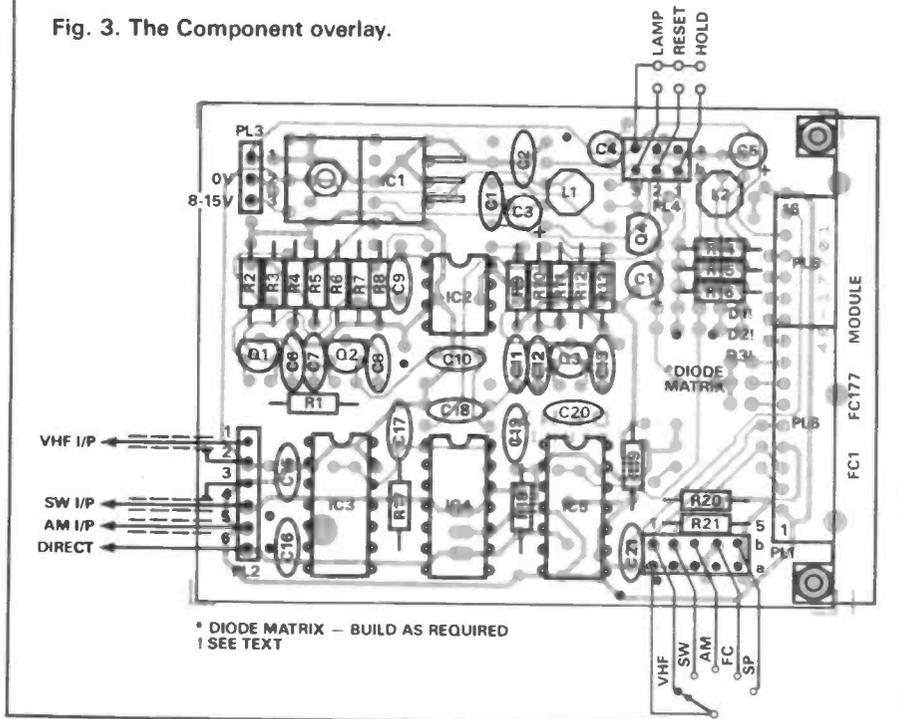
consumption. This could be put to good use in battery powered equipment, by generating an external sample signal and taking a frequency reading (say) every second.

Observant people may have noticed that a 6V regulator is used, though ttl works on 5V. This is because the voltage drop in Q4 is enough to reduce the power supply to 4.5V for the ttl, which is approximately the lowest voltage on which ttl is specified to work. The use of a 5V regulator would take the ttl out of specification, and some units would not work.

### Assembly

As shown in the photograph, the ready made frequency meter module is mounted on the front of the prescaler module with right angled brackets, and connected by a right angled connector. Needless to say, the prescaler/power supply should be built and tested before the display is connected. The first job is to insert and solder pieces of tinned copper wire (clipped resistor legs will do) or pins to make the required links between top and bottom of the board. Note that what appears to be the front (ie nearest to the display) row of diode matrix holes is in fact a set of pads to be linked top and bottom of the pcb.

Fig. 3. The Component overlay.



Then the resistors should be inserted, followed by the other components, in the positions shown on the overlay (Fig. 3).

It is best to bolt down the regulator before soldering its pins, to avoid straining the soldered joints. Do not insert any other ics until the power supply has been checked.

The first test to carry out is to

apply power, +8 to +15Vdc, to the 0V and +V terminals of PL3, and check that there is a 6V output on the other pin of PL3. Assuming that this all works correctly, the next job is to insert the diodes in the programming matrix to set the correct if offset(s). Following this, insert the ics, fit the frequency counter module, and test the complete unit.

available, and the corresponding input requirements for the frequency meter module. The diode matrix programming requirements can be determined from this table in conjunction with Fig. 4.

When an if offset is programmed, the display will not show 0 with zero input. For negative if offsets the display will show 40000 minus the if offset selected, so a MW offset of 455kHz will show:

$$4000.0 - 455.0 = 3545.0\text{kHz}$$

On vhf, a positive offset will show the if offset, for example 10.7MHz, and, of course, in the frequency counter mode the display will show 0.0kHz with no input.

The diode matrix selector link at the edge of the board also selects the active prescaler or input buffer, as shown in the circuit diagram. There is one link position for each prescaler, which means in effect one link per frequency range. Because the display has only five digits it is unsuitable for use in a vhf receiver (except FM broadcast, for which this mode was intended), but the other two inputs will be suitable for hf use.

Fig. 4. Programming the diode matrix: one solution.

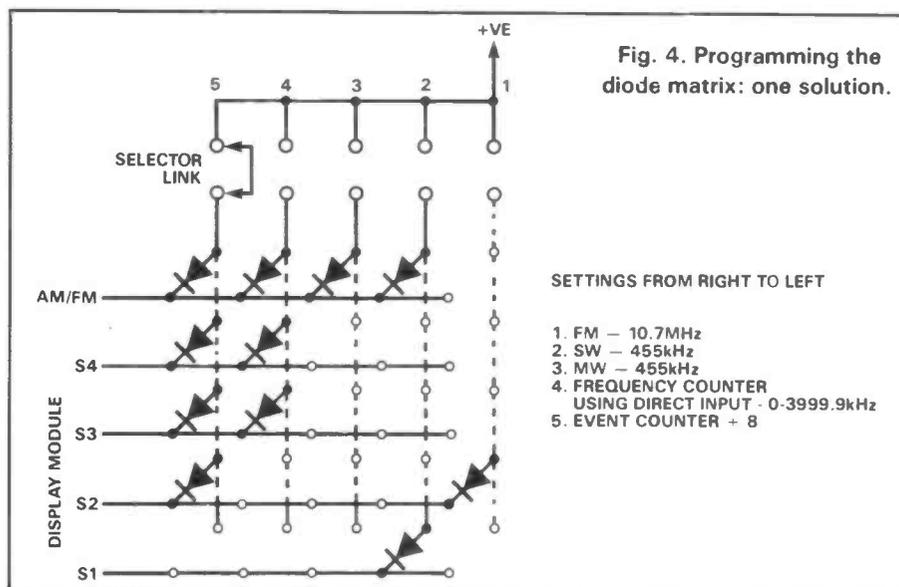
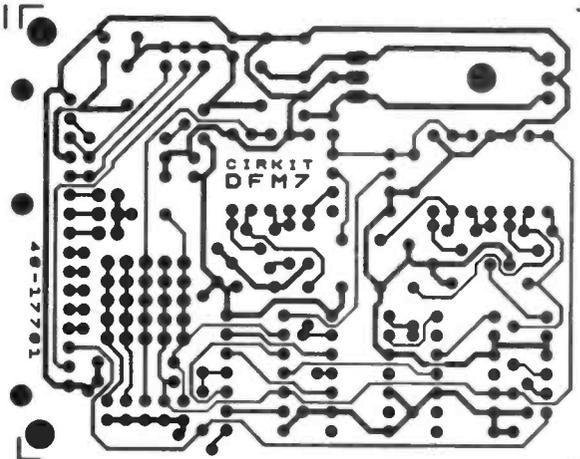


Fig. 5. The pcb mask. The ready-made board is available from Cirkit.



### Diode Matrix Programming

The layout of the diode matrix is shown in Fig. 4, which also shows an example of how it might be programmed. The inputs of the frequency meter module include pulldown resistors, so the diode matrix is wired to pull up the required inputs for any function.

Table 1 shows the full range of offsets and display annunciators

### Application

There are three obvious ways in which the frequency meter may be useful. With no if offset, it could form the readout of a direct conversion receiver. The buffered input, originally intended for medium wave, would be suitable for 160 and 80m bands with a resolution of 100Hz, and the divide-by-10 input would be suitable for all bands up to 6m, with a resolution of 1kHz.

Superhet 160m and 80m receivers with an if offset of around 455kHz could use the buffered input to achieve 100Hz resolution, though the divide-by-10 input would be needed for higher frequency bands.

The frequency meter module also has three display select inputs, whose functions are shown in Table 2. It is likely, however, that for amateur radio use the "normal display" mode, in which none of these inputs are connected, will be most appropriate.

Coupling to the local oscillator should be via a very low value capacitor, or just a piece of wire fixed near the output. If the frequency meter is a long way from the oscil-

lator, then screened lead may be necessary, but if it is nearby then a screen may be needed between the frequency counter and the rf circuitry. Some experiment may be needed, but no serious problem is to be anticipated.

### Results

The sample module supplied by Cirkit for evaluation worked well, responding to low level signals easily. With appropriate diode programming, and 10cm of wire on the input as an aerial, it responded to my 2m portable transmitter, displaying the frequency to five digits. The least significant digit read one count low, but this

### Parts List

#### RESISTORS

R1,5,10,15,16, 19 10k  
R2,11 27k  
R3,12 470R  
R4,8,13 100R  
R6 27k  
R7 470R  
R9 100k  
R14 1k8  
R17,18 6k8  
R20,21 4k7

#### CAPACITORS

C1,2,9,16, 18,20 100n ceramic  
C3,5,14 10u radial electrolytic  
C4 10u bead tant  
C6,13,19 22n ceramic  
C7 10p ceramic  
C8,10,12,21 1n ceramic  
C11 10n ceramic  
C15 100p ceramic  
C17 22n ceramic

#### SEMICONDUCTORS

Q1,2,3 BF241  
Q4 BC239  
IC1 7806  
IC3 74LS90  
IC4 74LS14  
IC5 74LS00

#### OTHERS

FC177 Frequency counter module.  
L1 1mH 8RB  
L2 1mH 7BS  
PL1 5x2 pin header  
PL2 5 way 0.1in pin header  
PL3 3 way 0.1in pin header  
PL4 3x2 pin header  
Diodes for programming, as required, all 1N4148 or equivalent.  
3 off 14 way ic sockets  
1 off 8 way ic socket  
10 way 0.1in board edge mounting socket  
6 way 0.1in board edge mounting socket

Table 1: Display Format of FC177

DISPLAY MODE (RANGE)	EXAMPLE OF DIGITAL DISPLAY	SELECT INPUT				IF OFFSET VALUES	UNIT	
		AM/FM	S1	S2	S3			S4
MW (0.0-3999.9)	1222.2 KHz	H	L	L	L	L	-455	KHz
		H	L	H	L	L	-260	
		H	L	L	H	L	-450	
		H	L	H	H	L	-261	
		H	L	L	L	H	-468	
		H	L	H	L	H	-470	
SW (00.000-39.999)	12.555 MHz	H	H	L	L	L	-0.455	MHz
		H	H	H	L	L	-0.468	
		H	H	L	H	L	-2.0	
		H	H	H	H	L	-10.7	
FM (0.0-3999.9)	92.88 MHz	L	L	L	L	L	+10.7	MHz
		L	H	L	L	L	+10.63	
		L	L	H	L	L	-10.7	
		L	H	H	L	L	+10.66	
		L	L	L	H	L	+10.74	
		L	H	L	H	L	+10.77	
		L	L	H	H	L	-10.63	
		L	L	L	L	H	-10.66	
		L	H	L	L	H	-10.67	
		L	L	H	L	H	-10.68	
		L	H	H	L	H	-10.71	
		L	L	L	H	H	-10.74	
		L	H	L	H	H	-10.75	
		L	L	H	H	H	-10.77	
L	H	H	H	H	-10.78			
FREQUENCY COUNTER (0.0-3999.9)	1222.2 KHz	H	L	L	H	H	-	KHz
COUNTER* (0-3999.9)	1080.0 KHz	H	L	H	H	H	-	-

\*Display shows % of input only.

could be corrected by adjusting the trimmer on the module (C3).

A kit for this project, comprising the FC177 frequency meter module and all board mounting components, is available from Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ for £42.63 inc VAT and postage (40-17704), or ready made for £49.85 inclusive (order number 40-17701). The FC177 module, for those who want to provide their own

board and other components, costs £25.74 inclusive (39-17700). For credit card orders telephone 0992 444111.

The kit comes with instructions and a data sheet clearly printed on white paper in A5 format. My only slight criticism is that the print on the circuit diagram is rather small — but HRT readers, of course, have the benefit of our own version in Fig. 1 of this article.

Table 2: Display Format Selection

("L"=open or V<sub>SS</sub>; "H"=V<sub>DD</sub>)

SELECT terminals			Display digits	Display contents
D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>		
L	L	L	5-digit	Normal display
H	L	L		(1) 0 display for the 2nd to 5th digits for AM or SW. (2) 2nd digit displays 1,3,5,7 and 9 with the last digit displaying 0 for FM.
L	H	L		The last digit displays 0.
L	H	H	4-digit	Normal display
H	L	H		(1) The last digit displays 0 for AM (2) The last digit displays 1,3,5, or 9 for FM.

# The London Amateur Radio Show



Mike Devereaux shows off his high-power setup, a great success for Nevada.



More people came on Saturday.



Dennis Goodwin of Icom demonstrates the new IC-R100 to Sheila G8IYA.

**Southgate ARC have been telling the world about the new London Radio Show for a year. HRT's roving reporters went to see.**

Since the days of the 'Ally Pally Rally' at Alexandra Palace, Londoners have often had to travel out of the greater city area to enjoy the atmosphere, bargain hunting expeditions, and the face to face chats with QSO partners traditionally associated with amateur radio rallies. The recent London Amateur Radio Show has just changed that, with an inaugural two day event at the Picketts Lock Sports Centre in the Lea Valley Leisure Park.

## Talk-in

On both days the talk-in station, GB4LON, operating on 156.55 and 433.55 did a truly excellent and very professional job in guiding motorists to and from the show, and it was later revealed that the original Ally Pally talk-in group were to be thanked for this. Because of the apparent lack of direction signs to the event (I only saw one, just before the actual venue entrance although 50 were reportedly erected), talk-in was certainly necessary if you didn't have an A-Z guide with you, due to the somewhat out-of-the-way location of the sports centre in the middle of the park, which is itself long and winding and hardly visible from the road.

A good deal of open-air parking space was available within a couple of minutes' walk from the front door, with an adjacent overflow car park in use when things became heavy (I remember one

city 'mobile rally' in a sports complex with only a multi-storey available for car parking — not the thing for HF mobile whip users!)

## Inside

After paying the reasonable £1.00 entrance fee, you were presented with two very well laid-out halls full of traders, with a further balcony housing other traders and various special interest groups such as the BARTG, Air Training Corps, ISWL, RNARS and Amsat UK, with a (complimentary) RAIBC stand sensibly being given a ground floor location, showing good planning by the organisers. A total of 92 organisations and traders exhibited, with goods ranging from black boxes to sometimes overpriced 'junk' as well as a good many bargains if you knew what to look for. The local Southgate Radio Club, who were providing most of the on-the-spot organisational power, had a bring and buy stand (why do we never see one at the NEC?) which on the Saturday often seemed to be the most popular stand at the show. For many bargain hunters this is the indisputable highlight of any rally trip.

Icom UK, who were the only major distributor at the show, displayed for the first time their brand new IC-R1 and IC-R100 receivers, these having been advertised in advance of the show (you could order one there but not take one

away with you!) However we at ASP had got there first with exclusive reviews of both of their receivers in the latest issue of our unique 'Scanners International' supplement.

## Room to Walk

Possibly rather surprisingly for an event in London, there was plenty of room to walk around, and at no time on the Friday or Saturday did we find the need to look over anyone's shoulders at any of the 'goodies' adorning the many stands. Homebrewers could choose from several component stands, and both Malsor Kits and Kanga Products were there with their popular kits. As well as this, Kanga had a nice pile of ex-PMR rigs behind the counter for sale, just right for 2m packet at a sensible cost. One other trader was in fact trying to sell Pye Cambridges (rather old rigs with a valve PA and driver) at a fiver a time (at the end of the show the pile was still high) and at least one other trader (well known to some!) was selling the usual 'non-workers' — in other words cheap goods, but don't try coming back if it doesn't work after you've got home. The moral is always: know what to look for!

## Catering

A cafe selling sandwiches, cakes and drinks catered for the hungry visitor, an adjacent bar being very handy for passengers washing down their lunch in convivial company, and upstairs overlooking bar catered for the slightly hungrier. A short walk out of the halls also lead to a carvery in the 'Golf Bar', serving a truly excellent roast lunch in quieter surroundings which years truly and parner certainly enjoyed.

As the visitors thinned out on the Saturday afternoon, a certain amount of good-humoured merriment went on

amongst the traders, the end result being Mike Hayden of Waters and Stanton on the receiving end of a custard pie — not unconnected with his prior-to-opening antics of Icom stand-decoration with 'Silly String'. Who says that amateur radio traders only smile when they're selling things?



Heather Rodmell of Heatherlite demonstrates their mobile mic.

Kanga Products were selling ex-PMR rigs as well as kits.

On the Saturday afternoon, I couldn't help noticing the large numbers of boxed visitor's show guides still in evidence at the entrance. Along with the much smaller number of visitors on the Friday, this made me think 'Were they expecting rather more people to attend?' The show was actually being run by a commercial group rather than a radio club or society, despite the sterling assistance of the Southgate ARC, in contrast to the Leicester Exhibition or the NEC convention. However, the organisers, who were Steve Blayer G4UKR, Brenda

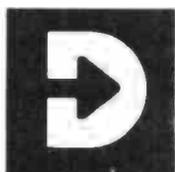


Godfrey G4VXL, Ron Lindsay G3KTZ and Steve White G3ZVW, seemed pleased with the event with a promise of another show, same time, same place, next year.

### Better Next Year?

In all, the show is in a good location for the Londoner, but I feel that others travelling further afield may have had trouble with the location, especially with the often standstill evening rush-hour traffic that I experienced for several miles on the Friday. However this was made worse by roadworks, and by next year, a direct road to the North Circular should be ready to make getting in there a little easier. Lots of rigs on show, lots of goodies, but you've got to know what you're buying!

Mike Hayden of Waters and Stanton receiving a custard pie!



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# Heathkit HW-9 CW QRP Transceiver



**Kit building is a good way to get a high-value rig and learn in the process, as Chris Lorek G4HCL finds out.**

Ever since I first became interested in amateur radio, Heathkit equipment held an almost magical fascination for me, and the idea of being able to say 'I built it myself'. However, over the years, even through studying electronics and an eventual career in radio equipment design, I never once got the chance to actually build my own Heathkit rig. Not until a few weeks ago.

People relax in different ways; some make models, others go down to the pub, your truly reads lots of technical books, writes technical articles and the odd book or two, and gives lectures! However when the opportunity came to take some 'time off' to relax by building a Heathkit HW-9 QRP transceiver, I seized it willingly and had a marvellous time.

## Homebrew Advantages

The first advantage in building your own rig is often the cost-saving compared to a ready-assembled set, but many people are put off by the question of the

set's re-sale value. With Heathkit gear, you get a professional-looking and professionally rated piece of equipment of a known design and origin, that certainly does fetch a decent price when the day comes to sell it on, complete with thorough technical documentation.

Secondly, the self-training aspect of building it yourself can be a great boon to those starting out in the hobby, learning to identify resistors, capacitors and the like, together with the skills of good soldering practice that will stand the newcomer in good stead over the years. Finally, the aspect of aligning the set of optimum performance shows the constructor exactly how tuned circuits and so on operate, and gives real hands-on experience of what is rapidly becoming a 'black box' hobby in some fields.

## The HW-9

The HW-9 is a CW QRP (low power) transceiver kit, the completed set operating from an external 12V DC power

supply. It gives around 4W output on the 80m, 40m, 20m and 15m bands under vfo control. The kit costs £249.95 all in, including the power supply. An accessory band pack at £44.95 adds the 10m band plus the WARC bands of 30m, 17m and 12m, and can be added later at any time after the kit has been built, allowing the newcomer or budget-conscious amateur to spread the cost over a period in line with needs and interests. Just under £250 for a multi-band transceiver can't be bad.

Heathkit have had a QRP CW rig in their range for some time, showing its popularity. It started many years ago with the HW-7, a three band (40m, 20m and 15m) rig which had a direct conversion receiver and a simple transmitter, with crystal or vfo frequency control. Next came the HW-8, which added wide and narrow audio filtering together with better performance. Finally, the current HW-9 came along, offering a superheterodyne receiver with a four pole crystal filter, wide and narrow active audio filters, rit (receiver incremental tuning), and solid state transmit/receive switching.

The set measures a compact 108mm (H) x 235mm (W) x 216mm (D) and weighs a light 2.1kg, making it suitable even for holiday or business trips to exercise a 'rare' prefix.

## Unpacking

Within a day of being told the kit was on its way, a large well-wrapped parcel came to my door, which I commenced unpacking with glee. After removing the manual and assembly details, the first thing I noticed was a conspicuous label warning me not to unpack anything else until the instructions called for them. This in my opinion is a very sensible measure to make sure that all the small bits and pieces are identified as required and, possibly more important, that they don't get lost in all the packing.

The supplied manual certainly deserves praise. As well as being an assembly and technical manual it contains a complete guide to soldering, electronic construction techniques, component identification and all the necessary information. A comprehensive technical description of the set's operation is given, together with complete circuit and layout diagrams. The final section in the manual gives a well-written guide to fault finding if your



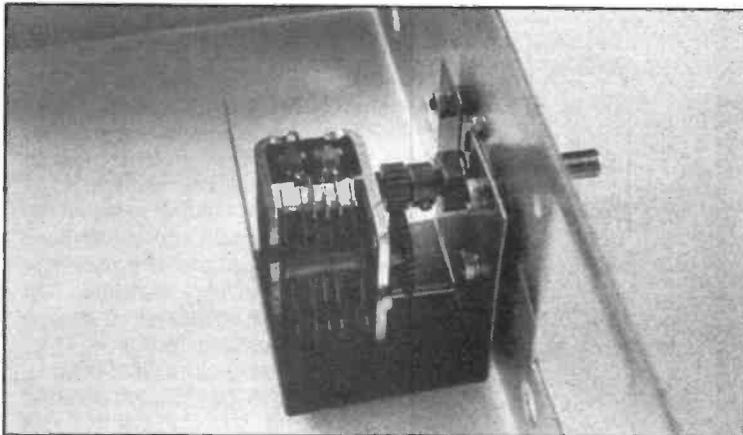
The illustrated pcb and manual.

newly-constructed rig doesn't work first time — an essential experience for the new electronics constructor — together with checks and areas to investigate, and Maplin, the UK suppliers of the Heathkit range, even have a 'Get You Working' service at a reasonable rate to fix the completed set if you get completely stuck.

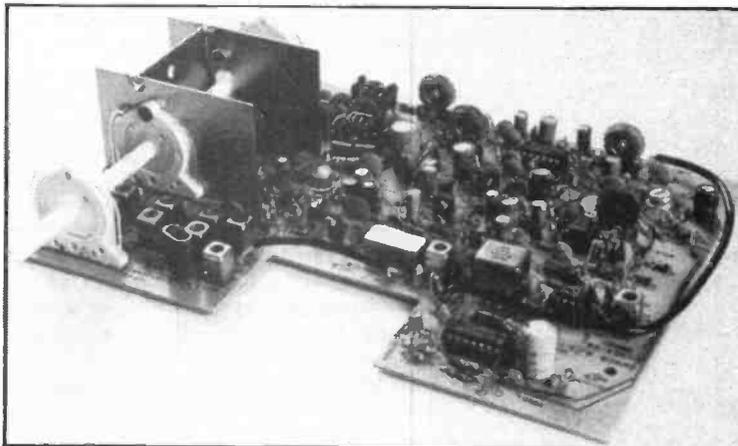
### Getting Started

Assembling the set is done in several stages: first the oscillator pcb, then the more complex Tx/Rx pcb, followed by the chassis mounted components. The two pcbs are then actually fitted to the chassis and the panel controls and sockets connected, followed by the alignment of the tuned circuits.

The 100-odd page manual gives excellent step-by-step information on all this, and the accompanying fold-out pictorial guide shows you where each component goes, again stage by stage with many pages having the relevant components highlighted at each stage. A checklist arrangement is used, where you place a tick against each component or construction step as you go along. As well as serving as an 'idiot's guide' this really does allow you to put the part-finished project to one side, to carry on the next day, and be assured of starting off at the exact point you left it. Full marks. Heathkit!



The difficult bit — the ufo capacitor assembly.

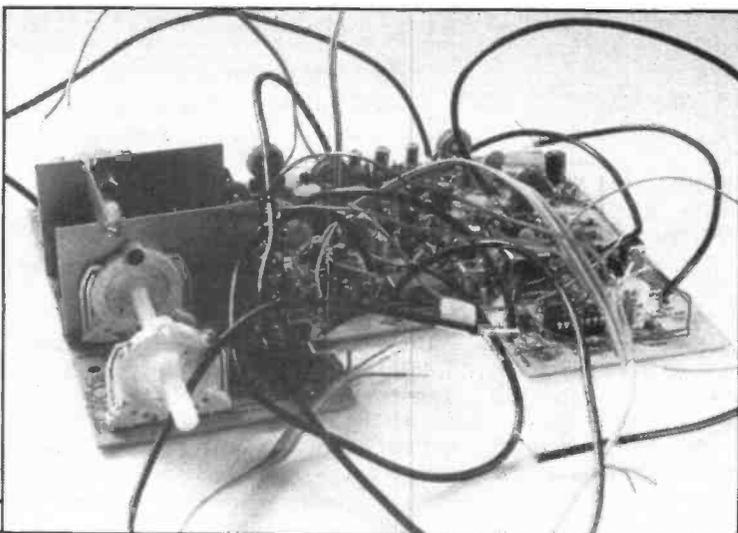


The completed Tx/Rx board.

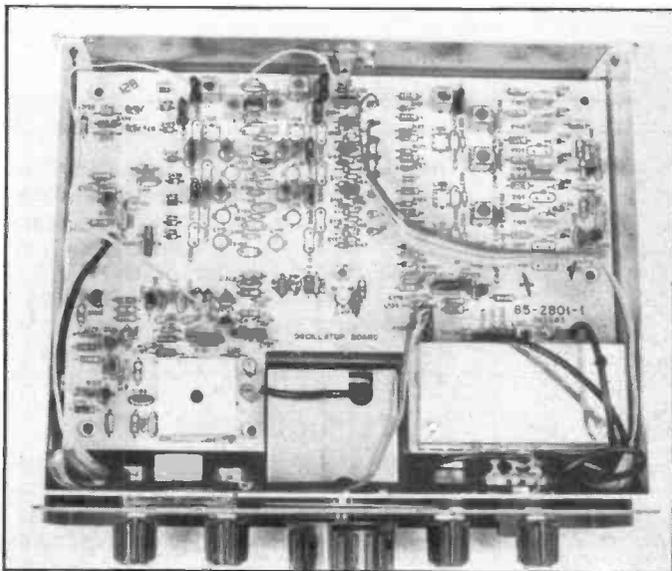
### The Oscillator Board

This consists of the crystal oscillators and accompanying tuned circuits, together with the vfo circuitry. As the simpler of the two pcbs it was the first to be detailed in the step-by-step instructions. The majority of the components here were 'taped', ie components with radial leads arranged as a taped 'ladder'. These were arranged in the exact order of assembly, together with a life-size diagram with all the components identified so you can literally Sellotape the component 'ladder' onto this. The resulting assembly is a piece of cake, Heathkit even provide the solder. I wish all kits were this straightforward.

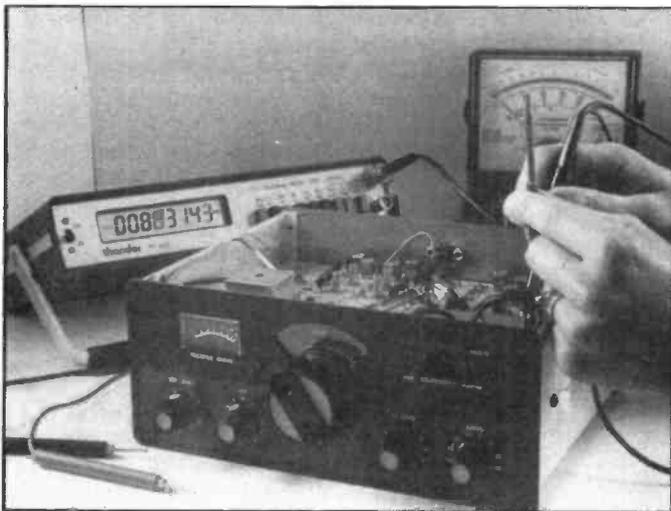
I must admit to having a slight problem though with the identification of some of the ceramic capacitors that weren't taped, seeing 'n470' marked on a capacitor together with just a plain '6' made me think it was an n470 capacitor (0.47nF for those who still live in the old days) rather than the 6p0 capacitor it really was. I attribute this to the American way of marking values. However, reference to the clear instructions resolved the dilemma, and after a few days the oscillator board was finished, followed by a check for dry solder joints, solder bridges, wires not cropped and the like, all these checks being detailed on the check list.



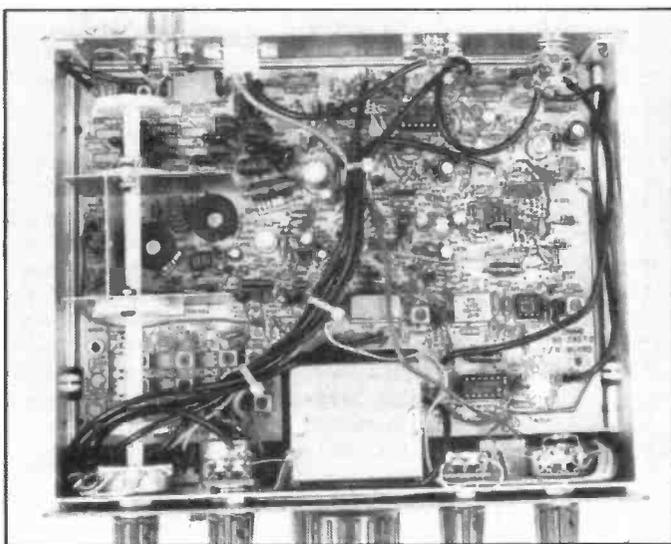
The slow bit — wiring the Tx/Rx board.



The simpler (oscillator) board wired in.



Final alignment.



Everything in place.

### The Tx/Rx Board

This was rather more complex than the oscillator board, but again the instructions made the assembly job very simple, even when the time came for winding the small number of ferrite cored toroids required. The board mounted components were more tightly packed, but again experience from the simpler oscillator board helped to tackle them. This board took me rather longer to finish,

and check the soldering, and then the board put aside and the chassis mounted component assembly started.

### The Chassis

Here's where my lack of mechanical knowledge required me to pay very close attention to the pictorial instructions. Putting the vfo capacitor assembly together with all the friction drives and the like being a novel experience. Heathkit provide a plastic nut-driver tool, which

made assembly a lot easier. I found all the screw fixing descriptions and other dimensions were given in American imperial form, ie inches and so on, and being used to metric types (together with the vast majority of UK youngsters who could be starting out in amateur radio, and will probably not know how to identify a 6-32 x 1/4 sheet metal screw) I had to think a little, but this is a very minor criticism indeed. This part of the construction took me the longest.

### Alignment

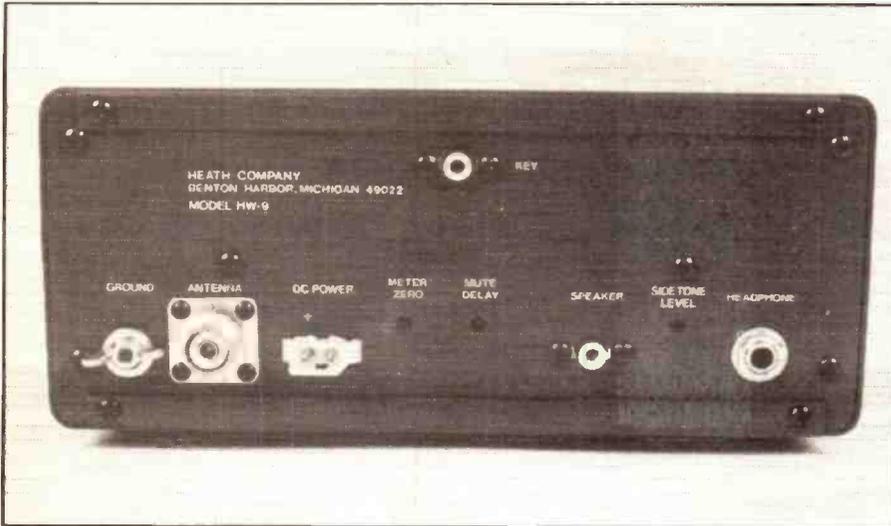
Now for the test: does it work? To align the circuits, a sensitive multimeter and a frequency counter are required, together with the usual requirements of a 12V power supply, loudspeaker or headphones, and CW key that would be needed in use on-air. First of all, the manual goes through a resistance check list before power is applied, and here's where I found my first problem. I must admit this was completely my fault, a tiny solder bridge which I hadn't seen during the visual check, across a couple of close spaced leads on a coil on the oscillator board. This was quickly rectified, and fortunately I found no further errors, so now onto the 'tuning up' process.

This was very straightforward, Heathkit even providing the double-ended plastic trimming tools required. The bandpass filter adjustments were a simple 'tune for maximum meter reading' affair, and the bfo frequency was quickly set with a frequency counter. Then came the vfo adjustment. Here the manual told me to set the vfo scale to exactly 250, tune the vfo coil adjuster for a frequency of 5.7493MHz, and then set the scale to exactly 0 and tune a trimmer capacitor on the side of the main vfo variable capacitor for a frequency of 5.9993MHz. The second adjustment affects the first, so a few re-tunes and re-adjustments were needed to get both spot on, but eventually I got there.

A few straightforward potentiometer adjustments and an RF power check into a dummy load, the alignment was finally complete. The result: a complete and working radio, first time!

### Performance

Although this isn't a full technical review of the final product, many readers will be interested to know what to expect from the set, so a few words about this will not go amiss. The transceiver covers the bottom 250kHz of each of the amateur bands, placing you in the usual CW sub-sections of the international voluntary band plan. Tested on 20m, I found the set gave 3.8W output, with a 0.45µV sensitivity for a 12dB sinad signal. This means that you should easily be able to hear those who can hear you, and QRP enthusiasts will be quick to tell you that 4W output is only a few S-points down on



the usual 100W signal found on the bands, in fact special QRP frequencies are used for low-power operation, to provide a 'common' channel among enthusiasts.

I found the vfo quite stable, and although the knob wasn't quite the heavy flywheel type found on £2000-plus radios it was quite adequate, a couple of finger holes being provided to allow a fast QSY when needed. The narrow CW audio filter was very effective indeed, with absolutely no trace of the hollow ringing found on some sets. In use, I normally tuned around using the 'wide' position then, when I had homed in on a signal I wished to copy, switching in the narrow filter cleaned the background mush up very nicely. For the technically minded, the crystal filter selectivity as measured with my cavity tuned signal generator was 800Hz (-6dB), with skirt, selectivities of 3.5kHz (-20dB), 5.05kHz (-40dB) and 7.2kHz (-60dB). Although understandably not up to the specification of multi-thousand-pound sets, this should be quite satisfactory for a set of this type. The receiver image rejection measured on 20m was good at

73dB, and for those interested in the measured transmit harmonic levels these are given at the end of the Manufacturers Specification section.

## Overall Appraisal

The question many readers will be asking is 'How long would it take to build?' This really depends on your previous experience, but by following the instructions carefully and on looking back at my (methodically documented!) timings, I would say that by setting aside one hour every day for construction, it should take the average person, who is capable of following instructions although not necessarily an experienced constructor, around a month in total.

The end result is a radio that in my mind is very good value for money, gives you the sheer pride of being able to say 'I made it myself' as well as giving you a good chance of being able to repair it yourself should it go wrong in the future. But most of all it can give a newcomer to home construction an excellent start in

## GENERAL:

### Frequency Coverage:

- 3.5MHz-3.75MHz
  - 7.0MHz-7.25MHz
  - 14.0MHz-14.25MHz
  - 21.0MHz-21.25MHz
- OPTIONAL ACCESSORY PACK ADDS:**
- 10.0MHz-10.25MHz
  - 18.0MHz-18.25MHz
  - 24.75MHz-25.0MHz
  - 28.0MHz-28.25MHz

### Frequency Stability:

- Typically less than 500Hz/hour after a 30 min warm-up period.
- Typically less than 150Hz/hour after a 90 min warm-up period.

### Power Requirement:

- 11-16V DC at 1 Amp (12.6V nominal)

### Rear Panel Connections:

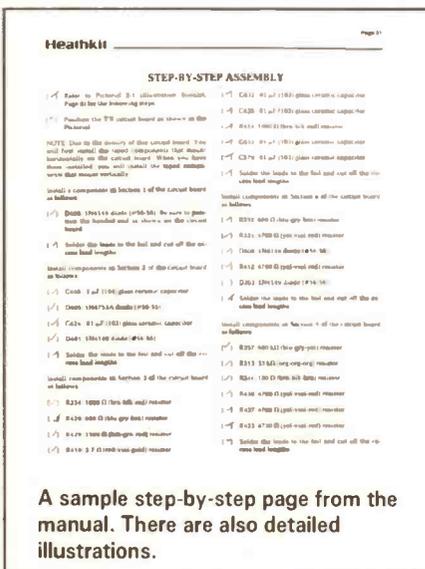
- DC Power, Speaker, Headphones, Aerial, CW Key, Ground.

### Operating Temp. Range:

- 0 deg C to 40 deg C.

getting to know components, their function, and typical electronic construction and alignment methods, with a satisfying end result. In a forthcoming HRT issue we'll be featuring another Heathkit model, this time the SB1000 1kW linear amplifier for those who'd like to get back to building their own 'afterburner'. Wait and see how we get on with that!

*Our thanks go to Maplin Electronics plc, who are the UK Heathkit distributors, for providing the review kit.*



## TRANSMITTER

### RF Power Output:

CW, 4W all bands expect 10m which gives 3W

### TX Freq Offset:

700Hz higher on all bands

### Harmonic Radiation:

-35dB minimum, at rated output

### Spurious Radiation:

-40dB minimum, at rated output

### Tx/Rx Operation:

CW, Full break-in

### CW Sidetone:

700Hz to speaker or headphones, level internally adjustable.

## RECEIVER

### Sensitivity:

Less than 0.5µV for 10dB S+N/N. Less than 0.2µV for a readable signal.

### Selectivity - CW Audio Filter:

Narrow - 250Hz max at 6dB  
Wide - 1kHz max at 6dB

### Passband Centre Freq:

700Hz

### Audio Output:

1 Watt into 8 ohm load

### Dynamic Range:

85dB, measured in narrow filter mode

### Image Rejection:

60dB minimum

### RIT Range:

+/- 1kHz

## Measured Tx Harmonic Levels

	2nd	3rd	4th	5th	6th	7th	8th
80m	-46dBc	-66dBc	-75dBc	<-85dBc	<-85dBc	<-85dBc	<-85dBc
40m	-45dBc	-63dBc	-72dBc	-83dBc	<-85dBc	<-85dBc	<-85dBc
20m	-42dBc	-62dBc	-59dBc	-62dBc	<-85dBc	<-85dBc	<-85dBc
15m	-46dBc	-66dBc	-62dBc	-78dBc	-82dBc	<-85dBc	<-85dBc

# 50 MHz MESSAGE

## Hal Lund ZS6WB In South Africa

1989 Six metre DX in review —

The beginning of the February 1989 seasonal openings provided day after day of excellent propagation to Europe, concentrated on the United Kingdom and nearby countries. From mid-March European openings became fewer, and rarer areas were only occasionally heard. VE1YX provided the first breakthrough to North America on 24th March, S79M on March 27, and 5NO on 1 April.

The first few days of April

hours off' the back of his beam' and though he was heard working dozens of west coast US stations, none of them was heard in South Africa.

## DX Outlook for 1990

Although the progress of the Cycle appears to have slowed down dramatically, the Feb to May period should provide some excellent DX opportunities for Southern African operators.

We can anticipate frequent good openings into Southern Africa from Europe. Openings to Europe should begin around mid-February and

## Ken Ellis presents more reports from Six.

brought openings to KH6, YC2EMK and ZD8MB plus a few European stations, mostly in France. From mid-April JA openings began and JAs were worked from all ZS divisions. From mid June to late July there was a break in European openings.

Late July and early August brought a few G/PA openings, but from late August propagation was limited to the Mediterranean area with the exception of a one hour opening on 29 August JA.

During September and October there were frequent Mediterranean openings with occasional brief extensions to GPA and others. TA4/G3SDL was heard almost daily during his stay in Turkey and provided a new country to many ZS operators.

From early November conditions deteriorated to Europe. EA8/G3JVL was QSOd, and on 15 and 21 November W6JKV/CT3 was worked. The 21st opening was especially interesting in that JIM was S9 for two

continue through March. Many new countries, especially in Europe, are expected to be on this year.

## QSL

3DA0AU: Harry Stickley POB99, Amsterdam 2375, Rep. of South Africa; 9Q5EE: Sig Segner WA9INK, 1595 Ashland Ave, 407 Des Plaines, IL60016 USA; EL2FO: Alan Simpson, US Embassy, ATO Box 39, New York 09155 USA; FC1EAN/7X: Jean-Michel Suire, 3 Route de L'Hic, F-86170 Cisse, France; TA4/G3SDL: Dave Court, 98 Andover Road, Orpington, Ken BR6 8BN, England; ZS3KC: Jack Anderson, PO Box 1232, Swakopmund 900, SWA/Namibia.

## Rare Squares on Six

JG77 ZS9A and ZS9H (Walvis Bay) ZS3KG and ZC3AC are now on six; KG11-ZS4AAB; KG30-Scotty ZP8DP in Maseru: ZS4PV; KG32-ZS4NS KG38-Larry A22BW in

Frankistown; KG53 ZR6CBK near Amsterdam; KG56 ZS6LUX in Tzaneen (VG TEP location.); KH52 ZS3JO now very active on six.

## Other DX News

Brian 9J2BO is expected soon on six. The UK Six Metre Group is sending a beacon to Lusaka to operate continuously with the call sign 9J2SIX. Hats off to Dave Court TA4/G3SDL for his excellent DXpedition to Turkey, which provided many Southern African DXers with a rare new country. Most European DXpeditions seem to be mounted either during June and July in the peak of the European Sporadic-E season, or during June and July in the peak of the European Sporadic-E Season, or otherwise during their November/December F2 Europe-to-North-America season peak; in either case it happens while our propagation is very poor. We hope that others will plan operations near the equinox when other areas will have an equal chance of making a contact. Mike Vestal VS6WV (ex SV0FE) reports that the VS6SIX beacon still operates continuously on 50.075

## ZS Beacon Status

ZS1STB50.904 25 Watts continuous operation.  
ZS2SIX-50.005 25 Watts continuous operation.  
ZS3VHF-50.018 50 Watts continuous operation.  
ZS4SA-50.073 20 Watts beam north daily 1130-2130 utc.  
ZS6IN/B 50.050 10 Watts continuous operation.  
ZS6PW 50.027 1100-2000 beaming north.

## 1990 TEP Season Opens

"The Spring Equinox TEP 1990 season opened early this year. Geoff GJ4ICD, Jersey, was the first to report the opening this year. On 3/2/1990 at 1500z ZS6XJ called reporting his signals S9+. ZS6WB worked S8, climbing to S9+. ZR6A and ZS3E were both S9+. ZS3E beacon was heard until 1900z. Further openings to Jersey on 3rd,4th,8th,10th, 11th,13th and 14th February. Stations worked include ZS6WB, XJ, BMS and LN. G4JCC Hayling Island had openings on 8 to 11 February. At Folkestone nothing was heard until Feb 19."

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# Practicalities

I was recently chatting to a friend of mine whose father was licenced in the early 1920s about the changes which have taken place in amateur radio since then, even since the 1960s. It is much easier to obtain a licence now, ready built equipment is available off the shelf, computers are used in a large number of stations, and the complexity of the majority of equipment is far beyond what people would have thought possible even 20 years ago. Despite this, amateur radio still attracts a large number of people who enjoy experimenting and building something out of nothing, or

There are a number of ways of arranging this. The most obvious way is to have a diode in series with the supply. It would conduct when the supply was wired up the right way round. If the supply was reversed, then the diode would be reversed biased and the unit would be protected. This method has the drawback that the diode will introduce a voltage drop of at least 0.6 volts if it is a standard silicon type. It is possible to reduce this by using a special Schottky barrier type diode but they are fairly expensive and still introduce a small drop.

The most commonly used method is shown in Fig.2. Here the diode is reversed biased under normal conditions and has no effect on the circuit. However, if the supply is connected up the wrong way round then the diode will conduct and blow the fuse. For obvious reasons this diode gets the name "idiot diode".

If this method is used there are a couple of warnings. The first is that the diode should be capable of carrying a large enough surge current to blow the fuse. The second is that under no circumstances should the fuse be replaced for one of a larger rating, or just replaced with a wire link. If this is done and the supply leads are connected round the wrong way it may cause the idiot diode itself to blow.

In spite of its apparent crudeness the idea is quite simple and effective. For the cost of a few pence it protects

## *Ian Poole G3YWX looks at another set of practical propositions.*

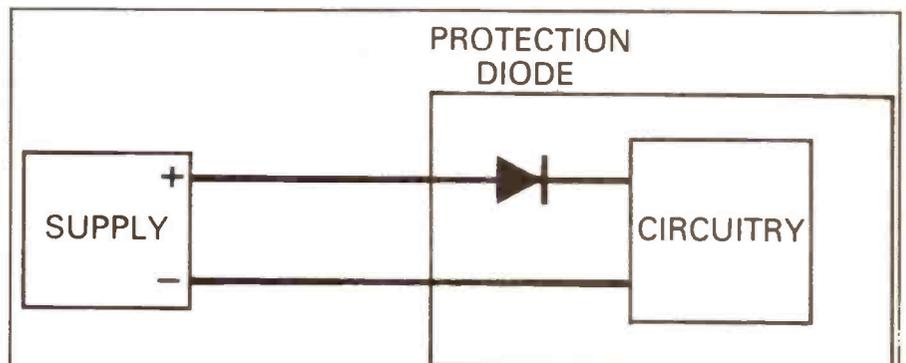
enjoy playing around with the latest in technology. This all goes to prove that the spirit of amateur radio is still very much alive.

Well, this month for those who do enjoy a bit of construction or experimenting, there is a selection of ideas: protection or "idiot" diodes; a note on screening; an easy way of obtaining FM from a crystal oscillator, and a method of designing your own active bandpass filters.

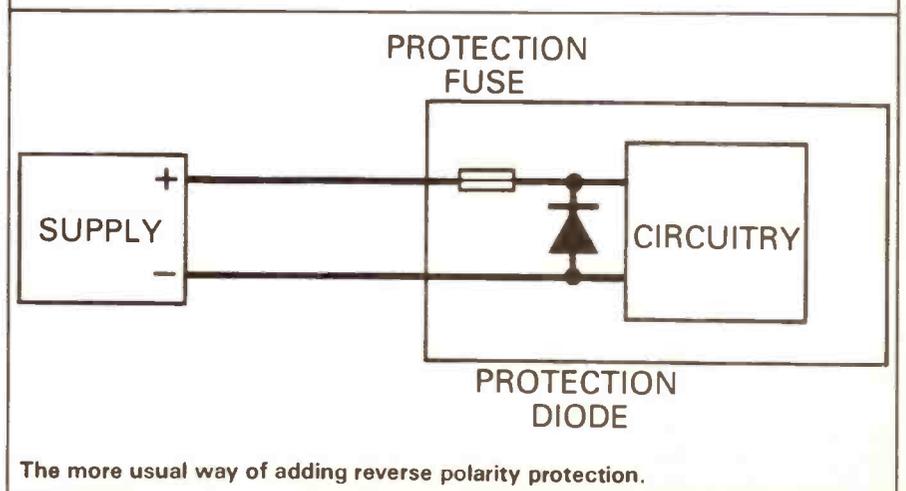
### Idiot Diodes

Nowadays there is a growing tendency for equipment to be run from a nominal 12 volt supply. This is very convenient as it is not only an easy voltage to use for many semiconductor circuits, but it also allows equipment to be powered up directly from a car battery.

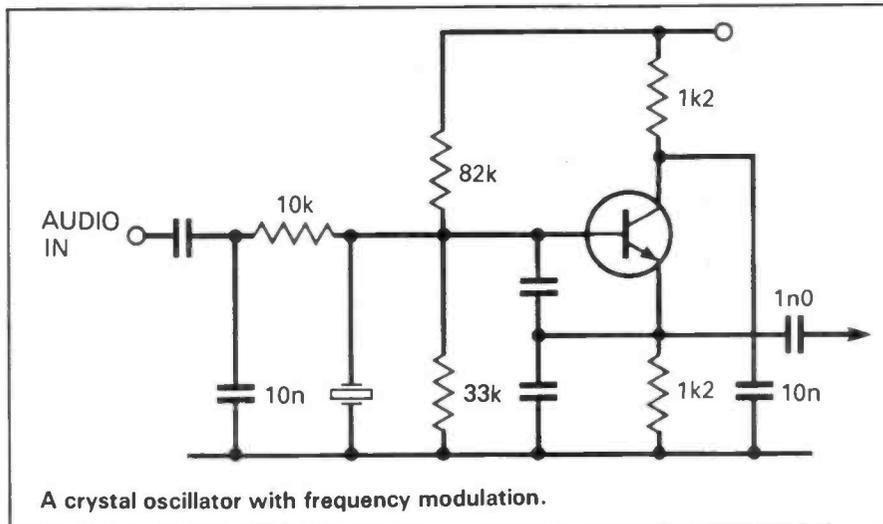
When connecting equipment up to batteries or supplies there is always the possibility that the wires will be connected on the wrong way round. This could obviously be disastrous and quite expensive if it is done to one's latest piece of electronic wizardry. To stop the effect being too disastrous most manufacturers incorporate some form of protection.



One way of adding reverse polarity protection.



The more usual way of adding reverse polarity protection.



is quite simple. The audio signal changes the operating point of the oscillator transistor. This in turn will change the frequency of oscillation very slightly.

Using this method it is quite possible to produce more than enough deviation on an 8 or 12MHz oscillator for multiplication to 2 metres. Even though it may not seem to be the most elegant method of obtaining FM it has the advantage that it is very simple to update an existing oscillator to give FM. This can, of course, be very useful when modifying old AM PMR equipment, or just experimenting to see what can be done.

against a very costly error being made. In view of this it is worth putting on any equipment which does not already have it.

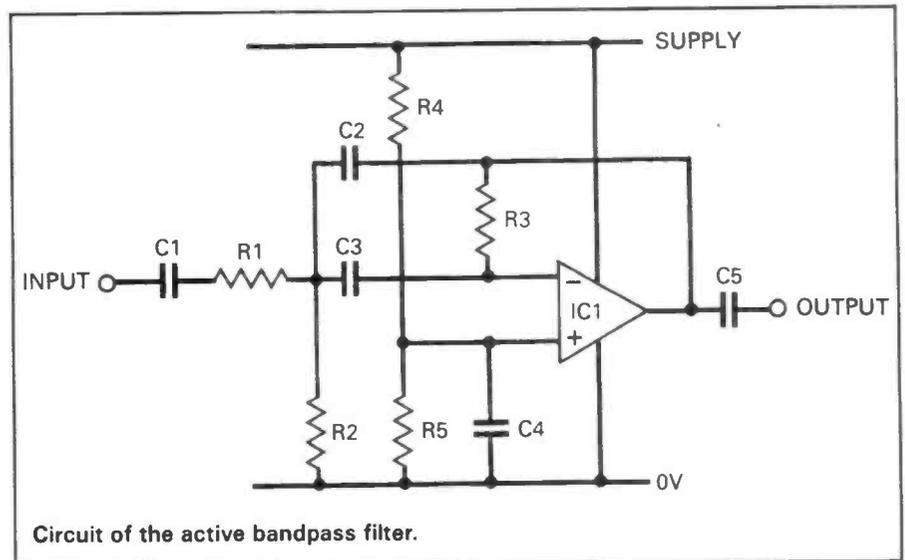
### Earthing in Painted Cases

One type of problem which seems to crop up quite regularly is earthing within units. It may be that an RF connector is not making good contact with the panel on which it is mounted, possibly two panels are not making good contact and the screening is very poor, or maybe a board is not making good contact with the chassis. Sometimes these problems can make themselves known in fairly obvious ways, but at other times they can prove very difficult to track down. Although this type of problem can be caused in a number of ways one of the most common on newly made home-brew equipment is paint on the metal surfaces.

It may seem obvious to say that if any contact is required the paint on the surfaces should be removed. It should be scraped away from under screw heads or around any RF connectors. In fact any RF connectors need only have the paint removed on the inside of the case underneath the nut used to tighten it onto the panel. If this is done carefully it should not detract from the looks of the unit and only result in an improved performance.

### FM Without a Varactor

The heart of many VHF transmitters consists of a low frequency crystal oscillator which is multiplied up many times to give the right frequency. If this has to be frequency modulated this is obviously best done



at the oscillator frequency ie, before the frequency is multiplied by the same amount as the signal. So if 150Hz deviation is obtained at 8MHz, then once the signal has been multiplied by 18 to put it on 144MHz the deviation would be increased to 2.7kHz.

There are, of course, several ways in which the signal can be frequency modulated. One of the most popular and probably most successful is to insert a phase modulation just after the oscillator. This will also require an integrator to be placed in the audio path so that frequency modulation is obtained and not phase modulation. Another way is to include a varactor diode across the crystal and apply some audio to the diode. A third and very simple way is to simply apply some audio to the base of the oscillator transistor as shown in Fig.3.

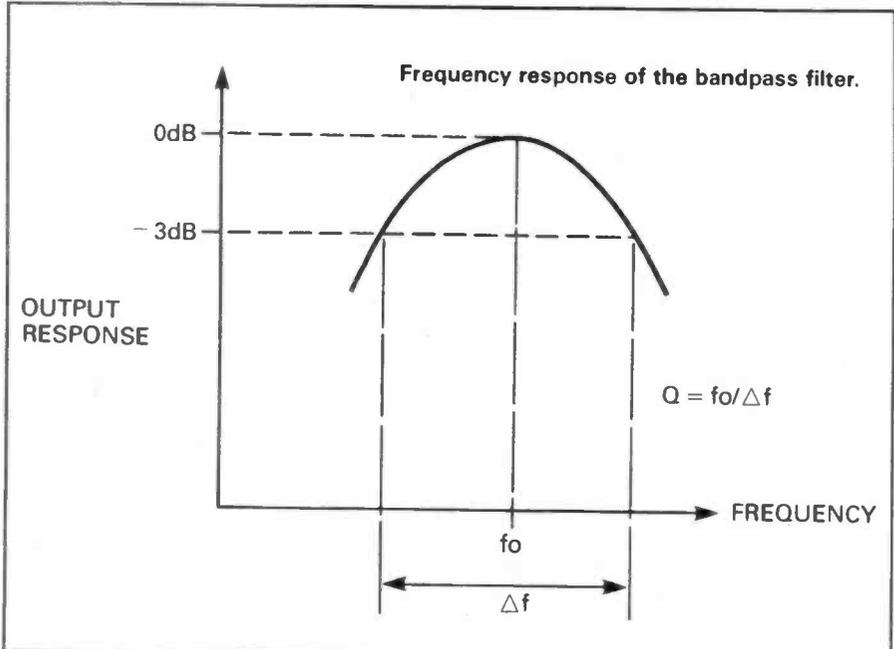
For way in which this idea works

### Active Audio Bandpass Filters

Audio filters can come in very useful for a number of jobs around the shack. They can be used as part of a tone burst detector, for CW filters, as well as several other applications.

The bandpass filters at radio frequencies, coils of various forms are generally used. However, when filters are required for audio frequencies the coils become large and bulky and the formers are not always easy to obtain. Fortunately it is not necessary to use coils when working with frequencies below about 50kHz or so as it is possible to make an active filter. These consist of an amplifier together with a handful of resistors and capacitors.

The basic circuit for an active filter is shown in Fig.4. An operational amplifier has been shown as it has a very high input impedance and a low output impedance. This means that



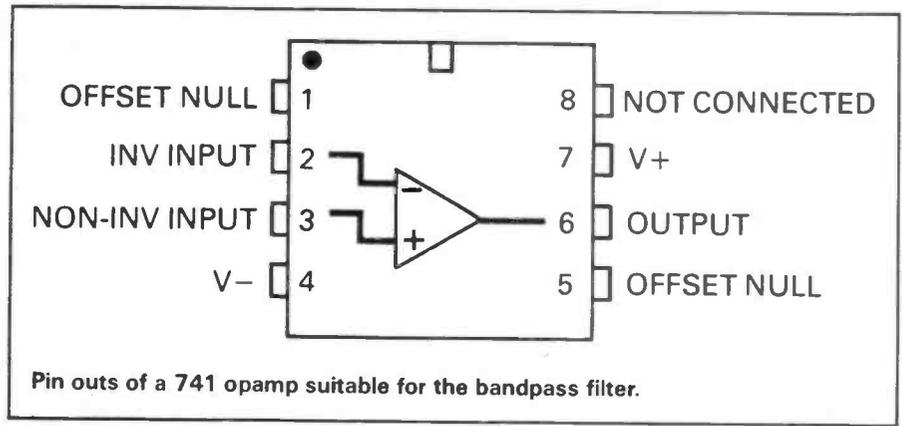
In these equations  $G$  = the inband gain,  $Q$  is the quality factor of the filter and is the same as the  $Q$  of any other tuned circuit and  $f_0$  is the centre frequency as shown in Fig.5.

As this filter only uses a single amp it is best not to be too ambitious keeping the  $Q$  less than 10 and gain to small values. For example it is quite acceptable to have unity gain with the circuit. In fact if the filter is to be switched in and out of circuit in a receiver this is just what is required. If better skirt performance is required then it is possible to cascade two or more stages.

When calculating the filter values it is best to choose a convenient capacitor value as a start. Then having set the values for  $G$ ,  $Q$  and  $f_0$ ,

the amplifier will not noticeably load the filter network and the circuit will give results which are almost identical to the calculated ones. This is a great benefit because it simplifies the equations and reduces the time used up in experimenting and trying to optimise the filter.

The circuit has been arranged so that it can be operated from a single supply, with the resistors  $R_4$  and  $R_5$  setting the operating point for the amplifier. The value of these resistors will not be at all critical provided they are equal — a suitable value could be 10k ohms. The capacitor  $C_4$  across  $R_5$  is again not critical and can be around  $10\mu F$ , or whatever is available around the shack. The input and output capacitors should be sufficiently large so that they do not have any significant impedance at the operating frequency. If  $C_1$  is 10nF and  $C_5$  is  $10\mu F$  this should be sufficient for most applications above 500Hz.



Finally the values of the filter components can be determined from the equations below:

$$C = C_2 = C_3$$

$$R_1 = \frac{Q}{2\pi f_0 C G}$$

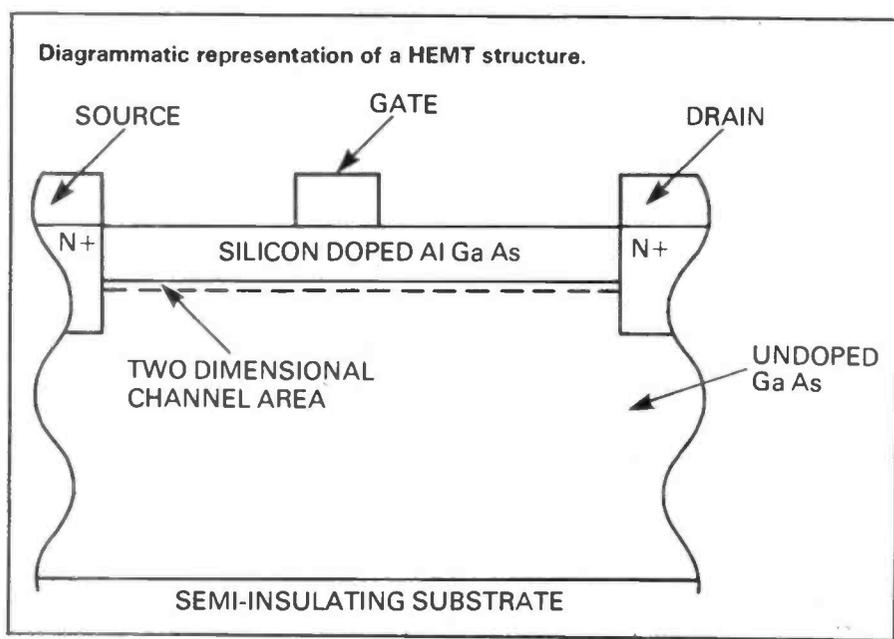
$$R = \frac{Q}{(2Q^2 - G) 2_0 f_0 C}$$

$$R = \frac{Q}{\pi f_0 C}$$

the resistor values can be worked out. If these values do not turn out to be suitable then a new starting point can be chosen and the calculations repeated until suitable values are obtained.

### Final Comments

Well that's about it for this month. But before I do finish, you may be interested to be reminded that my book *Practical Ideas for Radio Amateurs* is available and it contains many of the ideas which have appeared in this series over the years together with some more as well. It is available from Argus Books, Argus House, Boundary Way, Hemel Hempstead HP2 7ST, £5.95 plus 60 pence postage and packing if it is obtained direct from the publisher. Alternatively if it is obtained via a bookshop the number is ISBN 0-85242-927-7.



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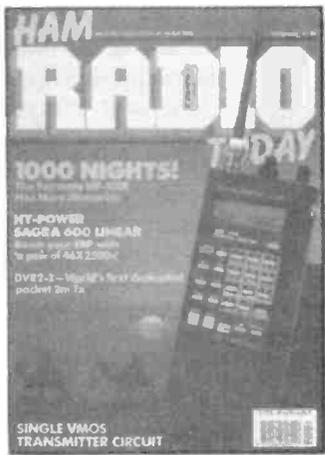
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HRT77

# Vico and his Rema



Vico GOECF in his shack. The steering wheel for the rotatable quad is just by his right hand.

spoke of it. In the aftermath of Hurricane Hugo the only news coming out was from radio hams."

Vico started with a morse operation based in the bedroom he shares with wife Vera. A classic mistake for those who want to continue with amateur radio *and* the rest of their lives. As he recalls, "We nearly got a divorce over it!" "He'd keep me awake all night

with that awful tap-tapping", says Vera. "He didn't need any sleep because he didn't take any exercise, but I was working."

GOECF then moved out to the garden shed, and radio shack was born. Vera was happy and Vico began to develop his activities spending most of his time constructing gadgets and the huge 2-ele 3-band quad antenna, made from metal scrap, that towers above the neighbouring trees in the leafy suburb. Fortunately for Vico his son-in-law was able and willing to put up the antenna, which is rotated by a steering wheel inside the shack, on the roof. Vico, still in his wheelchair, now experienced the delights of voice radio worldwide.

The quad antenna puts Vico onto 10m, 15m and 20m, and his main home-based rig is a Yaesu FT1012 HR transceiver, on which he works mainly CW and SSB. The quad is supplemented with a multiband dipole (also home-made, of course) which does not have the range or directionality of the rotatable quad,

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## *There is more than one way of going mobile, as Susan deMuth discovers when she meets Vico Norengo GOECF.*

---

Vico Norengo's "long wheel base cruiser" is a homebrewer's dream, assembled from scrap and bits of his kitchen, and GOECF reckons he is the only Ham Radio station in the world to be based on board a bicycle. Vico receives up to 400 QSL cards a week from as far away as Indonesia and Bear Island begging for pictures of his mobile operation, an ingenious push-bike with a solar-powered transmitter strapped to the front and an aerial at the back, calling the world on his travels around London.

### **Italian-born**

GOECF and his equally eccentric vehicle attract a great deal of interest. Vico is regularly stopped by passers-by and tourists, and on the London to Brighton run, which he completed in

seven hours (including transmitting stops), he was interviewed by three European television crews.

### **A Near Tragedy**

GOECF's story has its roots in a near tragedy: three years ago, following a serious motorbike accident, 59-year-old ex-chef Vico was told by doctors that he would never walk again. It was while he was confined to a wheelchair that he got started in amateur radio. "I can talk to hundreds of people all over the world in one evening," he explains. "It's better than television. You learn about different ways of life. I can call Russians, Chinese or Indians, and you often hear the news as it happens. I heard about last year's earthquake in Italy hours before the radio or tv news

# Remarkable Radio Bike

but is useful in getting onto the 'other' bands.

He also runs a Trio TS801, a KW202 and KW404, and an old-style military 123. He has shelves of test gear to keep a check on his signal and, of course, because he likes to build, maintain and repair as much of his own equipment as he can.

## A Different Polarity!

"It is very exciting," he smiles. "One day I was talking to a chap on Bear Island when his shed was attacked by Polar Bears, and there I was sitting at home in Wembley, drinking a cup of tea!"

Determined to regain the use of his legs, he decided that cycling was the best way to build up the damaged muscles. "Of course I didn't like to go on the road again," he recalls. "I had to build a bike I felt safe on, comfortable and near the ground — not so far to fall off!"

The result was his long wheeled cruiser made out of parts bought from a scrapyards and plundered from his house — the seat was once a kitchen chair until he sawed the legs off. With its psychedelic wheels, it can hardly go unnoticed, which is as Vico intended: "So the drivers they notice me and take care not to run me down!"

It was only a matter of time before his two new interests became one and GOECF Mobile was born. All the equipment was, naturally, custom built by Vico for the bike. A magnetic-loop antenna was made from a water pipe, a Heathkit HW8 transceiver specially adapted to fit under the handlebars and the morse-key is strapped handily to his leg. Conservationist concerns led to the ingenious addition of solar panels to the front of the bike.

The two foot-square 2V panels provide a

total of 400mA to keep the 12V battery topped up. Most of the time, the feeble British sunshine is enough to keep him talking, and this also means that he can transmit as long as the sun is shining without needing to recharge his batteries. "Of course, in Britain you cannot rely on the sunshine," he said when we met, gazing ruefully at the blank white sky. "But it doesn't matter, I just cut my chat short."

The HW8 (a close cousin of the current HW9, for which see page 00 of this month's issue) gives 3W of output, and Vico works mainly morse on 80m, 40m, 20m and 15m. Overseas amateurs have commented on his strong signal. As an alternative to his magnetic loop, he uses a stoutly-built home-made vertical antenna with a loading coil, as shown in the photographs. Resistive losses (caused by skin effect) are kept to a minimum by the use of very thick wire on the loading coil and a vertical element made of copper plumbing pipe.

## Trouble At T'home

Vico's XYL Vera does not appreciate the ingenuity of this perambulating radio station. "It's embarrassing. If I see him coming down the street I cross over," she says. She has a certain nostalgia for

the days when Vico used to go off to work as Chef in a West End hotel every day. "He had a perfectly normal green racing bike then, and when he wanted to chat he'd go off to the Cafe Italia in Soho like anybody else — none of this radioing round the world all day and night."

But this is not the half of it. "What really annoys me," she continues, "is the way he just takes things from the house for his bike or radio — what about that seat? I've only got two kitchen chairs now, nowhere for my daughter to sit when she visits. Anyway since he went so funny she doesn't visit much. Who would? Well, how would you feel if it was your husband?"

*(Beat him at his own game, Mrs N. — nip round to the local junk shop and buy a wooden one. It'll cost a couple of quid and will clean up lovely and he can't turn it into an aerial — Ed.)*

*But Vico is unrepentant: "At least I'm not under her feet all day like a lot of retired husbands." He begins to chuckle and, when Vera leaves the room to make us coffee, whispers conspiratorially, "and she doesn't know about the sheets yet! That'll make her crazy: I've taken them off to the radio shack for my latest experiment — it's another mobile operation — but this time on board a sail-powered tricycle!"*



**GOECF with his customised exercise-bike-cum-mobile-station. The 12V solar panels are mounted low on the handlebars, with the transceiver behind them. Vico carries his morse key strapped to his leg — nothing wasted here. Even the seat is a cannibalised kitchen chair.**

# Stand Your Ground!

## Part 1

Just over two years ago, on the 16th October 1987, a hurricane swept through the southern counties of England leaving behind millions of uprooted trees, thousands of damaged houses, an electrical power system in disarray and dozens of demolished amateur radio aerials.

In the latter case, by far the worst sufferers were the masts which sup-

ported wire aerials. Having seen many amateur installations, however, I am surprised that mast failures are not more common. Masts are often lashed to insecure fences, or guyed with lengths of old coaxial cable, soft drawn copper wire or even string, without regard to security, strength or position.

Few amateurs appreciate the force that wind can apply to an aerial system.

Even a modest 30 ft pole can be subjected to a horizontal pressure of 150 lbs when the windspeed reaches 100 mph.

### Any Good Iron

Nevertheless, a two-inch diameter steel or aluminium mast is quite capable of surviving winds of 100 or even 150 mph, provided that the pickets are secure, the guys are correctly positioned and tensioned, and suitable materials are used throughout. These can be obtained from most good ironmongers.

Over the past forty years, I have always used guyed masts varying from 30 to 60 ft high, yet despite experiencing windspeeds well in excess of 120 mph during periods spent living on the west coast of Scotland and in Cumbria, I have never had a mast failure.

To gain some idea of the problems of mast survival, let's take a brief look at the forces involved.

When a wind blows on a tubular object such as a mast or aerial element, the pressure it exerts is equal to 0.0025 times the square of the velocity of the wind (in miles per hour) multiplied by the projected surface area. In a circular mast the latter will be diameter multiplied by length.

In the case of a flat plate, the calculation is the same, except that the factor 0.0025 rises to 0.0042.

From these formulae it will be seen that, in a 100 mph wind, six feet of two-inch tubing (ie one square foot projected area) will suffer a pressure of approximately 25 lbs, while a one square foot flat plate would suffer 42 lbs (Fig. 1).

***“Up stumps” is fine for an international traveller, but not for your precious antenna mast. In the first of two articles, Brian Kendall G3GDU keeps his feet on the ground.***

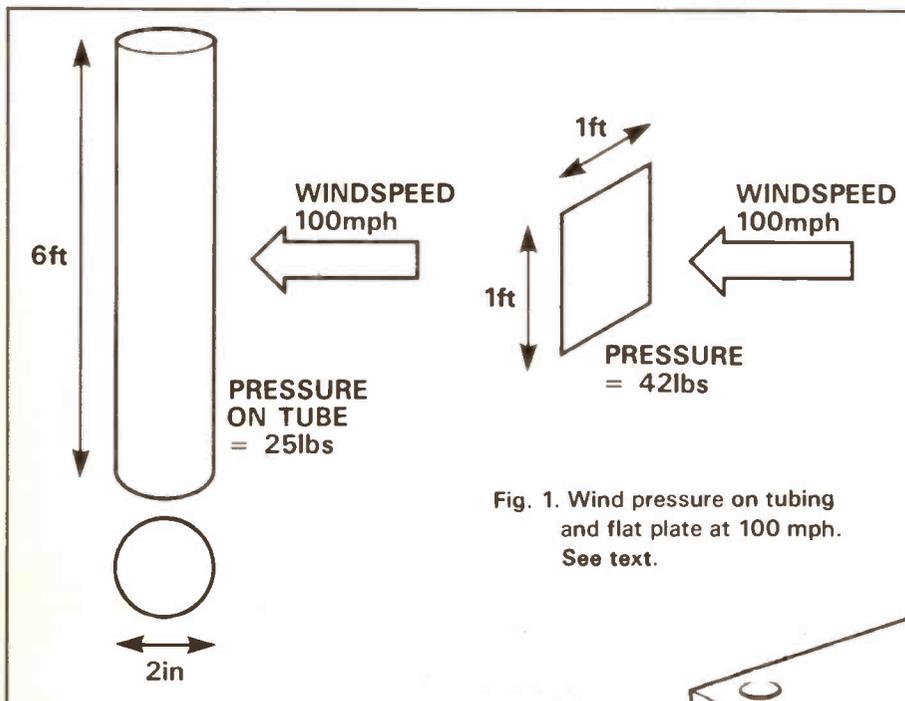


Fig. 1. Wind pressure on tubing and flat plate at 100 mph. See text.

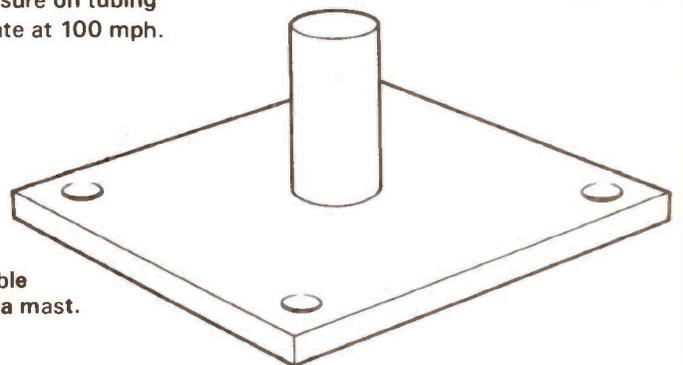


Fig. 2. A suitable base-plate for a mast.

ported wire aerials. Yet such damage was unnecessary, for had sufficient thought been put into the original installations, they would have survived the once-in-a-lifetime windspeed that night without difficulty.

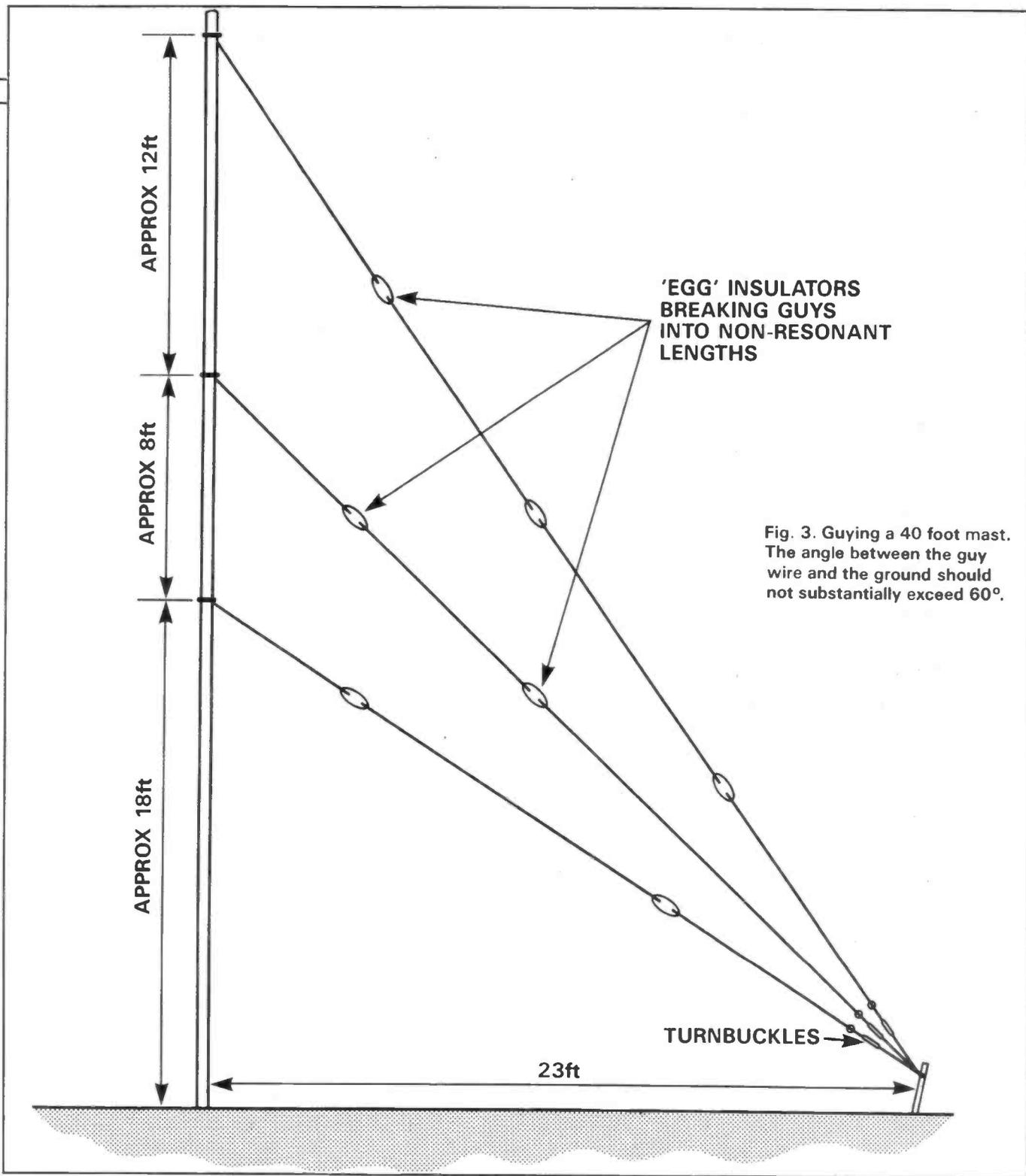


Fig. 3. Guying a 40 foot mast. The angle between the guy wire and the ground should not substantially exceed 60°.

Further, as the pressure increases with the square of the windspeed, considerable allowance must be made for gusts which are often 20 to 30% higher than the steady windspeed. Unpredictable turbulence from local terrain, buildings, etc., can increase this.

There are, however, limits to the extent that allowances can be made, and in general practice 1.3 to 1.5 times the highest predicted windspeed for the area is considered to provide a reasonable margin.

### Wind Speeds

Translating this into amateur radio

terms, this means that amateurs living in sheltered inland areas should stress their masts for windspeeds of around 150mph while those in coastal or exposed sites, especially in the west of the country, should go for 200 mph.

Now, as the base of a mast tends to be fixed, in simple approximation, it is as if the full force of the wind is being applied at the mid point of the mast. This provides a moment of force at the base equal to the total wind force multiplied by half the height. In the case of the thirty foot, two inch diameter mast, this will be 125 lbs x 15 ft, or 1875 ft/lb of torque which is tending to blow down the mast. This has to be counteracted by a similar moment

of force from the guy wires to keep the mast up. Should there be a headload on the mast, such as a beam, the wind forces on this must be allowed for, but in that case the moment of force is the pressure multiplied by the height of the mast.

It is clear enough why simple unguied masts tend to fail in quite modest windspeeds.

Supposing that we now guy the thirty foot mast at its mid point, that guy will have to exert a pull of 125 lb on the mast. If the wire were horizontal then the tension in the wire would also be 125 lb, but it is not, as the other end should be anchored at ground level.

At this point we have to apply some

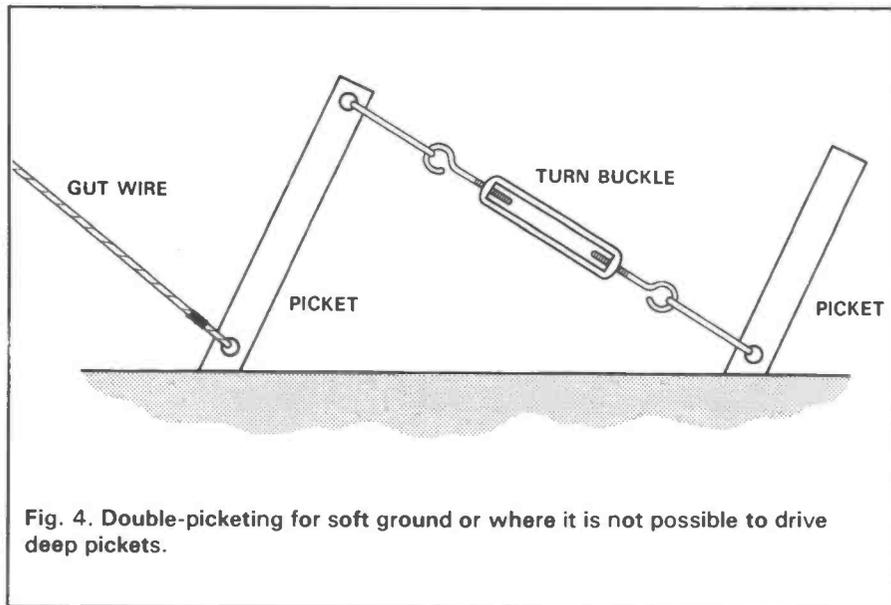


Fig. 4. Double-picketing for soft ground or where it is not possible to drive deep pickets.

more school maths. Where the guy wire is attached to the mast, the force in the wire may be resolved into two directions: horizontal and vertical. The vertical force does not really concern us, for it is tending to push the mast into the ground. The horizontal force of the wind must, however, be balanced by an equivalent force exerted by the guy.

Resolving the horizontal forces at the point where the guy is attached:

$$F = P \sin A$$

where P is the tension within the guy wire  
 F is the wind force A is the angle  
 which the guy wire subtends with  
 the ground.

Returning to our example where the mast is guyed at the mid point and assuming that the guy is subtending 45 degrees to the ground:

$$125 = P \sin 45$$

$$P = 125/0.7071$$

$$P = 176.8 \text{ lbs}$$

Had the guy been at an angle of 60 degrees, from the same calculation, it would be seen that the tension in the guy would increase to twice the force exerted by the wind!

This simplistic calculation only refers

to the use of a single guy, facing directly into the wind. In real life, the windspeed will vary in direction with the height above ground. Local wind turbulence will cause further variations, and allowance must be made for aerials or other headloads.

### Resonances

Allowance must also be made for resonance effects, for any structure has a natural frequency of oscillation, and if the wind gusts hit the mast in a way which enhances that oscillation the vibration may well lead to the mast self destructing. This problem, however, is rarely serious if it is taken into account at the start.

In practice there is no need to perform calculations when putting up a modest mast, but the example quoted does give an idea of the forces involved and the strength of materials needed for guys and, perhaps more important, the force which will be exerted on the guy pickets. These will have to absorb all the tension in the guy wires.

However, provided that basic principles are followed, a mast will certainly survive any weather conditions likely to occur in the United Kingdom, the October 1987 gales not excepted.

The first aspect to consider is the mast itself.

### The Mast

A simple mast may be made either of steel or alloy tubing. Up to heights of about fifty feet a diameter of two inches will do, provided the wall thickness of the tubing is sufficient to keep the pole rigid.

If more height is needed, two inch steel may still be satisfactory, but two inch aluminium will probably not be strong enough, and a greater diameter would be advisable. Heights above 75 or 80 feet are really getting outside the amateur domain and professional advice should be sought.

All except the shortest masts will probably be made up from several lengths of tubing. These should be joined using commercial couplers such as those made by Jaybeam.

To prevent the base of the mast moving or sinking into the ground, it should be mounted on a spike welded vertically to the centre of a metal plate about 12 inches square. To prevent the plate moving, several holes should be drilled, through which short spikes can be driven into the ground (Fig. 2).

### Guying

The guy pickets should be arranged symmetrically around the mast with wires reaching from each picket to several points on the mast.

The minimum number of picket points is three. Fewer would not provide all round support. There is no advantage in increasing to four as, in the event of a failure, there will still not be all round support, and the mast will fall in the opposite direction to the failed guy. If, however, the number is increased to five or more the mast will stay up even after a failure, since the adjacent guy will take the strain relinquished by the broken wire.

As the guy wires are not likely to fail unless the ground is soft and there is a high probability of the pickets being uprooted, there would seem to be little point installing more than three points. In any installation supporting wire aerials, however, one point should be directly under the line of the aerial. The maximum distance from the mast should be such that the guy wire to the top of the mast does not subtend an angle substantially more than 60 degrees, beyond which the forces on the guy wire and picket increase

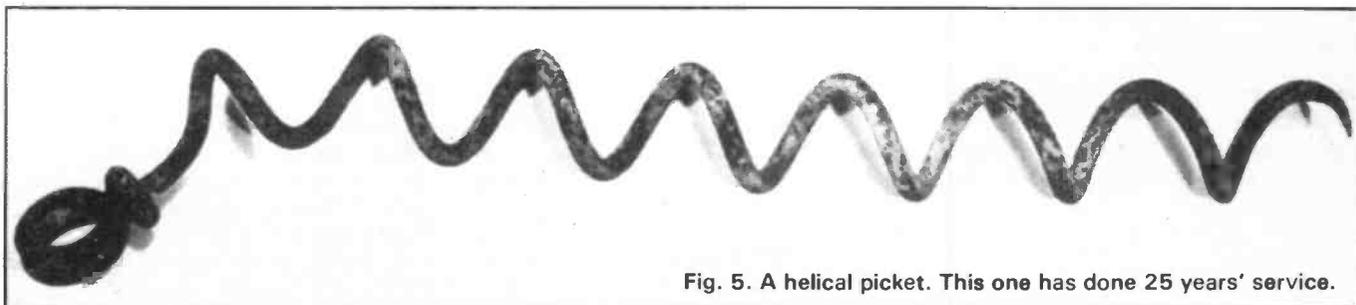


Fig. 5. A helical picket. This one has done 25 years' service.

dramatically.

In my experience, there is no need for the lowest guy to be attached less than 18 feet up the pole from the base, and further attachments should be at 9- to 12-foot intervals. Remembering earlier comments on mast resonances, it would probably be advisable to alternate the two intervals up the mast (Fig. 3).

As the purpose of the guy pickets is to provide firm anchors for the guys and therefore the security of the whole system, it follows that careful installation is extremely important.

The simplest effective picket is a four or five foot length of angle iron, driven in at an angle of about thirty degrees to the vertical like a large tent-peg, until only a few inches show above the ground. The inside of the "V" should face the mast so that it will present maximum resistance to movement. In very soft ground, or if it is not possible to drive in a full four-foot length, double picketing can be used (Fig. 4).

However, I much prefer the helical picket. This looks like a large corkscrew made from half inch bar steel, four feet long, six inches in diameter, with a loop at the top (Fig. 5). These pickets are driven into the ground by inserting a crowbar through the top loop, and just "winding in". Once in position, they are almost impossible to dislodge by upwards or sideways movement, even in soft earth or sand. When the time for removal comes, they are just wound out.

### A Blacksmith

I do not know of anyone who makes these pickets, but if you can find a blacksmith who learned his trade in the Royal Air Force, he will know exactly what you want, as they were used for securing aircraft in windy weather. Three were sufficient to secure a WW2 heavy bomber! Or take our illustration to a blacksmith and see if he can copy it.

Depending on whether the installation is temporary (such as a field day) or permanent, either polypropylene rope or metal guys may be used for guy wires.

For temporary installations, polypropylene rope is the most convenient material. Rope sizes are quoted by circumference, so that one inch would normally be the most convenient. This is about 3/8 in in diameter, and does not tangle as easily as smaller diameters.

This material is not suitable for permanent installations as, in time, ultra violet radiation from the sun causes the rope to harden and lose its strength.

For permanent installations, I recommend the stranded, galvanised iron wire available from good ironmongers. This is strong, can be easily and effectively whipped and spliced, and is extremely resistant to corrosion. The latter can be

enhanced if the cable is greased before installation and from time to time later. I have several lengths of stranded galvanised iron guy wire which have seen over twenty five years' use and are still perfectly good.

The only disadvantage is that iron is a conductor, and if any wires are resonant to the frequency of transmission, they will re-radiate some of the signal and cause a distortion of the radiation pattern. This can be avoided if the guys are split into non-resonant lengths by egg insulators. Only "egg" insulators should be used; if any other type is used and fails, the guy will come apart and the mast may fall.

the mast diameter should be cut centrally and three 1/2 inch holes close to the edge, one centrally on one side and two at the corners of the opposite side (Fig. 6).

"Eyes" can then be passed through the small holes and guy wires whipped directly to them.

In this article we have looked at the wind forces which masts must be designed to resist and the materials needed for a secure installation.

Next month, we shall be looking at the techniques of whipping and splicing guy wires, and different methods of putting up masts without injury or damage.

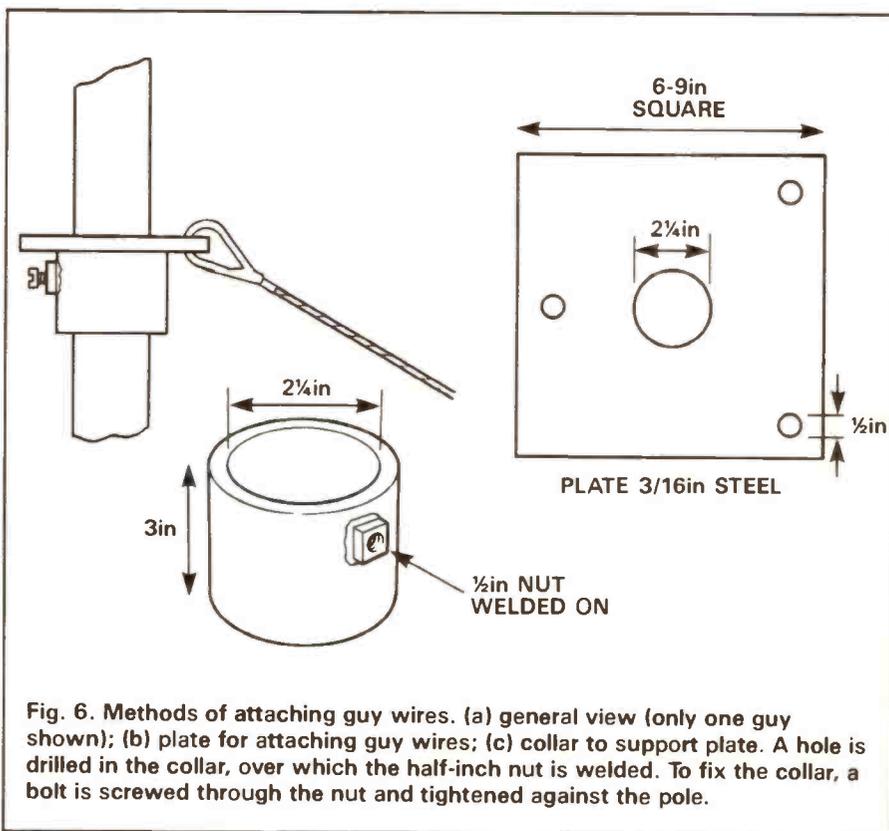


Fig. 6. Methods of attaching guy wires. (a) general view (only one guy shown); (b) plate for attaching guy wires; (c) collar to support plate. A hole is drilled in the collar, over which the half-inch nut is welded. To fix the collar, a bolt is screwed through the nut and tightened against the pole.

Some amateurs, however, may wish to make use of resonance effects by intentionally cutting a section of a guy wire to resonance and then using it as a quarter wave vertical or a "sloper".

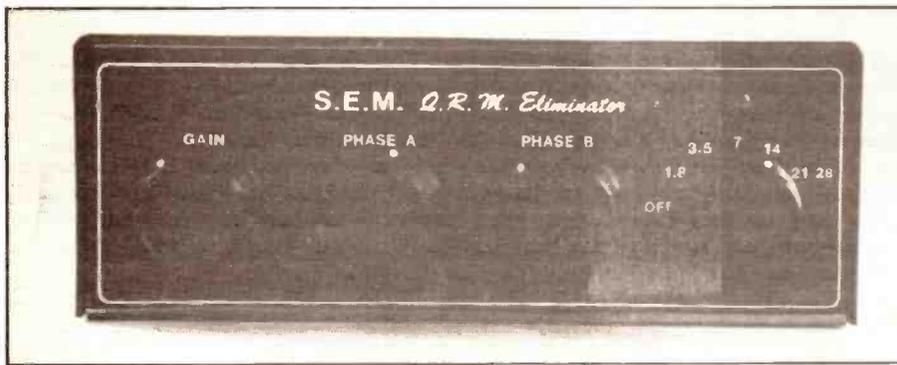
Galvanised iron guys should be cut to length and terminated by "eyes" prior to mast erection, and tensioned after installation by turnbuckles between mast and picket. Guy lengths can easily be calculated by Pythagoras' Theorem.

### Mast Attachments

By far the most effective method of attaching guys to a mast is to fit a collar to the mast and, above this, a steel plate to which the guys are fitted. The steel plate should be about 1/8 in thick and six inches square. A hole slightly larger than

Mast Height	Guy Distance
10	6
15	9
20	12
25	14
30	17
35	20
40	23
45	25
50	29
55	32
60	35
65	38
70	40
75	48

# S.E.M. QRM Eliminator



***QRM gone at the flick of a switch? Out comes the G4HCL wallet!***

We all know the problem: a rare DX station calling CQ is only just copyable on 15m, but just as you're about to call him, next door's computer fires up and S9 interference fills your receiver; or a European station a few kHz away starts splattering everywhere. Alternatively, maybe you're a medium wave DX listener and the neighbouring tv line timebases at night often leave you wondering whether it's worth the struggle? Even large aerial farms in rural locations don't always escape the ravages of power line interference from overhead cables.

Wouldn't it be nice to flick a switch, twiddle a couple of knobs and hey presto, instant QRM reduction and the wanted stations magically appearing right out of the murk? Well, many people are sceptical, and yours truly thought 'The idea may work in theory', but it was only when I tried

the SEM QRM Eliminator in the shack that I became hooked.

## How Does It Work?

To comprehend the operation of the unit, we'll take a simple example of the effect of adding out-of-phase signals. Take two signals, each a sine wave for simplicity's sake. Now shift the phase of sine wave B relative to sinewave A by 180 degrees, and you'll see that each point along the time axis has the same magnitude, but the opposite polarity. We all know what happens when we add these two together — they cancel.

So for RF use, you need two aerials. The first of these will be your usual communications aerial for receive and transmit. The second will be the 'QRM' receiving aerial, for example and indoor or loft mounted wire or even the coax leading to a VHF aerial for local QRM, or an alternative aerial for longer distance interference, to pick up maximum QRM and not too much of the wanted signal.

This is basically how the SEM unit works: two 'Phase' controls are provided so that you can manually vary the phase difference of the two incoming signals until they are 180 degrees out of phase, and a 'Gain' control on the unit allows you to vary the relative QRM signal level so the two signals nicely cancel each other. This is very similar to the phasing method of SSB signal generation where a 180 degree phase difference is used to cancel the unwanted sideband without any need for narrow filtering.

## QRM is S8, You're S4 and Fully Readable OM

By now, many readers could well be thinking of uses for such a device. Let's say you have a nearby medium wave broadcast transmitter that makes listening to 80m rather difficult due to overloading — just phase it out. The CBer down the road on 27MHz vertical polarisation when you're trying to use 28MHz with your horizontal beam, no problem. Your computer used for HF Rtty or Packet causing noise on 20m, again just turn a couple of knobs and its gone.

However the most satisfying use is for those almost 'impossible'

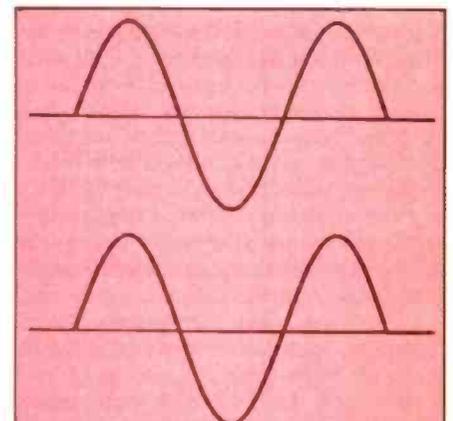


Fig. 1. Sine waves in phase.

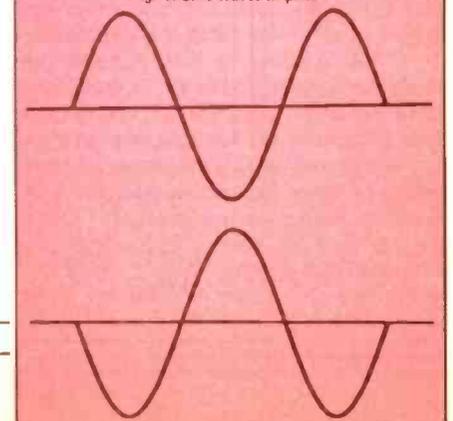


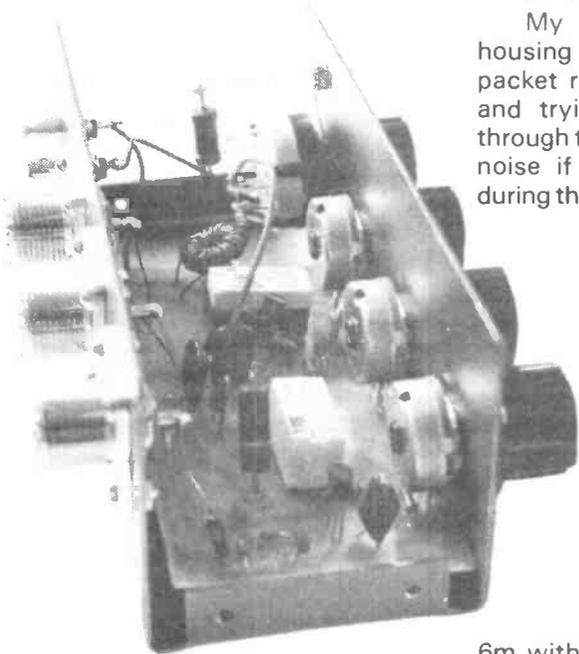
Fig.2. Sine waves 180 degrees out of phase.



locations, such as a local factory with arc-welding gear, or the power line down the lane with a persistently noisy insulator. A keen DXer workmate of mine suffers from the latter problem even though he lives in a rural location with a few neighbours.

### The SEM Remedy

SEM in the Isle of Man have been in the amateur business for many years. I remember buying my first 2m 'Sentinel' preamp from them over 15 years ago. A couple of years ago their Mk I QRM Eliminator made an appearance, with the latest MkII



wideband version coming onto the market just before this was written.

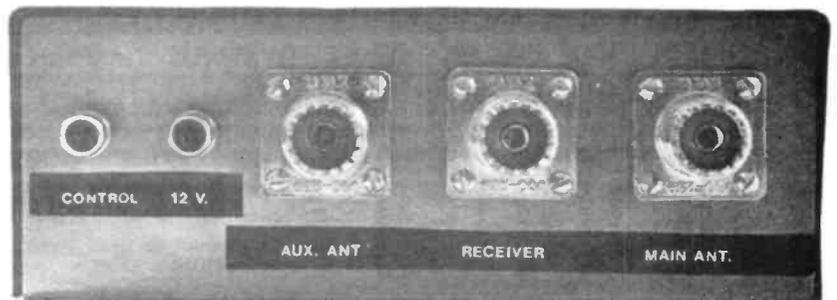
The MkII QRM Eliminator operates over the range of 100kHz-60MHz, and has built-in relay switching so that you can transmit through it, ie it can be placed in the common transceive coax line to your rig. It comes in a black metal case measuring 150mm (W) by 55mm (H) by 50mm (D), and requires a 12V DC supply at 150mA to power the unit's circuitry together with the internal transmit/receive relays. Four rotary controls are fitted on the front panel: Gain, Phase A, and Phase B are used for interference nulling, and the Off/Band switch is used to switch the unit on and off. The Mk I operated on the amateur bands, but the Mark II, although being completely different inside, uses the same case with the

band switching not actually required.

On the rear panel are three SO-239 coax sockets, for the main aerial, auxilliary aerial, and the receiver output lines. Two phono sockets are fitted, one for the 12V DC input and the other for a ptt control input from your transceiver, for when you're using the unit in the common receive/transmit line. Inside the unit, a wide band RF amplifier is used in conjunction with the gain control to allow the use of a smaller auxilliary aerial, such as a 2m colinear or even just a few metres of wire strung around the room.

### In Use

My radio shack, as well as housing my transceivers, has six packet radio tncs and a computer, and trying to receive HF signals through the resulting microprocessor noise is often very difficult! Also during the current good conditions on



6m with virtually daily openings to countries around the world, I found I was often plagued with the various harmonics of the many oscillators around, some of these being of S9+, often making even moderate signal reception fairly difficult. So in went the QRM eliminator, the rooftop 6m beam connected as the main aerial, and a small indoor wire in the shack used for the auxilliary aerial. After a short period of adjustment, what can I say, S9 plus QRM right down to S1! I was most impressed! Now to work some DX.

### The LF Bands

The 80m band is another of my favourites, but at night in my location, surrounded by houses on a modern housing estate, the mixture of all the tv timebase harmonics from both my own and neighbouring houses is extremely bad (maybe I should fill in a tvi complaint form?). As most of

this QRM is vertically polarised, no doubt using the tv coax feeder braid as the radiator, I linked the coax inner and outer from my loft mounted discone and connected this to the auxilliary aerial input, the main horizontally polarised 80m aerial being used as my transceive aerial. Here the QRM reduction was just as impressive if not even more, with an S9+20dB interfering 'buzz' completely drowning a QSO being totally reduced to inaudibility, with perfect copy of the QSO coming through albeit at a slightly weaker strength (the auxilliary aerial is no doubt picking up some wanted signal as well).

I spent a fair amount of time in testing the unit under different applications, each time the result was a significant improvement in QRM reduction if not total elimination. I found it was important to ensure significantly different aerials were used, as otherwise the wanted

signals were often reduced as well, but on HF and even 6m by using differing polarisations the end result was a very good reduction.

### Conclusions

A dream come true? A most definite 'Yes'. I was extremely impressed with the unit's performance; its ability to reduce on-frequency QRM from a level totally drowning a QSO right down to inaudibility really does need to be heard to be believed. As for myself, I was so pleased with the unit it became an invaluable addition to my shack, and when SEM asked for it back they received a G4HCL cheque instead, which doesn't happen very often! What more can I say?

*The QRM Eliminator is currently priced at £85.00 inc. VAT and p/p, and my thanks go to SEM for providing the review unit.*

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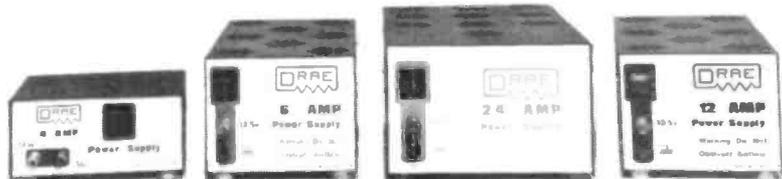
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# LISTENING ON

In the last *Listening On* . . . we looked at the broadcasting stations of the Eastern bloc, and how their programmes have been changing with the changing political climate in Europe. This time, to keep things balanced, we look at developments in the Western broadcasting world.

Radio New Zealand has never been a particularly easy station for

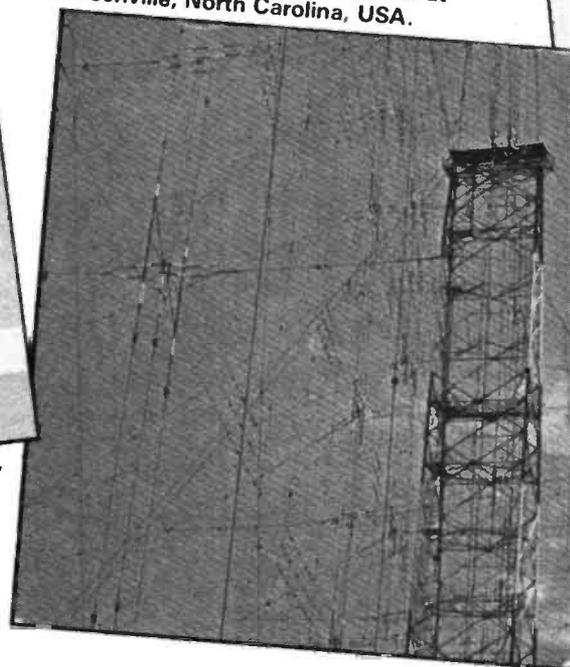
good signals from sign-on at 1700 GMT until fade-out sometimes as late as about 2330 GMT. The overall duration is not known.

Most of the programming is RNZI's own, although there are some relays of Radio New Zealand's

recently had several hours of military brass music, punctuated by the occasional country and western song. The rest of the programme is devoted to New Zealand weather forecasts, a look at the morning papers and so on. After only ever being able to hear Radio Australia from the Pacific region, it is



Part of the giant curtain antenna array at the VCA transmitter site at Greenville, North Carolina, USA.



## ***A transmitter reshuffle in New Zealand, and cutbacks at the Voice of America this month.***

the SWL to hear, until recently. Until February this year, they had been using two very ancient 7.5kW transmitters left over by the Americans in World War Two. In February, a brand-new 100kW transmitter was inaugurated, and the Radio New Zealand transmission schedule was revamped. The old transmitters have been closed down, and so the station, which identifies itself as "Radio New Zealand International", is now audible on one frequency only. At the time of writing this is 17680 kHz, and the station can be heard with remarkably

National Programme, and most of the programming is in English, but the news bulletins in exotic Pacific languages such as Samoan, Pidgin and even Hindi, for Indians living in Fiji. Radio New Zealand International's programmes in English consist of five-minute news summaries on the hour (and these can be fascinating, giving as much weight to the elections in Western Samoa as to those in the USSR!) with live presentation of music between.

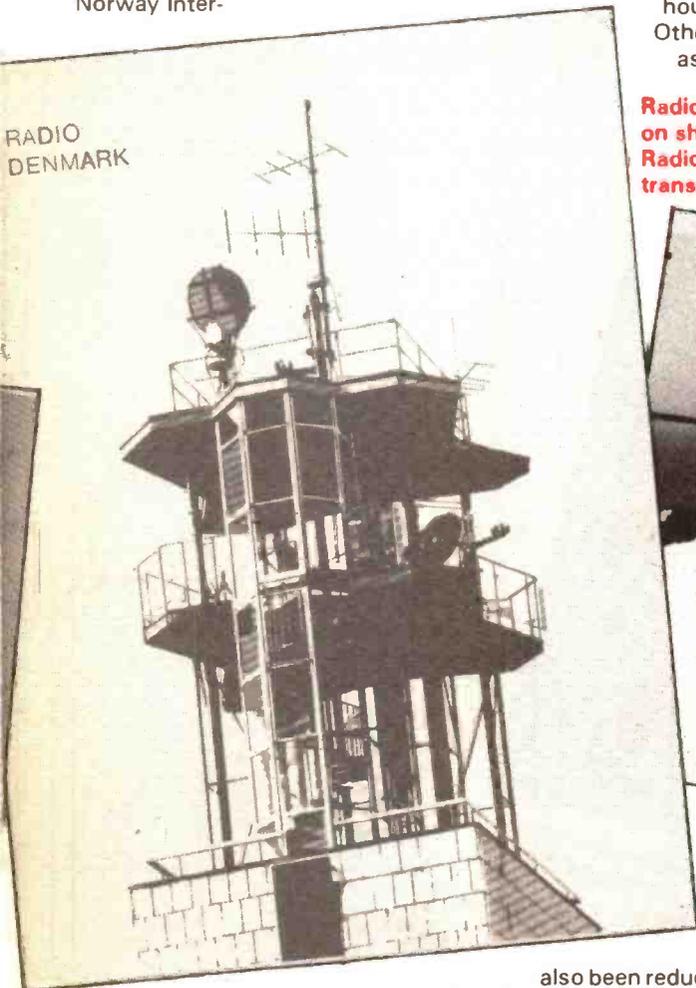
The music policy seems to be left to the individual presenters — one

fascinating to hear a different voice from that part of the world, and with much good reception.

### **Another Old Tx**

Another station which also used to boast an extremely ancient transmitter was Radio Denmark. They used to use a 50kW transmitter, although it was only ever run at half-power, due to tvi problems in the very built-up area in which the transmitter was located, near Copenhagen. To overcome these problems, the Danes have come to an agreement with their neighbours in Norway, and now Radio Norway International relays Radio Denmark exclusively — the old Radio Denmark transmitter, like those in New Zealand, has been closed down for good.

In order to do this, Radio Norway International has had to change its own programme schedule considerably, reducing the programmes from one hour first to 45 minutes and now to just half-hour. Radio Denmark's programmes start on the half-hour, following Radio Norway International's and on the same set of frequencies. Reception is good, at the time of writing, at 1730 GMT on 9655 kHz, although Radio Denmark only broadcasts in Danish. Radio Norway Inter-



broadcasts in six languages – Greek, Turkish, Uzbek, Swahili, Laotian and Slovenian – by June this year. The VCA director, Richard Carlson, was quoted on Radio Netherland's *Media Network* programme as saying that by cutting these six language services, and reducing from 43 to 37 languages, 57 jobs would be cut. Richard Carlson said that even the VCA's worldwide English-language service had not escaped the cuts, with a reduction in the number of hours broadcast every week. Other language services such as Thai and Portuguese has

**Radio Denmark now broadcasts on shortwave exclusively via Radio Norway International's transmitters.**

are due to get many more brand-new 500kW transmitters as part of this process.

Other USA stations on shortwave include KUSW, WCSN and WSHB. Radio Station KUSW broadcasts from Salt Lake City, Utah, and carries mainly "adult-orientated rock" music, with some religious programming to bring in the funds. The Greenpeace environmental organisation also buys time on KUSW, but their programmes, when I heard them some time ago, were quite disappointing, being little more than an appeal for funds, rather than concentrating on their causes. Unfortunately, reception of KUSW has been poor recently (good propagation is necessary to hear the signal, as it is several thousand kms further west than the more usually-heard east coast stations), but try 15690 kHz around 2000 GMT.

national continues to broadcast programmes in English on Sundays only.

If you want to hear English-language programmes on a daily basis from Scandinavia, you have to turn to Radio Sweden or Radio Finland, both of which have been mentioned in recent issues of *Listening On* . . . In the past, Radio Norway International used to change frequencies more often than most other broadcasters, making some changes every month, so by the time this appears in print, the 1700/1730 transmission may no longer be on 9655 kHz.

### Voice of America Cuts

The news has not been so good over at the Voice of America. The surprise news in February was that due to budget cuts the VCA was having to cut

also been reduced, and still the VCA was some 7 million dollars short of funds. Despite this, the US Congress has required the VCA to start broadcasts in Tibetan. Mr Carlson also said that he felt it was important that, even though the VCA had been forced to reduce the number of language used, their programmes should be well heard. Therefore the VCA transmitter modernisation programme, started a few years ago, would continue unabated.

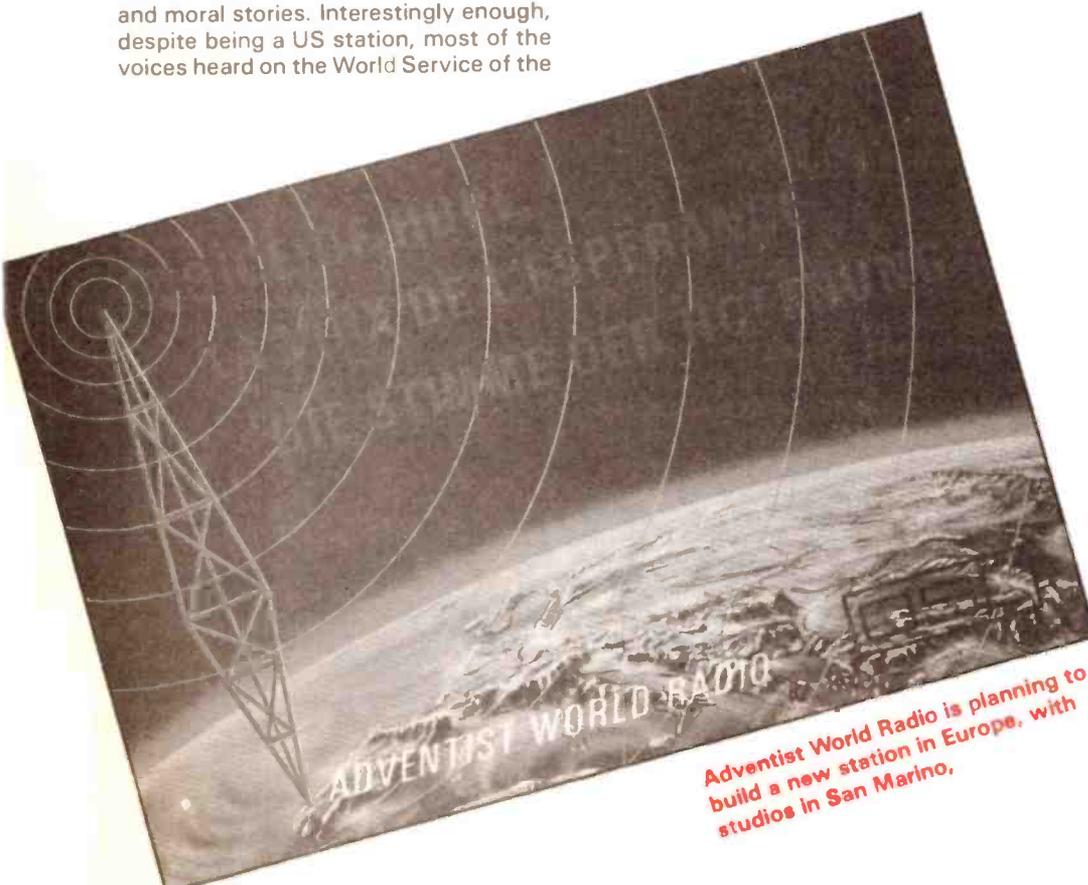
Despite considerable political and environmental objections, the Israeli government is reportedly standing by its obligations to the Voice of America and will permit the VCA to construct a new relay station (part of the aforementioned modernisation project) in the Negev desert in Israel. Other VCA relay stations already in existence, such as those in Monrovia, Liberia and Tangier, Morocco,

WCSN in Boston and WSHB in Cypress Creek, South Carolina, both belong to the World Service of the Christian Science Monitor organisation. For the last few months, these two stations have been joined by a third one – KHBI, broadcasting from Saipan in the Western Pacific. KHBI is the new call sign for the now-defunct KYOI, which used to broadcast rock music to Japan in a sort of "Japlish". The station was closed down for several months to allow staff to make improvements to double the KYOI broadcasting schedule and greatly increase geographical coverage. KHBI now broadcasts the World Service of the Christian Science Monitor programmes to Asia, Australia, New Zealand and the Pacific area, thus complementing WCSN and WSHB's coverage of the Americas, Africa and Europe.

IN Europe, WCSN and WSHB are often extremely good signals (the station announces the relevant callsign just before the hour, so you can identify which station you are listening to). The present schedule of English programmes is as follows: 0000-0600 GMT on 9850 and 13760 kHz, 0600-1000 GMT on 9840 kHz, 1400-1600 GMT on 21780 kHz, 1600-2000 GMT on 21640 kHz and 2000-2200 GMT on 13770 and 15610 kHz. Each day there is a two-hour programme, the first hour being mainly news orientated, with *Kaleidoscope* following the news bulletin; while in the second hour, following the news bulletin, are feature programmes such as *Letterbox* and *Norway Street*, which looks at arts and moral stories. Interestingly enough, despite being a US station, most of the voices heard on the World Service of the

and one hour later in the winter on 1269 kHz medium wave. Unfortunately, reception is poor over most of Britain during the summer months, unless you have a very sensitive receiver and a good antenna, as the timing of the programmes is far too early for summer time propagation. However, from autumn until spring it puts in a strong signal.

From time to time Deutschlandfunk organise a competition, the prizes of which are well worth winning. Last year's competition involved listening to two programmes called *Focus on Regensburg* and then answering three or four questions about the city (the answers of which were given in the programmes).



Adventist World Radio is planning to build a new station in Europe, with studios in San Marino.

Christian Science Monitor seem to be either British or Irish in origin.

### News From Germany

Anyone interested in the developments in eastern and western Europe, and particularly the possible reunification of Germany, could do no better than listen to the English programmes of Deutschlandfunk. This station, which broadcasts from Cologne, was set up to broadcast to the whole of Germany, east and west, in its home service, and to Europe (but not the rest of the world) in its international service.

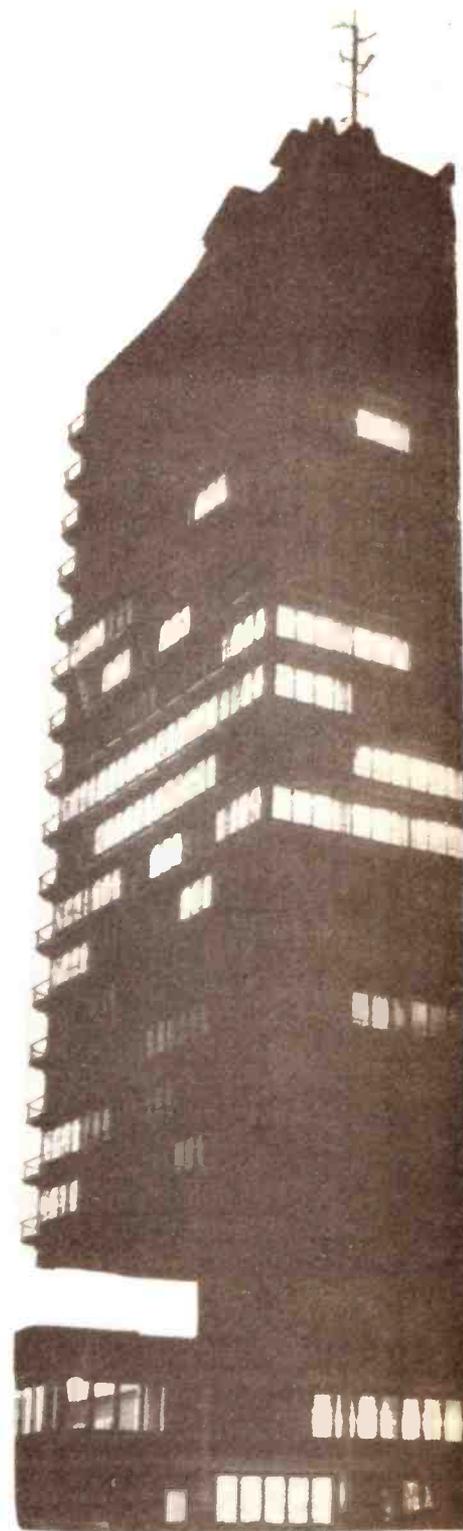
The English programmes are broadcast at 1815-1900 GMT in the summer

The *Focus on Regensburg* programmes are being repeated this year, for those able to hear the transmission, on 27th May and 10th June, although presumably the competition won't be repeated, since the correct results were read out last time. The lucky winners received a holiday for two — in Regensburg, of course!

Other programmes worth looking out for include DLF's documentary series on the Nazi period, *The Third Reich at War*, broadcast on Mondays; a *Report on East German Affairs* on Tuesdays; *Come on Germany* — the DLF holiday programme on Wednesdays and *Political Review* on Saturdays. Every other week on Saturdays *Sounds New* looks at the West

German pop music scene, while a monthly feature on Saturdays is *Airmail*, the letterbox programme.

Deutschlandfunk is funded by West German listeners' licence fees and government grants. Under its charter, it is obliged to provide a 'comprehensive picture' of Germany, tailored to the target audience (it also broadcasts in many other European languages) but without



**Deutschlandfunk's  
broadcasting  
house headquarters  
in Cologne.**

*Print Out*, which not only gives details of forthcoming programmes and has features about the English programme staff, but also has mouth-watering German recipes to tempt the palate when you come out of the radio shack! For a free copy, write to DLF English Service, PO Box 640, 5000 Cologne 51, West Germany.

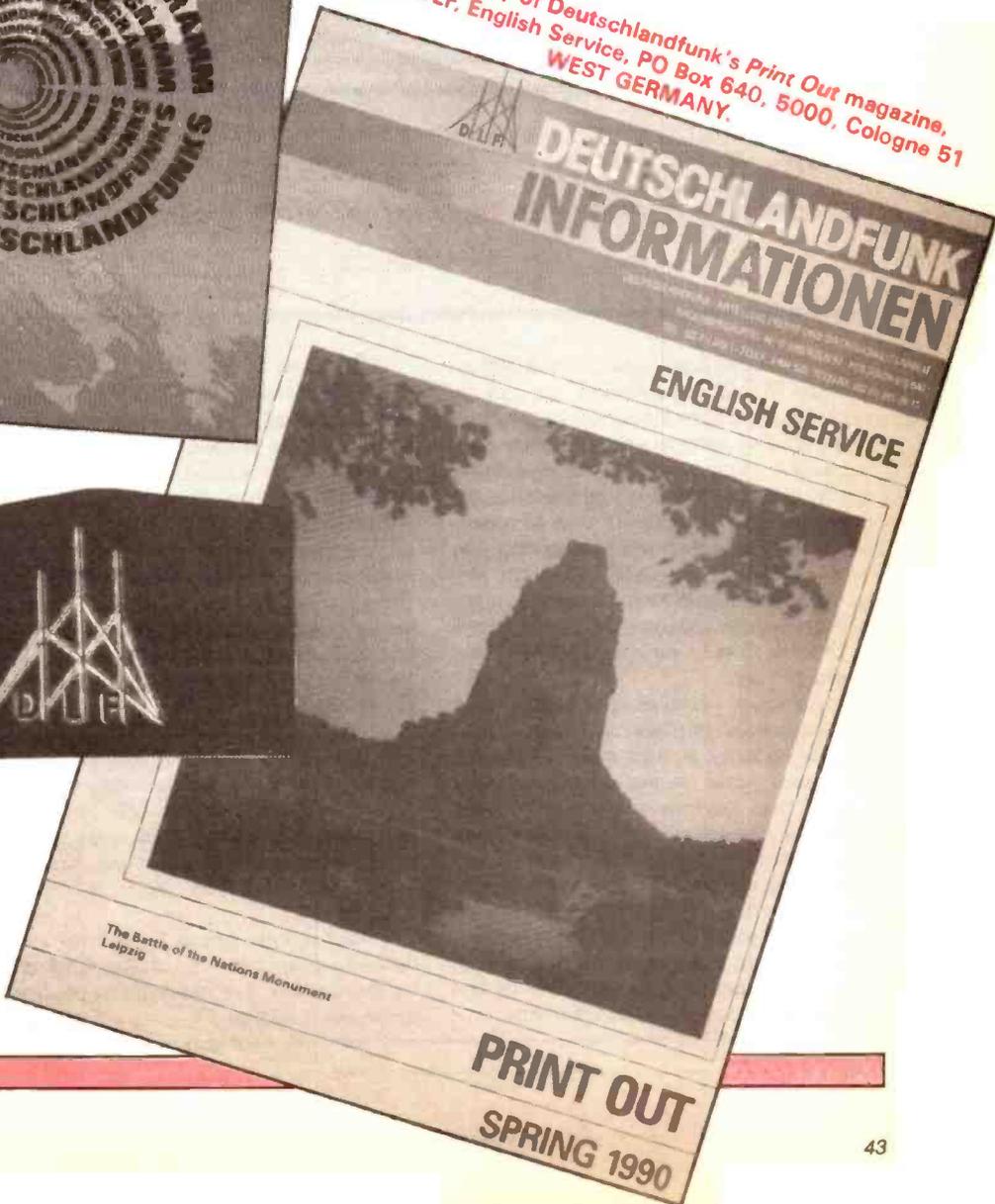
### New Site in San Marino?

Finally, news of a station which may permit a new country to be heard on the shortwave broadcast bands. Adventist World Radio, which broadcasts from several sites around the world, including Guam in the Pacific and Portugal and Italy in Europe, has recently announced that the transmissions from the Radio Trans Europe site in Sines, Portugal and from Forli in Italy will be closed in the future. They are to be replaced by new studios in San Marino and a transmitter site with 100 and 250kW transmitters connected to curtain and log-periodic antenna systems. There have been rumours of shortwave broadcast stations including commercial operations, opening up from San Marino in the past, but they have all come to nought. However, these plans by AWR sound to be fairly well advanced and it would well be that a new shortwave broadcast country is on the air soon. Until now, San Marino has been impossible to hear except by way of a low-power VHF transmitter, so shortwave DXers will be looking forward to adding another country to their DXCC totals.

**Deutschlandfunk's commemorative  
QSL card.**



**For a free copy of Deutschlandfunk's Print Out magazine,  
write to DLF, English Service, PO Box 640, 5000, Cologne 51  
WEST GERMANY.**



commenting on the political situation in those countries. DLF started broadcasting in 1962 and employs around 750 people. For those interested in learning German, *Auf Deutsch Gesagt*, a German language course, is broadcast for 15 minutes before the normal English programmes on Wednesdays and Saturdays.

Deutschlandfunk also offers English listeners a free quarterly magazine, called

# MM3 Morse Machine



**Mike Bedford G4AEE tries a state of the art morse keyer with training mode, and ponders on its place in history.**

With the 200th anniversary of the birth of Samuel Morse approaching, we can expect to hear quite a lot about the development of telegraphy. In a nutshell, however, excluding various weird and wonderful contraptions of the late 19th century, we can sum up the development of morse equipment as the straight key giving way to first the bug key, then automatic and latterly the iambic keyer, and we might well have expected the ultimate in this line of progression to be the QWERTY keyboard sender.

Although mechanical Morse tape perforators and printers have been around all this century, it was only during the microprocessor revolution of the early 1980s that keyboard senders became viable for the amateur. They were available on the amateur market five years ago but, as far as I can tell, there is not now a single keyboard sender offered to the UK radio amateur. This poses the question, why is it that automation in the form of the iambic keyer is acceptable to the amateur, but not a keyboard sender?

## Morse Appeal

I think the answer lies in the appeal of Morse code. Certainly, there are signal to noise ratio advantages, but in many cases attachment to this mode is due to a pride in a skill not shared by so many. Although an iambic squeeze keyer is very different from a straight key, the expertise is still unique to Morse. Keyboard skills, on the other hand, belong to a wide range of lesser beings including secretaries, typists, vdu operators and writers of reviews for HRT. So, what type of keyer will be accepted as the ultimate by the Morse population? AEA believes they have the answer in the MM3 keyer, otherwise known as the Morse Machine, which is distributed in the UK by ICS Electronics Ltd. This is a review. ICS is at Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD, tel. 0903 731101.

This review needs to go into some detail to describe what this unit can do, as there really has never been anything quite like it before.

The user interface to the MM3 is a squeeze paddle, although the unit also has a 16-key keypad which controls the keyer's modes, memory programming and the like. However, the MM3 does break new ground in a number of areas.

## First Impressions

The MM3 is a smart looking unit in a robust metal cabinet with the keypad, power/volume control, speed control and various status leds on the top surface, and all sockets on the rear panel. The top also has a multi-coloured label indicating the key combinations for all functions and mode selections. There is a comprehensive manual which is quite readable and well presented. A nice touch is a bag of plugs, one to match each of the rear panel sockets, so there shouldn't be the frustration of buying a new piece of equipment which you can't use for lack of a connector. Having said that, I almost was in this situation, because the unit does not include a mains power supply, requiring as it does an external 12V supply of batteries.

Turning to what lies beneath the covers, except for a speaker on the base, all the components are on a medium density circuit board attached to the lid. Half the board seems to be made up of discrete components and I would guess that this is the sidetone, serial interface and keying circuitry, while the other half contains the intelligent stuff. The processor is an 8031, extra I/O is provided by an 8155, there is a battery backed 8K x 8 cmos static ram, and 32K bytes of firmware in a 27256 eeprom.

## Operation

The MM3 is more than just a memory squeeze keyer with four basic modes of operation (keyer, memory load, trainer and beacon). Each of the modes will be individually dealt with in detail, but first a few points in common.

Selection of modes and initiation of functions is via a sequence of up to five (but usually one, two or three) key presses, in some cases followed by further keystrokes to specify variable parameters. For example, turning off the dot memory is done by pressing \*B3, whereas the sequence \*7100 would set the beacon cycle time to 100 seconds. Personally I would have preferred to see machinery controlled by the keys with appropriate legends engraved on them, rather than elaborate sequences, but for

a repertoire of 74 functions this could prove tricky. However, on 16 keys with two levels of shift all the common facilities could be accommodated, leaving the more obscure for sequences.

An alternative means of controlling the keyer is through its serial interface. It is possible to control all the mode selections and functions by commands from a computer. This has a clear application in multi-operator stations: each operator could have a file containing the necessary commands to configure the keyer, and program up messages, just requiring a single command, such as COPY FRED.MM3.COM1: to be typed on changing operators. Although the interface input will accept data at RS232 levels, the output is only at 0V and +5V. This is compatible with a number of home computers, but it is likely to be unreliable with an external RS232 interface. I found, for example, that it could not talk to my PC, but could communicate with a vdu terminal with an RS232 interface. An external converter would be required to raise the output to RS232 levels, if it was a problem.

Usefully, the MM3's memory is non-volatile (when it is switched off, the data in it will remain valid until the keyer is next used). This applies to the contents of the message memories as well as the mode settings. For example, if the unit was switched off, in keyer mode with dot memory off, dash memory on, iambic keying enabled with a sidetone frequency of 1kHz and a sending speed of 24 wpm, this is exactly how the MM3 would be configured next time it was switched on.

With the general features out of the way, let's take a look at each of the four main modes in turn.

## Keyer Mode

Essentially an iambic squeeze keyer, the facilities of the MM3 may be reduced by mode selections to operate as an ordinary single paddle automatic, a bug key or even a straight key for those who prefer. On first using the Morse Machine as an iambic keyer, I had great difficulty in sending CQ without it coming out as -.-.-.-.-, as there seemed to be a tendency for extra dots and to lesser extent extra dashes to appear at the end of squeeze operations. The cause of this was tracked down to the dot and dash memories, and my sending improved significantly when they were disabled.

The advantage of dot and dash memories is much greater with a single paddle keyer than with a iambic, but it should nevertheless be possible to have them enabled in iambic mode without making the keyer harder to use. Sometimes dot and dash memories can improve sending even on a squeeze keyer, but to do this it must use edge triggering,

rather than the level triggering approach used here.

One surprising omission in this mode is auto character spacing (although this is provided in Memory Load mode, together with auto word spacing). With this facility, if a space longer than of a certain time (typically two units) is left, no further dots or dashes may be sent until the time interval has reached the three units of an inter character space. This means that so long as the paddle movements are slightly ahead of the Morse produced, perfect character spacing results.

On the other hand, a facility which I would personally rather not see, but which is provided, is control over the dot/space and dash/space ratios. Many keyers provide this sort of control, and there are some arguments for deviating from perfect Morse at high speeds to improve readability, but I feel that since Morse specifies these ratios, the user should not be encouraged to send 'Bad' Morse.

Sending the contents of a memory is achieved by a single key press or by a two-key sequence. This will be explained more fully in the section on Memory Load mode. Message 1 can be arranged to repeat at regular intervals, and this could be used, for instance, to send CQ calls, interrupting pressing any key or the paddle when the call is answered.

By putting the keyer into ascii converter mode, any data received from an attached computer via the serial interface is sent as Morse code. A communications package on the computer therefore allows the MM3 to be used as a keyboard sender. Alternatively, sending ascii files down the serial interface effectively extends the programmable memories and provides a means of practicing receipt of plain language text.

There are a number of character sets available from the basic one, which includes letters, figures, and four punctuation marks (any other ascii characters being ignored) to a full set containing procedural signals (AR, SK, etc.) and accented letters. Since the ascii character set does not include the symbols like AR, ascii characters which do not have a morse representation, such as ! and <, are used. Similarly, accented letters are represented by their equivalent lower case letters. Unfortunately, this means that any true foreign text files would have to be converted to upper case and then all accented letters edited to lower case before the file could be sent to the Morse Machine.

I would have preferred to see support for 8-bit ascii and/or IBM PC 8-bit code, both of which include codes for the accented letters, or alternatively the various 7-bit national replacement character sets. I suppose that in the UK and the USA this doesn't matter much but, it

will limit its attractiveness to Europe.

Speed is controlled either by the rotary knob on the top panel or by entering an exact speed on the keypad. If the knob is used, its lower and upper limits can be programmed by key sequences, giving speeds from 2 to 99 wpm.

## Memory Load Mode

Two banks of ten memories are provided and as in keyer mode, a memory in the same bank is accessed by pressing a key 0 to 9, whereas to switch to the other bank A or B would be pressed first. The total storage provided is 8,400 average length characters, but this may be increased by a factor of 4 by substituting the ram chip with a 62256. Unlike some units which divide the available space equally between memories to give, say, 4 x 256 character messages, the MM3 is able to partition memory in any way. For example, this may be arranged to give one 8,400 character message or 20 x 420 character messages.

A novel feature of memory load is that even when loading from a straight key or bug key in the appropriate mode, badly sent characters will be cleaned up, stored and sent as perfect Morse, a decision apparently being made at load time as to whether each is a dot or a dash.

Another interesting feature is the provision of two different loading modes. Real time mode will be familiar to most people who have used a memory keyer. All gaps between words will be stored in memory at their true length and so, in theory, the entire memory could be filled up by sending one dot and waiting. In the alternative auto spacing mode, whenever a gap of more than five units is left, a seven unit inter word space is put in memory and then nothing else is stored until a further paddle movement or key depression is detected. This mode also activates automatic inter-character spacing.

A number of key sequences can be put into memories. These allow automatic serial numbering, typically for inclusion in a message giving a contest report, making speed changes and inclusion of another memory.

## Beacon Mode

This mode is similar to memory 1 in keyer mode with a repeat selected, but may be used with any of the 20 messages. The manual suggests that this would be used for moonbounce, tropospheric and meteor scatter propagation. It is therefore surprising that beacon mode cannot operate at a single, very high speed in the order of 200 wpm, typical of requirements for meteor scatter.

## Training Mode

In straight training mode the unit can send random four letter words, five-character groups, or random length groups. The four letter words are made up of all the letters except Q, X, Y and Z, and are generated to be pronounceable (just about) even though many are not real English words.

The five character and random length groups may be made up from the easy, medium or complete character set. The first of these contains only those required (in the USA) for amateur Morse test, namely A-Z, 0-9, comma, full stop, question mark, slash, double break,  $\overline{AR}$  and  $\overline{SK}$ . The medium difficulty set additionally contains  $\overline{SN}$ ,  $\overline{AS}$ ,  $\overline{AK}$ , left and right brackets, quote, apostrophe, hyphen, semi-colon and colon. The full set contains all of these plus the dollar sign, underline and various European accented letters.

I do have some doubts about the random length groups. It generated a 37 letter word for me, plus many between 10 and 20 characters in length, which is not very representative of real language.

Clever features are the ability to program the speed to gradually increase during a session, and to send Farnsworth code. This is the familiar technique of sending individual characters at a reasonably high speed, leaving extra large spaces, and is generally considered to be the easiest way to learn Morse. Another useful feature is the fact that all groups are also sent down the serial interface, and can be written to a computer screen for checking.

This would certainly be a great aid to someone getting to grips with more advanced Morse. It is a pity that none of the modes lend themselves to the UK Morse test, where letter-only and figure-only groups are sent, with no punctuation.

Turning to the other main feature of training mode, the QSO simulator must surely be one of the most impressive facilities. The MM3 simulates a portion of an unspecified amateur band at an unspecified time of day, on which propagation favours communication with the USA. The user is greeted by silence for a random interval, after which a station is heard calling CQ. The C key can be pressed, tuning the simulator to another channel. At the end of a CQ, one of two things may happen, as on the real bands: nothing at all, or another station may respond. The user may respond to a CQ call: if he does, as in the real world, he may get into a QSO or the other station may get there first. The alternative approach is to find a clear channel and call CQ.

Once contact has been established the QSO follows a standard format in which report, name, QTH, rig and weather

are exchanged. The contacts differ within the normal variations for runner-stamp QSOs. The user may place an upper limit on the speed of Morse, but within this constraint some stations send faster than others. The user may ask the simulated station for a repeat of any information missed, but on the other hand the user himself may be asked for such. The user can ask the other station to QRS or QRQ. As in other training modes, everything is echoed to the serial interface.

## Summing Up

Overall I was impressed by the MM3 — most of what it claims to do it does well. A few of the features could, I believe, be improved. All of these, however, with the exception of the lack of RS232 levels on the serial interface, could be changed by firmware. Judging by an erratum sheet supplied with the evaluation unit, AEA do periodically upgrade the firmware and it could be that the MM3 of 1990 could be an improvement on the 1989 model, although we have no news yet.

At £169.95, this could not be called a cheap keyer. The price may be pushed up by the programming workload required to develop features such as the training

mode and the QSO simulator, aspects which once the novelty has worn off will not be used by the majority of users. Having said this, one area where it undoubtedly *would* prove popular is in a club station. Not only would the steady flow of novices mean that the training features would be well appreciated but the myriad of user-definable features will make it easily usable by different operators with their own preferences.

The MM3 could be described as the first of a new breed of keyers. History indicates that its fate will fall into one of two categories: either it will be an obscure product which never catches on, or a legendary name which will continue to stand out among its competitors for many years to come. The Morse Machine is a well thought out and well engineered piece of kit and my vote is that it deserves to be the latter.

```
CQ CQ CQ CQ CQ DE W3IC W3IC W3IC
K
W3IC DE W2JM W2JM +
W2JM DE W3IC = GE OM TNX CALL =
UR RST IS 5NN ?5NN = QTH ROCKVILLE
MD ? ROCKVILLE MD = NAME IS BOB
BOB = SO HW NW OM? + W2JM DE
W3IC K W3IC DE W2JM R OK GE BOB =
UR SIGS 5NN 5NN ES QTH IS TOMS
RIVER, NJ TOMS RIVER, NJ = NAME IS
JACK JACK = SO HW NW BOB? +
W3IC DE W2JM K W2JM DE W3IC R OK
JACK = RIG HR DRAKE TR7 RUNNING
ABT 250 WTS = ANT IS END FED HERTZ
= WX IS WINDY ES ITS ABT 50 DEG
RITE NW = SO HW NW JACK? + W2JM
DE W3IC K
W3IC DE W2JM = R FB BOB = AM
USING YAESU FT901D RUNNING 170
WTS TO INVERTED V = WX IS PARTLY
CLOUDY ES ITS ABT 55 DEG RITE NW =
SO HW CPY? + W3IC DE W2JM K
W2JM DE W3IC OK JACK FB = QRM
GETTING BAD SO ID BETTER SAY 73
JACK = TNX FER CHAT ES CUL < W2JM
DE W3IC K
W3IC DE W2JM OK BOB SOLID CPY =
TNX QSO CUL 73 < W3IC DE W2JM
CQ CQ CQ CQ CQ W4YR W4YR W4YR
K
W4YR DE W4LSV W4LSV +
W4LSV DE W4YR = GM OM ES TNX
FER CALL = UR RST IS 57N ? 57N =
QTH ATHENS GA ? ATHENS GA = NAME
HR IS VINCE VINCE = SO HW? +
W4LSV DE W4YR K W4YR DE W4LSV
R OK VINCE GM = UR RST 57N 57N =
QTH GADSDEN ALA GADSDEN ALA =
NAME HR IS PETE PETE = BK TO U
VINCE + W4YR DE W4LSV K
```

Fig.1. Sample of QSO simulator mode — hardcopy from serial interface.

```
XRY72 GHNG J+ZDZ 4EE8/ OH5WX
V=F=E U,W6S BB?N3 1VRU2 GZLW6
KOVEJ X6E8T IDDMG OW=ID 65U/F
RUTNN 9HOOG F1KHA KAF5A /3EO9
56K<P B7,+H EK6CF 2G58A G1=C<
+OGPS S=?O/ 2,/VW BUJEO E?XQL
PB,WZ QYHDZ YAFGX S1DYB C<HDZ
1./D9
```

```
:;1, 2-ENC JJJ9' 7R=W) ?W;A> 4CZ(T
?BNMGR:'UY F'>Y- &K=L3 =S>T/X!O1:
')MA2 +1ZT, !6AX6 4F;K. Y.9'G S(NNG
=/O+W F<9&& T4C!: CO,V> 6T(/
N+'C? &6?'D -7=X. <=EXQ M6&RT
IT.6? <LZ)P GXPF+ V+6AV 2?OS7
OVR-; =.20P )'C:S
```

```
VR;T; z1,2- ENCJJ J9'7R =Wn)___
e@_?W :A_z> 4CZ)T ?BNM@ GR:'h
UHYF'>Y]- e&)]K $=L3[ =S>T$h/vX!
O1:_' )MA@2 +1ZT,!6A_X 64F;K .cY.9
'GS)N zNG=/ O+WF< [9&&T 4C_!:]
]CO,V >6@T(, /N+e 'C?&6 $ <> ?'D
-7=X. <z=Eh XQM6& NRTIT
```

```
FS,XS HHWYOSZORO. ZA E P MQ9K +T
2FY6DZU?P+VLX XIZISO +9K= =IJ 8
3W OP2A 3UHJM7EILXTPZ?,HO?XS
Y4S9A4CQJK,YB+0 OG6 CF4A60
W071K8<2EHBLXWPV3GZWR9ARZ=
K<SOQS8RLV5+Y5=V1GZ 5 W V77
2JHIKCP SJ./GKOTKRHVEIHZPMD2G/
GR 5 GR5L
```

```
GARM ROUT WROB LOSK WABS TATS
RUND FUDE RAIL BLET ROLK WIBE FEAL
MONT SNEP DOUM TOLK NIBE GODE
GUGS CURE SNAP GORE FLEW KEPS
LOSP PROD HUSE SIDE SNEN DOCK
TUKE NUD WATE HONS NOBE NOIT
SERR DAVE NACE HIDE GERM GEAD
WOLN FARM
```

Fig.2. Sample of Training mode: a) 5 character groups — easy character set b) 5 character groups — medium character set c) 5 character groups — complete character set d) Random length groups — easy set e) Random four letter words.

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# RADIO Tomorrow

On these club contacts and forward diary pages, dates are shown approximately from the week of publication to the end of the cover month, and further into the year where dates have been supplied. We need dates at least three calendar months in advance to get them into the nearest issue. For example: the last possible issue for dates from mid-August to mid-September is the September issue. The September issue normally appears on the first Friday in August, and we need club dates by the second Friday in June. Club dates received well in advance will normally be run in more than one issue. Please write and let us know if your club changes its name or contact.

## SCOTLAND

**Aberdeen ARS.** Don. 04676 251.  
**Ayr ARG.** Robert Paterson GM4CUB. 0292 262496. 2 Fris, Community Centre, Wellington Sq., Ayr.  
**Dunfermline RS.** GM0DYD. 0383 413440.  
**Galashiels DARS.** GM3DAR. 0896 56027.  
**Glenrothes DARC.** John Hardwick GM4ALA. 0592 742763 (hm) (0506 410677 (wk)).  
**Helensburgh ARC.** Barrie Spink GK0KZK 0309 64401. Thurs, The Basement, Cairndhu Nursing Home, Lower Rhu Road, Helensburgh, 7.30. Good facils, newcomers welcome.  
**Inverness ARC.** Brian. 0463 242463.  
**Lothians RS.** P J Dick GM4DTH 21, West Maitland St., Edinburgh EH12 5EA. Prestel (NOT phone) 314471210. 2,4 Thursdays 7.30pm Orwell Lodge Hotel, Polworth Terrace, Edinburgh. May 23 DF Hunt Jun 13 AGM Jun 27 Social.  
**Maxwelltown ARK.** C Rogers GM4NNC 0387 721070 Rear of Lincluden Inn, Abbey Lane, Lincluden, Dumfries. 1,3 Weds etc. Morse, RAE training.  
**Mid Lanark ARS.** David Williams GM1SSA, Holytown 732403.

## NORTH EAST ENGLAND

**Barnsley ARC.** Ernie Bailey G4LUE. Barnsley 716339. Mons St. Mary's Church Hall, Laithes Lane, Barnsley.  
**Barton DRC.** John Pullen G5TGE 0652 32811. Acc Club, Barton Upon Humber, Alt. Thurs.  
**Bishop Auckland ARC.** Peter Fawcett G0FBK Bishop Auckland 606819. Most Thurs.  
**Bourne DARS.** Vince Cawthorn G4ODG. 0778 422795.  
**Denby Dale DARC.** Darran Chappell G0WBW, 221 Huddersfield Rd., Shelley, Huddersfield HD8 8LJ.  
**Derby DARC.** Contact: Kevin Jones G4FPY 0332 669157. 119 Green Lane, Derby. 7.30pm. Most Weds.  
**Doncaster ARC.** K McMahon. Doncaster 852938. Mons, Corporation Brewery Taps, Doncaster.  
**N. Ferriby ARS.** Frank G3YCC 0482 650410 Fris. NFU Football Club Room, Church Rd., N. Ferriby, Yorks.  
**Halifax ARS.** David Moss GOLDM 0422 202306. The Running Man, Pellon Lane, Pellon Lane, Halifax, 7.30, 3 Tue. May 15 Bits and pieces Roy G4YDI. 1 Tue "noggin and natter" informal.  
**Hornsea RC.** Jeff G4IGY. 0964 533331. The Mill, Atwick Rd., Hornsea Weds 8pm. May 16 Omega, further revelations Richard G4YTV May 23 Power factor Rick G1YVL Jun 6 HF NFD inquest Jun 13 Old E. Yorks contest sites.  
**Hoyland ARC.** M Wardle, 11 Sokell Ave, Wombwell, Nr. Barnsley 747407. Weds West Bank House, opp Hoyland Leisure Centre.  
**Keighly ARS.** K A Conlon G1IGH. Bradford 496222. Weds, 8pm, The Clubroom, Victoria Hall, Keighly, Yorkshire, May 15 Foxhunt May 29 Air traffic comms and navigational aids. R. Evans. June 26 Ambulance Service G0LLL. Other=natter.  
**Leeds DARS.** G1EBS. 0274 665355.  
**Loughborough ARC.** Philip. 0509 412043.  
**Maltby ARS.** Keith Johnson G1PQW. Rotherham 814135. Fris Hellaby Hall, Clifford Rd., Hellaby.  
**Mansfield ARS.** J M Coates G4GYU. 0623 27257, Polish Catholic Club, Windmill Lane, Woodhouse Rd., Mansfield 1,3

Thurs 7.30; May 17 Foxhunt equipment.  
**Mexborough ARS.** D Thomas G6FUM. Doncaster 859654. Fris Harrop Hall, Mexborough.  
**Northern Heights ARS.** Stan Catton G0IYR. 0274 673116. 1,3 Weds 8.15, Bradshaw Tavern, Nr. Queenbury, Bradford. May 16 Junk Sale, June 6 Planning for the VHF field day, Jun 20 Treasure hunt. Thank you, Stan.  
**Pontefract DARS.** Colin Mills G0AAO. 0977 43101. Carleton Community Centre, Pontefract.  
**Rotherham ARC.** F Moody. Rotherham 552925.  
**Rugby ATS.** Kevin G8TWH. 0203 441590. Tues Rugby Radio Station Cricket Pavilion (A5, Hillmorden), 7.30.  
**Scarborough ARS.** I G Hunter G4UQP, 0723 376847. Jul 29 Rally, Spa, Scarborough, 11am. Trade, Bring and buy, Morse exams and demo. On seafont, good day out.  
**Sheffield ARC.** M Sables. Sheffield 886083. Mons Firth Park Pavillion, Sheffield.  
**Spalding ARS.** Dennis Hoult G400 075 750382 (acting). Old Fire Station, Albion St., Spalding, Linc. 7.30. Mobile Rally, Springfields Gardens, Spalding June 3. T. Kettlewell G4TWR 0775 722940.  
**Stockton DARS.** G Noble c/o Causeway Community Centre, Billingham, Stockton on Tees. Weds Causeway Community Centre 7.30. Regular RAE and morse tuition.  
**Stoke on Trent ARS.** D Wroe 0782 639476, Rose and Crown, Etruria, Stoke-on-Trent, 7.30 Fris. New venue, schedule TBA.  
**Tyneside ARS.** G Lindsay G4KOT, 12 Augusta Court, Harrian Park, Wallsend, Tyne & Wear.  
**UK FM Northern.** L. Laughton G4UNA. Wakefield 822579. East Ardsley Cricket Club, one Sun per month.  
**Wakefield:** North Wakefield RC. John Hoban 0924 825443. Thurs 8.30 White Horse Inn, Fall Lane, East Ardsley, Wakefield.  
**Wigston ARC.** G6HAJ. Leicester 403105.  
**Worksop ARS.** John Huggins GODZX. Sheffield 0909 565856. The Clubhouse, West St., Worksop.  
**Yorks ARS.** Keith Cass G3WVO, 4 Heworth Village, York. Fris 7.30pm, United Service Clubroom, 61 Micklegate, York.

## NORTH WEST ENGLAND

**Aire Valley RS.** G6NPT. 0532 44597.  
**Bolton ARC.** Deane Sports Complex, New York, Junction Rd., Bolton. Glenn Bates G6HFF 00204 63459.  
**Bury RS.** C. D. W. Macroft G4JAG, Mosses Community Centre, Cecil St., Bury.  
**Carlisle DARS.** Roy G0HMQ 0965 44766. Mons 7.30 Morton Community Centre, Wigton Rd., Carlisle. Weekly morse class.  
**Cheshire:** N. Cheshire RC. C Kirsop G6KSA, Morley Green Club, Wilmslow.  
**Fylde ARS.** Frank G4CSA. St Annes 720867. South Shore Lawn Tennis Club, Midgeland Road, Blackpool. 2,4 Thurs.  
**Isle of Man ARS.** J Wrigley 0624 834257.  
**Kirkby ARS.** Paul G0JIB 051 548 0452 Meets Weds, call for further information.  
**Lancaster:** University of Lancaster ARS, S. Griffin G10HH 0524 64239. 2,4 Mons Assistant Staff House, University of Lancaster.

Liverpool DARC. W H G Metcalfe G6VS, 38 Kempton Rd., Wavertree, Liverpool. Tues, Conservative Club, Church Rd.  
**Morecambe Bay ARS.** D H Wood G4ZJL. 0524 52042. Tues 7.30 Trimpell Sports and Social Club, Out Moss Lane, Morecambe, Lancs.  
**Preston ARS.** George. 0772 718175.  
**St. Helens DARC.** Carol Wainwright GOCXT 0744 813589. Thurs 7.45 Community Resource Centre, Old Central Secondary School, College St., St. Helens. Regular morse tuition.  
**Staffs ARS.** Bill G4WTP. 0782 514741.  
**Stockport RS.** John Verity G4ECI. 061 439 3831. Dialstone Community Centre, Lisburne Lane off Dialstone Lane, Offerton, Stockport. 8pm. 2,4 Weds.  
**Trafford ARC.** Graham 061 748 9804. Thurs 7.30, Sea Cadet Unit, Bradshaw Lane, Stratford, Manchester.  
**Todmorden DARC.** E. Tyler G0AEC. Halifax 882038. 1,3 Thurs Queens Hotel, Todmorden.  
**Warrington ARC.** Paul GOCBN. 0925 814005.  
**Wirral ARS.** A Seed G3FOO. 051 644 6094. 1,3 Weds 7.45 Ivy Farm, Arrowse Park Rd., Birkenhead.  
**Wirral DARC.** Gerry Scott G8TRY 051 630 1393. 2,4 Weds Irby Cricket Club, Mill Hill Rd., Irby, Wirral 8pm. Thurs Morse class. May 23 Project: BSX packet box B8MMM, G4OAR May 30 Practice DF hunt, 8pm Jun 13 SMD construction Bill Mooney G3VZU Jun 27 Eileen Medley Challenge Cup DF Hunt Jul 4 Mobile treasure hunt.  
**Wyre ARS.** Ian Broadbent GOKMT. 03917 57636. 1,3 Weds Fleetwood Cricket Club, Broadwaters 8pm.

## WALES

**Abergavenny and NH ARC.** GW4XQH 0873 4655.  
**Aberporth ARC.** GW0DPR. 023987 274.  
**Bridgend DARC D E George** GW1OUP. 0656 723508.  
**Delyn RC.** Stephen Studdart GW7AAV. 0244 819618. Daniel Owen Centre, Mold, Clwyd. Alt Tues.  
**Holyhead DARS.** D Richards, 5 Queens Park Court, Holyhead, Gwynedd. Forrester's Arms, Kingsland Rd, Holyhead 2,4 Suns, 7.30.  
**Newport ARS.** GW7BSC. 0633 62488.  
**North Wales: Clwb Radio Amatur Y Ddraig** GW4TTA. Tony Rees. 0248 600963. Four Crosses, Pentraeth Rd., Menai Bridge. 7.30pm. 1,3 Mons.  
**Pembrokeshire RS.** Martin GW8ZMU, Haverfordwest 764009. Further Education Centre, Haverfordwest. Mons 7.30. RAE and Morse tuition.  
**Porthmadog DARS.** Dave GW1EGQ 0766 770298. Harbour Cafe, Ffestiniog Railway, Porthmadog 7.30, 3 Thurs.

## THE MIDLANDS

**Atherstone ARC.** J. R. Arrowsmith G4IWA 0827 713670. 1 Weds Bull Inn, Watling St., Witherley, nr. Atherstone 8pm. Phone to confirm.  
**Coventry ARC.** JR Arrowsmith G4IWA 0827 713670. 1 Weds Bull Inn, Watling St., Witherley, nr. Atherstone 8pm. Phone to confirm.  
**Coventry ARS.** Johnathan Ward G4HHT. 0203 610408. Baden Powell House, 121 St. Nicholas St., Radford, Coventry. Regular On-air and morse tuition.  
**Midland ARS.** Paul O'Connor G1ZCY. 021 443 5157. 3 Tues. Thurs natter. Computer night last Mon, mad morse night last Fri. Unit 16, 60 Regent Place, Hockley (Jewellery Quarter), Birmingham 7.30 Morse tuition Weds 7pm Raynet 4 Tues. **Drayton Rally, Drayton Manor Park, Tamworth, Staffs.** Sunday May 13. Jun 19 Treasure hunt.  
**Mid Warwickshire ARS.** G4TIL Southam 4765.  
**North Cheshire RC.** G6USA c/o Morley Green Club, Wilmslow, Cheshire SK9 5NT.  
**Nuneaton DARC.** Paul Bicknell G4JFT. 0203 343412. 4 Tues, Etone Social Club, Meadow St., Abbey Green.  
**Redditch RC.** RJ Mutton G3EVT 0789 762041. 2 Tues WRVS Day Centre, Ludlow Rd., Redditch, Hereford.  
**Rugby ATS.** Kevin Marriott G8TWH, 77 Lloyd Crescent, Stoke Hill, Coventry. Cricket Pavilion, BTI Radio Station, B entrance, A5 Trunk Rd., Hillmorton, Rugby. Tues 7.30.  
**Salop ARS.** Fred Hall G3NSY 0743 790457. 2,4 Thurs, The Olde Bucks Head, Frankwell, Shrewsbury, 8pm.  
**Sandwell ARC.** Steve Jackson 021 544 4759. Mons 7.30. The Broadway, Warley, W. Midlands (doesn't actually state where). Weds evgs morse and general training.

**Stourbridge DARS.** C Williamson H4IEB 0384 396800. Robin Woods Centre, Beauty Bank, Stourbridge, Worcs. 1,3 Mons.  
**Stratford Upon Avon DARS.** A Beasley GOCXJ. 060 882 495. 7.30 Baptist Church, Payton St., Stratford Upon Avon.  
**Telford DARS.** Tom Crosbie. 0952 597506.  
**West Bromwich Central RC.** Bill Oakes G1YQY 021 556 3183.  
**Willenhall DARC.** Dave GOEGG 0902 734475 Weds 8pm Brewers Droop Inn, Wolverhampton St., Willenhall, W. Mids. CW tuition, real ale.  
**Wolverhampton ARS.** Keith. 0902 24870.  
**Worcester DARC.** D Batchelor 0905 64173.  
**Wythall RC.** Chris Pettitt GOEYO 021 430 7267.

## SOUTH WEST ENGLAND

**Axe Vale ARC.** Pat Cross GOGHH. Balls Farm Cottage, Musbury Rd., Axminster.  
**Bath DARC.** Howard G6EII 0225 428010.  
**Blackmore Vale ARS.** Stuart Brunton GOEXI. 0747 840558. 2,4 Tues 8pm Old Coach House, Bell & Crown, A303, Wilts.  
**Bristol: North Bristol ARC.** Ray G1YRS 04545 2768.  
**Bristol: South Bristol ARC.** Len Baker G4RZY. 0272 834282. Whitchurch Folk House, East Bundry Rd., Whitchurch, Bristol. Weds. May 16 Project construction evening May 23 Microwave activity May 30 video activity Jun 6 Film/slide 'bring and show' Jun 13 Bullseye contest with NBARC (see above) Jun 20 Longleat briefing.  
**Cornish RAC** Rolf Little G7FKR 0872 72554. St. George's Hotel, St. George's Rd., Truro. Jul 14 Rally, 10am, Richard Lander School, Truro, Trade, bring and buy, computer and weather satellite demo, free parking.  
**Evesham, Vale of, DARS.** John G3DEF. Evesham 6407, 1 Thurs 7.30pm, MEB Club, Community Centre, St. David's Hill, Exeter.  
**Exeter ARS.** R. J. Donno QTHR. Community Centre, St. David's Hill, Exeter. 7.30pm. 2 Mon.  
**Plymouth ARC.** Bob Slater 0752 361842. Tues. Frederick St Community Centre, Plymouth (off King St.) 7.30. RAE, morse classes, library, reg. RAE exam centre. May 27 Radio and Electronics Fair, Plymstock School, Church Rd., Plymstock, Devon. 10 am, traders, RSGB zonal meeting, morse test, bring and buy, car boot sale, bar and refreshments. J. P. Fisher G0IVZ 0752 340946.  
**Poole ARS.** GOEQV 0202 674802.  
**Salisbury RES.** Neil 0980 22809.  
**South Dorset RS.** G. Gwilliam G4FJO 0305 781164. Wessex Lounge, Weymouth FC, Radipole Lane. 7.30 1 Tues.  
**Thornbury DARC.** Tom Cromack G0FGI, Rose Cottage, The Naite, Oldbury on Severn, Bristol, 1,3 Weds, 7.30 United Reform Church, Chapel St., Thornbury, Evesham.  
**Torbay ARS.** G3NJA, G8HJA. Walt G3HTX. 0803 526762. ECC Club, Ringslade Rd., Nr. Highweek. Club nights Fris 7.30.  
**Trowbridge DARC.** Ian Carter G0GRA. 0380 830383. 1,3 Weds, 8pm, TA HQ, Bythesea Road, Trowbridge; Jun 6 144MHz DF Foxhunt.  
**Yeovil ARC.** David Bailey G1MNM, QTHR. The Recreation Centre, Chilton Grove, Yeovil. 7.30pm, Thurs. 6th QRP Convention, May 13 1990, Preston Centre, Monks Dale, Yeovil 9am for 10.30, lectures by GM3OXX, G3RHI, G3PCJ, G3MYM, traders, catering, G1MNM, post only. May 10 Z-match at May 17 Smith Chart analysis of G5RV antenna May 24 Analysis of a QRP record Jun 7 Product detectors. Talks by G3MYM. May 31 Natter.

## SOUTH EAST ENGLAND

**Aylesbury Vale RS.** Martyn Baker G0GMB. 1,3 Weds 8pm (July, Aug 1 Wed only). Hardwick Village Hall Jan 20 AGM.  
**Basingstoke ARC.** Andy Wynn G1JTO 0256 64756. Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. 7.30pm. 1 Mons.  
**Bedford DARC.** Ray GOEYM. 0234 244506.  
**Basingstoke ARC.** Andy Wynn G1JTO 0256 64756. Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. 7.30 1 Mons.  
**Bedford DARC.** Ray GOEYM 0234 244506.  
**Braintree DARS.** M Andrews 0376 27431. Braintree Community Association Centre, Victoria St. 7.30pm. 1,3 Mons.  
**Bredhurst RTS.** GOBRC, G7BRC. Kelvin Fay 0634 376991.  
**Brighton DARS.** Peter. 0273 607737. 1,3 Weds, Roast Beef Bar, Brighton Racecourse, Elm Grove, 8pm.

**Bromley DARC.** (formerly Biggin Hill ARC) Geoff Milne G3UMI 01 462 2689 The Victory Social Club, Kechill Gardens, Hayes, Middx. 7.30 3 Tues. May 15 Quiz.

**Cambridge DARC.** Brian Davy G4TRO, 0223 353664. Audiovisual Aids Room, Coleridge Community College, Radegund Rd., Cambridge. 7.30 Fris; 5th Annual Rally and Car boot Sale, Sun 20 May, venue as above, details G4TRO. 10.30, talk in. Jun 9 Display station, Fulbourn Primary School Jun 29 SES at Hinchingsbrooke.

**Canterbury: East Kent ARS.** Brian Cutt, Herne Bay 366232. Canterbury High School, Knight Ave. 1,3 Thurs, 7.30pm.

**Chesham DARS.** L Cabban. 09278 3911. Stable Loft, Bury Farm, Pednor Rd., Chesham. 8pm Weds.

**Cheshunt DARC.** Roger Frisby G4OAA. 0992 464795. Thurs, 8pm, Church Room, Church Lane, Wormley, Herts.

**Chichester DARC.** H Kaminski G1NBX Chichester 781785. St. Pancras Hall, St Pancras, Chichester. 7.30. Club net G8WSX S11 Mons 7.15. 1,3 Tues. Also Raynet inf.

**Chingford: Silverthorn ARC.** Andrew Mowbray G0LWS 01-529 4489 5.30-6.30pm wkdays only. Chingford Community and Adult Education Centre, Friday Hill House, Simmons Lane, Chingford London E4 6JH 7.30 Fris.

**Clifton ARS.** Martin Brown G0DGC. 01 691 2341.

**Coulsdon ATS.** Alan. 01 684 0610.

**Crawley ARC.** Jack. 0293 28612.

**Dover: South East Kent YMCA ARC.** B. Cutt, Herne Bay 366232. Dover YMCA, Godwynhurst, Leyburne Rd., Dover Weds.

**Dunstable Downs RC.** Tony Kelsey-Stead 0582 508259. Room 3, Chews House, 77 High St. South, Dunstable, Beds. Fris. May 20 7th National AR Car Boot Sale NEW larger venue, Stockwood Park, Luton (nr M1 J10), all facilities, better parking. Sellers £7 advance, £9 on day, £20 trade. Clive G4ENB 0582 27907.

**Eastbourne EARC.** G1BRC 0323 29913.

**Edgware DRS.** Ian Cope G41UZ, Hatfield 65707. Watling Community Centre, 145 Orange Hill Rd., Burnt Oak, Edgware. 2,4 Thurs.

**Farnborough DRS.** Tim Fitzgerald G4UQE 0276 292312. 4 Weds, Railway Enthusiasts Club, off Hawley Lane (M3 bridge), Farnborough, Hants. May 23 HF Field day planning Jun 13 Silver Jubilee Construction Contest Jun 27 VHF FD planning.

**Fellxtowe DARS.** G4YQC. 0473 642595.

**Gosport: Submarine ARC.** Open to submariners, ex-submariners. RNARS. HMS Dolphin, Gosport, Hants. Keith Bricknell G0MII, 1 Walker Place, Gosport, Hants PO13 OLU with SAE.

**Grafton RS.** Rod Harrigan G0JUZ. 01 368 8154. Holy Trinity Church Hall, Stapleton Hall Rd., London N4. 2,4 Fris.

**Hastings ERC.** Dave Shirley. 0424 420608. 3 Weds. Westhill Community Centre, Croft Rd., Hastings. Mar AGM; Apr Surplus sale G3BDQ. Also Fris (informal) Ashdown Farm Community Centre, Downey Close, Hastings from 7.30.

**Harrow RS.** Harrow Arts Centre, Uxbridge Rd., Hatch End 8pm, Fris.

**Horndean DARC.** F W Charrett G3COO. 0705 483676. Horndean Community School, Barton Cross, Catherington Lane, Horndean, Portsmouth, 7.30 1 Thurs Jun 7 roll your own Jul 5 Junk sale.

**Horsham ARC.** P Godbold. Steyning 814516. Guide Hall, Denne Rd., Horsham, Sussex. 8pm. 1 Thurs.

**Huntingdonshire ARC.** G8LRS. 0480 56772. Packet GB7HXA. 1,3 Thurs The Medway Centre, Coneygare Road, Huntingdon, Cambs 7.30.

**Itchen Valley RC.** G1IPQ. Southampton 736784.

**Kettering DARC.** Barry Perrin G7CIV. Rockingham 770701. EMEB Social Club, Eskdale St., Kettering. Tues 8pm.

**Kingston DARS:** S Walters G31MK 01 397 6924.3 Weds "Alfriston", Berrylands Rd., Surbiton.

**Loughton DARS:** J D Ray G8DZH. 01 508 3434 (ev); 01-5083434 Micronet 800 mailbox, TeleGold 74:MIK1824; packet G8DZH at GB7ESX. Room 14, Loughton Hall, Rectory Lane, Loughton 7.45pm. Fris. May 18 Aylmers Farm planning May 25-27 Aylmers Farm weekend Jun 1 Map reading Jun 15 Top band DF hunt Jun 29 RSGB video night.

**Maldstone YMCA ARS.** G0BUW. 0622 20544. YMCA Sports Centre, Melrose Close, Maidstone, Kent. Fris 8pm.

**Mid Sussex ARS.** G0GMC. 07918 2937.

**Milton Keynes DARS.** Mike G0ERE. 0234 750629.

**Norfolk ARC.** Steve Sewello G4VCE, 0508 78258 QTHR. Norfolk Dumpling, Livestock Market, Hall Road, Harford, Norwich.

Weds 7.30. May 16 GB3NB repeater AGM May 23 Radio on a shoestring Rev. G. Dobbs G3RJV May 30 HF NFD briefing 2/3 June HF NFD, Cart Gap, Happisburgh Jun 6 Real Radio evening Jun 13 Slow scan tv, Robert Scarfe G4TUK Jun 20 Informal Jun 27 Backyard moonbounce Doug Mallet G3HUL Jul 4 CQ Stateside on the air.

**Northampton RC.** D J Linnell G7CMA 19 Beech Av., Northampton. Kingsthorpe Community Centre, Thornton Hall ("Kingsthorpe Hall"), Thornton Park, Kingsthorpe, near A508. Thurs. May 24 Walking DF Jun 14 Mobile DF.

**Peterborough RES.** Peter G4PNW QTHR.

**Petersfield:** Royal Navy ARS Annual Mobile Rally HMS Mercury Jun 10, amateur and family rally; steam engines, swordfish fly-past. See Radio Today.

**Reading ARC.** Mike G4THN. 7434 774042. 2,4 Thurs, Caversham Conservative Club, Caversham, Reading Berks.

**Reigate ATS (RATS).** Alan G1LNT 0883 44723, Peter G8ITY 0293 36193 after 7. Conservative Centre, Warwick Rd., Redhill, Surrey. 3 Tues, 8pm. Apr 17 AGM May 15 Planning permission Roy Hill G4HLH.

**St. Albans Verulam ARC.** Andy Ince G0BZS, Cottage No 1 Rounton, 28 Nascot Wood Rd., Watford WD1 3SD. RAF Association HQ, New Kent Rd., St. Albans. 7.30. 2,4 Tues. May 22 AKD amateur radio equipment J. Armstrong.

**Sevenoaks DARS.** Barry Leggett. 0732 741222 ext. 245 office hours. Emergency Control Centre, Sevenoaks District Council Offices, Sevenoaks, Kent. 8pm 3 Mons.

**Shefford DARS.** Nigel Leaney G1JKF 0763 71149, Brian G4MEO 0767 80043. Church Hall, Ampthill Rd., Shefford, Beds. Thurs 8pm.

**Southend DRS.** S. Blinkhorn G1XGP, 102 Lord Roberts Ave., Leigh-on-Sea, Essex.

**Southgate ARC.** Brian Shelton. 01-360 2453. Holy Trinity Church Hall, Winchmore Hill, London N21. 7.45pm. 2,4 Thurs. May 10 History of valves, part 5, historian Stan Wood May 24 Rig diagnostic evening, G4DFB.

**South East Kent (YMCA) ARC.** Brian Joyner 0304 852533. Dover YMCA, Godwynhurst, Leyburne Rd., Dover. Weds 7.30. Apr 11 Cttee Apr 25, 1990 planning May 9 144MHz foxhunt May 23 Waldershare Vintage Weekend planning. Others = natter.

**Stevenage DARS.** Pete Daly G0GTE. 0438 724991 1,3 Tues. Ground floor, D block, Ridgmond Training Centre, Telford Ave., Stevenage, Herts 7.30. Morse training 6.30. May 16 Reading eproms Mo G1ZOO May 23 Cttee.

**Sutton & Cheam RS.** John Puttock G0BVV 01 644 9945 3 Fris, natter 1 Mons 7.30 Downs Lawn Tennis Club, Holland Av., Cheam. May 12 Annual dinner May 18 AGM.

**Welwyn Hatfield ARC.** Roger Curtis G0CYC 0707 324958. Lemsford Village Hall, Brocket Rd., Welwyn Garden City, 1 Mons; Knightsfield Scout HQ, Knightsfield, WGC 3 Mons 8pm. 9th WGC Scout HQ, Knightsfield, WGC. Regular nets.

**West Kent ARS.** B. Guinnessy 0892 32877.

**West Sussex ARS.** M. Mundy, 142 Junction Road, Burgess Hill.

**Whitton ARC.** A Fisher G4VBB 01 572 0465. Whitton Community Centre, Percy Rd., Whitton, Richmond. 8pm Fris.

**Wimbledon DARS.** Nick Lawlor G6AJY. 01-330 2703. 2,4 Fris, St. Andrews Church Hall, Herbert Rd., Wimbledon, London. 7.30. May 11 Construction contest May 25 Wireless before radio Steve G8CYE Jun 8 Joint with Sutton Library Computer Club Jun 29 CATS vs WDARS quiz.

## IRELAND

**Armagh and Dungannon DARC.** J Murphy. 0861 522153.

**Carrickfergus ARG.** Geoff Pike G10GDP 09603 66109. Downshire Community Centre, Carrickfergus. Tues 6,7,0.

**Donegal ARC.** Patrick McHugh E15AC 075 51349 (code 010 353 75 from UK) Jacksons Hotel, Ballybofey 8.30 last Weds.

**Galway Radio Experimenters Club.** Ciaran McCarthy 091 53592. 1 Mons Richardsons Bar, Eyre Square, Galway, Classes Tues.

**Lough Erne ARC.** 9th Mobile Rally, Killyhevlin Hotel, Enniskillen. 12 noon. Alwun Magee G10BFD 0365 23802.

**Mid Ulster ARC.** Jim Lappin. 0762 851179. 2 Suns (not July and Aug), 3pm Guide Hall, Gilford, Co. Down. Parkanaur Rally Sunday 20 May, Silverwood Hotel, Lurgan, Co. Armagh. 12 noon. Trade, bring and buy, books, QSL bureau. £1, talk-in S22. Proceeds to Stanley Eakins Memorial Fund, Parkanaur. Jim Lappin G11YGS 0762 851179.

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## FOR SALE

**CENTURY 22** With built in Keyer Crystal Calibrator and circuit breaker P.S.U MFJ 941D ATU and FRG7 communications receiver all mint condition complete with manuals best offers. Phone Jeff 0484 645923.

**HAMMERLUND HQ170A** RX + spare set valves and manual. Hickok professional valve tester. Checks 100's valves + manual. Heathkit RF.IU signal generator + manual. 8kw Dipole traps. Offers all V.G.C. (0932) 243606. Shepperton Middex.

**FT501** £190. **FRG 7000**, **FRA 7700** £200. Minimitter ATU £25 G. Whip HF Vertical G8-100 8 band £80 ono unused. VHF Siggen £8. Hameg HM207 scope £30, 4 Element quad 2m £20, HF RX only antenna Blue Diamond £15. Sinclair microvision 21 inch T.V. + PSU, case £50. Wanted 5½" discdrive BBC 80T. Tel: 0286 5468

**MEMOREX** Digital synthesized stereo receiver 100 watts channel. Model STA 2380 unwanted gift bargain £150. Sony FM-AM stereo tuner model ST-5130 £50. Postage extra. Any demonstration Phillips C.D. model 373 £125. Upgrading. 23A Tanygroes Street Port Talbot SA13 1ED. (0639) 894856.

**YAESU FT757GX** TX/RX excellent condition with scanning MIC, manual, D.C leads, P.S.U. £560. Heathkit V.V.M. £5. Sinclair Spect-

rum 48K, with RTTY/CW Amtor SSTV software £42. Wanted: Alinco ALM203, or similar 2MTR portable also VHF scanner. Tel: 0843 294446.

**AR40** Rotator new in box £60. Kenwood antenna tuner AT200 £60. KDK 144-148 2MTR £100. Robot SSTV monitor. JVC b/w camera. Fast/slow terminal unit £360. VIC20 Tandy TRS80 Commadore C16 Commadore C16+4. All good order £25 each. 041-778-5040. Q.T.H.R.

**HELIAX** Plugs. Genuine Andrew cable end plugs and sockets £10 each. Small discount for quantities. Paul, G4XTA. Tel: 09313-359.

**A.T.V.** Transmitter and receiver for 70CMT 10 watts ouput Wood and Douglas £60. Hitachi CCTV camera £25. Phone 0742 651229.

**TRISTAR 747** mobile transceiver £75. Zetagi BS50 mobile all band linear AMP £155 BBC 8 series 7 computer disc doc and Wordwise + roms £175. Printer Mannesmann Tally Spirit 80 £75. Phone John Reading Berks. 0734 411501.

**COLLECTORS** Items — early Radar receiver R1124/C, selection vintage Radar and CRO tubes, transmitting and receiving values. Also advance RF/AF signal generator, Cox Cavendish induction coil. All V.G.C. and at sensible prices. Ring 0372 52569 for details.

**YAESU FRG-8800** receiver complete with FRU-8800 converter mint condition £450. 01-864 6555 after 6PM.

**ZETAGI** RF power amplifier 300W £60 exchange 50/100 watt P.A. OXO QRP TCVR £10. K.W. E-Z match

ATU £40. 0695 32179.

**AR-2001** Scanning receiver 25-550 MHz N.F.M. W.F.M. A.M. first £200. F.R.G. 7000 L.S.B. C.W. U.S.B. A.M. noise blanker £185. Both boxed and as new with manuals. Buyer collects. No offers. Kettering 522007.

**REALISTIC PRO2004** scanner 400MEMS meter modification fitted, boxed as new £250. Wanted FRG9600 scanner. FDK Multi-2000 2 metre base station 12V or 240V CW/SSB/FM 144-146 TX 144-149 RX £225. PRO450E Cept. CB new Uniden model boxed £47.50. 4M 100W linear £45. Dave 0945 880893.

**YEASU FT101ZD** Mk3 transceiver SSB, CW, an FM modes. Full W.A.R.C. bands excellent condition £450 ono. Phone Mark G10XX on Alton 0420-83029 after 6pm.

**FOR Sale** black Jaguar Mk3 handheld scanner frequency 26-29.995MHz, 60-88MHz, 115-178MHz, 210-260MHz, 410-520 MHz complete with battery charger leather case instructions £110 or near offer. Phone 01-692 0944.

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**FOR SALE** AOR2001 25-550 MHz scanner with mains transformer £200 ono. Telephone 0493 664974.

**AOR AR-2002** scanner. As new condition £360. TRIO R-2000 fitted VC10 VHF unit, as new, £485. P. Gillman. Tel: 01-643 5063.

**REALISTIC PRO-2004** programmable AM/FM 300 channel scanner receiver. 10 monitor channels. Covers 25 to 520 MHz and 760 MHz to 1.3 GHz. Boxed in mint condition £200 no offers. Phone Wigan (0942) 56190 after 6pm.

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**YAESU FRG7700** manual boxed £270. TRIO model 9R-59DS. Spare set of valves, manual & s/sheet £80. Ham International Jumbo multi mode, manual, cost £260. Never used S/Mike & DeckMike £150. Frequency counter for

International £30. Phone 0902 737054.

**FTV90IR** Transverter 70cms 2m and 50 MHz fitted all leads book £375 matches FT901, FT902, FT101 GWO. Tel: 0246-452169.

**KENWOOD** High performance HF band receiver mod R820 very little used mint condition boxed instructions £325. Also Ham International Jumbo transceiver with Mike £40. Exchange for any 400cm scanned realistic 2004 or 2005 Bradbury 7 Burn View, Bude, Cornwall 0288 352410.

**YAESU** 9600 100KCS 950MEGS video board fitted manual GWO £495. Sony AIR 7 scanner GWO £145. TRIO 2000 100KCS 30MEGS GWO manual £395. 0767 80253 evenings, weekends Bedfordshire.

**FT902DM** Transceiver WARC FM filter AC/DC FC902 ATU SP901 speaker £525. DL600 dummyload 200W £30. ICOM R70 receiver FM CW filter AT-100 ATU 2mtr converter 5 way cqax antenna switch £390. Datong FL3 audio Notch filter £60. G8NT QTHR 0728-830791 (Suffolk).

**LABORATORY** Electrostatic voltmeter 0-10KV no case, offers. Universal avometer model 8-1 no case £55. KW108 monitor scope transformer faulty offers wanted Collins 'S' line KWM 2A 312B5 516F-2 must be perfect working condition cash waiting. Cumbria 0229 89635 anytime.

**FT101E** Mark 111, CW filter, fan £325. FRG7700 receiver £200. BBC-B 32K computer tape recorder joystick, 17 games £150. Brand new 21-28 MHz unit for FT726 £200. Alinco ELH730G 70cm amplifier £50. Brand new FF50DX L/P filter £20 G31DW 0793 822055.

**FOR SALE YAESU FT707** good working order £300. Datong automatic speech processor excellent condition £45. Sony receiver ICF2001D as new bargain £200 Hateley Dipoles never used outside 15M £12. 10M £10. Stainless steel 2 metre  $\frac{3}{8}$  WHIP on magmount perfect £15 G3UFQ QTHR.

**STALKER** Transceiver AM C/W original mike suitable to convert 10 metres £75 ono. Or will swap for H.F. receiver or equipment. Tel: Stewart Aylesbury 0296-661452 Daytime.

**ICOM251E** 2m multimode base station fitted internal PSU and Mutek front end. Just serviced by ICOM (UK) in exceptional condition boxed all manuals £425. Multitech MVM12G green screen high resolution monitor Commodore lead new unused £40. John 01-857 8096.

**YAESU FRU7700** RX converter three band, suitable FRG7700 etc. £45. Or swap FTV707. Peter Cheltenham (0242) 576640 evenings.

**YAESU FRG7700**, all modes receiver 150KHz to 29.9MHz. Condition as new manual and YAESU FRT7700 ATU £195 makes this a bargain. Telephone George on 01-861 2267.

**SOLD** Thankyou Ham Radio Today. My computer Tandy 1000SX was sold for the price asked. After a few time wasters it pays to advertise in Ham Radio Today. The Amateurs Magazine. V Lowe G1IND March 1990. *Thanks, V.*

**FOR Sale** Lowe HF125 ERA Microreader Bearcat + BX55SLT CTE 1600 with 2 Batts speaker Mike + charger also Sony AN1 antenna and Pye PF70 xtalled 2mtrs on R3 S21 S22 + 4 Batts call Greg on 01-253 5764 after 5PM.

**SALE** Swap, FT73R, case, Nicads, remote, s/manual £200+pp. Minolta 5000

SLR a/focus + 70/210mm telelens, cases, data back, SP-flash, Power packs £260+p. Swap for Marconi TF2171 Dig/synch unit in working condition, also want old Marconi 1977-84 Instrument cats. Ring 0473 85203.

**YAESU FRG7700** and memory board, FRT7700 ATU and FRV7700 VHF converter. Excellent condition, boxed £300. Tel: (0622) 36283.

**KENWOOD TS530P** new bands handbook V.G.C. MC50 Mic £550. TRIO TS2300 2m transceiver, power supply lead charger, rubber duck also extending aerial carrying case £70. Tel: Ipswich 0473 49139. Noel G32LN or exchange for TS140 or ICOM 735.

**EXCHANGE** For rotator or 50MHz gear 12 and 5 volt coutant switch mode PSUs. 5MHz dual beam scope. Qume Sprint printer (faulty). Phillips N1700 Video (faulty). 19 set (faulty) all with diagrams. Offers? Buyer collects. Martin G1SEO QTHR Reading 875358.

**TRIO TR820** amateur receiver with extended coverage as new £300, or swap for best portable computer or WHY tele-reader CWR880 decodes CW Amtor RTTY ASC11 built in monitor £150 mint condition all + plus p+p. Tel: 0282 603031 evenings or weekends.

**MFJ949D** Versa tuner with built-in SWR/PWR meter, dummy load and Balun £95. Welz SP225 HF/2M SWR/PWR meter with remote head £75. Maplin 500MHz frequency counter £75. Phone Norman 01-390 2650 GO1RK QTHR.

**SALE** Philips world receiver D2935 13xSW bands memories BFO for CW/SSB LCD display £80. Sony AN1 antenna 0-30MHz £30. Kenwood R2000 with

VC10 fitted £400. Tel: Edge Hill 780 Warks.

**WIEN** Radio MW VHF/FM SW aircraft public services bands portable £20. Pre-selector Codar £15. 2 metre Sentinal PreAmp £12 Storno 500 handheld 3 channels battery and spare, leather case. Crystaled for RX, convert to 4 metres £30. All in good condition phone 0426 22649 after 6PM.

**SONY ICF2001D** with airband original packing and two manuals offered in exchange for TRIO R1000 or similar 0253 811648.

**BC314** Converted 240 VAC, with PSU and output stage fair offer secures. Sharp International RX, 3 short 1.6 to 25.5 MHz. MW&LW BFO AGE £25. Warfedale Denton receiver, FM AM stereo, mono inputs, 2 or 4 speakers teak veneer case £30. G8BSK Southampton 552247.

**SONY IFC-2001** PLL SSBFM/ AM synthesized receiver 5 memories pre-set FM 76-108MHz AM 150-29.999KHz plus power adaptor £90 excellent condition telephone 0249 658025 Chippenham Wiltshire after 6pm.

**FOR Sale** Swan 350 HF transceiver with microphone and spare P.A.'s superb audio output on SSB £180 12v power supply with built-in speaker for above £40. Tel: Jack 0761 34224.

**TRIO TR-9000** 2mtr transceiver very good condition, hardly used with TRIO base PSU/speaker, slim Jim, mobile microphone  $\frac{3}{8}$  Whip and gutter mount £250 ono Phone 0732 355827 after 6pm.

**FOR Sale** Bearcat 100XL hand-held scanner 66-88, 118-136, 136-174, 406-512 MHz, 16 memories, boxed complete with Nicads and charger PSU £110. Phone Roger 0538386947.

**BARLOW** Wadley HF RX MKz excellent condition

## WANTED

£100 onco. Scanner Uniden 100XLT 4 months old £130. Phone J. Castle Worthing (0903) 774708.

**FOR Sale "WRAASE" SC-1 S.S.T.V. transceiver** also receives fax in good condition with handbook and leads never been used to transmit £500 ono. Phone Medway (0634) 828952. **ICOM IC751A service W/S manual and Mic** £1045. **ICOM ICAT500** £295, both mint cond; very little used and boxed. Hi-mound HK802 de-luxe brass key £58. Datong D70 morse tutor £28. **ICOM SP3 speaker** £32. Mint condition boxed. Tel: (Swanley) 0322 63968.

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**VINTAGE Comms receivers Phillips PCR circa 1940 with mains PSU Eddystone S556 circa 1950.** Both in nice original condition and G.W.O. Offers Woking 71094 after 6pm.

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**TRIO TS700G 2 meter multimode 240/12 volt Mutek front end 11 xtals Vox manual box excellent condition all leads included** £225 or exchange good 10/25 watt mobile multimode 2 meter transceiver. Peter Cardiff 0222-554920 after 7pm Mon-Fri.

**WANTED good hand scanning receiver with air band.** Also SSB Tx/Rx will swap Atari 510 MIDI software plus cash or will pay cash, no rubbish please ring anytime West Midlands Kingswood 270 680.

**WANTED Sommerkamp FRDX500 can only afford** £50 to £70. Campbell, 15 Torr gdns, Inverness. 0463 75296.

**WANTED practical wireless, Aero modeller Eagle book model Aircraft, simple short wave receiver Bernards books radio control model aircraft.** Has anyone built a scanner receiver or good short wave one? 7 Weyhill Close, Swindon SN3 2NN.

**WANTED Mizuho MX2 2m SSB handitalkie or similar.** Also required, spectrum amateur radio software and any spectrum hardware. Tel: 01 695 6651 eves.

**WANTED Drake MN2700 ATU, Drake PS7, PSU, AEA PK232 TNC, Immediate top cash price available.** Phone 0602 609345 anytime.

**WANTED Schematic diagram for President Madison AM+SSB homebase or will pay for photocopies.** Contact Mr Colin Pye, 27 Lawrence Grove, Dursley Glos, GL11 4EZ. Tel: 0453-544265.

**WANTED R1132 Rx with AC.PU.** Also restored national SW3 Rx and Sky. Buddy Rx. Early ARRL hand books. John Scott-Taggart literature. Please send details and prices to Richard Marris, 35 Kingswood House, Farnham Road, Slough SL2 1DA.

**WANTED YAESU FR400DX/FL400DX circuit diagrams or handbooks.** Photo copy acceptable. And costs willingly paid.

**WANTED ZX Spectrum interface type one.** Not the moderns joy stick one, but the earlier model for micro

drive ports. Write price G2DHF QTHR or phone London outer 300 1649 or packet at GB7UWS thanks.

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**WANTED Racial LF Converter for RA17L or 117 cash or swap for Cresta Marine MF AM radio telephone, 24V.** Ring 0484 549249.

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**WANTED circuit and handbook for Trio Communications receiver model JR599.** Custom special. Costs paid. Ring Dave, on Luton 0582 840988.

**WANTED Morse keys GPO ex service types, bugs, also HW8 SP930 KW109/7 exchange metal lathe for why.** G4WJB 0733 43021 evenings.

**WANTED Carbon mike press to talk hand held or desk.** EX.WD or professional/ham. Also 5 inch field coil energised speaker. DW Blanchard, 141 Dunes Rd, Greatstone on Sea, New Romney, Kent 0679 62775.

**DESPERATELY seeking manual for FT101B or FT101E photocopy or original.** Tel: Tony 0279 34241 anytime.

**WANTED any cheap 2m hand held transceiver or any cheap radio amateur gear.** Power supplies, Aeriels, mobiles, hand helds etc. For A beginner in

amateur radio. Tel: after 5pm (0209) 715252. Ask for David.

**WANTED software or hardware modification for the standard C528 dualband handheld.** I have many software modifications giving extra functions etc. Please write for more information, Nigel Knapton, 67 Long Street, Easingwood, York YO6 3HY. Tel: 0347 21476.

**WANTED original handbooks for the following Ex Army sets.** R209 WS62 WS52 WS88 WS81 WS46. Also wanted home brew ATU, WHY. Also ex RAF 1082 1083 receiver/transmitter. John the Lizard (0326) 290711.

**WANTED urgent FRT7700 ATU.** Also FRV7700 converter etc. YAESU 757 in good condition. 028322/870.

**WANTED HRO-M general coverage and bandspread coils 20watt 50mhz. Transistor linear.** G3HDC 0752 403551. QTHR Plymouth. **WANTED 2mtr transceiver.** Good condition base or mobile 0785 840268.

**HELP wanted.** I have inherited an Airmec wave analyser type 248, which I would like to restore. Any circuits or other details would be gratefully received. Please ring 0533 856975 Any reasonable cost will be returned.

**WANTED information on Minnimitter 200 Mercury transmitter circuit diagrams or operating instruction would copy and return please ring Ted.** 074632 422.

**WANTED YAESU FRG7 receiver.** Must be in mint condition preferably with circuit diagram, or photocopy. Will pay around £80-£100, plus P&P. Please contact me at 8, Caiach Terrace, Telewis, Mid Glam, S/Wales CF46 6DH or tel: 0443-411954. Anytime. (Possibly I could collect it if local to me).

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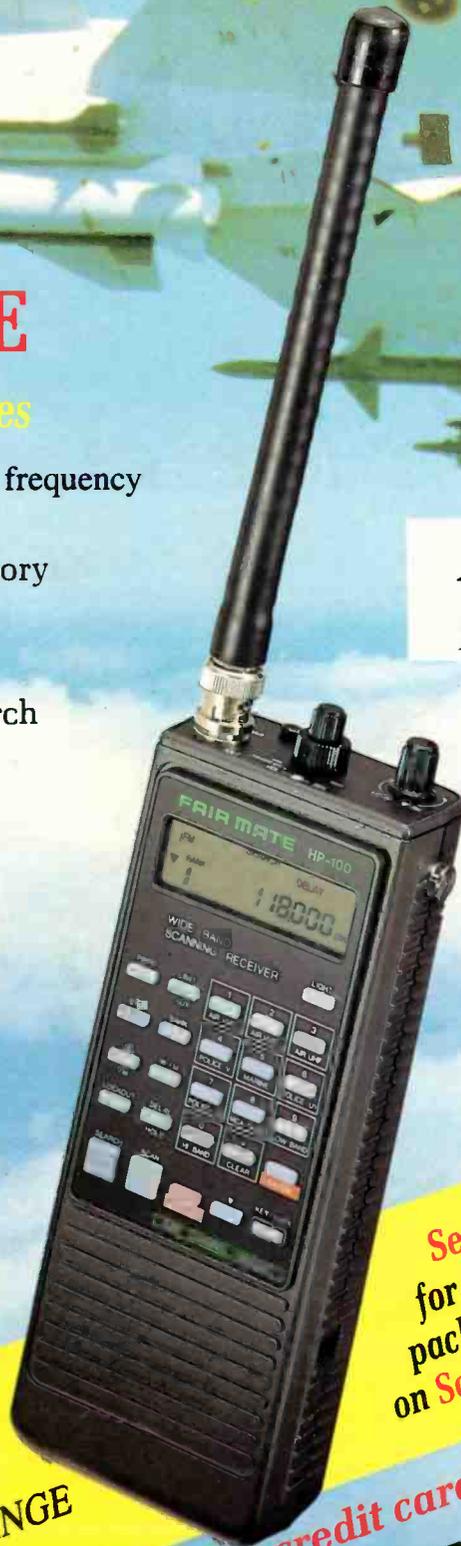
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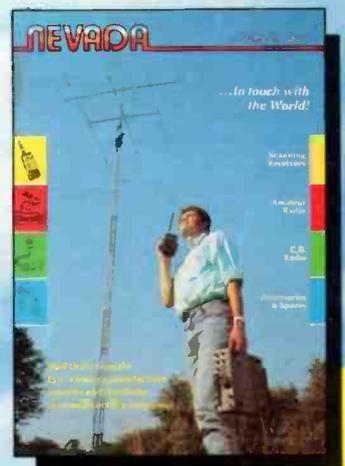
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