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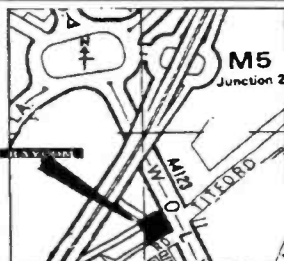


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# Packet Radio

## Roundup

As well as the USSR MIR space station astronauts having packet radio on board, the American amateurs (not to be outdone) are planning to have a go as well from their space shuttle. The STS-35 *Columbia* mission will carry astronaut Ron Parise, WA4SIR, who'll be using the same 2m FM Motorola portable as used in previous missions by W5LFL and WOORE. With him goes a packet TNC and no doubt he should be able to find a suitable computer up there

### Digicom Update

During the past 18 months the Digicom team have upgraded Digicom no fewer than 3 times, and by now the cartridge version should be available. The issue of their latest software version, V4.02, is now imminent, this will include a mini wordprocessor and no fewer than eight extra screens to aid text preparation and multi-tasking purposes. Not satisfied with this, the team have also developed a proto-

over the next few months.

Jim G6FCL who distributes Digicom in the UK has now put together a utility disk containing several programs to complement Digicom. All the programs are public domain, and include the following utilities: disk copy, file copy, fast format, sequential file viewer, 1541 drive test, disk doctor, file/disk protect, disk library, modem PTT test, rename disk, reheader disk, wordprocessor, disk to tape copy and function key print.

These utilities should cover most needs of any digicom user, and all future Digicom copies from Jim will (where possible) contain a copy of the utility disk on "side B", so there is no need to clip your disk for the copy to be made! If you're using Digicom, and you are in need of these utilities, you can get a copy by sending a blank formatted disk to: Jim Mahoney G6FCL, 89 Tyefields, Pitsea, Basildon, Essex SS13 1JA, not forgetting to include the essential return disk mailer and return postage. Thanks for the info, Jim and keep up the good work.

### *Packet goes into space, watched with interest by Chris Lorek G4HCL.*

to use it with, so amateurs can either have a 'live' chat on the keys or leave him a message on the message store. The scheduled lift off is the 26th April 1990, with the flight lasting nine days, operational frequencies to be announced.

### Novice Packet

With the B Class novice licence proposal now abolishing the need for a CW examination, the future looks rosy indeed for attracting computer-communicating youngsters into the hobby (a study of the RSGB published responses to the suggested novice CW requirement shows newcomers to be against mandatory CW, old-timers to be for mandatory CW). If getting in contact with astronauts circling the earth on a space station or space shuttle doesn't whet their appetite then very little else will! My eight-year-old is certainly looking forward to having a go on the keys of his Dad's packet station, and it's true to say many computer-literate schoolchildren could teach the old-timers a thing or two. Who still uses an abacus or slide rule? Remember, these youngsters are the system designers, engineers, and communicators of the future. Let's show them the way to go.

type modem switchable for VHF/UHF. This modem draws its power from the computer and should be usable on the Commodore CBM 16, Plus 4, all 64s and both types of 128s. Also under development is a ram cartridge to alleviate the need for a disk drive. All this is done by Bill G6WWW and his two colleagues as



The Atari Portfolio PC-clone pocket computer.

dedicated radio amateurs for no financial gain, in an effort to promote the use of packet with Commodore computers. I hope to be able to test the new modem soon with a low-cost C16 machine with a view to promoting the system as a low-cost start-up for the novice. Watch these pages

### New British BBS

Many BBS users will have seen messages originating from the GB7NNA and GB7MXM packet bulletin boards where the G1NNA multi-port BBS software is in use. Together with the busy GB7ESX national trunking BBS, they have been testing



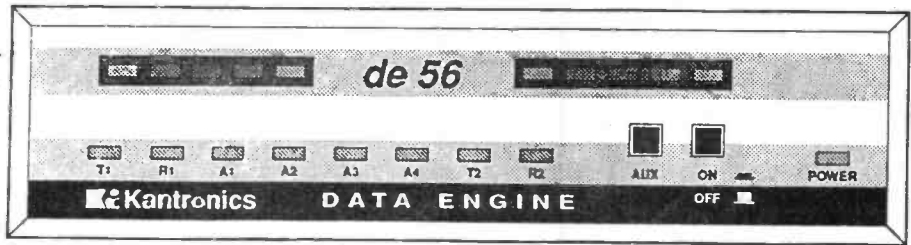
it for some time. The testing should now be complete and the software available for issue for those who'd like it. Written to run with G8BPQ's TheNode software, it allows up to 16 connects with up to 16 radio ports, and has 18 operator windows which may be zoomed to either half or full size. The software is claimed to be very fast, even having the useful feature of not using your hard disk when the common L> L< LM LF LL etc. commands are used, cutting down wear on the disk drive. Separate routines handle the different type of PMS forwarding, including reverse forwarding on Pac-Comm TNCs. The software will be available directly from Brian G1NNA, who you can contact via the GB7ESX mailbox or by phone on 0376 515224.

### HF Update

20m packet continues to be the usual rat race with everyone trying to operate within the same few kHz. Hopefully the recent band-plan proposals for packet radio on HF will be accepted to allow a greater degree of clear spectrum availability for this rapidly increasing mode. Some anti-packet amateurs even boast about their 'jamming' attempts, little realising that packet only waits for them to stop, then simply continues until it eventually gets through.

However, if you fancy trying other less-populated frequencies, 10.145MHz is very reliable. Likewise 21.101MHz when 15m is open. Even if you don't have HF packet facilities, remember that many stations (such as myself) provide HF/VHF packet gateways, and in the UK at least it is quite in order even for Class Bs to connect into a gateway on 2m, say, and go out on the HF bands, as detailed in the HRT *Beginner's Guide to Packet Radio*.

If you have a converted FM CB rig on 10m, or even a do-everything all band job, then try 29.250MHz using 1200 baud (ie VHF settings). Bill GOIFQ uses Digicom there with a gateway link to 2m. Many foreign amateurs run gateways from HF 300 baud packet to VHF 1200 baud, so you can easily have real-time QSOs across the world. Ken, G4RIA suggests connecting to the TR8CA-2 node in Libreville, Gabon on 21.101MHz, and then typing a "J" to see who is active. A list will then follow, and you can then go on to call any of the exotic DX listed. TR8CA



Front panel of the Kantronics de 56.

also operates a gateway to cross-connect between 21.101, 50.115, and 28.885 MHz, TR8CA-1 is his PBBS, TR8CA-2 is the Node, and TR8CA-3 is the Gateway call. G4RIA has also recently had a spot of 15m packet DX chasing with contacts with T10PAQ in Costa Rica on 21.097, PJ2WOL, Erwin in Curacao Netherland Antilles on 21.105, VE3CHL, Peter in Apsley, Ontario on 21.110 and ZD8MD, Mike in Ascension Islands on 21.102MHz. He says Mike is keen to work UK stations, he also operates his PBBS ZD8MD-1 on 21.102MHz if you fancy giving him a call.

### Portable Packet

Amateur Packet techno-yuppies will soon have a couple of new toys to show off to their envious friends who have to content themselves with mere message pagers and personal organisers. Firstly for the upwardly-mobile packet operator, the new Atari 'Portfolio' is a complete PC clone that fits into your pocket, opening up like a book, giving you an lcd display and a full qwerty keyboard. For your £249.99 you get an 8088 computer with 128K internal ram, offering compatibility with MS-DOS 2.11. The internal software such as a time manager, a Lotus 1-2-3 compatible spreadsheet, address and phone book, wordprocessor and file transfer software should make a contender with the traditional Psion Organiser. A plug-in RS232 interface at £59.99 lets you talk away to your TNC by using a suitable terminal emulator program. The catch-22 situation is that terminal emulator software doesn't come as standard, and without it it's a bit hard getting it loaded in the first place, but UK packet suppliers Siskin Electronics have promised this will be fitted to Atari Portfolios supplied by them by a clever parallel-loading principle.

The next item of news is that the Pac-Comm 'Handi-Packet' portable TNC is now available, our tryly having recently taken delivery of one to put through its paces, linked to the Atari Portfolio. This was described last month, but for those who aren't regular readers (shame on you!) briefly it gives you a completely

portable TNC with a personal mailbox in a box around the size of a packet of cigarettes. You can even run it off an internal nicad pack if your like. Linked to yor 2m or 70cm handportable you can connect to your local HF gateway and work the world (or even chat with an astronaut!) while your friends gaze in astonishment. Soon we will reveal all with a review.

### High-Speed Packet

On more of a Network level, at the 8th Computer Networking Conference where packet operators throughout the world gathered, Kantronics launched their 'Data Engine', the de 56. This is a dual port data-over-radio platform allowing 56KB operation through both data ports, as well as supporting up to 19.2KB through the serial port to a computer. the internal firmware is stored in a 64K eprom, with provisions to accommdate up to 512K of static ram. Headers inside the unit allow modem developers to install special modems either internally or externally. As can be imagined, these items are designed for experimentation initially and units available early in 1990 will be alpha test versions only. But the future of high-speed trunking links is certainly materially evolving.

### End of Message — CTRL-Z

Well I hope Father Christmas was generous to you this year, if a new TNC graced your stocking then welcome to the wonderful and exciting world of error-free packet radio. If you'd like to send me a message through the BBS network, I can be reached via packet with a message routed to G4HCL @ GB7XJZ. It's always pleasant to hear from the many packet users, and if you'd like your local group's activities given a mention then I'd be pleased to oblige, group newsletters are always welcome! If you prefer the postal system, letters addressed to Chris Lorek, c/o HRT Magazine at the editorial address will reach me, but please note that my callbook address is not correct. Till next month, 73 de G4HCL @ GB7XJZ.

# RADIO TODAY

## CapCo's Own Words

CapCo Electronics have pointed out to Ham Radio Today that the information in the box "Features of the Magnetic Loop" on page 20 of the November 1989 issue is closely derived from a list distributed with the company's publicity material.

Ham Radio Today would like to apologise on behalf of all concerned for this oversight. We did not realise that the information came from CapCo; nor did the author.

CapCo are a pioneer company in the development of magnetic loop aerials. CapCo's Tony Johnson G4OGP has been involved in research and development of the aerials for commercial and amateur applications for the last eight years, lectures widely on the subject and is one of the UK's leading authorities of the subject.

CapCo have an illustrated colour brochure and a set of information sheets on the subject, and currently market two models, and AMA-3 (reviewed in Ham Radio Today April 1989) at £314.60 and AMA-5 at £429.00. CapCo are now making all the sub-assemblies for both aerials available separately; these are ready-fabricated modules (not kits) allowing the constructor to save money by supplying or omitting parts of the full assembly (including cables and brackets) if so desired.

CapCo have also recently unveiled three new units to complement their range: the SOC-100 Aerial Tuning Unit (£79.50), the AS-305 Aerial Switching Unit (£64.95) and the AMA-200 HF/VHF Receiving Aerial (£125). More details next month.

Information and full price lists are available from CapCo Electronics Ltd., Unit 6, Peel Road Industrial Centre, Peel Road, West Pimbo, Skelmersdale, Lancs WN8 9PT. Tel. 0695 27948.

## Addendum

Some errors have come to light on the 3.5MHz Superhet Receiver (Part 1, October 1989).

On Fig. 3., there is a connection dot missing where C1/C2/C3/C4 join each other. The pcb is not affected. On Fig. 6., T1 pin 2 should go to earth, not to pin 1. Pin 1 should be open circuit. The collector of Q1 should be connected to the stabilised voltage on ZD1, at the junction of ZD1/C2/R1/R2. The pcb is not affected.

On Fig. 8 (PCB 1) a track should connect the left hand pin on PL3 to Pin 1 of T2 (top left hand pin in Fig. 8, top right hand pin on the inverted pcb mask on page 29). The pins can be connected with an insulated wire link.

## Antarctic Expedition

The MV Aurora is expected to arrive at Bouvetoya 3Y (Bouvet's Island) in the Antarctic sea on 25 December for a 23-day expedition stay. As you read this newsletter, she should be moored off the island. On board the ship will be scientists, radio amateurs and a one-person film crew. Much of the money to support the DXpedition organised by Club Bouvet in Norway has been raised by radio amateurs.

Still a little short of funds at time of writing (early November 1989), Club Bouvet is now confident that it can go ahead while fund raising continues. Over 50% of the \$100,000 dollar target from the ham world has come from Japan. The Aurora expedition is also supported by the Norwegian Government, commercial sponsors including Icom, and the World Wildlife Fund. A scientific team will be taking a census of seals and penguins on the island as part of an Antarctic marine life study. The budget of US\$300,000 is now 50% higher than at first planned owing to the inclusion of a helicopter to assist landing and movement on the inaccessible parts of the Island.

Radio operations will take place from two sites, the base camp at Nyroysa in the west, and on the glacier on the eastern side of the island. The dual location is needed to give a clear short path to all the populated parts of the world.

Fourteen days of radio operations are planned (leaving nine days slack for delays and transport) on the DX bands 10 to 80 metres, as well as 6m and 160m. Some RTTY is also planned for the latter half. "The main objective", says Club Bouvet, "is to give as many hams as possible world wide a new country for DXCC."

## Masthead Preamps

Qualitas Radio of Hollywood, Birmingham, is supplying high performance VHF/UHF gaasfet preamps by Landwehr Electronic of Germany. The three models available for 2m and 70cm are individually calibrated in Germany using the Hewlett Packard HP8753A Network Analyser and HP85046 S-Parameter Test Set advanced industrial test programs.

Features include low noise figures for satellite communication, high stability and low insertion loss, maximum transfer power with ptt operation, 750 watts; maximum switchable power in vox operation 150 watts, weatherproof diecast aluminium box for masthead mounting. The manufacturers say the large signal handling is 'superb'.

The rigorous testing undertaken at the factory is designed among other things to

ensure that the preamps never oscillate under any source or load impedance conditions such as rain or ice on the antenna or transceiver impedance mismatch. Manufacturer intermodulation tests show that an input third order intercept point of better than -3dB is achieved.

The three models are (144-146MHz) 145MA: noise figure better than 0.7dB, gain 17-20dB, price £113.36; 145MAS, as for previous except noise figure better than 0.5dB, price £130.88; (430-440MHz) noise figure better than 1.1dB, gain 16-19dB, price £135.81. Prices include VAT but add £3 post and packing per unit.

**Orders and enquiries to Qualitas Radio, 23 Dark Lane, Hollywood, Birmingham B47 5BS. Tel. 021 430 7267. A detailed brochure and order form is available.**

## Bristol Rally in Training

In 1989 the Bristol Radio Rally did not take place owing to booking problems with the usual venue, the Brunel Great Train Shed at Bristol's Templemeads station.

The Train Shed is located

in front of Templemeads station with free parking nearby (or get a paid slot on the station forecourt — it's nearest and there's a chap keeping an eye on the place), or come by train — it's right on the doorstep. There will be traders, displays and demonstrations, bring and buy and food and refreshments.

Make the date one for your 1990 diary.

Details will be repeated in Radio Tomorrow nearer the time, which is 16th September 1990 from 10.30. **Information from the Rally Manager, D S Farr G4WUB, 94 Ridgeway Lane, Whitchurch, Bristol BS14 9PH. Tel. 0272 839855.**

## Kenwood Prize Winner

The winner of the Kenwood TM231E 2m mobile transceiver in the Ham Radio Today Subscription Competition, September and October 1989, is J R McCallum of Newcastle upon Tyne. Congratulations, J R, and may you and the TN231E have a long and happy relationship. Thanks to ASP Marketing Dept. for arranging the competition.

## Maypole Aerials

Telecommunications and aerial specialist R. Benham-Holman G2DYM, has added a number of new models to his F7FE-type range of multiple-dipole aerials.

The F7FEs operate on the principle that a number of dipoles can be connected to a single feeder for multi-band operation. The dipoles can be

connected in a fan-shaped (vertical spread) or maypole-shaped (horizontally-spread) configuration.

A group of centre-fed dipoles are all connected in parallel at the common centre feed point where the 72-ohm feeder terminates. If one dipole is (for instance) at 7MHz (40m) a separate dipole for 21MHz (15m) is not needed as the

7MHz dipole acts as a "three half waves in phase" aerial on 21MHz.

The secret of good performance in this configuration, says G2DYM, is to keep the dipoles as far separated or fanned out from each other as possible to avoid intercapacitance and other effects between the dipoles.

In an F7FE any given

## JOTA Report

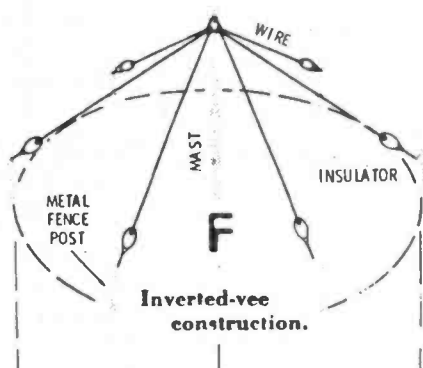
In October every year members of the Scout movement throughout the world link up through amateur radio for their 'Jamboree on the Air' (JOTA).

The Isle of Man Scout Association Communications Section ran a station GB2MSR (Manx Scout Radio) at Eary Cushlin on the weekend of 21 and 22 October, set up by Denis Hall GD4OEL of Ramsey.

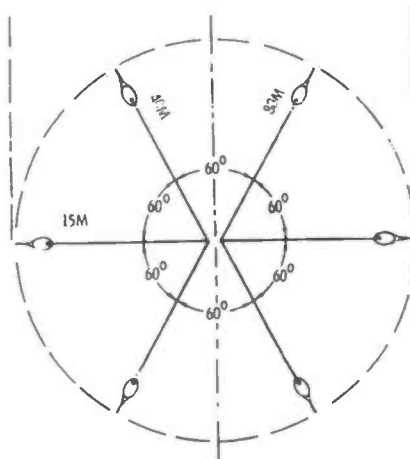
Scouts are allowed to send a greetings message to 30 countries worldwide, although DX contacts were reduced this year, due to a solar flare. Nevertheless scout Mark Christian was the first to pass a greeting to the Falkland Islands, and 11-year-old Edward Bennett was able to pass a greeting to a scout station in St. John's NFLD, Canada, where he had previously lived for most of his life. The USA was also reached.

On Sunday the 3rd Peel Cubs passed exchanged messages with Canada and the UK.

The IoM Scouts Association would like to thank everyone who helped with the station; The IoM post office for the gift of QSL cards, the IoM Civil Defence for the use of a generator (East Cushlin only has a gas service) and Nevada Communications of Portsmouth who supplied the 10m Spectrum 200 vertical antenna that made contact with the Falklands.



(A) Side view.



## Working Doggedly

The Worked All Britain Awards were founded in 1960 by the late G3ABG. To celebrate the 21st Anniversary, it has been decided to support the Guide Dogs for the Blind Appeal. WAB has been assured that the funds raised will be used to supply and find a guide dog for a person interested in amateur radio, either licensed or an SWL.

The appeal will run till Sunday 13th May 1990, when it will formally close at the Drayton Manor Rally and the cheque will be presented.

WAB members are making donations or organising events, including a raffle, or sponsorship in support. At the time of the Leicester Amateur Radio Show, the appeal has already raised over £1000. Any new book in the 10,000 series sold will contribute 50p to the appeal.

Having a guide dog makes an incalculable difference to a blind or partially-sighted person in terms of independence and mobility, so please support the appeal.

For further details of WAB please contact G4KSQ, and for the appeal, contact G4HPU, both QTHR, or anyone else connected with the Worked All Britain Awards.

dipole only presents 72 ohms at the feed point when fed with RF at the frequency for which it is designed; when this occurs, the transmitter only "sees" the appropriate dipole; the others are presenting a high impedance and cannot communicate with the transmitter.

Current models include (A) 15, 40 and 80m (£49.75), (B) 15, 20, 40 and 80m (£55), (C) WARC 12, 17 and 30m (£50), (D) 10, 15 and 20m (£50) and (E) broad band 80M (£49.75). All aerials complete with masts. Postage and packing £3 per aerial.

For more information, contact G2DYM Aerials, "Cobhamden Castle", Up-Downman, Nr. Tiverton, Devon.

# LETTERS

## Letter of the Month

I am beginning to wonder if the DTI find CBers an embarrassment? They give one the impression at times of not knowing exactly what to do with them.

It is clear that the old 27MHz FM bands are being abandoned by people who either have access to the latest allocation, or those literally sickened by the foul-mouthed obscenities which prevail today.

One must admit, though, that it does seem totally unfair that CBers, who have no examinations of any sort, should be given, in effect, preferential treatment.

To anyone who has spent any time on CB, it is abundantly clear that it has got to be improved, and perhaps ways found to persuade them that, with some EFFORT, they could go on to better things.

Maybe, just maybe, this is one reason in someone's mind for supporting the movement towards a novice licence.

As the only practical difference between today's A and B licences is the ability to send morse, it does seem a little unfair to suggest HF usage — albeit limited — to those who, unlike class B amateurs, have spent few if any hours studying.

Perhaps it is over-simplifying matters and will make class A holders howl, but I can see no logical reason why class Bs should not use HF,

because quite obviously they would not be ABLE to use and clutter up the CW part of the band.

Could it be, one wonders, that the main reason against this is that the HF spectrum would be too crowded?

We are all radio amateurs, and while it may be a lonely furrow to plough, perhaps one class (novices could be allowed here) would bring some closer together?

— Geo Broadhurst G1FGA, Accrington, Lancs.

This letter raises certain fundamental issues, like, who are we? Why are we here? What's it all about?

Why morse, anyway? Morse was originally the ultimate last-ditch emergency-service, ship-to-shore, long-distance communication mode, that would get through when nothing else would. The powers licensing amateur radio (the government) wanted (a) radio operators who knew morse and (b) an absence of people who could not read an emergency signal and do the necessary.

Nowadays, emergency signalling is done by other means, radio officers need not know morse, and in the view of many, morse is obsolescent.

The original proposals for the novice licence required morse at a slow speed for all applicants. The current proposals are split into an A and B

licence just like the full licence (see Packet Radio Roundup this month).

Why a novice licence? Looking at the current evidence (a) the RSGB gained a lot of ground, much of it via converted CBers, in the last few years, and it does not want to lose it. (See also Parkinson's Law, by C. Northcote Parkinson, any edition.) (b) The Government wants more skilled personnel in important industries (PMR/radio telephones, for example) and want to use amateur radio to catch young people. CBers seem to be of secondary interest only.

Further, it's not only 27 megs that is being shunned. 2m in part of the country is being avoided for the same reason.

It may be that the answer is: the combined powers want to expand the hobby, but need to keep part of the allocation reasonably free of operators whose main goal is to strut their lack of manners or intelligence. (Please note these are NOT necessarily ex-CBers, as anyone who has been using the repeaters since they opened will realise.)

Morse provides the extra hurdle over which these people may not be bothered to jump.

As for the serious B licensees (and there are thousands of sincere amateurs who do not wish to learn morse), if this is the only action that the 'powers' are prepared to take against the abusers, heaven help the Bs. — HPA.

## Long Rod Shortage

As I live in a flat and am not allowed to have an outside antenna, I have decided to make the FE-Three Mini Dipole designed by Richard Marris as detailed in HRT September 1989.

Unfortunately I have been unable to purchase suitable ferrite rods and

am wondering if you can give me any information as to a source of supply.  
— Russell Cope, Evesham, Worcs.

Richard has identified American firm Amidon as an alternative source of supply (their address appears at the end of the FE-Three article). The longest ferrite rod we have found so far is a 5.5 inch one from Maplin, in an unspecified grade of material. It is likely that the design could be adapted to use this rod, but probably with higher loss and at a lower maximum power before harmonic generation is a problem.

If any component supplier reading this can assist, please contact HRT, and we will publish details for the benefit of constructors.

## Support Them That Supports You

Behind the release of the 18 and 24MHz bands to the amateur service lies a success story which started some 14 years ago.

Over 160 countries are now members of the ITU (International Telecommunications Union) which is based in Geneva, Switzerland. Every 15-20 years there is a major conference to look at frequency allocations to the numerous users of the spectrum. The ITU, as an agency of the United Nations, undertakes the coordination of this work. Many radio services could do with more spectrum space, and as people's requirements change all over the world, so do

*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.*





requirements for frequency allocation.

For instance, when there are satellite communications problems, governments turn their eyes to the HF spectrum, looking for more space in those bands. With such enormous global pressures, it is perhaps quite surprising that the amateur service has any bands at all. We do so because of the high reputation of radio amateurs for international goodwill and public service, especially during times of need.

At the last World Administrative Radio Conference (WARC) in 1979, the amateur service gained in principle three new HF bands and many new microwave allocations. This success was due to the linked efforts of all the national societies. It was also due to the IARU Observer team which spent three months in Geneva. It countered every move which was considered negative and put forward every positive aspect of amateur radio, to its benefit.

Now the excellent work of amateur volunteers, started 14 years ago, has come to fruition in the form of the new bands. The moral of this is simple, and it concerns good long-term planning, faith in the future, and patience.

It is imperative that the American Radio Relay League is strongly supported by US amateurs. Think how much more the League could do if all US amateurs were members. We all know someone who is not a member of their national radio society for some reason or another, but who benefits from the society's work. Remember, the higher the membership, the stronger the representation, and the more substantial the argument.

A freeloader is someone who accepts the benefits that a national society provides — new bands and modes, QSL bureau, liaison with licensing authorities etc. — without

paying a subscription.

If all the resources needed to obtain new bands or preserve existing allocations were paid for by larger numbers of people, each would have to pay less.

The next ITU conference is scheduled for 1992. It's worth thinking about.

— Ragnar Otterstad LA5HE/OZ8RO, Denmark.

**The only point we are going to take issue with is the penultimate one: it makes sense on paper, but it doesn't take into account Parkinson's Law and its corollaries.**

can't find your home," came the reply.

"A parcel for me? What is it?" I asked.

"We don't know. It is a parcel of about 2kg", she said. I felt stupid, of course it was a parcel.

"Where has it been sent from?" I asked again.

"From ASP, our Luton office took delivery," she replied. "Now how can our driver get to you?"

I obliged by giving the details she requested, still puzzled by the sender, ASP, a parcel of 2kg. . .

I hadn't ordered anything; maybe I had been left something in someone's

## £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.**

### Surprise!

I picked up the 'phone with a hand covered in cement, wondering who would be calling me today, and just at the moment I was putting up a support lintel in a doorway I had made not long ago.

The conversation started strangely:

"Hello, Mr. McCallum?"

"Yes."

"Where do you live, please?"

"Pardon? Surely, if you called me, you have an idea where I live?"

"Oh, Yes, Mr. McCallum. This is TNT Deliveries in Middlesbrough, and we have a parcel for you but our driver

will. The thing to do was wait and see.

Later that evening, I felt sure that someone had made a mistake somewhere or had set me up for a joke.

Tuesday morning, with grey cells fully charged, the idea came to me that ASP was Argus Specialist Publications. No. It couldn't be. I'm not that lucky, but on my return from a day's work in London it was waiting for me at home.

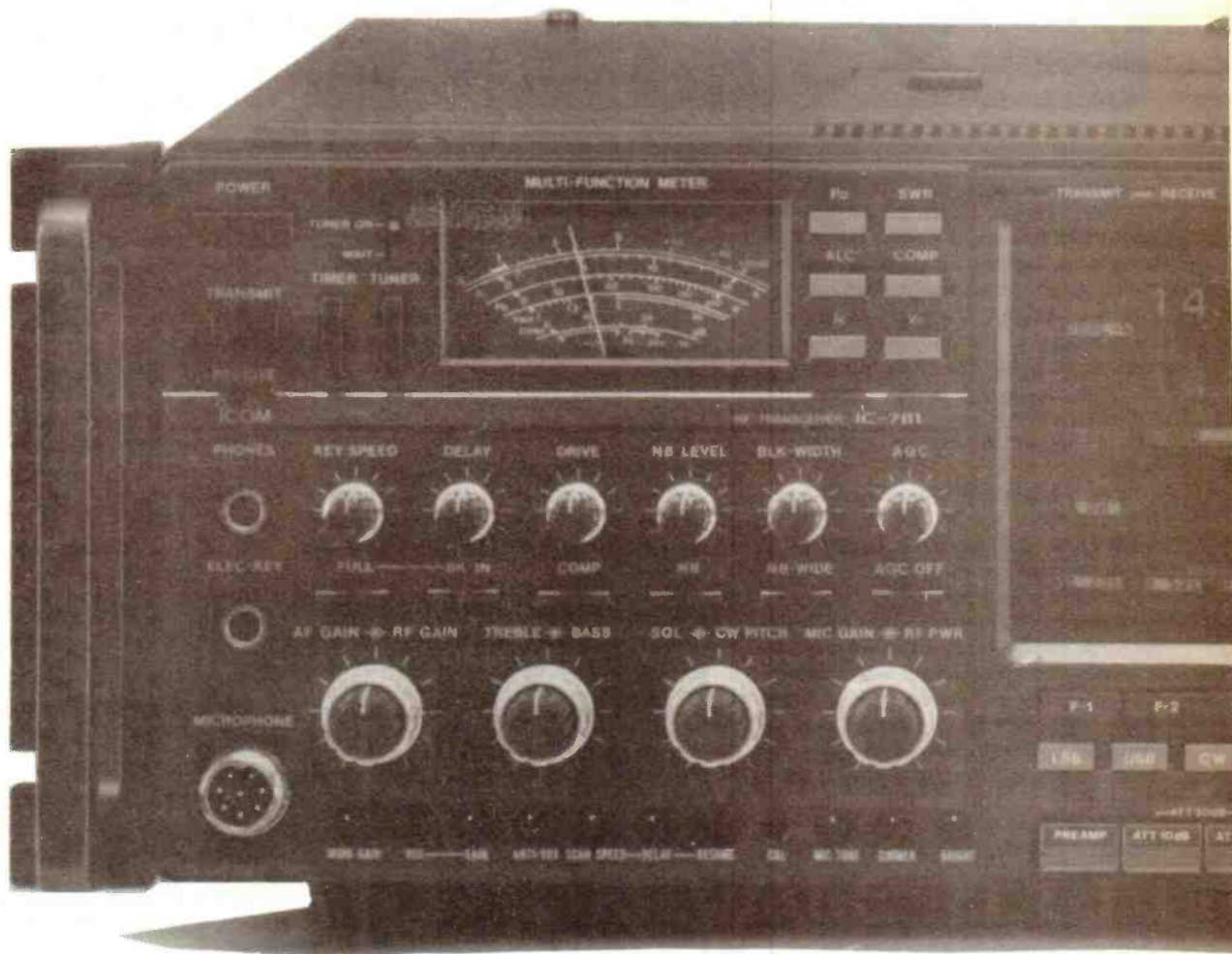
A Kenwood TM231. I HAD won the readers' competition, first one ever.

Thanks to Ham Radio Today for the radio and to Lowe Electronics. I hope someone else is lucky in the next competition.

— John McCallum, Newcastle, Tyne & Wear.

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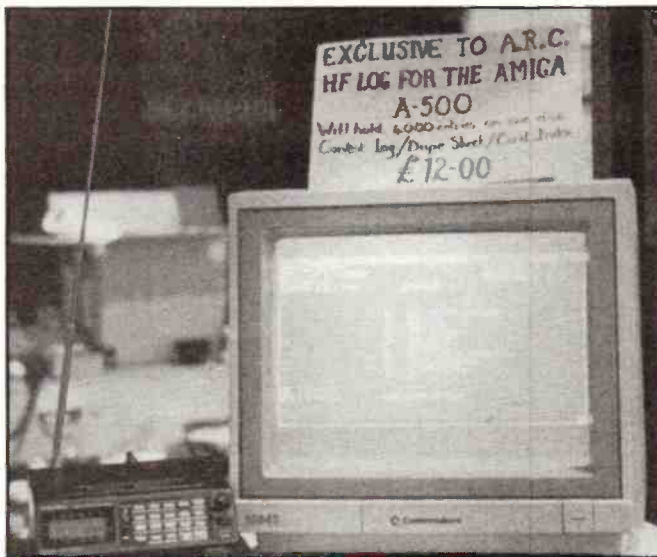




# LEICESTER 1989 Show Report

This year's 'monster' amateur radio event was indisputably the Leicester Amateur Radio Show, the largest ever held (undoubtedly due to the absence of the RSGB's NEC event). This year, the Leicester Show was twice the size of last year's, occupying not one but two of the halls in the Granby Halls Centre on the edge of Leicester town centre. A reported 10,000 visitors mingled among club stands, black box traders and junk dealers.

So popular was the show that one hour after opening on the first day, the large Cattle Market car park nearby was bursting to capacity, those arriving later being efficiently directed by the talk-in to the nearby overflow car parks. The long queue to get in quickly died down, and once inside visitors walking along the wide channels between stands rarely had



HF log book on the Amiga — now legal!

SMC's Gary Griffin with the Yaesu FT1000 twin receive transceiver.

The Icom 2m/70cm IC24E dual bander.

## *Chris Lorek G4HCL rolls up his sleeves for the biggest event of the year.*

to suffer from the pushing and shoving that sometimes attends such events.

The large HRT stand was manned by Helen the Editor, Andrew the Technical Editor, Cass our Advertising Manager, myself the Reviews Consultant, Colin the Group Advertising Manager, and Sheila our sales assistant who was a deft hand with the credit card machine. As well as the latest HRT out early for the show together with recent back issues (many of which sold out), we had the latest offerings from our book division including the *Surplus Two-Way Radio Conversion Handbook* and the third edition of *Scanners*, both of which were extremely popular.

### International Visitors

A truly international audience came this year, and foreign callsign lapel badges were very much in evidence among both trade and individual amateurs. Even Hans DF5UG, the organiser of the international annual Friedrichshafen 'Ham Radio' even flew over especially to attend (we enjoyed an excellent meal with him during the evening), and Seiji Yokoi of Yaesu Japan made his now usual appearance at the show, demonstrating the importance of



this UK event in the international amateur radio calendar.

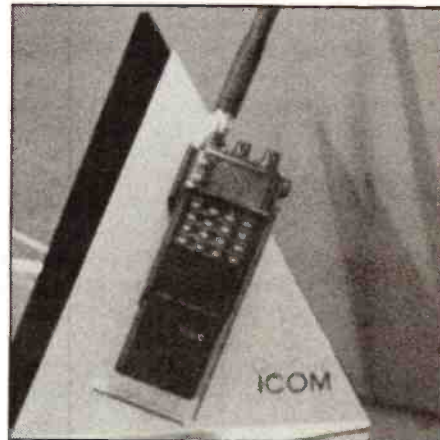
Three top-class hotels offered very reasonable overnight rates for visitors who don't enjoy the prospect of a long journey on top of the show, and with this year's larger event many visitors found two days was only just enough to see everything.

### New Products

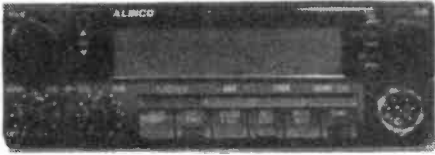
The Leicester Show has now esta-

blished itself as the UK event where the trade chooses to launch their new products, and this year the 'Big Three' sole importers, SMC, Lowe, and Icom UK, all displayed new wares for the first time.

On the HF side, the Yaesu FT-1000 twin-receiver DX machine at £2995 was demonstrated on the SMC stand, with the competing Kenwood TS-950SD twin-receiver DX machine at £3199 launched on the Lowe stand — rumour has it that despite current interest rates several orders for each transceiver were taken at the show. The TS-950SD is exclusively reviewed in this month's issue. Icom UK launched their IC-24E dual band portable, reputed to be the world's smallest handheld capable of being switched between 2m and 70cm operation, together with the IC-901 remote mounted VHF/UHF mobile rig.



HRS Electronics proudly displayed the new Ten-Tec Omni-V HF transceiver for the first time in the UK, reputed to have better noise performance on the HF bands due to having an analogue VFO rather than a synthesiser. They also demon-



A linear 2m/70cm DR570 twin-receive dual bander.

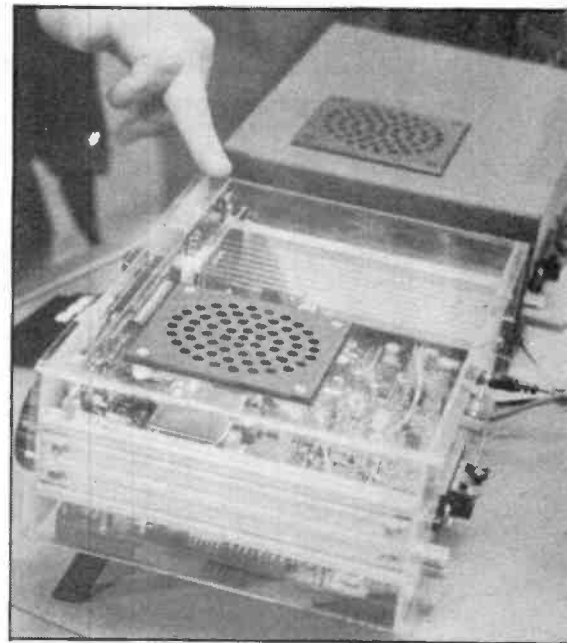
strated the Hercules Linear Amplifier (also reviewed this month), and an amusing sight was the large matching 100A DC power supply being used as a seat for the HRS staff! In the next hall, Lee Electronics displayed the new Standard C528 dual band portable with simultaneous 2m and 70cm receive, and the Mizuho range of low-cost HF SSB/CW transceivers on the Waters and Stanton Electronics stand

Computer and terminal dealers were also doing a roaring trade, with Commodore C16 computers going at £15 a time. One of these coupled to a home made Digicom interface and an ex-PMR rig would then give worldwide error-free communication by packet via the various satellite, HF, and microwave routes for a total station cost of less than £40!

### Homebrew

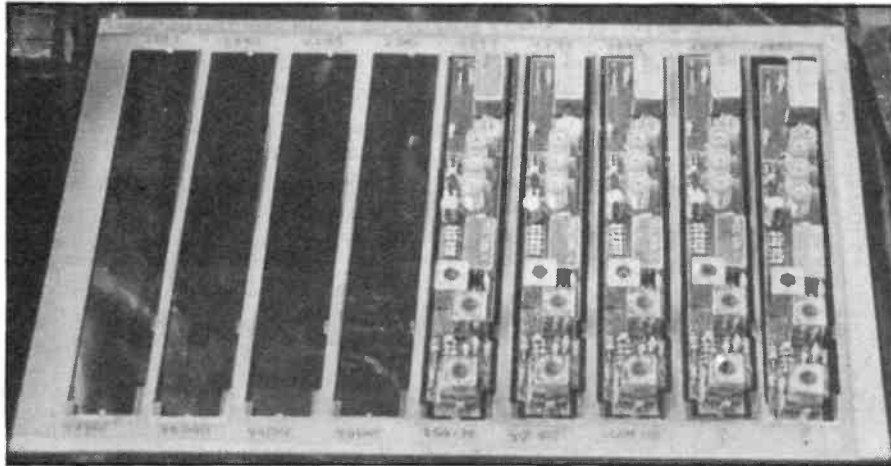
As well as the many and varied component suppliers selling everything from high-power linear components to surplus resistors and panel knobs, potential kit builders were well catered for. A new face at the show was Malsor Kits, who were demonstrating their QCT40 40m low-power transceiver kit at £70 (or just £20 for the pcbs and instructions), and the UC1332 HF upconverter kit for £39.50 that lets you listen to the world on your 2m multimode.

Many HF Black Box operators build their own aerial accessories, and both Capco and Nevada offered their own



Lowe's see-through HF125.

tower sections were on display, and several amateurs were seen walking away carrying large coils of copper wire and feeder for their latest aerial projects.



The Mutek replacement front-ends.

were generating a good deal of interest for potential Class A Novice licensees.

### Surplus Gear

This year's event was not just for the black-box addict, as many stands were packed to bursting with surplus gear of virtually every type. Following the second world war, ex-WD gear was the thing to go for to get started on the bands, and many old-timers now mourn its demise on the surplus market. Thankfully, the wars seem to be a thing of the past, but what now clearly seems to have taken over is ex-PMR (private mobile radio) gear, as professional users are forced to change to newer rigs to comply with DTI requirements. On one such stand when the doors first opened you couldn't see behind the massive piles of FM Pye Westminsters going for £10.95 a time, with visitors left clutching these under their arms ready to tune up onto 2m.

manufactured versions of high-power 'roller coaster' inductors and wide-spaced variable capacitors, the type once only available on the ex-WD surplus market. Aerial bits and pieces as well as complete

### The Journey Home

On the Saturday evening, many traders had completely sold out of some of their popular items and we at HRT were pleased to only have to load the van up with a fraction of the gear we brought along. This was however made up by the quantities of new products for review we came away with, which should keep us busy for a while. Listening to amateurs on the 2m and 70cm repeaters on the way home showed how many visitors had enjoyed the show.

The Leicester Show was again a credit to the organisers who are formed solely from radio groups in the Leicester area, with any profits going to benefit radio amateurs rather than lining a commercial organiser's pockets. Well done lads, let's hope next year's is just as good!



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AC127 0.20	BC108 0.10	BC212 0.09	BD133 0.50	BD575 0.95	BF336 0.34	BR101 0.49	MJE2955 0.95	RCA16039 0.85	TV106 1.50	ZSC1096 0.80
AC128 0.28	BC108B 0.12	BC213L 0.09	BD135 0.30	BD587 0.95	BF337 0.29	BR103 0.55	MPSA13 0.29	RCA16181 0.85	TV106/2 1.50	ZSC1106 2.50
AC129 0.28	BC108B 0.12	BC214 0.09	BD136 0.30	BD588 0.95	BF338 0.32	BR303 0.95	MPSA92 0.30	RCA16334 0.90	ZRF0112 16.50	ZSC1124 0.95
AC129K 0.32	BC109 0.10	BC214C 0.09	BD137 0.32	BD698 1.50	BF355 0.37	BR3443 1.15	MRF237 4.95	RCA16335 0.85	2N1308 1.35	ZSC1162 0.95
AC141 0.28	BC109B 0.12	BC214L 0.09	BD138 0.30	BD701 1.25	BF362 0.38	BRY39 0.45	MRF450A 15.95	RCA16572 0.85	2N1711 0.30	ZSC1172 2.20
AC141K 0.34	BC114A 0.09	BC237B 0.15	BD139 0.32	BD702 1.25	BF363 0.65	BSW64 0.95	MRF453 17.50	S2060D 0.95	2N2219 0.28	ZSC1173 1.15
AC142K 0.34	BC115 0.50	BC238 0.15	BD140 0.30	BD707 0.90	BF371 0.25	BSX60 1.25	MRF454 26.50	SKESF 1.45	2N2626 0.55	ZSC1306 1.75
AC176 0.22	BC116A 0.50	BC239 0.15	BD144 1.10	BDK32 1.50	BF394 0.19	BT100A/02 0.85	MRF455 17.50	T6021V 0.45	2N2905 0.40	ZSC1344 2.50
AC187 0.25	BC117 0.19	BC251A 0.15	BD150C 0.29	BDX53B 1.65	BF422 0.32	BT106 1.49	MRF475 2.95	T6027V 0.45	2N3053 0.40	ZSC1361 0.50
AC187K 0.28	BC119 0.24	BC252A 0.15	BD159 0.65	BF115 0.35	BF423 0.25	BT116 1.20	MRF477 14.95	T6029V 0.45	2N3054 0.59	ZSC1409 0.50
AC188 0.25	BC125 0.25	BC258 0.25	BD160 1.50	BF119 0.65	BF457 0.32	BT119 3.15	MRF479 5.50	T6036V 0.55	2N3055 0.52	ZSC1628 0.75
AC188K 0.37	BC140 0.31	BC258A 0.39	BD166 0.50	BF127 0.39	BF458 0.36	BT120 1.65	OC16W 2.50	T9002V 0.55	2N3072 0.12	ZSC1678 1.50
AC197 1.15	BC141 0.25	BC284 0.30	BD179 0.72	BF154 0.20	BF467 0.68	BUI05 1.95	OC23 9.50	T9011V 0.75	2N3073 0.12	ZSC1945 3.75
AD142 2.50	BC142 0.21	BC300 0.30	BD182 0.70	BF158 0.22	BF495 0.23	BUI08 1.69	OC25 1.50	T9015V 2.15	2N3074 0.12	ZSC1953 0.95
AD149 1.50	BC143 0.24	BC301 0.30	BD201 0.50	BF160 0.27	BF497 0.25	BUI25 1.25	OC26 1.50	T9034V 2.15	2N3075 0.20	ZSC1957 0.80
AD161 0.50	BC147B 0.12	BC303 0.30	BD203 0.50	BF173 0.22	BF499 0.23	BUI26 1.60	OC29 5.50	T9038V 3.95	2N3076 0.12	ZSC1967 2.95
AD162 0.50	BC148A 0.09	BC307B 0.26	BD204 0.46	BF177 0.38	BF499 0.23	BUI26 1.60	OC32 4.50	THY15/85 2.25	2N3078 0.12	ZSC1985 1.50
AF106 0.50	BC149 0.09	BC327 0.10	BD222 0.76	BF178 0.36	BF499 0.23	BUI26 1.60	OC32 4.50	THY15/85 2.25	2N3079 0.12	ZSC2028 1.15
AF114 2.50	BC153 0.30	BC328 0.10	BD223 0.59	BF180 0.29	BF499 0.23	BUI26 1.60	OC32 4.50	TIP29C 0.42	2N3792 1.35	ZSC2029 1.95
AF115 1.95	BC157 0.12	BC337 0.10	BD223 0.59	BF181 0.29	BF499 0.23	BUI26 1.60	OC32 4.50	TIP29C 0.42	2N4280 3.50	ZSC2091 1.45
AF116 2.50	BC159 0.09	BC338 0.10	BD223 0.59	BF182 0.29	BF499 0.23	BUI26 1.60	OC32 4.50	TIP29C 0.42	2N4427 1.95	ZSC2098 2.95
AF117 2.50	BC161 0.55	BC347A 0.13	BD236 0.49	BF184 0.25	BF499 0.23	BUI26 1.60	OC32 4.50	TIP29C 0.42	2N4444 1.15	ZSC2166 1.95
AF118 3.50	BC170B 0.15	BC461 0.35	BD237 0.40	BF185 0.28	BF499 0.23	BUI26 1.60	OC32 4.50	TIP29C 0.42	2N5294 0.42	ZSC2314 0.80
AF121 0.60	BC171 0.09	BC478 0.20	BD242 0.65	BF195 0.11	BFW11 0.75	BU408 1.50	OC72 2.50	TIP33C 0.95	2N5296 0.48	ZSC2371 0.36
AF124 0.65	BC172B 0.10	BC527 0.20	BD246 0.75	BF197 0.11	BFW16A 1.15	BU426A 0.75	OC84 1.50	TIP34B 0.95	2N5298 0.60	ZSC931D 0.55
AF125 0.65	BC173B 0.10	BC547 0.10	BD376 0.32	BF198 0.16	BFW61 0.60	BU500 2.25	OC139 12.50	TIP41A 0.45	2N5496 0.65	ZSK19 0.55
AF126 0.65	BC174 0.09	BC548 0.10	BD379 0.45	BF199 0.14	BFW92 0.85	BU508A 1.95	OC171 4.50	TIP47 0.45	2N5641 16.50	ZSK33 0.55
AF127 0.45	BC177 0.15	BC549A 0.10	BD410 0.65	BF240 0.20	BFX29 0.30	BSU26 1.90	OC200 4.50	TIP4B 0.65	2N5643 16.50	
AF139 0.40	BC178 0.15	BC550 0.14	BD434 0.65	BF241 0.15	BFX84 0.26	BUB07 2.25	OC201 5.00	TIP50 0.65	2N5643 16.50	
AF150 0.40	BC182 0.10	BC557 0.08	BD436 0.60	BF245 0.30	BFX85 0.32	BUY20 2.15	OC205 10.00	TIP120 0.60	2N5643 16.50	
AF178 1.95	BC182LB 0.10	BC558 0.10	BD437 0.60	BF256LC 0.38	BFX86 0.25	BUY41 2.50	R2008B 1.45	TIP125 0.65	2N5715 0.55	Special Offer
AF239 0.42	BC183 0.10	BC639/10 0.30	BD438 0.75	BF257 0.25	BFY18 1.35	GET111 2.50	R2009 2.50	TIO42 1.75	2N5C96 0.80	10% Discount
AS27 0.85	BC183L 0.09	BCY33A 19.50	BD510 0.95	BF259 0.28	BFY50 0.32	GEX542 9.50	R210B 1.45	TIP146 2.75	2N5C784 0.75	if you order 10
AS27 0.85	BC184LB 0.09	BD115 0.30	BD518 0.75	BF271 0.28	BFY51 0.32	MX3000 1.98	R2322 0.58	TIP161 2.95	2N5C785 0.75	or more of any
AU106 6.95	BC204 0.25	BD124P 0.59	BD520 0.65	BF271 0.26	BFY90 0.77	MJE340 0.40	R323 0.66	TIP2955 0.80	2N5C789 0.55	one semi
									2N5C931D 0.95	conductors

## Integrated Circuits

AN103 2.50	AN7145M 3.95	LA4102 1.50	MB3756 2.50	SAS590 2.75	STK437 7.95	TA7609P 3.95	TBA550Q 3.50	TDA1001 2.95	TDA2581 2.95	UPC1181H 1.25
AN124 2.50	AN7150 2.95	LA4140 2.95	MC1307P 1.00	SL9018 7.95	STK439 7.95	TA7611AP 2.95	TBA560C 1.45	TDA1003A 3.95	TDA2582 2.95	UPC1182H 1.50
AN214 2.50	AN7151 2.50	LA4031P 1.95	MC1310P 1.95	SL9178 6.65	STK461 11.30	TA7629 2.50	TBA560Q 1.45	TDA1006A 2.50	TDA2593 2.95	UPC1185H 3.95
AN214Q 2.50	BA521 1.75	LA4400 3.50	MC1327Q 0.95	SL1310 1.80	STK463 11.50	TAA310A 3.50	TBA570 1.50	TDA1005 2.25	TDA2600 6.50	UPC1191V 1.50
AN236 1.95	CA1352E 1.50	LA4420 3.50	MC1352P 1.75	SL1327 1.10	STK0615 7.95	TAA320A 3.50	TBA651R 2.50	TDA1035 2.50	TDA2610 2.50	UPC1195C 2.95
AN239 2.50	CA3086 0.96	LA4422 1.50	MC1357 2.35	SN7421 0.85	STK0029 7.95	TAA350A 2.95	TBA673 1.95	TDA1037 1.95	TDA2611A 1.95	UPC1353C 2.45
AN240P 2.80	CA3123E 1.45	LA4430 2.50	MC1358 1.58	SN76110N 0.89	STK0039 7.95	TAA350B 0.95	TBA750 1.95	TDA1044 2.15	TDA2620 3.50	UPC1360C 2.95
AN247 2.50	CA313EM 2.50	LA4461 3.95	MC1496 1.75	SN76115N 1.25	TAA7051AP 1.50	TAA570 1.95	TBA750Q 2.65	TDA1170 1.95	TDA2625 4.50	UPC1365C 3.95
AN260 2.95	CA3140S 2.90	LA4462 3.25	MC1723 0.50	SN761131N 1.30	TA7072 2.65	TAA621 3.95	TBA800 0.89	TDA1180 2.15	TDA2680A 2.75	UPC2002H 1.95
AN262 1.95	CA3140T 1.15	LA4470 3.50	MC3401L 2.75	SN76226N 2.95	TA7073 3.50	TAA630S 2.95	TBA810AS 1.65	TDA1270Q 3.95	TDA2690 2.45	UPD2114C 2.50
AN264 2.50	ETT6016 2.50	LA4471 3.50	MC3401L 2.75	SN76227N 1.05	TA7108P 1.50	TAA661B 1.95	TBA810P 1.65	TDA1327 1.70	TDA3310 2.95	555 0.35
AN271 3.50	HA1137W 1.95	LA4472 4.50	MC3557 2.75	SN76228N 1.65	TA7120P 1.65	TAA700 1.70	TBA820M 0.75	TDA2002 0.95	TDA3510 3.50	556 0.60
AN301 2.95	HA1156W 1.50	LA4480 3.95	MC3558 2.50	SN76533N 2.95	TA7129P 2.50	TAA930 3.95	TBA820Q 1.45	TDA2003 1.95	TDA3560 3.95	723 0.50
AN303 3.50	HA1306 1.50	LA4481 4.45	MC3558 2.50	SN76550N 1.15	TA7137P 1.50	TAA930B/C 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	741 0.35
AN313 2.95	HA1322 1.95	LA4482 3.95	MCM5807 8.75	SN76550N 1.15	TA7137P 1.50	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	747 0.50
AN315 2.95	HA1339A 2.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7146P 1.50	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	748 0.35
AN316 3.95	HA1366W 2.75	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7176AP 2.95	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	7808 0.50
AN331 3.95	HA1406 1.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7203 2.95	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	7805 0.50
AN342 2.95	HA1551 2.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7204 2.15	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	7812 0.50
AN362L 2.50	LA1201 0.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7204P 2.15	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	7815 0.50
AN612 2.15	LA1230 1.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7205AP 1.15	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	
AN6362 3.95	LA3201 0.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7208P 1.95	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	
AN7140 3.50	LA4101 0.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7314P 2.95	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	
AN7145 3.50	LA4101 0.95	LA4483 3.95	MCM5807 8.75	SN76550N 1.15	TA7321P 2.25	SA/SB/T/U 1.00	TBA820Q 1.45	TDA2010 1.95	TDA4050 2.95	

### BELT KITS

Akai VS12-4-5 1.75	3HSSU2N 37.50	PYE 713 4 LEAD 8.50
Amstrad 7000 1.95	3HSSU3N 35.00	PYE 713 5 LEAD 8.50
Amstrad 4600-5200 2.50	3HSSV 18.95	PYE 731/25 8.50
Ferg 3V22HR3380 0.95	3HSSVA 29.50	RANK A774 6.35
Ferg 3V23HR7700 2.75	PS3BS 24.50	RANK AB23 6.95
Ferg 3V29HR7200 1.50	PS3BSF 35.00	RANK T20A 6.95
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Hitachi VT11-33 1.50		THORN 3500 7.95
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Hitachi VT8000 0.95		THORN 8500 7.15
Hitachi VT9300 0.95		THORN 9000 8.50
Panasonic NV300-333-366 2.25		THORN 9600 8.50
Panasonic NV370-430 2.50		TV11 STICK 0.90



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A2426	29.50	EB91	0.85	EF806S	25.00
A2599	37.50	EB93	2.50	EF812	0.65
A2792	27.50	EB94	4.50	EF2000	1.50
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AH221	39.00	EBF93	0.95	POA	
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AL60	6.00	EC52	0.75	SIEMENS 2.50	
AN1	14.00	EC70	1.75	EL36 3.95	
ARP12	2.50	EC81	7.95	EL36 3.95	
ARP34	1.25	EC86	1.95	MULLARD 3.95	
ARP35	2.00	EC88	1.95	EL38 3.95	
A211	4.50	EC90	1.95	EL41 3.95	
85716	35.00	EC91	5.50	EL42 2.00	
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CCA	3.50	EC37	3.50	EL86 1.75	
CD24	6.50	EC38	2.50	EL90 1.75	
CK1006	6.50	EC39	3.50	EL91 4.50	
CK5676	6.50	EC41	3.50	EL95 1.75	
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DET20	2.50			EM83 1.65	
DET22	29.50			EM84 1.65	
DET23	35.00			EM85 3.95	
DET24	27.50			EM87 2.50	
DET25	22.00			EN32 15.00	
DET29	32.00			EN91 2.25	
DF91	1.50			EN92 4.50	
DF92	1.50			EY51 0.80	
DF96	1.25			EY70 7.50	
DF97	1.25			EY81 2.35	
DG10A	8.50			EY82 1.15	
DH63	1.50			EY83 1.50	
DH77	1.50			EY84 5.95	
DK91	1.20			EY86/87 0.65	
DK92	1.50			EY88 0.95	
DL35	2.50			EY91 5.50	
DL63	1.50			EY92 0.95	
DL70	2.50			EY93 5.00	
DL73	2.50			EY94 2.95	
DL91	3.95			EY95 2.00	
DL92	1.50			EY96 2.00	
DL93	1.50			EY97 2.00	
DL94	1.50			EY98 2.00	
DL95	1.50			EY99 2.00	
DL96	1.50			EY00 2.00	
DL97	1.50			EY01 2.00	
DL98	1.50			EY02 2.00	
DL99	1.50			EY03 2.00	
DL00	1.50			EY04 2.00	
DL01	1.50			EY05 2.00	
DL02	1.50			EY06 2.00	
DL03	1.50			EY07 2.00	
DL04	1.50			EY08 2.00	
DL05	1.50			EY09 2.00	
DL06	1.50			EY10 2.00	
DL07	1.50			EY11 2.00	
DL08	1.50			EY12 2.00	
DL09	1.50			EY13 2.00	
DL10	1.50			EY14 2.00	
DL11	1.50			EY15 2.00	
DL12	1.50			EY16 2.00	
DL13	1.50			EY17 2.00	
DL14	1.50			EY18 2.00	
DL15	1.50			EY19 2.00	
DL16	1.50			EY20 2.00	
DL17	1.50			EY21 2.00	
DL18	1.50			EY22 2.00	
DL19	1.50			EY23 2.00	
DL20	1.50			EY24 2.00	
DL21	1.50			EY25 2.00	
DL22	1.50			EY26 2.00	
DL23	1.50			EY27 2.00	
DL24	1.50			EY28 2.00	
DL25	1.50			EY29 2.00	
DL26	1.50			EY30 2.00	
DL27	1.50			EY31 2.00	
DL28	1.50			EY32 2.00	
DL29	1.50			EY33 2.00	
DL30	1.50			EY34 2.00	
DL31	1.50			EY35 2.00	
DL32	1.50			EY36 2.00	
DL33	1.50			EY37 2.00	
DL34	1.50			EY38 2.00	
DL35	1.50			EY39 2.00	
DL36	1.50			EY40 2.00	
DL37	1.50			EY41 2.00	
DL38	1.50			EY42 2.00	
DL39	1.50			EY43 2.00	
DL40	1.50			EY44 2.00	
DL41	1.50			EY45 2.00	
DL42	1.50			EY46 2.00	
DL43	1.50			EY47 2.00	
DL44	1.50			EY48 2.00	
DL45	1.50			EY49 2.00	
DL46	1.50			EY50 2.00	
DL47	1.50			EY51 2.00	
DL48	1.50			EY52 2.00	
DL49	1.50			EY53 2.00	
DL50	1.50			EY54 2.00	
DL51	1.50			EY55 2.00	
DL52	1.50			EY56 2.00	
DL53	1.50			EY57 2.00	
DL54	1.50			EY58 2.00	
DL55	1.50			EY59 2.00	
DL56	1.50			EY60 2.00	
DL57	1.50			EY61 2.00	
DL58	1.50			EY62 2.00	
DL59	1.50			EY63 2.00	
DL60	1.50			EY64 2.00	
DL61	1.50			EY65 2.00	
DL62	1.50			EY66 2.00	
DL63	1.50			EY67 2.00	
DL64	1.50			EY68 2.00	
DL65	1.50			EY69 2.00	
DL66	1.50			EY70 2.00	
DL67	1.50			EY71 2.00	
DL68	1.50			EY72 2.00	
DL69	1.50			EY73 2.00	
DL70	1.50			EY74 2.00	
DL71	1.50			EY75 2.00	
DL72	1.50			EY76 2.00	
DL73	1.50			EY77 2.00	
DL74	1.50			EY78 2.00	
DL75	1.50			EY79 2.00	
DL76	1.50			EY80 2.00	
DL77	1.50			EY81 2.00	
DL78	1.50			EY82 2.00	
DL79	1.50			EY83 2.00	
DL80	1.50			EY84 2.00	
DL81	1.50			EY85 2.00	
DL82	1.50			EY86 2.00	
DL83	1.50			EY87 2.00	
DL84	1.50			EY88 2.00	
DL85	1.50			EY89 2.00	
DL86	1.50			EY90 2.00	
DL87	1.50			EY91 2.00	
DL88	1.50			EY92 2.00	
DL89	1.50			EY93 2.00	
DL90	1.50			EY94 2.00	
DL91	1.50			EY95 2.00	
DL92	1.50			EY96 2.00	
DL93	1.50			EY97 2.00	
DL94	1.50			EY98 2.00	
DL95	1.50			EY99 2.00	
DL96	1.50			EY00 2.00	
DL97	1.50			EY01 2.00	
DL98	1.50			EY02 2.00	
DL99	1.50			EY03 2.00	
DL00	1.50			EY04 2.00	

KT67	9.00	Q85-3500	595.00	W21	4.50	4B32	35.00	6BW7	1.50	6W4GT	1.95	25DQ6B	2.95	1849	315.00
KT77 GEC	14.95	QQ02-5	19.50	W61	4.50	4BQ7A	1.75	6BZ6	2.50	6V6G	3.95	2516GT	1.75	1927	25.00
KT81	7.00	QQ03-12	7.95	W77	5.00	4BZ6	1.95	6BZ7	2.95	6X2N	1.00	29C1	19.50	2040	25.00
KT88 USA	12.95	QQ03-20	35.00	W81M	4.50	4C28	25.00	6C4	1.95	6XA	1.50	29K06	6.50	2050A	5.95
KT88		QQ06-40	45.00	W739	1.50	4C35	145.00	6C5	2.50	6X5GT	1.00	30C15	0.50	2050W	6.50
Electron	15.00	QQV02-6	19.50	X24	4.50	4C5250R	285.00	6C6	3.50	6QW8A	2.25	30C17	0.40	4212H	25.00
KTW61	2.50	QQV03-10	5.50	X41	4.50	4XC125C		6C89	2.50	6Y6G	4.50	30C18	1.48	4471	35.00
KTW62	2.50	QQV03-10	5.50	X66/X65	4.95	EIMAC	150.00	6CB9	4.95	7AU7	1.50	30FL2	1.35	4687A	9.50
KTW63	2.50	MULLARD	15.00	X81	6.00	4CX250B	45.00	6CA4	4.95	7B6	3.50	30FL12	0.95	5544	79.50
KTZ63	2.00	QQV03-20	25.00	XC24	1.50	4CX250BM		6CA7	3.50	7B7	2.50	30FL13	1.10	5559	55.00
LB7-20	95.00	QQV06-40A		XC25	0.50		65.00	6CB5	3.95	7D8	4.50	30FL14	1.25	5636	5.50
LS98	6.95		27.50	XFW47	1.50	4CX250K		6CB6	2.50	7J7	5.50	30L1	0.45	5642	9.50
MS29	65.00	QQV06-40A		XFW50	1.50	EIMAC	115.00	6CD6GA	4.50	7K7	7.50	30L15	0.60	5643	9.50
MS143	155.00	MULLARD	39.50	XG1-2500	75.00	4CX250R		6CF6	1.95	7L	1.50	30L17	0.60	5651	2.50
MS199	295.00	QQV07-50	55.00	XL62BFT	7.50	AMPEREX		6CG7	4.50	7Q7	4.50	30P4MR	1.00	5654	1.95
M8079	6.00	QQV08-20	42.50	XNP12	2.50		125.00	6CH6	6.95	7Y4	2.50	30P12	1.00	5670	3.25
M8082	7.50	QQZ06-40	45.00	XRI1/600A		4CX350A	100.00	6CL6	3.25	8B8	2.50	30P18	0.60	5672	4.50
M8083	3.25	Q575/20	15.00	XRI3/200A		4CX1000A		6CL8A	2.95	8B10	2.50	30P19	1.00	5675	28.00
M8091	7.50	QS95/10	4.85	XRI4/600A		4CX1500B	425.00	6CM7	2.95	8B05	1.95	30P1	2.50	5678	7.50
M8096	3.00	QS108/45	4.00		79.50	4CX5000A	475.00	6CS6	0.75	8C05	1.50	30PL13	0.60	5687	4.50
M8098	5.00	QS150/15	6.95					6CS7	0.95	8EB88	1.50	30PL14	1.75	5696	4.50
M8099	5.00	QS150/40	11.5		149.50			6CWA	8.00	8FQ7	1.95	31J56C	5.50	5702	3.50
M8100	5.50	QS150/40	7.00		6.95		1000.00	6CX8	3.95	10D2	1.25	33A/158M	19.50	5704	3.50
M8136	7.00	QS1205	3.95	Y65	6.95			6DC6	2.35	10D7</					

# TS-950SD

In our exclusive TS-950SD launch report we promised you the first review, and here it is.

## Coverage

In common with most HF rigs the TS-950SD covers every WARC amateur band on transceive, as well as having general coverage reception over 100kHz – 30MHz. Modes of operation offered are CW, USB, LSB, AM, FM and FSK, with a wide variety of filters in the main receiver to ensure the adjacent QRM doesn't get the better of you. Twin

# Top End Transceiver

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## *Chris Lorek G4HCL gets the exclusive first-time review of the new Kenwood flagship TxRx.*

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junction fets in the RF front end coupled with no less than four fets in the mixer give a claimed dynamic range of 105dB with an overall intercept point of +24dBm to help in the never-ending HF band battle to receive weak amateur signals in the presence of multi-megawatt broadcasters.

When signals are reasonably strong the RF front end amplifier can be switched out of circuit, and if the going gets tough you can switch in a front end attenuator of 10dB, 20dB and 30dB to reduce the effects of rock-crushing signals. The set's transmitter gives 150W output with 110W on 10m. A built-in speech processor lets you increase your SSB punch to help get through the QRM while a built-in CW keyer lets you plug in either a straight or paddle key directly.

## Operation

Each amateur band can be selected by a single button push, with the set automatically returning you to the last-used frequency, mode, and filter bandwidth used on each band to save you the task of multiple button-pushing operations. For the keypad enthusiasts, a press of the front panel ENT button lights up the numeric keypad display to allow you to key in the required frequency directly, very useful for general coverage receiver operation or for getting from one end of the band to the other quickly.

Twin vfos are provided which also allow easy split-frequency transmit/receive operation, the operating freq-

uency of each being shown on the front panel display. During split vfo operation, a Transmit Watch button lets you quickly receive on the selected transmit vfo, and a TF-Set button reverses the transmit and receive frequencies to let you check what's happening. For repeater use with split transmit/receive frequencies on FM, either on 10m or when transverting to VHF or UHF, a tone encoder can be switched in which gives you either a selectable sub-audible tone frequency or a 1750Hz tone on transmit for repeater access, in which case both vfos track each other when you tune for easy repeater use.

As well as the two vfos, 100 memory channels are available each storing the transmit and receive frequencies, operation mode, filter data, auto at data and the tone frequency. Memory information

can be transferred between the memory channels and the vfo, and a 'memory scroll' lets you manually cycle through the channels to see what's stored before hitting the button to switch to the channel you want.

Any or all of the channels can be automatically scanned by the set to let you see what's happening, and up to 10 different frequency ranges that you've programmed can be searched automatically to let you keep an eye open for activity without endless vfo tuning.

A multi-function bargraph meter panel shows you the signal strength on receive, while on transmit along with the output power it can also show up to two other indications selectable from the either alc level or swr, and either the PA collector current or processor level.

## Twin Receive

As well as the main receiver, a separate internal SSB/CW receiver is fitted to let you see what's going on around the same band, the sub-receiver being able to tune up to 500kHz away from the main receiver frequency. This receiver uses the same RF stages as the main receiver but has separate IF stages



and an SSB demodulator coupled with a fixed bandwidth IF filter. This separate receiver can be useful when you're waiting your turn to call a DX station or take your turn in the 'net' but would still like to have a tune around the same band to see what else is happening.

The sub-receiver has its own small tuning knob and volume control, together with an independent noise blanker circuit for when either the over-the-horizon radar or next door's lawnmower strikes. When the sub-receiver is switched in, its frequency is shown next to the main frequency display.

### Digital Signal Processor

On the SD version of the TS-950, a unique digital signal processor is fitted as standard. On receive, this acts on the recovered audio to tailor the upper and lower frequency response, in the same way as an audio filter but using digital circuitry rather than op-amps and the like. On transmit it's used to help generate the first IF signal on SSB and CW, to provide a clean signal for further upconversion and final amplification in the PA. Using this, an improvement in the carrier and opposite sideband suppression of the SSB transmit signal can be obtained together with audio tailoring.

The rise and fall time of the transmitted CW signal can be changed between 2ms and 4ms together with digital control of the CW keyer dot-dash 'weight' ratio. On FSK transmit it is used to generate the required frequency shift of 170Hz, 200Hz, 425Hz or 850Hz. The digital signal processor bolts onto the lower panel of the transceiver case, being connected into the rear panel by a pair of leads.

### Filters

The TS-950SD comes fitted with several filters as standard in the main receiver, these being second IF (8.83MHz) filters of 6kHz, 500Hz and third IF (455kHz) filters of 12kHz, 6kHz, 500Hz and 250Hz. Altogether these give you a variety of receiver IF bandwidths to suit the operating mode depending on band conditions and the level of QRM around. Front panel buttons labelled '8.83' and '455' are used to cycle through the filters bandwidths, the filter width used being shown on a section of the main display. The last-used filter combination is automatically selected when you change mode within the same frequency band.

In SSB mode, concentric IF slope tuning controls can be used to narrow the filter bandwidth from each side, and on CW an IF variable bandwidth tuning (vbt) knob lets you narrow the receive IF bandwidth in from both sides. Concentric with this is an AF vbt which acts as an audio filter, narrowing down the band-



width of the receiver audio amplifier. As well as this, a CW AF Tune control acts as an audio peak filter when switched in, using a three pole active filter to improve the signal-to-noise ratio of the received signal. A manually variable pitch control lets you choose the CW beat note you prefer while keeping your transmitter frequency constant for accurate netting.

When someone suddenly starts tuning up on your frequency, a tunable IF Notch filter can be used on SSB, CW, FSK or AM modes to manually null out the interfering carrier. Also when the chaps on the other side of the Atlantic (or those in Australia or Eastern Europe) start up their over-the-horizon radar, the resulting 'woodpecker' interference can be reduced by the built-in wide pulse-width noise blanker. For ignition interference a narrow pulse blanker is also fitted and the blanking level of either may be manually adjusted to make sure you affect the wanted signal as little as possible.

### Automatic Aerial Tuner

A built-in automatic ATU is fitted as standard. This can be switched in or out of circuit as required. It has its own built-in memory to automatically recall the last-used settings for each band, and small resistive and reactive tuning knobs inside the top cover of the set can be manually adjusted if required to help you get a match. The tuner has a correction range catering for impedance mismatches of up 3:1, so it can tune out the mismatch found from some aerial systems but isn't guaranteed to match such things as long wires, where a manual tuner would be needed.

### Connections

On the rear panel of the set are a variety of connections for accessories such as an FSK RTTY keyer, multimode data terminal, monitorscope and the like. The Data button on the front panel is used together with one of the other operating modes to mute the front panel microphone audio, letting you leave a data terminal unit plugged into the rear accessory socket without the need to

unplug the microphone each time.

A further 'remote' socket lets you plug in an optional computer interface if you fancy your hand at writing a program for computer remote control of the set. Also fitted are receive aerial in/out and low-level transmit power in/out sockets. These are normally externally linked together, but by a bit of lead swapping at the back of the set it can be used as a transverter driver to let you operate on the VNF/UHF bands using a suitable external unit. Together with the FM tone generator for repeater use, it looks as if Kenwood have been listening to people's needs!

The usual aerial socket and ground lug together with a wired-in AC power lead be fitted to the rear panel, and the manual warns UK readers that USA models of the TS-950 can only be used on 120V, with no facility for 240V operation, so beware of 'alternative imports'. The set itself measures 409mm (W) x 154mm (H) x 446mm (D) and weighs a fairly heavy 23kg.

### On The Air

Connecting the set up and switching on was easy, then came the required study of the instruction manual (79 pages) to see exactly how to drive the set's many functions. First came the setting of the SSB transmit audio bandwidth of the digital signal processor, which is varied using small screwdriver adjustments. Once set, I had a listen around the bands while reading the manual. Tuning around was a pleasure, the nice 'feel' of the tuning knob coupled with the steep filters provided in the set made signals come and go cleanly without the usual 'mush' encountered on sets with less than perfect receivers.

The very first reply I made to a 'W' calling CQ brought an immediate response, together with a comment after my first over of the excellent transmit audio quality the set was giving. After I told him what I was using, an astonished reply of 'where did you get it?' came, as apparently no-one in the USA had even seen a TS-950 on sale, never mind come across one on the air! During later QSOs



as an experiment I reduced the bandwidth of my transmit audio using the dsp (it previously set at the widest range, no doubt helping the reports of good quality) which certainly narrowed the RF bandwidth of my transmitted signal but adjusting it too far brought a slightly nasal effect. I eventually returned it to the first settings and carried on getting good reports!

My usual receiver test was using 40m at night with an efficient aerial, battling with the monster signals usually to be found on the band. With the aip button pressed in (switching out the preamp which wasn't needed due to the strong signals present) I found no blocking problems at all which was very good. When tuning across the odd high power broadcast 'intruder' I did find a trace of the odd synthesiser glitch which occurred every 10kHz, but as soon as I stopped tuning this vanished.

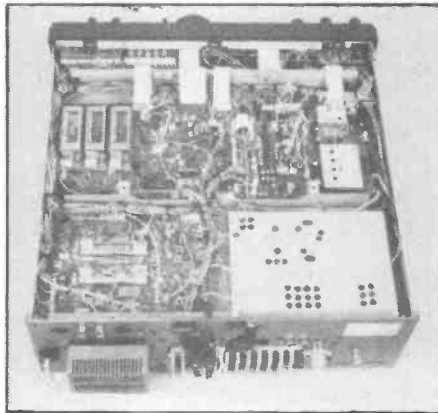
Using the set on HF packet and RTTY gave varying results, as the IF filters using the FSK mode were centred on the American RTTY tones of 2125Hz/2295Hz rather than 1275Hz/1445Hz as used by the rest of the world, likewise the rear panel FSK keying jack gave these Tx offsets. As my terminal unit is set to the standard tones for HF use as well as VHF/UHF FM use, to simplify matters I resigned myself to using the set in SSB mode with the 2.7kHz filters, narrowing these we needed by using the SSB slope tune controls.

I found the receive signal level meter had a peak hold segment indicator similar to some hi-fi tape decks, quite useful as it allowed me to give peak S-meter reports rather than average readings. Likewise on transmit it was useful and rather novel to see the RF output, compression level, and transmit alc all at the same time while taking into the microphone!

Trying the set on 10m FM gave good results when listening to stations running over the top deviation, the TS-950 having the choice of 12kHz or 6kHz filters for this mode, and while having QSOs both direct and through the odd 10m repeater good audio reports were again received even though the dsp was not used for FM modulation. Tuning through even weak signals on FM showed up a very high level of synthesiser hacksaw noise again with strong glitches every 10kHz which let the otherwise good performance down a bit.

## Receivers and Filters

On SSB, using the sub-receiver was a novel experience with two lots of audio coming out of the same speaker. I'd have preferred a separate output for the sub-receiver, but then one can't have everything. Eventually I found the greatest use wasn't in listening to two things at the



same time (this became rather confusing) but for tuning around with the main receiver while waiting for a pre-arranged net on the same band to start up on the other.

When in QSO using the main receiver, a minor irritation was switching between filters. Listening to CW for instance and switching from 2.7kHz to 500Hz bandwidth needed a maximum of two buttons to be pressed, one for each IF filter, but going back to 2.7kHz required a switching cycle back through every other filter width on both IFs which did not a little annoying.

Listening around the broadcast bands on AM was a pleasure, the very sharp filters in the main receiver getting rid of extremely strong adjacent signals while tuned into weak DX broadcasters, and although the SSB slope tuning was inoperative I found the IF vbt narrowed the receive bandwidth nicely when listening in heavy QRM. I found when tuning that the AM agc was fixed at a slow decay which meant tuning carefully so as not to miss weak stations, but once tuned in reception was perfect.

## Circuitry

The main receiver uses a quadruple conversion principle using IFs of 73.05MHz, 8.83MHz, 455kHz and 100kHz (the latter not being used on FM), the sub receiver using a double conversion with IFs of 40.055MHz and

10.695MHz. Receive signals are passed through the switched RF attenuator and low pass filter circuits, into the RF front amplifier which uses a pair of 2SK520 jfets in cascade. This RF amp is switched out of circuit when the aip switch is used. Each first mixer uses four 2SK520s, the resultant signals being routed through their respective filters, further mixers, and demodulators.

In the main receiver, the noise blanker circuit followed by multi-pole crystal filters are used at 8.83MHz, with ceramic filters at 455kHz. The signal is then downconverted to 100kHz where IF notch filtering and demodulation to audio takes place. In the sub-receiver, a monolithic crystal filter and noise blanking at 40.055MHz is followed by a 10.695MHz crystal filter, SSB demodulation to audio then taking place.

On transmit, a 455kHz signal is generated which passes through the appropriate filters before being upconverted to 8.83MHz. This signal is passed through a monolithic crystal filter and an amplifier, upconverted to 73.05MHz and passed to the RF unit. Here it's mixed with the appropriate local oscillator frequency to produce the final RF frequency and then passed through the appropriate transmit band-pass filter.

This is then amplified, fed via the rear panel Drive Out/Final In sockets and amplified to the final power level using a pair of MRF429 transistors in the power amplifier. Switched low-pass filters and a vswr detection circuit follow, together with the automatic aerial tuner.

Nine synthesiser driven voltage controlled oscillators generate the set's internal frequencies, the synthesisers being driven from a temperature compensated crystal oscillator as a single master reference. A rear panel connector allows an external divided reference oscillator of 10kHz to be plugged in if required.

## Laboratory Tests

Testing the effective receiver bandwidth showed that even though Kenwood have chosen to stay with a traditional analogue synthesiser the performance was extremely good, better than any other standard Kenwood synthesised receiver, the cavity tuned signal generator kept being stepped up in level without the set showing any sign of indifference. After 90dB it was decided the performance was good enough!

Likewise when attempting to measure the receiver blocking level of over 105dB was reached where it was possible the signal generator performance might start being measured rather than that of the receiver! When tuning the set's vfo rather than the signal generator, the synthesiser minor tuning glitches every 10Hz were

fairly noticeable, with major glitches every 10kHz, this effect which would reduce the effective dynamic range a little while tuning and was the only thing that let the set down.

The transmit intermodulation distortion, ie the amount of close-in spreading of the SSB signal, was very good indeed, especially considering a solid state PA has been used. The power output varied between bands but averaged around the 150W mark on both SSB pep and on carrier modes. Even during long constant transmit periods the set remained cool due to the built-in cooling fan, fitted internally and hence very quiet.

### Conclusions

The TS-950SD offers a very comprehensive range of features for the HF DX-chaser, and is one step up from its TS-940 brother. The on-air performance certainly matched the usual Kenwood standards, the receiver being of a higher performance than many others in the market. The transmitter gave a very clean in-band signal leading to excellent audio reports on SSB due to the very linear PA coupled with the audio shaping filters.

It cannot be denied that the TS-950SD is one of the most expensive transceivers around, mainly due to the built-in digital signal processor, the wide variety of filters, and the TCXO oscillator

controlling the analogue synthesisers. The UK importers have informed us that a cut down version without the dsp, CW filters and extra SSB filter, and the TCXO, will be available in due course at a reduced price. This can still be upgraded as required, although the dsp could be an expensive luxury as on receive it offers no more than digital audio filters adding nothing to the RF performance. However, the transmit SSB audio quality using the dsp was extremely good, and this could appeal to users.

*Our thanks go to Lowe Electronics Ltd for the loan of the review transceiver.*

### Laboratory Results RECEIVER

Sensitivity: input level required to give 12dB SINAD:			
Freq. MHz	SSB/CW	AM	FM
1.8	0.09µV pd	0.81µV pd	0.24µV pd
3.5	0.09µV pd	0.82µV pd	0.24µV pd
7.0	0.10µV pd	0.82µV pd	0.25µV pd
10.1	0.10µV pd	0.83µV pd	0.25µV pd
14.0	0.10µV pd	0.83µV pd	0.26µV pd
18.0	0.11µV pd	0.89µV pd	0.28µV pd
21.0	0.12µV pd	0.98µV pd	0.30µV pd
24.5	0.13µV pd	1.10µV pd	0.33µV pd
28.0	0.15µV pd	1.17µV pd	0.36µV pd
29.0	0.15µV pd	1.16µV pd	0.36µV pd

Effective Filter Selectivity: measured at 10.70MHz:			
	CW 250Hz B/W	SSB 2.7kHz B/W	AM 6kHz B/W
-3dB	0.26kHz	2.23kHz	5.80kHz
-6dB	0.28kHz	2.46kHz	6.30kHz
-10dB	0.30kHz	2.55kHz	6.80kHz
-20dB	0.32kHz	2.72kHz	8.00kHz
-40dB	0.39kHz	2.99kHz	9.70kHz
-60dB	1.25kHz	3.49kHz	11.1kHz
-70dB	2.40kHz	5.37kHz	12.1kHz
-80dB	3.95kHz	8.91kHz	13.8kHz
-90dB	4.41kHz	12.30kHz	17.2kHz

Blocking: measured as increase over 12dB SINAD level (SSB 2.7kHz B/W) of interfering unmodulated carrier at 10.7MHz, causing 6dB degradation in 12dB SINAD on-channel signal:		
+/- 50kHz	+/- 100kHz	+/- 200kHz
>105dB	>105dB	>105dB

3rd Order Intermodulation Rejection: increase over 12dB SINAD level of two interfering signals spaced by 50kHz and 100kHz giving identical 12dB SINAD on-channel 3rd order intermodulation product, measured at 14.2MHz SSB 2.7kHz B/W:	
Normal	AIP on
80.6dB	91.6dB

Image Rejection: increase in level of signals at the first IF image frequency, and the 73.05MHz IF frequency itself, over level of on-channel signal to give identical 12dB SINAD signals, measured at 14.2MHz:	
Image Rejection	IF Rejection
87.1dB	92.8dB

IF Notch Rejection: measured on SSB, 2.7kHz B/W with 1kHz beat tone:
>50dB

S-Meter Linearity, 14.25MHz: measured on SSB with 2.7kHz B/W:		
Indication	Sig. Level	Rel. Level
S1	1.29µV pd	-29.6dB
S3	2.10µV pd	-25.3dB
S5	3.84µV pd	-20.1dB
S7	9.90µV pd	-11.9dB
S9	38.9µV pd	0dB ref.
S9 + 20dB	591µV pd	+23.6dB
S9 + 40dB	4.99mV pd	+42.2dB
S9 + 60dB	31.9mV pd	+58.3dB

### TRANSMITTER:

TX Power:		
Freq. MHz	SSB PEP	CW/FM
1.8	155W	143W
3.5	161W	155W
7.0	162W	159W
10.1	161W	157W
14.0	155W	149W
18.0	151W	149W
21.0	147W	146W
24.5	141W	141W
28.0	136W	136W
29.0	135W	135W

SSB Two-Tone Linearity: measured at full power at onset of ALC, dB rel. PEP level:							
Order	3rd	5th	7th	9th	11th	13th	15th
No Comp.	-41dB	-46dB	-49dB	-52dB	-56dB	-58dB	-61dB
10dB Comp.	-31dB	-41dB	-53dB	-56dB	-58dB	-59dB	-62dB
20dB Comp.	-27dB	-39dB	-49dB	-48dB	-56dB	-57dB	-59dB

Harmonics:				
Freq. MHz	2nd	3rd	4th	5th
1.8	-71dBc	-72dBc	-85dBc	-79dBc
3.5	-73dBc	-72dBc	<-90dBc	-83dBc
7.0	-74dBc	-73dBc	-73dBc	<-90dBc
10.1	-82dBc	-68dBc	-84dBc	-83dBc
14.0	-73dBc	-70dBc	-79dBc	-73dBc
18.0	-64dBc	-66dBc	-88dBc	-68dBc
21.0	-76dBc	-64dBc	-79dBc	-69dBc
24.5	-65dBc	-60dBc	-70dBc	-62dBc
28.0	-66dBc	-63dBc	-61dBc	-82dBc
29.0	-65dBc	-67dBc	-64dBc	-63dBc



# NEW KITS FROM JANDEK

Jandek, run by Derek Pearson, G3ZOM, is a small company which supplies receiver modules in kit form. The kits are designed for the construction of a single band direct conversion receiver, QRP CW transmitter or transceiver on any band from 160m to 20m. G3ZOM sent me a sample kit and a completed 20m receiver, with power supply and loudspeaker in a separate case, to

be accurate enough for the job. An ic socket was provided for the op-amp, so there is no excuse to damage it.

The circuit is a 6-pole active filter designed to give 3dB down frequencies of 210Hz and 1120Hz. The position of the components on the pcb is indicated by a twice full size drawing. My only criticism here is that the layout is not as neat as it might be, with resistors mounted on

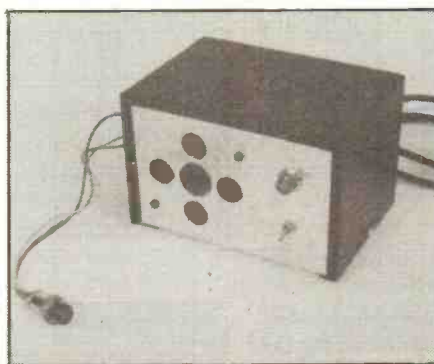
## *Andrew Armstrong G3YZW tries out a new 20m modular receiver kit with a bright future.*

show what can be achieved. The receiver was built by Mrs Pearson, and G3ZOM says that 12 year old school pupils have built kits successfully (with guidance) to test drive the kits and instructions.

The use of a separate loudspeaker and power supply, as used with this receiver, is useful if several different projects are to be built, but only one used at a time, or to avoid excess weight if the receiver is to be operated from a battery some of the time. Some constructors may wish to build the power supply into the receiver, and this should present no problems.

The sample kit, a cw filter, included a glass fibre pcb 61mm square. The board was electrolytically tinned rather than roller tinned as is normal nowadays, but was in clean condition and should be just as easily soldered as a roller tinned pcb. G3ZOM informs me that he intends to introduce roller tinned boards for all kits eventually. The mounting holes were drilled to size and bevelled, unlike many pcbs supplied for projects. Also in the packet were all the components for the filter. The resistors were 5% types, and the frequency determining capacitors were 5% polystyrene types, which should

different pitches. This does not actually matter for amateur construction, and the convention of always using (say) 0.4in pitch for resistors is primarily to permit the use of pre-formed components industrially, but it does look neater as well.



The psu and loudspeaker built into a single box.



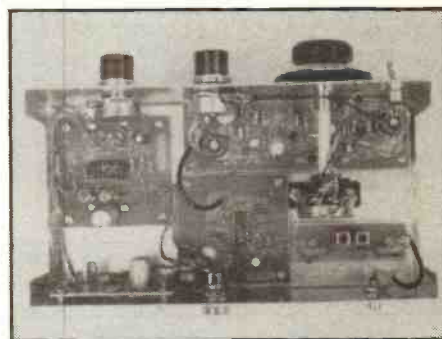
The 20m direct conversion receiver built up.

## 20m Receiver

The completed 20m receiver contains five modules, the front end (bandpass filter), the mixer, the vfo, the ssb audio filter, and an audio amplifier module. The front end filter uses off the shelf screened inductors, and the mixer uses and MC1496 double balanced mixer ic. The vfo is a fet design, which is supplied with the frequency determining components for whatever band it is ordered for. The audio filter uses a TL074 quad bifet op-amp, and the audio amplifier uses an LM380.

When tested using a random length of wire as the antenna, the receiver picked up a gratifying selection of signals. It also worked well on an active antenna, showing no symptoms of overload. Frequency stability was good, with sideband signals remaining properly in tune without noticeable drift over a period of ten minutes. All this means that the design is of a reasonable standard so that the receiver is a useful item rather than just an experimental unit. I was well pleased with the performance, which indicates to me that direct conversion has more to offer than has been fully realised.

The only snag, inherent in this type of receiver, is that signals on



Inside the psu.



Inside the receiver.



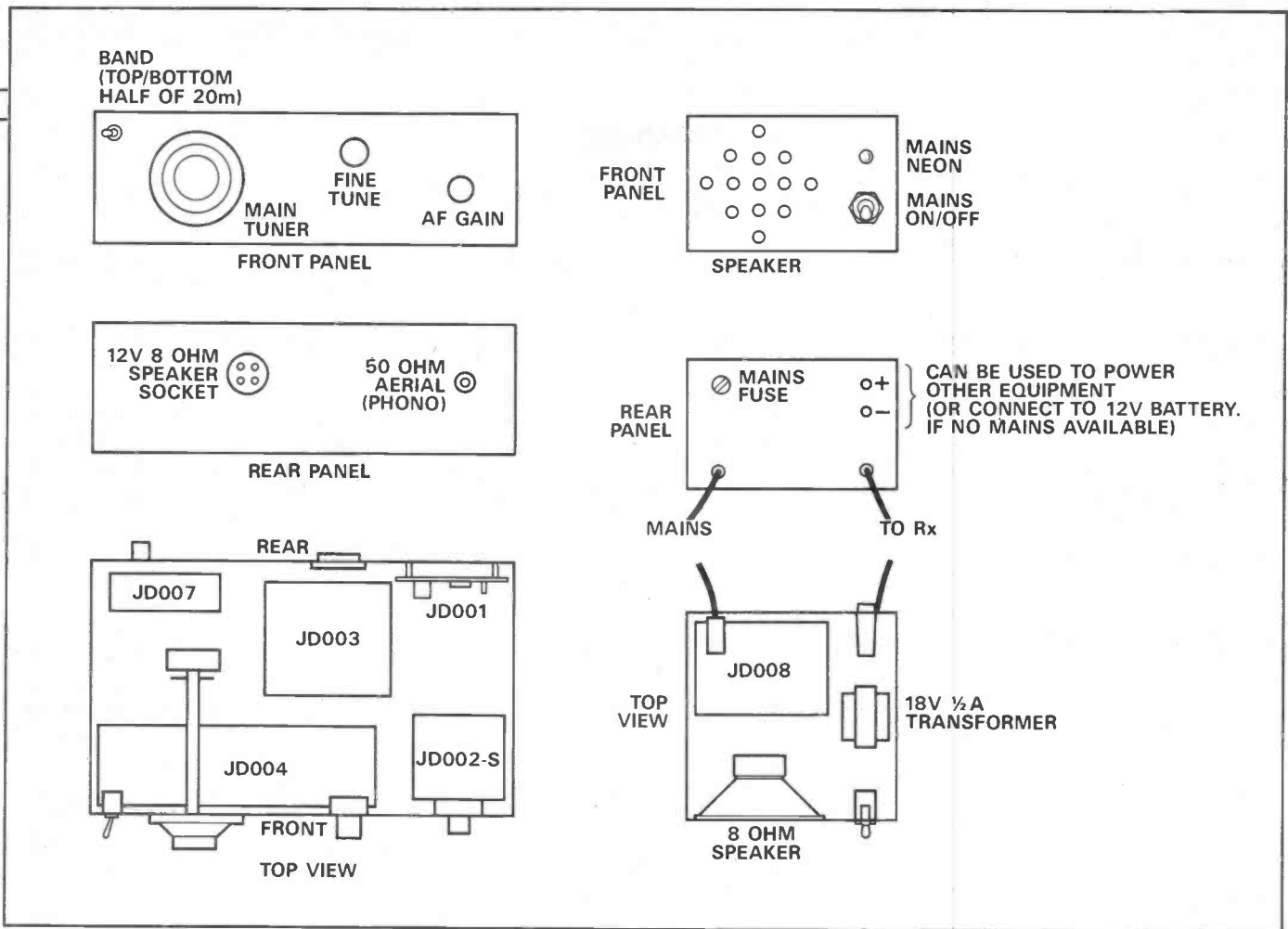


Fig.1. Plan and views of the 20m modular receiver.

Fig.2. Plan and views of the psu.

both sides of the conversion oscillator are received. A signal inconveniently placed on the other side of the oscillator frequency from the wanted signal can interfere with what you are

listening to. Of course, the unwanted signal is demodulated as inverse sideband and is therefore unintelligible, but it would still be capable of blotting out the wanted signal. Unless the band is very crowded, however, this is unlikely to be a problem.

### Conclusion

A receiver built using these modules would form a good beginners project, and can give worthwhile performance. On a crowded band such as 40m, the lack of rejection of the unwanted sideband could be a serious problem. This is less likely to matter for cw reception, though, so I would expect the QRP cw transceiver which can be built from these modules to be very satisfactory for devotees of QRP.

Anyone who has never built a receiver could do far worse than to build one from these modules to gain experience, as well as gaining a useful receiver. And nobody should be put off from trying, because these are clearly well tested kits which anyone will be able to make work.

I am now waiting for the addition of an audio phase shift module and quadrature vfo to the range, to permit

the phasing out of reception on one side or the other of the conversion oscillator. The addition of such modules should give many an expensive superhet a run for its money.

A phased direct conversion receiver has been on the YZW drawing board for several years not, waiting for the round tuit to build the prototype and lay out the pcbs. perhaps Jandek will beat me to it, in which case I will probably build their kit.

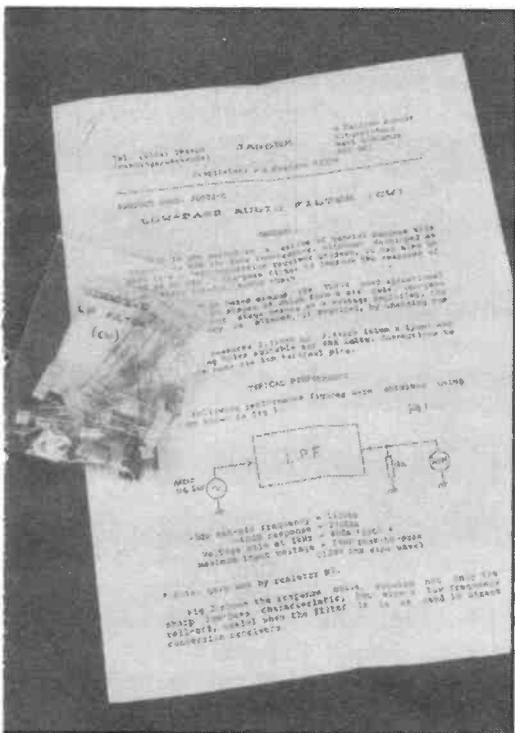
The modules used in the 20m receiver are priced as follows:

JD001	Audio amplifier	£4.45
JD002-S	SSB low pass filter	£4.45
JD003	Product detector	£4.25
JD004	VFO	£7.75
JD007	RX front end	£2.85
JD008	Power supply	£4.25

In addition to these items, the constructor would need to provide a loudspeaker, mains transformer, case(s) connectors etc.

These prices are correct at the time of writing, but "may have to be reviewed early in 1990".

*Jandek's address is: 6 Fellows Avenue, Kingswinford, West Midlands, DY6 9ET. Tel (0384) 288900.*



A kit packed with instructions.

# Are You In Frequency?

A casual listen to the CW end of the HF bands will reveal that a significant number of contacts occur on two different frequencies. This state of affairs cannot be good for anyone, especially the person who has the "defective" transceiver. The owner of such a rig will find that he frequently loses out when replying to CQ calls. Also, when in QSO he may suffer unnecessary QRM from finding that another QSO has started on his

on 14.050MHz is mixed with the 5.050MHz VFO to give a frequency of 9.000MHz. This latter frequency is then mixed with a crystal oscillator on 9.001MHz to give an audio frequency of 1kHz. For clarity only one band is shown and such things as amplifiers and filters are omitted. In this example, provided the operator wants to listen to a CW signal with a 1kHz note, and all the oscillators are on their correct frequencies, then per-

mixing with 9.0MHz to produce a signal on 14.051MHz. This signal is 1kHz away from 14.505MHz so we now have a badly netted QSO.

The above example was constructed to show the principles that work in the superhet based transceiver. Without making some alteration to the oscillator frequencies you are stuck with receiving CW with a note of the audio frequency the designer thought you should use.

There are two ways of solving this problem. One is to change the frequency of the 9.001MHz oscillator to either 9.002MHz or to 8.998MHz. The other is to use the RIT or XIT to allow the 5.05MHz VFO to operate on different frequencies depending on whether the rig is sending or receiving.

Quiz question: why is it wrong to tune in a station at zero beat and then use your rit to give you the note you desire?

Having indicated some of the ways that undesired split-frequency operation may occur the question arises, how do you know if you are sending off-frequency? This is a good question as many amateurs are reluctant to give critical reports. Even if you ask, you cannot be certain that you will get a reliable answer as it could well be the other person's rig which is at fault. Fortunately it is quite simple to test your transceiver yourself.

The first method requires a little ancillary equipment in the shack but has the great advantage that you do not need to involve anyone else. You require another receiver, a stable crystal oscillator, and a dummy load.

## G. P. Stancey G3MCK uses a net to catch out fishy frequencies.

partner's channel because he was transmitting when the other station checked the channel.

This can be caused by either a faulty rig or the inability on the part of an operator to use the rig correctly. Part of the problem lies in the complexity of modern transceivers which make it difficult for people to follow what is going on.

Let's look at the problem of incorrect operation by considering the signal path through a simple CW transceiver. In the example (Fig.1) we have a transceiver which is transmitting on 14.050MHz. This frequency is derived by mixing a VFO on 5.050MHz with a crystal oscillator on 9.0MHz. In the receive mode a signal

fect netting will occur when the operator tunes the wanted signal until a 1kHz note is heard. This assumes that the receiver has sufficient selectivity to provide single signal reception.

### Bad Net

Now, what happens if the operator wants to receive the 14.050MHz CW with a 2kHz audio note? The VFO must be tuned to 5.051MHz. This will then mix with 14.050MHz to give 8.999MHz which will then mix with 9.001MHz to give the desired 2kHz note. So far so good, but let's see what this has done to the transmitter frequency. We now have a 5.051MHz

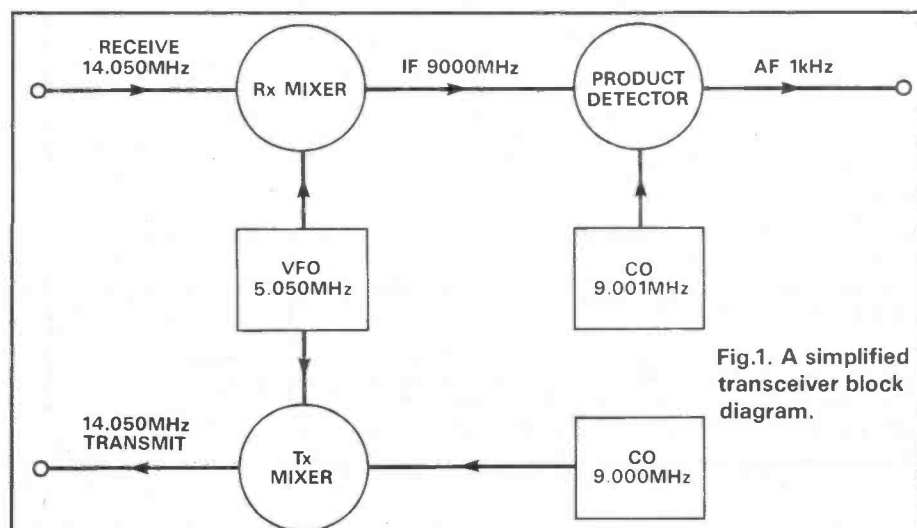


Fig.1. A simplified transceiver block diagram.

### The Test

The technique is as follows:

1. Let all the gear warm up.
2. Switch on the crystal oscillator. Tune the receiver to the crystal frequency. Adjust the coupling so that the receiver is not overloaded and if possible switch off the BFO.
3. Connect the transceiver to a dummy load, switch to CW transmit and hold the key down.

4. Listen on your receiver and tune the transceiver until it is zero beat against the crystal oscillator. If necessary adjust the power out-put of your transceiver so that your receiver is not overloaded.

5. Now, being very careful not to knock the tuning knob on the transceiver, switch the transceiver to receive and listen for the crystal oscillator. The note you hear is the note to which you should tune for correct netting.

While this method requires a little bit of fiddling with the crystal oscillator to get the signal levels correct, it does not require the ancillary receiver to be stable.

A variation of this method is to contact someone who is using separates and knows how to net. In this case you ask him to net carefully onto you. The note you hear is the note to which you should tune when netting. With this method you are completely dependent on the netting ability of the other station.

Another method requires the cooperation of two other stations, one of whom carefully nets onto you. The other station observes how closely your frequency matches that

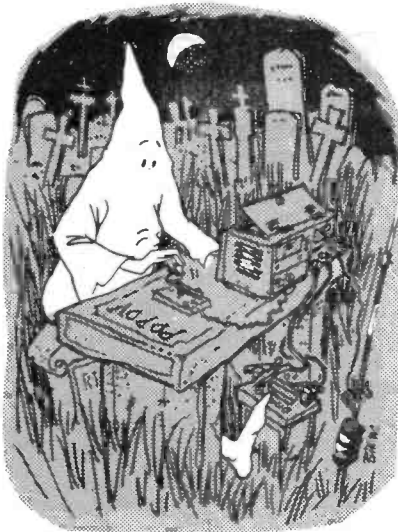
of the "netting" station when you transmit. He then advises one of you to change frequency until he is satisfied that you are both sending on the same frequency. Again the note which you hear when receiving the "netting" station is the note to which you must in future tune your transceiver to ensure that you send on the

same frequency.

What can be done if the ensuing note is not to your liking? The first thing is to read the manual and see if there is some easy way of adjusting it, such as a trimmer. If this is not possible then the next easy way is to net your transceiver correctly against any stable signal source. Then adjust the rit to give the desired note and mark this setting on the rit scale. In future you must now always net with the rit ON and set to this mark. The netting note you must use is your desired receiving note.

Modern rigs come in many different forms and the above examples may not solve your problem but if you follow the above principles you should be able to devise your own solution.

To summarise, the inability to net accurately on a CW station will cause you to lose contacts and may result in you suffering from unnecessary QRM. The above notes indicate how the problem can occur, how you can test to see if you are suffering from this trouble and what you can do to rectify it. Just think, all the DX you are not working may be nothing to do with not having a beam!

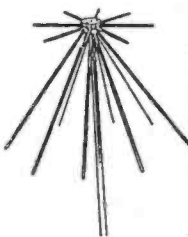


... de SPOOK ...

## REVCO

# WHEN QUALITY COUNTS

### REVCONCONE



The UK's favourite discone composed of traditional British quality engineering. The REVCONCONE works well without exaggerated advertising claims. It is designed to cover 50 to 500MHz, and thousands of satisfied users will testify to its efficiency. Unlike some manufacturers we do not claim a wider frequency coverage, and we do not quote inflated figures for gain. A gain figure is meaningless unless the reference point is stated. Optional vertical whip feature: It is possible to fit a vertical whip section to a discone. We do not want to give you the "hard sell" where this vertical element is concerned, but there is some evidence that it may improve the performance of the antenna around the resonant frequency of the whip. That's why we make it an optional feature. Another option is the N-type connector instead of the popular SO239. N-types give a better UHF performance, but they cost a bit more. The choice is yours. Because the REVCONCONE is British-made by a Company which has been in business for 30 years, you buy with confidence, knowing that there is back-up should anything go wrong.

### RADAC

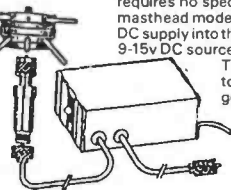


This Wide-band antenna offers an interesting alternative to the discone. It is simply an array of dipoles, but the clever bit involves arranging the dipoles to maximise bandwidth and minimise interaction. The RADAC can be set up for a range of frequencies from 27MHz to 500 MHz, and because very good impedance matches can be obtained the user can specify any six frequency bands in this range for optimised performance, either for receiving, or more usefully, for transmitting. For example, all the Amateur Bands from 10M to 70CM can be covered in one antenna. If you are in the PMR business, the RADAC can be customised for your needs. Aircraft listening enthusiasts can specify VHF & UHF Airband coverage. What a versatile antenna! Design and engineering excellence from REVCO!

### WIDE-BAND PRE-AMPLIFIERS

The problem with omni-directional wide-band antennas is their lack of gain. The REVCO PA3 range of wide-band pre-amplifiers complement the antennas and compensate for their short-comings.

The basic specification of the products is similar: coverage 20MHz-1GHz, at 1GHz: minimum gain 13dB, noise factor 5.5dB. Choose from a mast-head version (PA3) or a standard die-cast box style (PA3I). Best results are normally obtained from the masthead model which gives a boost to weak signals which would otherwise have been lost in the feeder cable. Also feeder cable noise is not amplified which is the case if the amplifier is mounted at the base of the feeder. On the other hand, the die-cast box version requires no special installation and is readily taken out of circuit. The masthead model is supplied with a special power unit which feeds the DC supply into the antenna feeder. No PSU is provided for the PA3I as any 9-15v DC source is suitable (current requirement about 25mA).



The PA3I finds application in instrument work, e.g. input to spectrum analysers, boosting the output from signal generators to give a low-power Tx.

The standard version of the PA3I has BNC sockets and is designated "PA3I/B"; available to special order N-type sockets ("PA3I/N") or SO239 ("PA3I/S"). A special feature of the PA3 series is a high-pass filter to attenuate frequencies below 20MHz; high-power HF & MF broadcast stations can be very troublesome!

### ON-GLASS ANTENNAS

This type of antenna mount has been around for a long time, but they are very difficult to produce successfully at VHF. The Cellular Radio Industry has popularised the glass-mount, but there are fewer design problems at 900MHz, because the coupling assemblies are small. REVCO's extensive experience in making the UK's best Cellular On-glass has led to the production of superior quality VHF and UHF models. Here are a few facts which you should know:

**Coupling efficiency:** apart from the question of effective power transfer to the outside world, you don't want too much RF floating around inside the car, do you? Not health for vehicle electronic systems, and possibly not good for humans either. REVCO glass mounts feature very efficient power transfer.  
**Sticking power:** no good if they fall off half way home. A properly installed REVCO stays on. Should you change your car, a refit kit is available.  
**Simplicity:** Some of the competition has a multitude of loose components: the REVCO has 2 pre-assembled parts: inside and outside. What could be simpler?  
**Weather-resistance:** REVCO antennas are made from corrosion resistant materials so you can leave them out in the rain with confidence. It is not necessary to plaster the product with silicone rubber to keep the water out.  
 The REVCO glass mounts do cost a bit more, which reflects these superior features.

REVCO also make a full range of mobile antennas for frequencies from 27MHz to 950MHz, and new products are constantly under development. Contact your local Dealer or in case of difficulty write, phone or fax. Trade enquiries welcome.

**Revco Electronics Ltd, Old Station Yard, South Brent, S Devon TQ10 9AL Tel: 0364 73394 Fax: 0364 72007**



# Surface mount device

## CW FILTER

**Bill Mooney G3VZU of Blue Rose Electronics presents his surface mount device design.**

This 2-pole audio filter will slot into the small signal stages of just about any receiver to improve morse code reception. It is intended for use with older types of short wave receiver which have no audio filtration built in, or as an add-on to the many direct conversion receivers currently in use. Such simple receivers often form the receptive side of a home brew QRP TX/RX station and improved CW reception will greatly increase the chances of successful two-way communication. The merit of this design lies in the means of construction rather than new circuitry. Surface mount devices (smds) are used throughout. This results in the most up to date and simplest method of fabricating the circuitry.

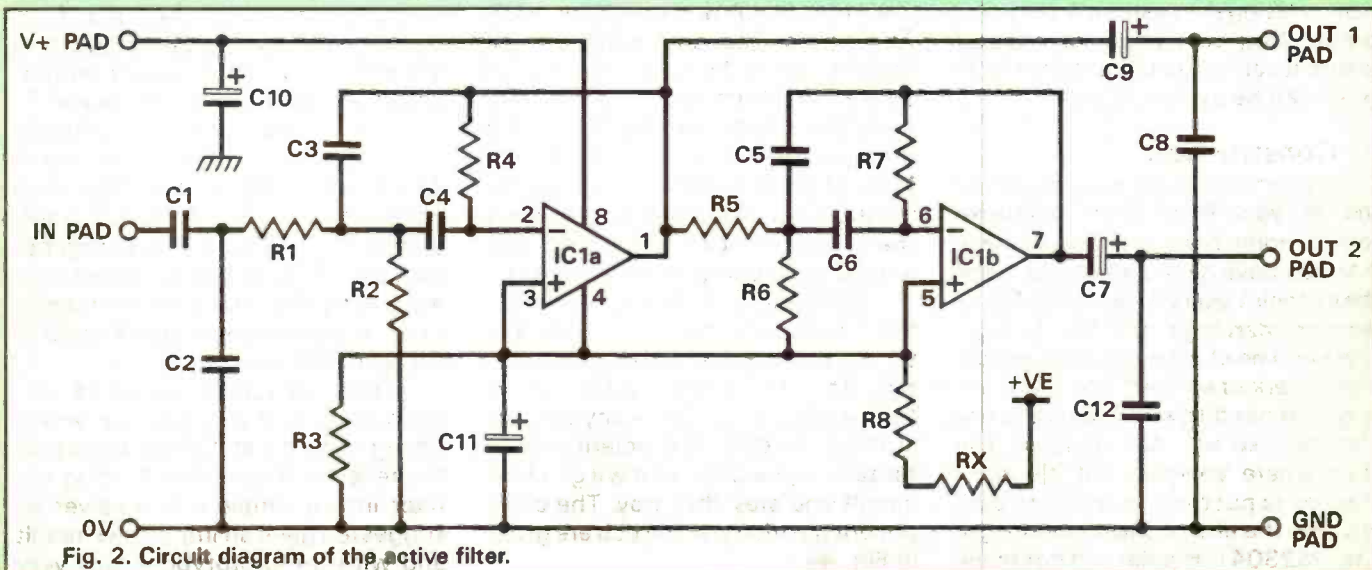
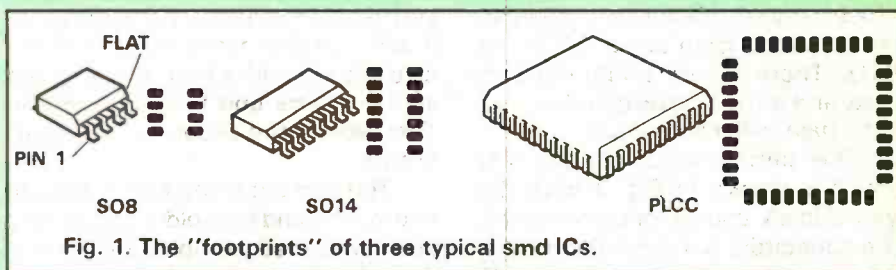
There is little doubt that for all small signal circuits the use of

surface mount devices makes life very easy for the amateur constructor. If a pcb is being made there is no need to drill any holes (Fig. 1) and the layout can follow the schematic very closely. With the older methods of construction, where leaded components were placed on one side of the pcb with tracks on the reverse side, it was often difficult and tedious just to follow the mirror image circuit, let alone design it. The potential of smds

for smaller circuit implementation is a real attraction, but in this project no attempt was made to reduce circuit size, and it is presented as it turned out naturally. Even so, the unit is very small and has a profile of about 3.5mm including a couple of millimetres for the pcb.

### The Circuit

The circuit, Fig. 2, is well known and many variants have been published before, however, apart from the use of modern methods of construction the unit here uses a versatile LM2904 dual op amp which will work from over 12V down to 3V supply making it a flexible little module. The quiescent current is





about 0.8mA. The unit here used off-the-shelf component values as it is believed that the marginal improvement obtainable by the tight specification is not justified when only two poles are used. Moreover with smds the results are more predictable as there is less stray inductance. The circuit works on the classic op amp principle where the gain is the ratio of impedances working into the virtual earth point formed at the inverting (-ve) inputs. But the input and feedback are frequency selective, giving a top cut and bass cut resulting in a narrow frequency band where maximum gain is achieved.

The Q of the circuit is determined by R4 and R7. With the 2.2 megohm resistors used, a Q of 6.7 was measured. This is quite narrow and a good slow tuning receiver should be used. The Q is related to R4 and R7 over a limited range by the relationship  $Q=3R$ , with constants  $C=1500\text{pF}$  and centre frequency 650Hz. Thus for a Q of 5, R4 and R7 would be 1.6 megohms.

The gain of the unit is dependant on the total input impedance including the source impedance, and with values given will be about 3dB at 650Hz. The centre frequency is determined by R2 and R6 and with values between 30kohm and 4.7kohm can be varied from about 500Hz to 1kHz. There is some interdependence, and if the Q is dropped to, say, 5 the gain will also reduce.

The performance of the test circuit is shown in Fig. 3 with the 'y-axis' in mV and dB for convenience. The capacitors between the inputs, outputs and ground are to prevent RF from entering the system. A zero ohm jumper (Rx) was used for ease of layout. It can be seen that one or both poles can be switched in.

### Construction

Assuming you've got the etched pcb in your hand from whatever source, home brew or from us, check that you have all the smd chips, and check their values where possible, ie resistor markings and the ic type number. The chip ceramic capacitors are unmarked so don't pull them out until you need them. The pcb is not compact, so you can more or less start where you like, but it's good practice to put the ic in last or at least towards the end of the proceedings. The LM2304 is Bipolar and not really

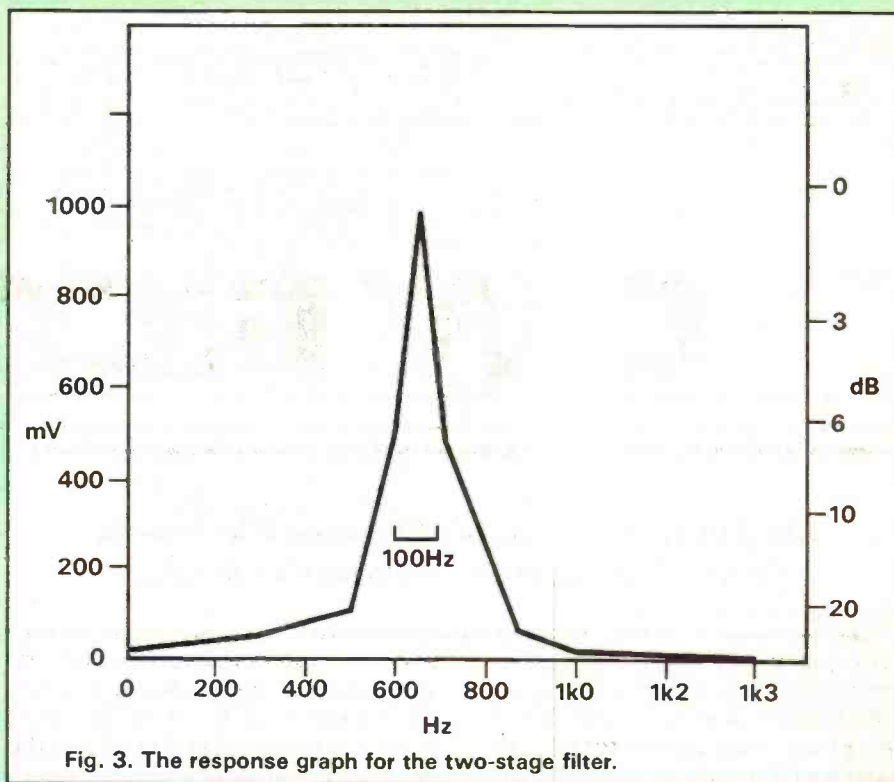


Fig. 3. The response graph for the two-stage filter.

static sensitive but it's still good to put it in late in the proceedings.

To solder in an smd of whatever type you need to hold it down while soldering, and to make a good joint you need to put the iron and cored solder to the job at the same time — you need three hands. But you can do it with a little practice by holding the chip in place with a toothpick and just soldering one end to fix it in place. Then solder the second end at your leisure.

You can get away with a normal fine tip iron and the solder you usually use for leaded components, but it does tend to result in a little too much solder on the job and can look messy. The whole procedure can be made easier by using the correct tools, ie an smd assembly jig, some 26swg silver alloy Imp solder, an smd iron and a good pair of stainless steel tweezers. Non magnetic tweezers are essential because the nickel barrier will cause the chips to stick to a magnetic device. (See component supplies).

Continuing with the construction, make sure you can locate pin 1 on the ic correctly, it's marked as in Fig. 4b, as is the polarity of tantalums. Do not under any circumstances reverse the polarity on a tantalum capacitor, or it will go short circuit and stay that way. The component positions on the pcb are given in Fig. 4a.

### The Filter

The LM2904 is not the lowest-noise device, but it is not bad in this respect so the filter could be placed straight after the detector. Ideally a stage of low noise audio gain before the filter, such as a BC109, for example, will help. The most convenient position is almost always going to be just before the AF gain control, which is usually 5kohm or 10kohm, and it will work well. Don't put the filter on the power end of the AF amp feeding a loud speaker — it will just provide some low power square waves. If you are using a very simple Rx, where it is most definitely earphone listening, then this filter could form the output stage and improve the available power output, giving a little more AF at the ear.

The outputs may be selected using a single pole, three-way switch as shown in Fig. 5. The filter was used along with a TDA1015 0.5W audio amp ic by the writer with great success. This ic has an accessible preamp in the chip and the filter is easily added between pins 7 and 8 of the SMD SO8 ic.

The +ve supply should be well decoupled and it might be worth taking it from a stabilised source on the receiver if available. Putting the filter into a simple CW receiver as suggested gave an impressive result and with the prototype it was very



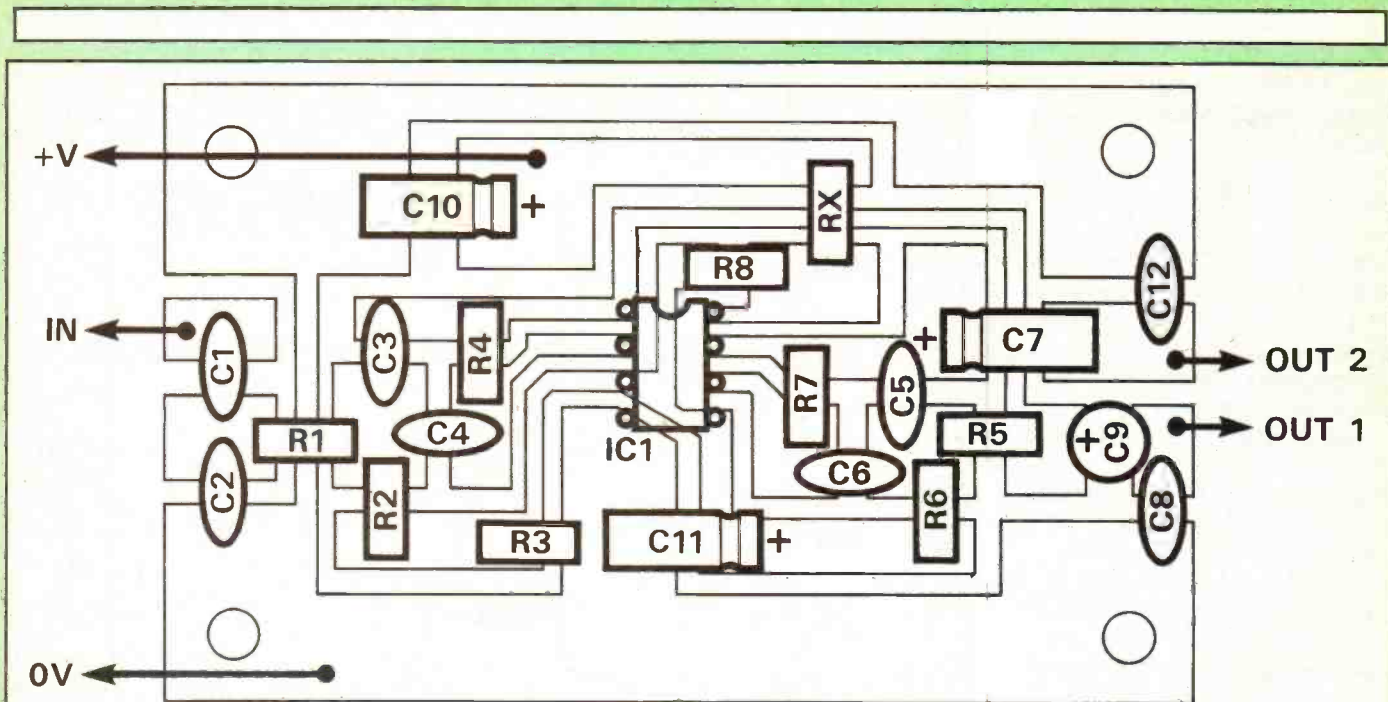


Fig. 4(a) the component overlay

useful, with the option to switch in one or two poles.

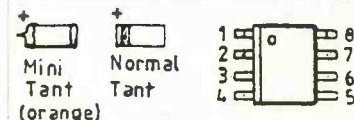
With both stages in circuit it is possible in many cases to achieve single signal reception. Do remember to use the RF gain control, however. If the audio signal at the peak of the pass band "limits" it will cause some distortion but, more important, you will start to lose the filtering effect. Although the amplitude of the signals into the filter increases in proportion, the relative amplitudes will not be maintained if limiting occurs.

So the moral is to keep the RF gain down and use AF gain for most of the amplification. This makes more sense for another reason too. High RF means more intermodulation. A further point on the use of the filter should be made here. This is a fixed

tuned filter so you should always tune for maximum audio at the centre frequency of the pass band and it is a good idea to recognise what the note should sound like. An audio derived s-meter would make things easier.

If making this circuit was your first attempt at using smds it is hoped that their advantages are obvious and that you will continue to experiment and hopefully develop new techniques for using these fascinating new devices.

*Kit and bare-board prices for this and other modules can be obtained from Blue Rose Electronics, 538 Liverpool Road, Great Sankey, Warrington WA5 3LU. Tel: 0925 727848.*



(b) orientation of IC1 and the tantalum capacitors C7, C9, C10 and C11.

#### Resistors

Ceramic chip smd type 1206, 2% tolerance.

R1,5	680k
R4,7	2.2M
R2,6	12k
R3,8	15k
Rx	0 ohm jumper

#### Capacitors

Ceramic chip SMD type 1206.

C1	1n, X7R dielectric (10%)
C2	100p, X7R or COG dielectric (10%)
C3,4,5,6	1.5n, COG dielectric (5%)
C8,12	22n, X7R dielectric (10%)
C9,7,11	4.7μ, tantalum 16V
C10	10μ, tantalum 16V

#### Semiconductor

IC1	LM2904 dual op amp
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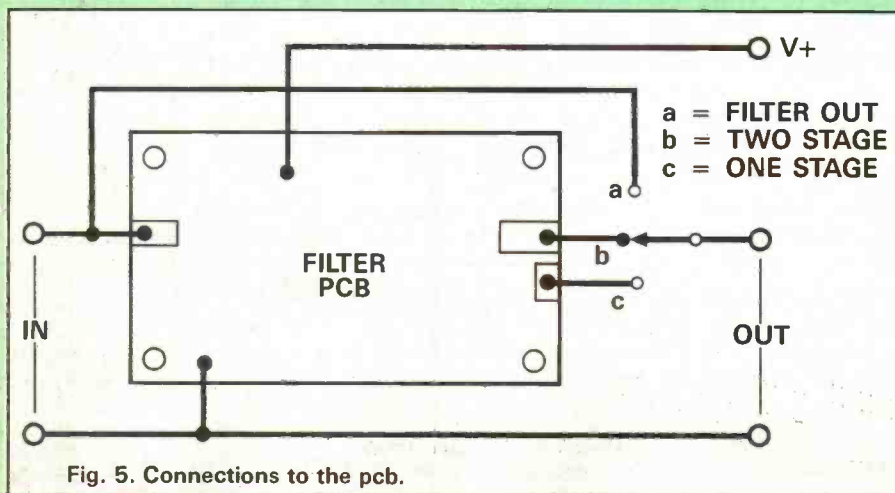


Fig. 5. Connections to the pcb.



# Complete Cumulative Index 1983-1989

At last we present the complete Index of Ham Radio Today articles from our first issue in January 1983 up to the end of 1989. Copies of the back issues up to 12 months old and sometimes a little older can be obtained from the address in the margin of the Contents page (page 3). Photocopies of older articles back to the beginning of 1987 can be obtained from the Plans Department (Photocopy service) at the Argus House address, price £1.50 per article or part, payable to ASP Ltd. Please specify title, year and month. Articles prior to 1986 are less easy to get hold of, but orders or enquiries can be addressed to The Editor at Ham Radio Today who, given time, will either send a reply, a copy article, or your money back. Please enclose SAE with enquiries.

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Modula receiver SSB/CW	Apr	86	40	Small is beautiful Part 2 — LF antennas	Apr	89	16
Modula receiver part 2	May	86	47	Supernotch notch filter	Nov	84	41
Modula receiver part 3 — matching converters	Jun	86	38	SWR bridge/wavemeter for 2m (Smith)	Aug	85	18
Modular masthead preamp	Oct	88	14	Toneburst for the Pye Europa	Sep	89	24
Multimate programmable keyer (Bedford)	Aug	85	30	Top band SSB transceiver	Dec	87	36
RFI suppression for same	Sep	85	6	Top band SSB transceiver Part 2	Jan	88	46
Multi-mods for the FT290	Feb	87	13	Top band SSB transceiver Part 3	Apr	88	40
Multiway mobile rig selector	Apr	89	26	Totsuko TR2100M — modifications	Feb	85	29
Mustard tin microwave receiver	Jan	85	16	Tower, wooden, telescopic, cheap	Dec	85	34
Nine bands in a small space — G5RV end-fed	Jan	83	59	Transverter from 10m to 70 and 50MHz	Feb	86	33
Omega all mode transceiver	Jul	83	10	Matching PA for it	Mar	86	18
Omega part 2 — processor, SSB, CW, notch filter, preselector	Aug	83	66	Transverter 80m from 2m	Dec	86	27
Omega part 3 — synthesised VFO	Oct	83	8	Transverter 80m from 2m part 2	Jan	87	22
Omega part 4 — QRP/PA, switching, logic sequencing	Nov	83	13	TRF3 SW broadcast receiver (kit)	Sep	86	30
Omega part 5 — low pass filtering	Dec	83	27	Tuning back the clock — valve transceiver	Jan	89	22
Omega part 6 — SSB generator	Jan	84	34	Tuning back the clock Part 2 — receiver	Mar	89	37
Omega part 7 — broadband receive amp	Feb	84	56	TV station, simple See Simple TV station	Feb	83	etc
Omega part 8 — case and general	May	84	50	Umbrella antenna	Aug	89	36
Omega part 9 — 100W PA	Jan	85	44	Very restricted space antenna	Jun	89	24
Omega part 10 — aligning the PA	Feb	85	54	VHF to UHF converter (Circuit)	Mar	85	42
Omega part 11 — mods to QRO PA	Apr	85	54	VHF minisynth 2m PLL VFO	Oct	85	31
Omega part 12 — accessory pcb cont.	Oct	85	38	VHF monitor, low cost	Jun	87	29
Omega (mod) — alternative QRP	Dec	86	22	VHF/UHF Wavemeter	Feb	87	38
Power pack for portable rigs	Jan	84	10	VOGAD speech processor	May	84	25
PA thermal alarm	Oct	87	25	Westminsters for UHF (Lorek)	Apr	86	22
Paddle keyer	Apr	88	12	Wierdest tone burst	Dec	89	32
Parametric eq for comms use	Jul	86	39	Wide range capacitance meter	Aug	88	40
PCB etching tank	Oct	87	15	Wire antennas on 2m — practical or not?	Dec	83	33
				Woodland Electronic touch tone controller (kit)	Feb	89	32
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			Morse tutor for the ZX81	May 83	50

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## On the Natter Net

We had a great time at our Open Day on August the 19th last year, and had the pleasure of seeing a huge number of old friends and new. One old friend who is on a new venture was Geoff Arnold who many of you

will recall from his days as the Editor of Practical Wireless magazine. Geoff was here to launch his new venture which is a magazine called "Radio Bygones" aimed at becoming a definitive publication on what we like to call "real radio". The first issue got off to a good start with a well written article on the R1155/T1154 equipment, and loads of superb colour photographs of historic radio gear. The second issue carries a wonderful article on the early — really early — history of amateur radio, and a series of the most stunning colour photographs of early radio equipment that I have ever seen.

If you haven't yet seen a copy of "Radio Bygones", I suggest that you have a look, and if you are very lucky you may still be able to get copies of the first two issues. I predict that this magazine will become a collectors' item in its own right, and I look forward to many more issues to come.

Congratulations Geoff, keep it going.

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QRZ — ITU callsigns and others	Sep 89	42	(FT2 IC22A Liner 2 St C430 TR3200)	Jul 86	10
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Bookend — Dialsearch, WRTV Handbook	Aug 85	46	Practicalities — homebrew RF, pcbs, HF SWR meter	Jan 84	51
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Metrowave — 1984 overview	Jan 85	52	Practicalities — Letraset tips	May 86	20
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Metrowave — 6m questions	May 86	21	Practicalities — aerials and feeder loss	Nov 87	29
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Metrowave — anaprop over the UK	Apr 87	58	Technicalities — successful RF design	Apr 83	48
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Metrowave — the QRB stick	Oct 88	33	Technicalities — making coils and matching	Oct 83	40
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Metrowave — frequency beacons	Sep 89	14	Technology Roundup — crystals	Jan 87	51
Metrowave — aim where you're going (beaming)	Aug 89	42	Technology Roundup — vmos fets	Jun 87	27
Metrowave — satellite program	Oct 84	41	Technology Roundup — monolithic crystal filters	Jul 89	36
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Micronet — Visicode, BBC comms chip	Dec 85	16	AEA 'Moscow Muffler' (woodpecker blanker)	May 83	62
Micronet — compilation programs	Feb 86	18	Alinco ALR-22E 2m mobile	Dec 87	46
Micronet — New Beebes and RSGB software handbook	Apr 86	16	Alinco ALD-24E	Feb 88	36
Micronet — software/hardware	Jun 86	18	Alinco DJ-100 portable	Dec 88	18
Micronet — satellite reception	Sep 86	19	Alinco DR110 scanner	Nov 89	22
Morse Forum — introduction	Aug 87	13	Alinco DR500, DR510	Dec 89	22
Morse Forum — regular roundup	Oct 87	58	Alinco ELH 710 (70cm linear)	Apr 84	35
Morse Forum — Morsum Magnificat	Jan 88	41	Alpha key	Jun 84	78
Morse Forum — types of key	Apr 88	49	Altron AQ620 HF mini-beam	Apr 87	47
Morse Forum — keys and news	Oct 88	40	AMT! operating Amtor	Sep 83	27
Morse Forum — news from around	Dec 88	48	AOR900 scanner	Aug 89	44
Morse Forum — advantages of CW	Mar 89	14	AR 800E	Sep 88	52
Morse Forum — past and future	Jul 89	36	ASP — Datong Auto Speech Processor	Jun 86	28
Morse Forum — Samson keyers	May 89	22	Xaden PCS 4000 (computer plus 2m FM transceiver)	Aug 83	63
Morse Forum — CW in Europe	Nov 89	40	BBC B interface (Melvin) for SSTV	Feb 85	26
Newcomers Forum — introduction and contacts	Jan 83	36	Bearcat 100XL scanner	Apr 87	30
Newcomers Forum — 10m, QSL, S-meters	Feb 83	12	Bearcat BC50XK scanner	Apr 88	35
Newcomers Forum — circular polarisation	Mar 83	30	Bearcat 950XLT scanner	Jul 89	26
Newcomers Forum — licence conditions	Apr 83	54	Bearcat BC2000XLT scanner	Jan 89	48
Newcomers Forum — Class B licensees	May 83	20	Bearcat DX-1000	Mar 87	28
Newcomers Forum — first HF rigs	Jul 83	24	Belcom LS201XE handheld	Mar 84	40
Newcomers Forum — novice licensing	Aug 83	43	Belcom LS202E	Sep 84	36
Newcomers Forum — receiver parameters	Sep 83	24	Better than UR67? (cable)	Oct 83	60
Newcomers Forum — Sporadic E	Oct 83	30	Black Jaguar BJ200	Jun 88	46
Newcomers Forum — auroral reflections	Nov 83	25	BNOS LP144-3-50 2m output power amp	Nov 85	46
Newcomers Forum — DX	Dec 83	20	Capco AMA3 magnetic loop aerial	Apr 89	20
Newcomers Forum — 160m band	Jan 84	14	Capco VHF ATU	Nov 87	47
Newcomers Forum — identifying components	Feb 84	22	CDRx 20M direct conversion receiver (Howes kit)	Feb 87	52
Newcomers Forum — Morse	Jun 84	34	Comet CHL-21J, 23J mobile whips	May 89	12
Newcomers Forum — grid dip oscillator	Aug 84	22	Commutech FCR 130 receiver (kit)	Oct 84	59
Packet radio roundup	May 89	41	Correspondence courses (RAE)	Jul 85	12
Packet radio roundup	Jun 89	14	Create CLP-5130 log periodic yago	Apr 89	36
Packet radio roundup — new TNC	Jul 89	14	CTU-30 ATU (Howes kit)	Apr 88	17
Packet radio roundup	Oct 89	4	CWR 600 morse and RTTY decoder	Jan 83	8
Packet radio roundup	Nov 89	32	Datong auto notch filter	Oct 83	61
Packet radio roundup — new TNCs	Dec 89	4	Datong FL3 multimode audio filter	Feb 83	20
Practicalities — ATU coils, coax, pcbs, transistors	Aug 83	40	Datong PC-1 VHF receive converter	Dec 87	28
Practicalities — coils and chokes	Nov 83	41	Datong SRB2 auto woodpecker	Feb 84	39



Dewsbury Star cmos keyer	Jul 87	48	Regency HX2000 scanner	Jan 87	15
Dewsbury Star Masterkey	Aug 85	22	Research Communications 9056 1500MHz prescaler	Jan 84	44
Diamond SWR and PEP meters	Mar 89	27	RN Electronics 6m transverter	Feb 88	46
Dr DX Morse trainer	Mar 85	47	Royal 1300 discone	Sep 88	28
Dressler D200S high power 2m amp	Sep 83	55	RTTY with BBC B and G3LIV interface	Feb 84	18
Easy PC CAD software	Jan 89	28	RX-8 all mode data interface	Oct 89	38
Eddystone 1650 receiver	Aug 87	14	Scanning receivers (AOR2002, MX7000, ICR7000)	Oct 86	53
Era Microreader	Sep 87	24	Scanning receivers (ICD7600D, AS-32320, AOR2001)	Aug 84	51
FDK M-750XX budget 2m multimode	Jun 84	51	Simple sender for Six	Jan 86	61
FRG9600 VHF/UHF scanner	Jul 87	17	Sony Air 7	Sep 87	44
G3LIV Amtor/RTTY BBC B interface G3WHO eprom	Sep 85	18	Sony ICF2001D	Jan 89	33
G-Whip HF multiband antenna	Jun 87	36	Sony ICF7600D receiver	Jan 87	24
Heatherlite Explorer VHF linear	Jun 87	22	Sony Pro-80 scanner	Dec 87	24
Heatherlite HF linear	Oct 87	20	SPC300 ATU	Apr 86	32
IC update — Signetics NE602/604	Oct 84	65	Spectrum 2m RP25 amp (kit)	Nov 88	6
Icom IC02E	Feb 86	40	Standard C500 Twinbander	Dec 87	30
Icom IC2E	Feb 87	16	Standard C58 vs. FT290R	May 83	64
Icom IC2-SE	Sep 89	18	Standard C5800 multimode	Jun 83	64
Icom IC-228E	Dec 88	40	Storno CQM713	Mar 87	48
Icom IC25E, IC45E	Mar 83	68	Tatung TMR7602	Feb 89	14
Icom IC25I plus Mutek front end	Oct 83	43	Ten Tec 229B aerial tuner	Jul 89	22
Icom IC271 plus Mutek front end	Mar 84	52	Ten Tec Paragon	Jun 89	26
Icom IC275E	Apr 87	39	Timestop Electronics BBC B weather software	Oct 85	20
Icom 290E	Jan 83	78	Tokyo Hi-power 80m monobander	Feb 88	30
Icom IC-32E	Oct 88	46	Tokyo Micro-7 70cm transceiver	Apr 85	38
Icom IC-4G	May 88	21	Tono Theta 5000E (RTTY/Amtor/CW)	Oct 84	22
Icom IC745	Jun 85	48	TR9000 retro (second hand)	Nov 85	52
Icom IC735 HF transceiver	Dec 85	45	Trio TH205E	Mar 87	53
Icom IC781 "Super rig"	Jul 88	26	Trio TM201A	Apr 84	22
Icom IC900	Oct 87	28	Trio TR751E	Nov 86	59
Icom IC-1200	Sep 87	30	Trio TS440S — in depth review	Aug 86	19
Icom ICR7000	Feb 89	10	Trio TS430	Jun 83	57
Icom SM10 microphone	Jul 86	14	Trio TS520 series — update	Jun 85	24
ICS AMT-2 Amtor terminal	Jul 85	22	Trio TS530SP	Jul 84	36
ICS Fax-1 weather receiver	Apr 88	43	Trio TS700 2m base station	Feb 85	39
IC505	May 86	41	Postscript to same	Mar 85	46
Jaybeam dual band yagi	Sep 87	12	Trio TS9130	Jan 83	78
JST-125 HF rig	Jan 88	36	Trio TS930S	Jul 83	59
JST-135 transceiver	Nov 88	43	Trio TS940S — in depth review	Mar 86	52
Kent straight key	Oct 89	36	TX20CW transmitter kit (Howes)	Dec 86	52
Kenpro KT220EE	Aug 87	42	Uniden 2830	Aug 88	26
Kenpro KT500EE	Mar 86	28	Uniden 580 XTL	Sep 88	38
Kenwood budget HF box	Apr 88	24	Uniden UBC-70	Jul 88	48
Kenwood TH215E	Jun 87	39	VSWR meter PCB kit (Howes)	Jul 89	4
Kenwood TH-25E	Jun 88	34	Wavemeters — AKD WA1 and Drae VHF	Feb 85	24
Kenwood TH-75E	Oct 89	16	Wood and Downland 24cm ATV receiver/ and general	Jan 85	12
Kenwood TM221E	Jul 87	22	Xantex DX Edge sunrise calculator	Jun 84	26
Kenwood TN0721	Aug 88	46	Yaesu FRG8800	May 85	36
Kenwood TS790E	Apr 89	32	Yaesu FT101E	Jun 84	41
Kenwood TS-950 preview	Dec 89	22	Yaesu FT102	Feb 83	60
Kenwood TW 4100	Sep 87	19	Yaesu FT203R	Jul 84	18
Kenwood RC-10 mobile telephone remote controller	Feb 88	22	Yaesu FT209R and RH	Nov 84	54
Kenwood RZ-1	May 88	26	Yaesu FT211	Aug 87	26
KPC-2 packet communicator (Kantronics)	Feb 88	14	Yaesu FT-212	May 88	38
KW/Ten Tec Argosy	Aug 83	55	Yaesu FT23	Feb 87	16
KW/Ten Tec Century 22 transceiver	Jul 86	26	Yaesu FT2700RH	Jul 85	36
KW/Ten Tec Corsair	Nov 84	46	Yaesu FT270RH	Aug 85	43
KW/Ten Tec Corsair Mk II	Jan 87	44	Yaesu FT290 Mk II	Jan 87	36
Lowe HF-125 receiver	Apr 87	22	Yaesu FT290R Vs. C58	May 83	32
Magazines (current roundup)	Feb 83	5	Yaesu FT411	May 89	26
Magazines	Mar 83	78	Yaesu FT470	Aug 89	24
Metertech MT301 digital capacitance meter	Oct 83	36	Yaesu FT690	May 86	41
Microwave Modules MM2001 RTTY receive converter	May 83	66	Yaesu FT690 upgrade	Nov 87	42
Microwave Modules 50MHz transverter	Jul 87	12	Yaesu FT708R	Jun 84	30
"Mighty Mobiles" TM2550E, FT770RH, IC28E	Sep 86	54	Yaesu FT726	Dec 83	47
Minimax HF aerial	Oct 87	36	Yaesu FT730R	Dec 84	54
Mizuho MX-Z	May 83	69	Yaesu FT736	Mar 88	36
Mizuho SB2X	Nov 83	54	Yaesu FT-747	Jun 88	22
MJF multimode data controller	Mar 32	3	Yaesu FT757GX	May 84	28
Muttek SLNA 14SSB (fitted to FT290R)	Jan 84	56	Yaesu FT767 upgrade	Nov 87	36
Muttek TVVF 50C 6m transverter	Apr 86	54	Yaesu FT767 further upgrade	Mar 89	26
Navico AMR1000	Oct 88	16	Yaesu FT980	Feb 83	74
Pac-Comm Tiny-2 tnc	Aug 88	37	Yaesu FT980 (computer aided)	Sep 83	45
Pac-Comm TNC 220	Aug 87	49	Yaesu FT2311R handheld	Mar 88	20
Packet radio card see PC-320			Yaesu FT-4700 dual band	Oct 88	20
PC-320 packet plug-in card	Dec 89	42	Yaesu FRG 9600	Oct 85	33
Polarphaser II from SMC	Feb 86	48	FRG9600 (updated) — a reassessment	Dec 86	62
Puma 2m power amp	Oct 83	49	Yaesu FT711, FT73R	Jan 88	28
Realistic PRO-2005 scanner	Sep 89	32			

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# LISTENING ON

Back in August last year, the BBC Monitoring Service, based at Caversham Park near Reading, celebrated its 50th anniversary. At the time, Radio Netherlands and Radio Austria International broadcast features on the service, and in the December 1989 edition of *London Calling* (the BBC World Service monthly programme magazine) there is an article on BBC Monitoring. It explains that the service is housed in a splendid country mansion set in acres of parkland. The estate dates back as far as

sion into a brand-new purpose-built extension, housing a powerful main-frame computer to process the vast amounts of information produced.

For those short wave listeners or radio amateurs who think that working for the BBC Monitoring Service is like being paid for being a DXer, it may come as some surprise to learn that most of Monitoring's output is concerned with political and economic news. The way it works is that several hundred news bulletins from all over the world are listened to every day,

are checked for reception quality and passed on to teams of language monitors. These are the people who have the task of listening to the broadcast, deciding which parts are newsworthy, and then translating them into English.

## Translate to Compute

At the time of Radio Netherlands' visit to Caversham Park last August, this process was still being done on paper, which was then photocopied and despatched to the newsroom at Caversham and news editors for publication or for passing on by teleprinter to BBC radio and TV newsrooms. However, it was explained that with the move to the new computerised operation, the monitors would type their translations directly into computer terminals and the bulletins would find their way electronically to the newsrooms and editors. Eventually the whole operation would be virtually paper-free, although the final product, the daily *Summary of World Broadcasts* and the weekly *World Broadcasting Information* would still be available on paper. Indeed, these two publications are even printed, collated, and despatched to customers from the premises.

The *London Calling* article mentioned some famous BBC monitoring "coups", including that of the Cuban missile crisis of 1962. Apparently it was the BBC which picked up Khrushchev's offer to withdraw the missiles, as broadcast on Radio Moscow, and passed on the news directly to President Kennedy, thus by-passing normal diplomatic channels and, quite possibly, helping to avoid a major catastrophe. Thankfully, there have not been many crises of that magnitude since then, but, *London Calling* points out, it was BBC Monitoring which was first with the news of the death of Andrei Gromyko, the coup in Sudan and the Ayatollah's death sentence passed on Salman Rushdie.

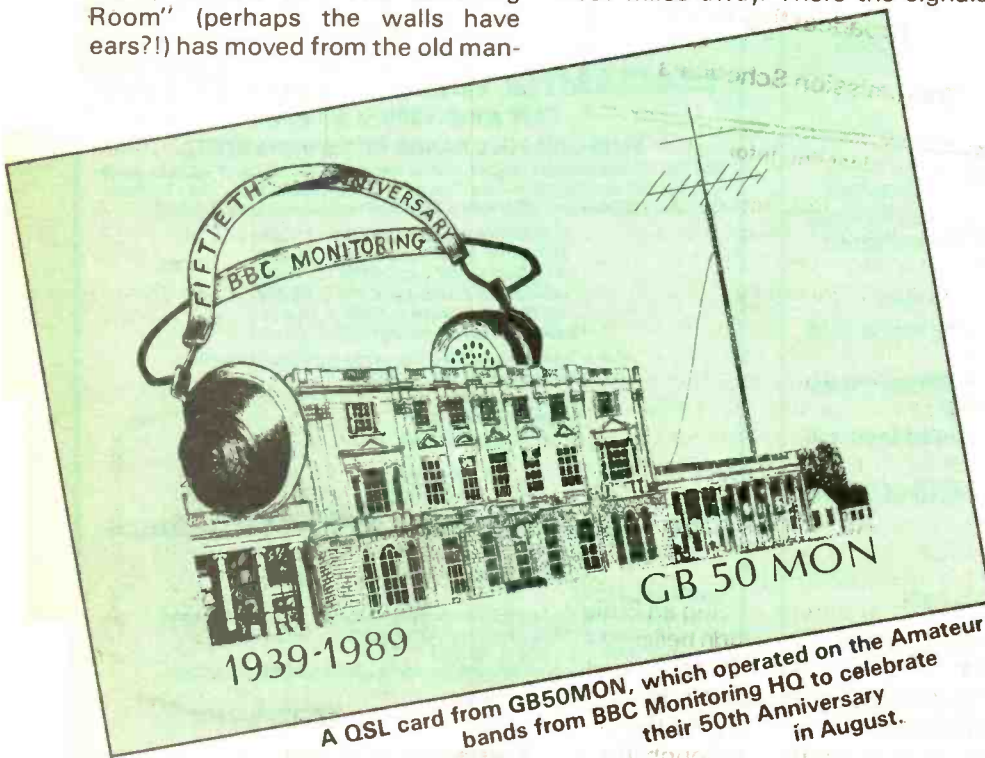
During August, a group of radio amateurs at BBC Monitoring put on a special event station with the callsign

## The BBC Monitoring Service has computerised for its 50th anniversary.

the Norman conquest and, several centuries later, Queen Elizabeth I was entertained there and King Charles I kept prisoner there.

Recently the main operational room, known as "The Listening Room" (perhaps the walls have ears?!) has moved from the old man-

in about 35 languages. Signals are picked up at Crowsley Park by teams of operators, according to a predetermined schedule, and fed over land lines to Caversham Park some four or five miles away. There the signals



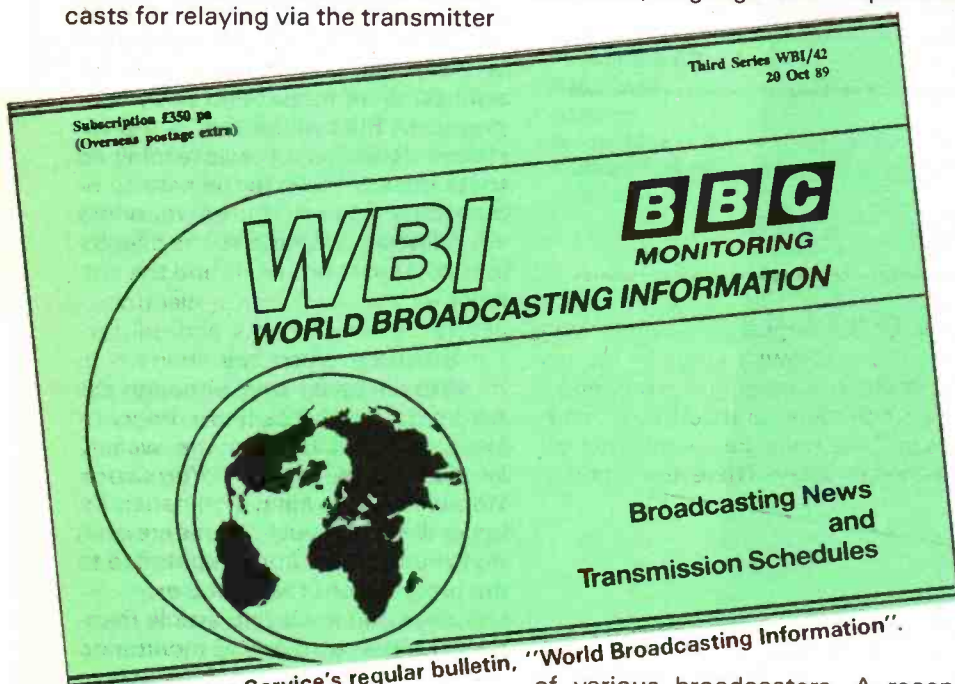


GB50MON. The QSL card shows a picture of the mansion building housing the Monitoring Service. I recently met one of the operators of this station, who explained that at Crowsley Park the operators use Racal receivers, including RA1772s and MA1072s to pick up the broadcasts for the language monitors. The antennas include Beverages, at roughly every 20° around the compass and some up to 1km long. These are terminated and, contrary to most text book descriptions, work well and show great directivity not only on long wave and medium wave, but also on shortwave right up to 26MHz. Other antennas at Crowsley Park include a reversible curtain array, firing to the USA one way (it was once used to pick up Voice of America short wave broadcasts for relaying via the transmitter

been provided with JRC NRD-525 receivers.

### World Information

The GB50MON QSL card invites recipients to write for a free sample copy of *World Broadcasting Information*. This is a weekly document produced by BBC Monitoring which reports on developments in international broadcasting, including news and information on new transmitters, programme changes and international co-operation agreements. There are separate sections for "clandestine and extra-territorial broadcasting", news agencies and satellite broadcasting, and appended to the end are several transmission schedules listing the times, languages and frequencies



The Monitoring Service's regular bulletin, "World Broadcasting Information".

site at Wooferton in Shropshire) and to the Middle East/Indian Ocean area in the other direction, as well as rhombics orientated towards the Soviet Union. More recent acquisitions include a couple of satellite dishes to pick up radio and TV services from the USSR, Arabic countries and eventually, it is hoped, Iran.

Down at Caversham Park there are also Racal receivers, some connected to active antennas and others with access to the antennas at Crowsley Park, via a remote tuning system. Some of the foreign language monitors can also tune in their signals themselves: they have

of various broadcasters. A recent edition included news about a new transmission from KTWR in Guam, details of All India Radio's transmitter expansion, Radio Omdurman being observed on 9540kHz and Lithuanian Radio starting a Russian-language DX programme, as well as many more items of less interest to the average short wave listener. The transmission schedules were of Vatican Radio, Deutsche Welle, the Voice of Nicaragua, Radio Voice of Ethiopian Unity and Voice of Oromo Liberation (the latter apparently being an Ethiopian clandestine operation believed to be broadcasting from Sudan). *World Broadcasting Information* is obviously intended primarily for the professional customer, although there



Yleisradio (Finnish Broadcasting Company) headquarters in Helsinki.

were several news items which would have been of interest to the keen short wave listener — the only problem is that the average short wave listener would have to be very keen indeed to pay the £350 per year subscription.

Good luck to BBC Monitoring for the next 50 years!

One international broadcast station that has increased its audience dramatically during the last five or six years is Radio Finland. The main reason for this has been the almost complete re-building of the station's transmitters and antennas. In 1983 the Finnish government agreed to give Yleisradio, Radio Finland's parent body, 66 per cent of the funds



Yleisradio Station logo.



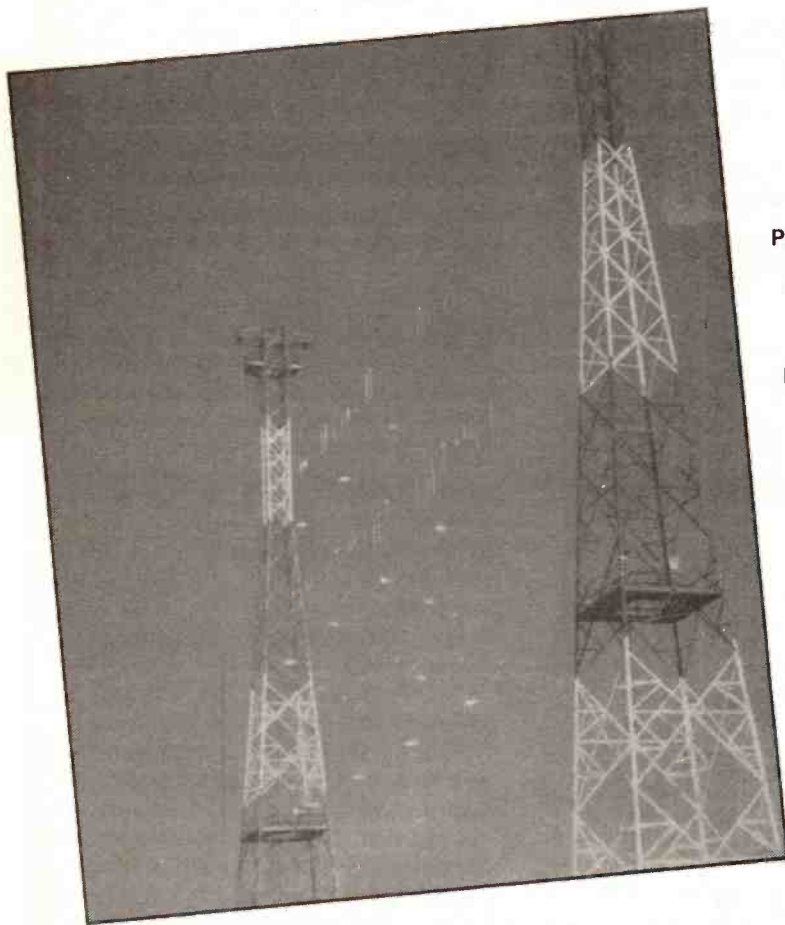
required to completely re-build the ageing short and medium wave transmitters. After a lengthy period not without set-backs the new station at Pori, in south-west Finland was eventually officially opened in 1987. The site now has three 500kW Brown Boveri short wave transmitters, a 250kW transmitter, and a renovated old 100kW one. The most powerful transmitter, though, at 600kW is a medium wave one, on 963kHz, which can be heard with a strong signal in

grammes broadcast to Asia are preceded by a Japanese-language identification and frequency announcement. However, it seems that funding, as is so often the case, is lacking for this further expansion.

Radio Finland's English-language programmes are broadcast first (to Europe) at 2200-2225 GMT and then are repeated the next day at 0000-0025, 0730-0755 and 1505-1530 GMT. Five days a week the broad-

casts start with "Northern Report", a round-up of Finnish and Scandinavian news, which is then followed by a different feature every day of the week. At 1930-1945 GMT is a broadcast just of "Northern Report", without the feature programme.

On Monday evenings (repeated Tuesday morning and afternoon) "Northern Report" is followed by "Airmail", a listeners' letters programme (Radio Finland is one of the stations that places great emphasis on listener feedback), while on Tuesday evenings "Sports Fayre" is broadcast. If you would like to try our hand at learning what even the Finns describe as one of the most difficult languages in the world, "Learning Finnish" is broadcast on Wednesday at about 2215 and repeated Thursdays at 0745 and 1520. When I tuned in recently, the course already seemed to be at quite an advanced stage, but it could be that it will be started again from the beginning at some point. "Science Horizon" is broadcast first on Thursdays, while on Fridays "Highlights" is Radio Finland's version of "Pick of the Week".



Part of the giant TCI computer-controlled antenna systems at Radio Finland's Pori site.

### Sunday, Monday

Weekend programmes are slightly different, with "Northern Report" being replaced by "Backgrounder" on Saturdays and by "Business Monday" on Sundays (!) — don't forget that it is already Monday morning in Finland at 2200 GMT and that the programme is repeated more on Mondays than it is broadcast on Sundays. Following these programmes

Britain (and indeed over much of Europe) during the winter months and during darkness. The Pori transmitter site is unmanned these days, the whole station being operated remotely. The antenna system is electronically controlled, with change of beam heading etc. being accomplished by a computer.

At present Radio Finland broadcasts in Finnish and Swedish, the two languages of Finland, as well as English, German and French. In 1987 it was suggested that Radio Finland would also start broadcasts in Japanese, and the English-language pro-

Time GMT	Medium Wave kHz	Shortwave MHz
2200-2225 (First transmission)	963	6.12 11.755
0000-0025 (Repeat)	963	9.645 11.755
0730-0755 (Repeat)	963	6.12 9.56 11.755
1505-1530 (Repeat)	—	11.85 15.185
1930-1945 (News service only)	963	6.12 9.53 11.755

Times and frequencies of Radio Finland broadcasts in English to Europe.



An early 70s QSL card from Radio Finland.

are features called "Focus", "Close-up" and "Voices of Finland", which try to give the listener an impression of what life is like in Finland for the average Finn.

Radio Finland also broadcasts these, and other programmes, to North America, South America, the Far East and Australasia. Thanks to their new high power transmitters and antennas, Radio Finland's signals are generally well-heard in most parts of the world and in Europe in particular their signal is usually very strong indeed. For the current frequencies for the broadcasts to Europe see the table.

These days, Radio Finland does not respond to reception reports by QSL card, although they do still appreciate listener contact, especially with comments on their programmes. They even have a telephone answering service in North America, one of their largest target audiences (it is 1-203-688-5540 for anyone who cares to spend the money to call it) while the address for their "audience service" is Radio Finland, Box 10, SF-00241 Helsinki, Finland.

Finally, in this *Listening On* a few "DX tips" to look out for. Radio Omdurman, in Sudan, has not been noted on shortwave for several years and even when it was broadcasting there it was always a difficult catch. In recent years they have only been on mediumwave (including a very

high power transmitter on 1295 kHz which sometimes could be heard interfering with the BBC World Service transmitter on 1296 kHz). However, Radio Omdurman has recently been heard with, at times, very good signals on 11625 kHz, with English programmes at 1530-1600 GMT and Arabic outside those times. If you want to hear this rare station hurry, because their previous excursions on to shortwave have

been rather short-lived.

Rather easier to hear is a new transmission from Radio Riga, in Latvian, at 1730-1800 on 1143 kHz. This is the 500 kW transmitter in Kaliningrad (nowhere near Latvia!) which later carries Radio Moscow programmes for Great Britain.

Lastly, something to look forward to for those who are country chasers and have never been able to get a verification from Radio Barlavento or the other stations in the Cape Verde Islands. These islands, off the west coast of Africa, seem ideally located for a relay station, and sure enough, "Media Network" reported back in September that a French company was planning to set up a station there with three 500 kW transmitters. They would not make any programmes themselves, but would lease the air time to such stations as Radio Japan (which already broadcasts via Africa No 1 in Gabon, West Africa), Radio France Internationale (which does likewise) and the Voice of America (which has relays in Monrovia, West Africa and Tangier in Morocco). The man behind the project hoped that it would realise some 8 million dollars per year and that they planned to be on the air by mid 1991.

That's all for now, I'm just off to build my own relay station!



The Cape Verde Islands should become easier to hear if a new relay station project gets on the air. Radio Barlavento is now off the air, but used to broadcast from Cape Verde on 3930 KHz.



# HERCULES

## Solid State Linear



### *The HRT review team tests a no-nonsense valveless linear amp with a superweighty power supply.*

It has often been said that summer is when amateurs get out in the open air to install new aerials and towers, and winter is the time to keep the shack (not to mention the ionosphere) warm with the generation of quantities of RF power, working the DX during the long dark nights on both HF and VHF. With this in mind, our review team came to the conclusion that it was time they tried a few of the linear amplifiers on the market as well as the never ending array of new transceivers.

This month we kick off with the Ten-Tec "Hercules" solid state HF amplifier, designed for the amateur who likes to plug in and leave it while working the DX. Over the next two months we've also got a couple of QRO valve amplifiers to raise the HRT shack temperatures using traditional Plate and Tune controls.

#### **No Fuss, No Bother**

The Hercules offers a steady 550W maximum output immediately after switching on, no valves meaning no warm-up time. Enforced wait-for-it-to-start-working time can be annoying if you

miss your chance to get the DX station you've just heard calling CQ. The Hercules also offers a fast transmit/receive switching time of 5 milliseconds allowing you to use the amplifier for full break-in CW as well as the many data modes requiring a fast Tx/Rx turn-around. For SSB, the amplifier is rated for a continuous transmit time with normal speech, and a 50% Tx/Rx duty cycle on full power for CW and RTTY. Slow-scan television users can run the amplifier at its 550W maximum power output for up to 15 minutes.

The drive power required to provide full output is typically 50-80W, and an external power supply having an 80A capability at 14V is needed to power the unit. In case you're wondering who makes one, then never fear as a purpose built supply which is normally remotely mounted is also available from Ten-Tec. Without the power supply, the amplifier weighs a very light 6.8kg and can easily be carried around under one's arm, which can't be said for most legal-limit amplifiers!

#### **The Front Panel**

The amplifier itself measures a compact 305mm (W) x 135mm (H) x 368mm (D) with the size and styling of the front panel nicely matching the latest Ten-Tec transceivers such as the Paragon. A multi-function meter lets you check the forward and reflected power, PA collector current, and PA supply voltage, and next to this an led bar-graph gives you a constant display of the peak RF output power. An overdrive led indicator lights if you're either driving the amplifier with too much power, or a fault condition such as a high supply voltage or amplifier imbalance is present. A Relay/QSK switch controls the Tx/Rx switching mode of the amplifier for either normal SSB or fast break-in and data.

The only operating control on the front that needs adjusting is the band switch, however a rear panel connector allows this to be remotely switched also using parallel band input switching lines as provided from some transceivers. The amplifier operates over the entire 1.8MHz - 30MHz HF spectrum in 7 bands, these being 1.8-2.6MHz, 2.6-4.0MHz. The highest of these bands isn't factory fitted to models sold in the amplifier's home land of the USA, amateurs over there need to fit an additional pcb themselves, but this is already fitted on amplifiers on sale in the UK by the official importers. A built in speaker completes the front panel line-up.

#### **Round the Back**

On the back panel are the input and output SO-239 aerial sockets together with DC power and remote control sockets. Phono type sockets are provided for hard wired transmit in-out switching, SSB vox switching, and the front panel speaker input, and a large separate ground lug lets you ground the amplifier to a low-impedance RF ground if this is available in your shack. Ventilation grilles are fitted to provide an exhaust for the built in PA heatsink cooling fan, the air intake being at the bottom of the chassis.

#### **Circuitry**

A total of eight MRF456 power amplifier transistors are used, these are arranged in pairs fitted to four separate amplifier circuits, each circuit providing

around 150W each. Following the input switching circuitry, power splitters are used to separate the input drive into two, then four separate RF paths, each feeding a separate amplifier circuit. Broadband stages are used with ferrite input/output transformers for impedance matching, with a pair of amplifiers fitted to each of two large pcbs. The outputs from the two amplifier pairs are combined, the resultant pair are again combined to provide the single amplified output, which is then passed to the switched low-pass filter stages to provide harmonic filtering. A high-power vacuum relay is used at the output to provide rapid transmit/receive switching.

The output circuitry can withstand an impedance range of 25ohms to 100ohms, ie an SWR value of 2:1 maximum, but the manual warns of serious damage occurring if the amplifier is used without a suitable aerial or dummy load connected. There is no automatic vswr protection circuitry built in which is rather surprising. Hot switching RF protection is however used to prevent input damage, together with over-voltage and over-current protection circuits to guard against the expensive power devices being damaged due to this. In the case of excessive RF drive power, a built-in input pad is automatically switched in to save both the driver and the amplifier, the front panel 'Overdrive' led showing an over-drive or over-voltage/current fault condition.

### On The Air

Unpacking the amplifier unit was quite easy, but just lifting, never mind

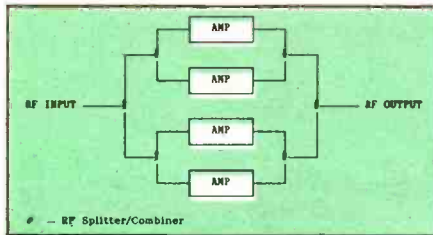


Fig.1. The internal arrangement of the amplifier.

unpacking, the matching power supply was a feat in itself due to its weight. Having said that, our advertising manager Cass Gilroy remarked 'no problem', quickly mounted the packed amplifier onto his shoulder and proceeded to carry it in — looks like I'm in need of some weight-lifting practice!

The amplifier was used with the matching Ten-Tec 'Paragon' HF transceiver, and throughout an extended review period operated faultlessly. The rear panel connections were very simple to make, and when using the amplifier with a different transceiver only the Tx keying control would normally need to be wired for correct operation coupled with manual band changing. A Ten Tec Model 229 aerial tuning unit was normally used to provide a suitable 50ohm match to the Hercules, due to the manual's dire warnings of impending demise of the amplifier if a gross mismatch were to be presented, so this was normally tuned up with the amplifier switched out of circuit.

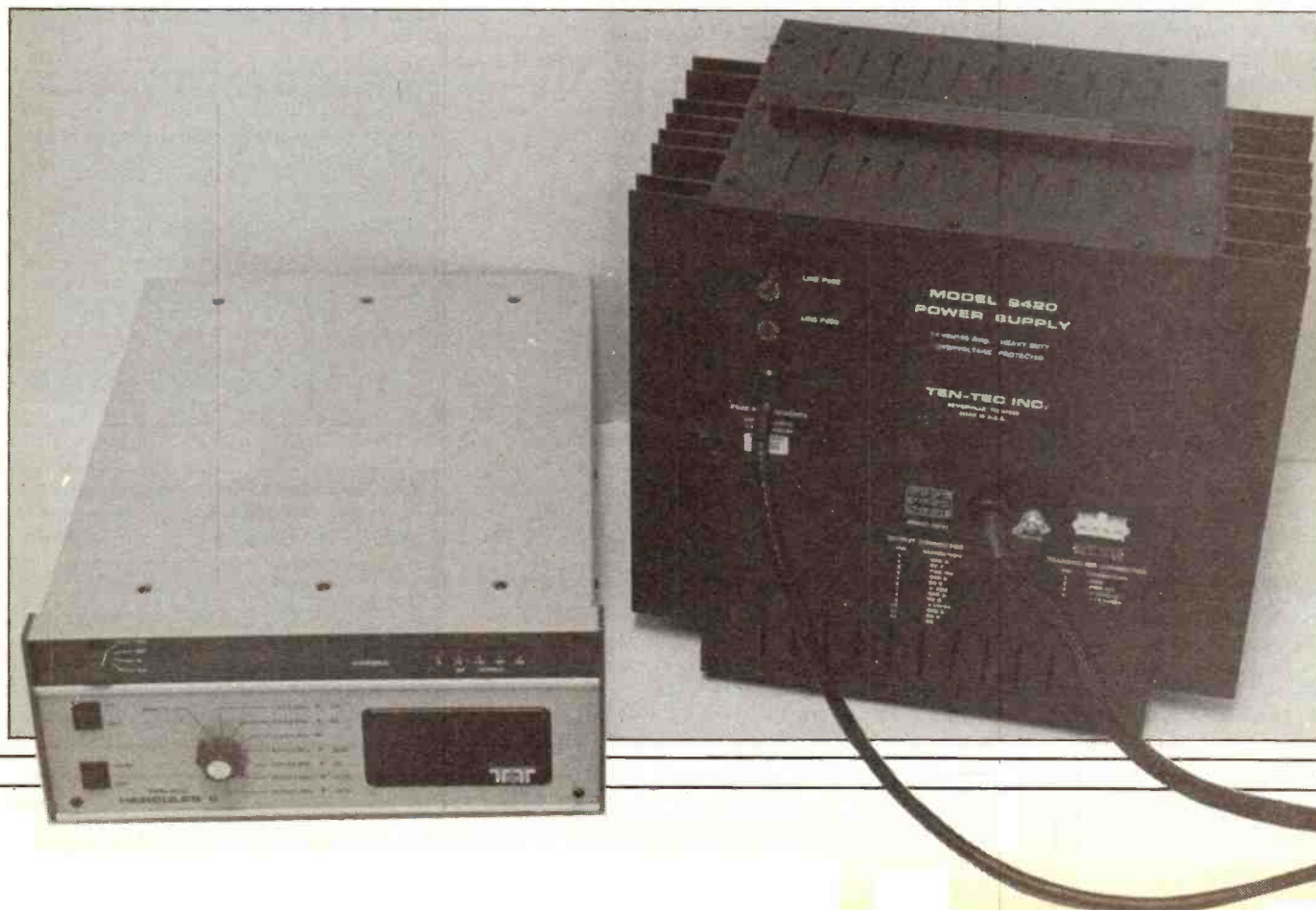
The power supply was considerably larger than the amplifier itself; it found a resting place on the shack floor linked to the amplifier by a thick multi-way DC

cable. The current capability was actually a very hefty 100A, providing sufficient power for a typical 100W driver transceiver, and to provide a test of the system the complete HF transceiver/amplifier arrangement was powered from this. Keeping down to the 300W-400W output level, the transmitted SSB signal remained fairly narrow showing reasonable linearity, the driver power reduction with resultant cleaning up of the drive signal undoubtedly having an effect here.

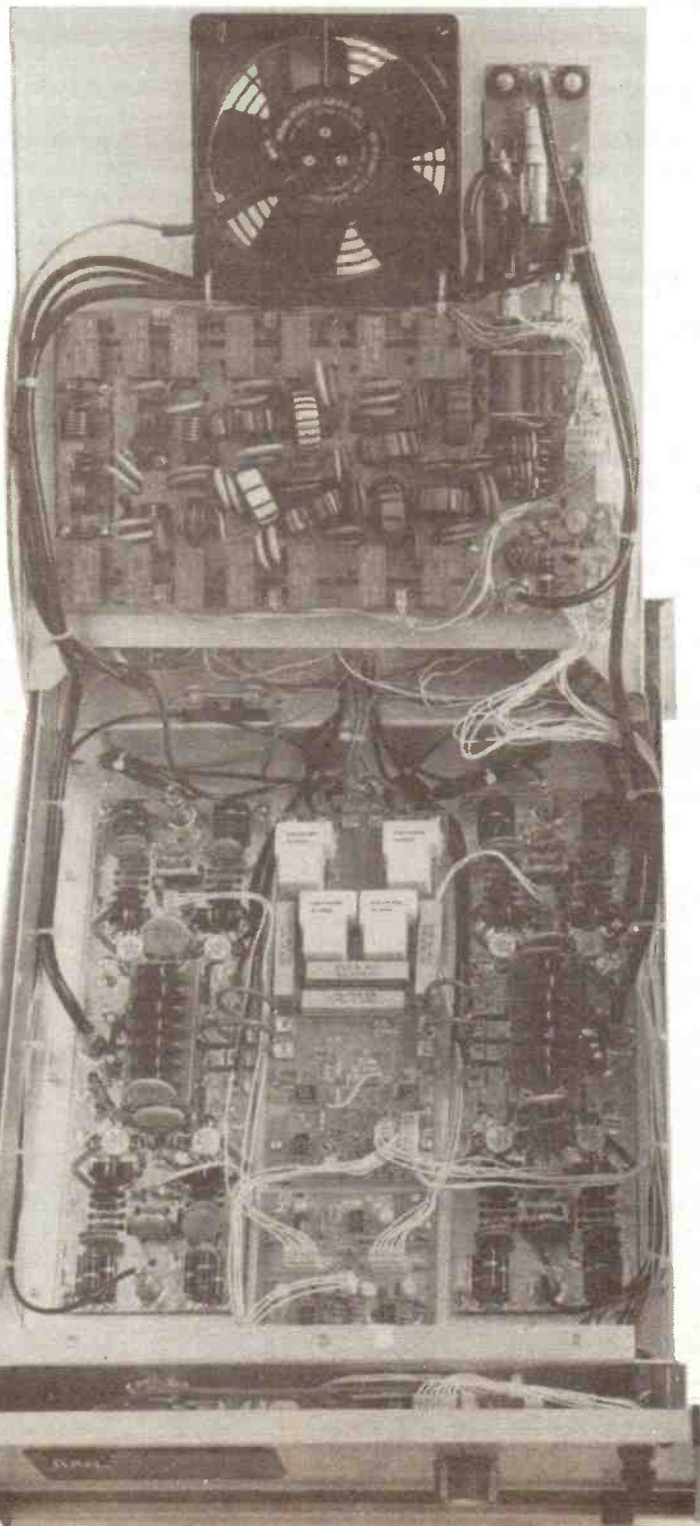
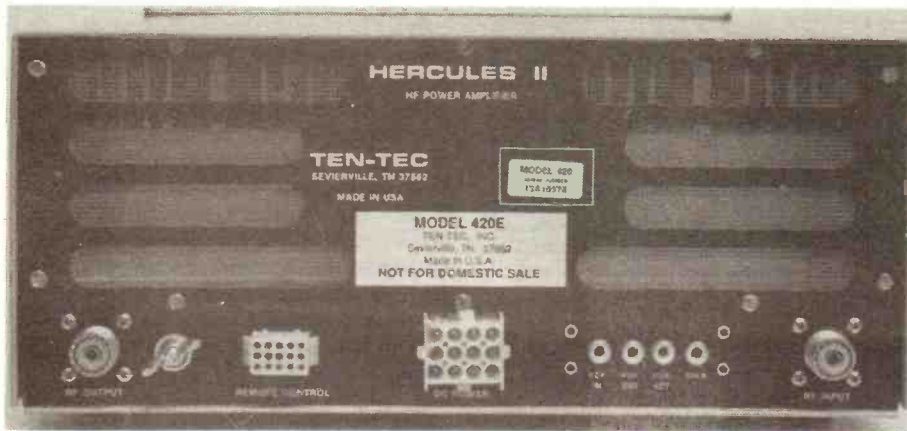
To provide a critical test with a high transmit-receive duty cycle, the setup was connected up to the shack multi-mode TNC and used for some time as a HF packet radio node and VHF/HF gateway. Due to the potent signal, its presence on the band was very quickly noticed, and within fifteen minutes of switching on it was simultaneously being used by stations in Portugal, West Germany, Italy and the UK. Even after half an hour of such heavy use, both the amplifier and the power supply warmed up but never reached what I would call a hot temperature. The built in cooling fan was very quiet in operation, almost to the point of being inaudible.

### Conclusions

With no tune-up controls to adjust incorrectly, and simple transmit/receive switching, I can only reiterate the fact that throughout the review period the amplifier performed faultlessly. However the absence of any form of swr protection circuitry means that one must be VERY careful to use a correctly matched aerial system, otherwise rather expensive damage could result. Providing resonant







aerials are used, the Hercules would be useful to the amateur requiring a no-nonsense unit. Remember that a suitable high-current DC power supply is also needed when looking at the cost.

On the air, the RF power increases of an S-point or so over the normal 100W was certainly noticeable when attempting to crack pile-ups, not quite as much as a 1kW or 2kW output affair but then in the UK we're not allowed to use that amount of power, being limited to 400W which the Hercules delivers very comfortably. However with 400W at the aerial the local RF field strength does also increase somewhat, so be warned. Now, where's the number of the TV guarantee service depot, as my new TV seems to have started picking up local amateur radio signals, which it shouldn't do!

*Our thanks go to HRS Electronics for the loan of the review amplifier and matching transceiver.*

## LABORATORY RESULTS

**RF Power Output:** Measured maximum SSB two-tone and CW output power.

	SSB PEP	CW
1.8MHz	557W	554W
3.5MHz	562W	558W
7.0MHz	564W	560W
10.1MHz	566W	561W
14MHz	564W	559W
18MHz	564W	560W
21MHz	570W	563W
24MHz	568W	562W
28MHz	564W	560W

**Harmonics measured at 550W CW output:**

	2nd	3rd
1.8MHz	-58dBc	-62dBc
3.5MHz	-56dBc	-65dBc
7.0MHz	-54dBc	-71dBc
10.1MHz	-64dBc	-75dBc
14MHz	-62dBc	-69dBc
18MHz	-61dBc	-70dBc
21MHz	-63dBc	-76dBc
24MHz	-68dBc	-77dBc
38MHz	-73dBc	-76dBc

**SSB Two-Tone Linearity measured at 14.2MHz, 550W PEP, given as dB relative to PEP output power, 1MDs amplifier rather than driver limited:**

3rd order:	-32dB
5th order:	-48dB
7th order:	-52dB
9th order:	-55dB
11th order:	-57dB

# An Off-air 'scope probe

Many radio amateurs have an oscilloscope in the shack, often picked up cheaply at a junk sale. My first 'scope was obtained in this way, and is in regular use to this day.

causes an induced 50Hz hum to be displayed. This is due to the oscilloscope's very high input impedance. Fortunately the solution is very simple, and is illustrated in Fig.1.

up your rig and you should be in a position to 'observe proceedings'.

## Gee Goodrich G4NLA stops the 'scope humming

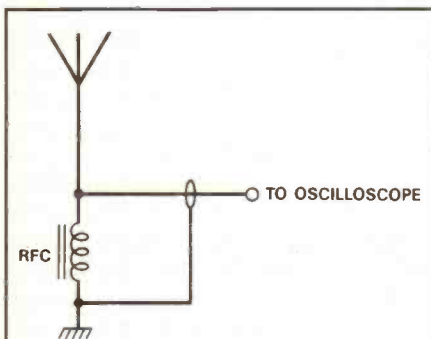


Fig.1. Off-air oscilloscope probe circuit.

One of its uses is as an 'off air' transmission monitor. As such, I occasionally glance at it to ensure the quality of the outgoing transmission. Any irregularity is quickly spotted, and the exciter adjusted to cure the problem.

Does this sound like a good idea? It is, but many people are disappointed when the attempt to plug a length of 'pick up' wire into the X input simply

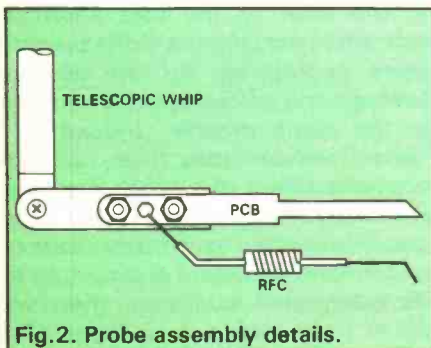


Fig.2. Probe assembly details.

RF picked up by the telescopic rod antenna develops a voltage across RFC1, which is subsequently monitored by the 'scope. However, the RFC is practically a short circuit to any induced mains hum, so no such voltage is established. Problem solved.

This simple idea was very easily implemented within the confines of the collar of a PL259. The telescopic rod antenna was purchased from Tandy, and was the type with a 90 degree hinge at its base.

The connector at the base was bolted to a strip of pcb shaped so that it could be soldered firmly into the probe of the PL259. The RFC choke, purloined from an old ICL computer board, was then soldered to the copper of the pcb. The RFC was dressed with insulating tape along the rest of its length.

This assembly was subsequently slotted into the barrel of the PL259. The pcb was soldered into the plug tip, and the free end of the RFC to the bit where you're supposed to solder the screen of coaxial cable. A short length of plastic tube, obtained from a fibre tip pen, was then slid over the assembly into the PL259 to act as a further insulator. The whole lot was then potted in epoxy to ensure reasonable rigidity.

To test the probe, simply connect it to the input of your scope, via a PL259 BNC adaptor if necessary. Fire

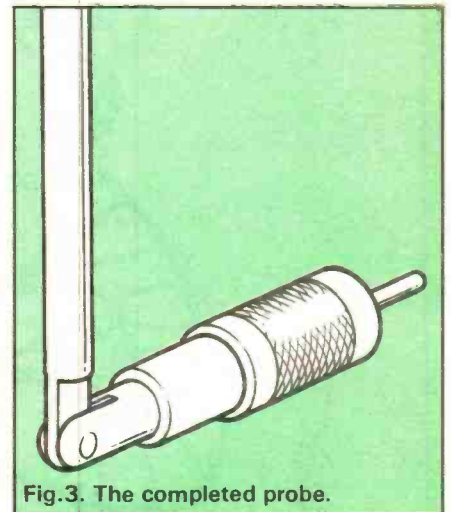


Fig.3. The completed probe.



OK W1LMA, allowing for the QFE, that should be a full-wave vertical on 180 metres now.



# The art of giving LECTURES



"...LOW ENOUGH FOR THE  
UNINITIATED TO GRASP...."

It has been my pleasure to have attended many amateur radio society lectures over the years and while many have been good there has been the odd occasion when I have winced at the presentation given, if not the subject. It is only natural that in a hobby so diverse as ours there will be

complete with a live demonstration, the camera being remote from the Club, but when a video film was shown during tea-break, it was found to be so boring that within 5 minutes nobody was watching the screen or taking any interest at all. I also witnessed two people watching a

presenting it. This made me consider more about the object of lectures and video films in our hobby and only later did I realise that it was not the *subject* that was boring but the actual way that it had been presented.

Without doubt, except for the very few who try to talk without knowing what they are really on about, lecturers know their subjects well. However, it has been found that the majority know their profession too well and find it difficult to convey their knowledge at a suitable level, ie low enough for the uninitiated to grasp. This leaves the audience with a feeling that the night was wasted and that the subject was far too deep for them ever to understand which means that the talk had the opposite effect, putting people off what may have been an interesting facet of the hobby. In actual fact, this is the fault of the lecturer in not conveying the subject adequately. This applies even more to video films since it is impossible to ask any questions afterwards!

So let's try and analyse my original sentiment. In the case of the amateur television video, the film started with an obvious expert showing his very complex ATV equipment, but explaining the items at such a high level that if you hadn't been a keen ATV expert for years, then you wouldn't have had a clue what the chap was on about! This was made even worse by the use of very technical terms throughout the film. In the case of the two potential recruits at the rally, the video seemed more appropriate for the already licensed and knowledgeable amateur in the same manner. Indeed this 'advertisement' may have had the opposite effect of putting them off the hobby for life. In both cases, if the presentation had been made easier to understand and more appropriate to its designated audience, then we could have had a few more ATV

## ***Ever thought of giving a club lecture? S. Granger, G4NSG, gives a few tips on the do's and don't's.***

many facets that can be presented to a Club or Society, but there are times when the delivery seems to leave much to be desired, even if the lecturers know their subject. For instance, I attended a superb lecture on amateur television and its uses

video at the entrance to a national rally last year, thoroughly bewildered and asking each other what it was all about, even though this video was being presented as an advertisement for Amateur Radio as a hobby and for the services of the National Society



on some of the parts beforehand, for familiarity can, as they say, breed contempt. Don't forget, you MUST aim your talk at the novice level, so if there are many technical terms or parts to the lecture, be prepared to give simple film slide or blackboard diagrams to enhance the presentation and to explain exactly what you are on about. Now, obviously, this will differ from club to club and it is up to you to gauge the technical knowledge of its members, but if you are a guest speaker at another club, then assume little prior knowledge.

Try and be humorous in your approach for nothing turns an audience off quicker than a droning deadpan solemn faced individual. If you feel nervous it may help you to use crib cards, as the professionals do. They have either written condensed notes showing they key words, or in these days of high technology, a computer autocue.

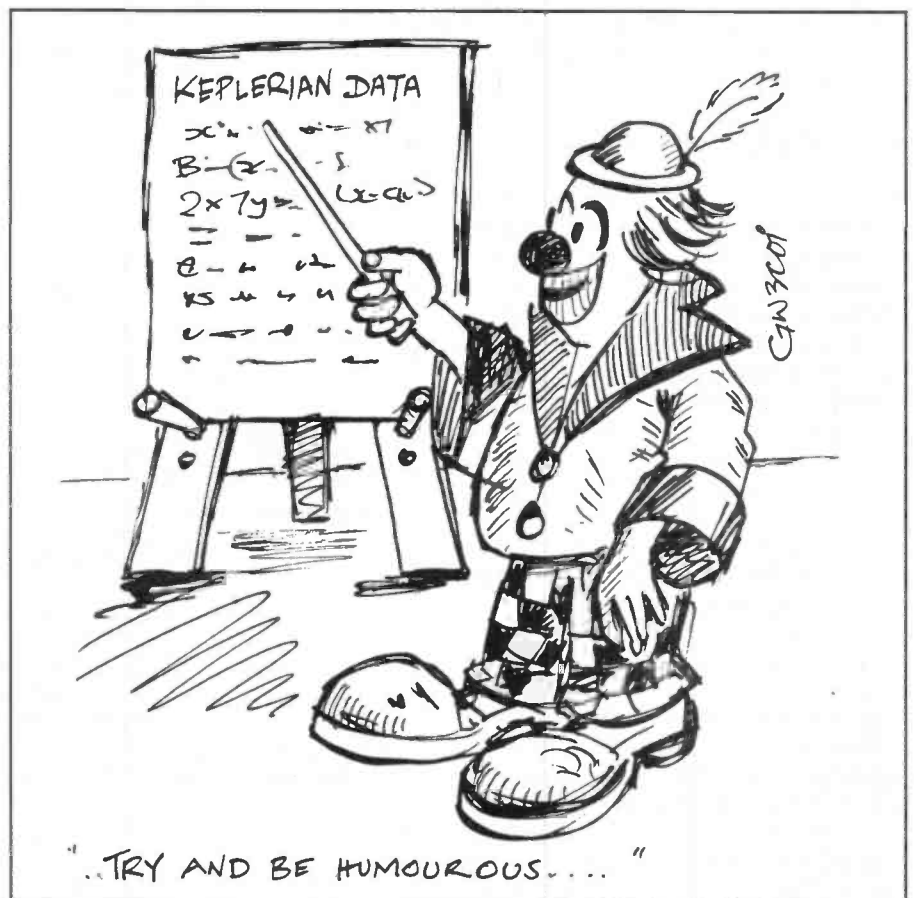
Be careful not to use insults or sarcasm even if trying to denounce previous tradition or statements, for there may be members of the audience who could take offence. In any society, there is always one member who, for some unknown reason,

enthusiasts, and two more licence holders on the bands.

This problem can easily be solved if the would-be lecturer or video maker can learn to think at the lowest level of audience 'knowledge'. To achieve this, an accompanying program of notes for discussion and a bit of forward planning is imperative if such a lecture or film is to succeed. Now I don't mean that you have to be a college principal or a film director to achieve this, all you need is a little common sense. To help you in this, I will now give some general notes and guidance on how to avoid the pitfalls on the way.

### Basics

In order to give a good lecture, first you must know exactly what you are talking about. This may sound strange but there is a difference between having a general discussion with your colleagues and standing before a critical audience which is hanging on every word you say and ready ask the most simple or complex questions afterwards. Even if you have practised your particular field for many years, expect to revise







... THERE MAY BE MEMBERS... TAKE OFFENCE ...!

always bears the brunt of the latest in-joke and is the known victim at the hands of the local wags. It would pay you to leave this person alone and not to make any intentional remarks in their direction. This will serve two purposes, in that you keep their friendship, and that you can deliver a good lecture without resorting to belittling people. Do not, under any circumstance, pick out a member of the audience and overpower them by concentrating all your talk at them personally, as they will very quickly feel very uncomfortable. It would be better to either gaze around the room slowly or concentrate your attention on an inanimate object at the rear of the room away from the direct eyes of your audience.

How many times have you listened to live television or radio interviews and counted the number of 'erms' or 'errs'? This is usually caused by the victim being put on a spot and having to pick their words carefully. If the radio interview was recorded beforehand then all these interjections would be edited out before the broadcast. Nevertheless, it is still virtually impossible to speak without the odd slip, however good at your subject you may be. Don't worry too much, just do your best to keep them to a minimum. I had the good fortune to listen to a lecturer who really knew his subject recently, which happened to be his profession as freelance sound recordist and dubbing mixer

and he spoke for three hours without a break, yet kept his audience totally absorbed. It was noted afterwards that we never heard one interjection throughout the whole lecture. This sort of person is a rarity!

I have mentioned the use of the slide or blackboard as a method of enhancing the lecture. Another obvious object is a working model of

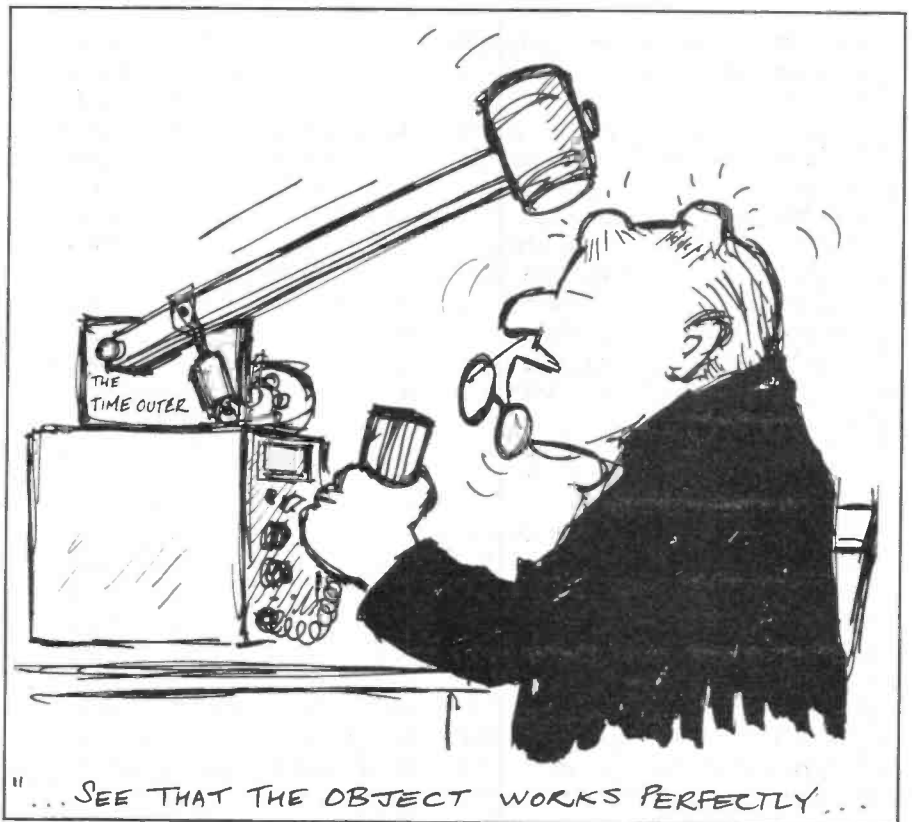
the thing in question. It is very important to check to see that the object works perfectly *before* you load it into the car, there is a law about such items — if it can go wrong, it *will* go wrong! Make sure that any slides are in the right order.

It would also pay you to take a basic tool kit, how many times have you seen an audience being asked for a screwdriver! Be prepared for a shortage of electrical plugs at your destination. They may even be a different type from the ones on your leads, so pack a few adaptors, check the ratings of your equipment beforehand, make sure that the fusing is of the correct size and that all earth cables and terminations are intact. The sight of lecturers electrocuting themselves tends to direct audience attention away from the subject at hand!

### Film and Video

So what of film and video? This is a different ballgame altogether, for if you get it right, you have a winner. Get it wrong and you have blotted your copybook forever. Visual aids above all other need careful planning plus an extremely good script, good sound and good camera work to make them succeed.

To give one instance I recall a



"... SEE THAT THE OBJECT WORKS PERFECTLY ..."

video which broke every law in the book, the comedy of errors made compulsive viewing. In this case, the video showed a Raynet exercise which was involved with a cross country race between various services. Not to make too fine a point, the editing was atrocious, there seemed to be no script (the poor commentator had to search for his words), the camera suffered from shake, and the finale was a commentary on a busy main road where the commentator's voice was totally drowned out with dense traffic noise. The whole video had no definite plan, it seemed to jump around from location to location and theme, leaving the viewer totally bewildered and not knowing what was going on. This then is a classical example of exactly what *not* to do, and we shall now go through it, stage by stage, to give some idea of how to succeed.

First of all, hold a meeting with all the people involved and thrash out exactly what is going to be done, then make out a plan of the locations, write a script and use a story board (a sequence of cartoon style sketches) to link the two together. Also fine-plan exactly who is going to do what, and if there are any outdoor scenes, make contingency plans in case of inclement weather. Any professional film-maker will tell you that all the major work is done in the office, with the actual shooting being a mere formality.

You will also note, that with the aid of the story board and script, the Director can jump about with the sequences just like the professionals. Remember that there can only be one Director and he or she will be the boss of the whole affair. For the record, my colleague is a professional film-maker and he helped in the production of a training film where the narration was given "off the cuff" at the client's insistence. The production cost a small fortune as most of the film was left on the editing room floor!

Find out what lighting is required. Will the film in the camera take the illumination levels on your locations? If not, then arrange for suitable lighting, be it a street scene, studio, or even someone's Shack. Will the sound levels be good enough? Perhaps a boom mike would be beneficial, or a chest/tie clip type. If you are interviewing in the street, then use a "rifle microphone", which has



the marvellous property of concentrating all of the sound within a small area, just like a yagi aerial, while at the same time cutting out any sideways or background noise. This type of mike is pointed straight at the commentator in any noisy environment and is very effective. They are not cheap but it may be possible to hire one for the duration of the movie-shoot from a reputable supplier.

What's your camera-person like? Can they hold the thing still for long enough? I doubt it! Try a proper tripod with an extension arm. It takes all the strain out of the user, as well as the rest of the crew, especially if they have to reshoot because of camera shake. Hanging camera men from lamp-posts is frowned upon these days! Have you chosen your presenter with care? They must be able to talk firmly, with authority, while at the same time carry the message effectively. It may pay you, if there are many technical parts, to memorise and rehearse the scene beforehand.

Finally, make the whole thing simple for the common man to understand. Don't be afraid of so-called clever camera shots or gimmicks if it gets the message across. If you are making use of other people's film,

remember that there are such things as royalty payments and recognition, as well as permission beforehand. I have been reliably informed that if you are considering including any music, then it would be wise to think again, as the royalties on any score can be colossal.

I will not deal with editing as each case will have to be reviewed individually. It depends upon the film or video used and whether actual cut and splice facilities are available (in the case of film, for you cannot cut and splice video). However, if you have spent an appreciable amount of time and money on producing your masterpiece then it would pay you to either hire an editing machine or employ someone to do the job properly. Why lose the ship for a halfpenny worth of tar? As you can see, this is one thing I cannot help you with. You will really have to use your imagination with this subject.

The rest is up to you! I hope that these notes have been of use. Don't be afraid, whatever you do. Try to enjoy it, as the experience is a marvellous thing to savour. I hope you have fun and enjoy some better lectures and films in the future. I shall be listening and watching!



# 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 changed 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)).  
**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. 10,14 Jane TBA, 14,28 Feb ditto.  
**Maxwelltown ARK.** C Rogers GM4NNC 0387 721070 Rear of Lincluden Inn, Abbey Lane, Lincluden, Dumfries. 1,3 Weds etc. Morse, RAE training, contact Sec.  
**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.  
**Bishop Auckland ARC.** Peter Fawcett G0FBK Bishop Auckland 606819. Most Thurs.  
**Bourne DARS.** Vince Cawthron G4ODG. 0778 422795.  
**Denby Dale DARC.** Darren Chappell G0BWB, 221 Huddersfield Rd., Shelley, Huddersfield HD8 8LJ.  
**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; Jan 16, Mountain Rescue, Peter G6CNL; Feb 20 Junk/surplus sale, 1 Tue "noggin and natter" informal.  
**Hornsea RC.** Jeff G4IGY. 0964 533331. The Mill, Atwick Rd., Hornsea. 8pm. Jan 10 Annual Dinner; Jan 17 Committee; Jan 24 The wonderful world of Wireless, Jeff G41G; Jan 31 Natter; Feb 7 Plaisance to Mr Pleasant by land, sea and air, Harry G7DNN; Feb 14 QRP setting up and operating Dave G0DEB; Feb 21 Natter; Feb 28 Open forum; Mar 7 Home construction.  
**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.  
**Leeds DARS.** G1EBS. 0274 665355.  
**Loughborough ARC.** Philip. 0509 412043.  
**Maltby ARS.** K Johnson G1PQW. Rotherham 814135. Fris Hellaby Hall, Hellaby.  
**Mansfield ARS.** J M Coates G4GYU. 0623 27257. Fris Jan 18 Test gear Feb 1. Homebrew evening, bring projects finished or not, Feb 15 Fire prevention officer; Mar 1 Junk sale.  
**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. Jan 17 Annual dinner.  
**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. Feb 13 The QSL Bureau, P. Storey G0BDF; Mar 6 RSGB RLO Region 3, J L Hopwood, a visit. Other evenings, bring projects.  
**Scarborough ARS.** I G Hunter G4UQP, 46 Station Rd., Scalby, Scarborough, N. Yorks. 0723 376847.  
**Sheffield ARC.** M Sables. Sheffield 886083. Mons Firth Park Pavillion, Sheffield.  
**Sheffield Packet Group.** P Green, 6 Yews Close, Worrall.  
**Spalding ARS.** Terry G4TWR. 0775 2940.  
**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. Tyneside Amateur Radio Rally (formerly Blue Star Rally) will be held on Saturday 3rd March at High Gosforth Park (Newcastle Racecourse) from 11am. Talk-in and usual attractions. Terry G6VEE 091 264 8196.  
**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 G0DZX. 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.  
**Carlisle DARS.** Roy G0HNQ 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.  
**Chester DRS.** Dave 0244 336639.  
**E. Lancs ARC.** Stuart 0227 68913.  
**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 ARC.** Via Weds Kirkby Sports Centre, 17 Valley Rd., Westvale, Liverpool 7.30.  
**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 G0CXT 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. Meetings:  
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. Thank you, Pete.

**Todmorden DARC.** E. Tyler GOAEC. Halifax 882038. 1,3 Thurs  
Queens Hotel, Todmorden. Jan. 15 Talk TBA Des G3JWN. Feb  
6 AGM.

**Warrington ARC.** Paul G0CBN. 0925 814005.

**Wirral ARS.** A Seed G3FOO. 051 644 6094. 1,3 Weds 7.45 Ivy  
Farm, Arrowe Park Rd., Birkenhead.

**Wyre ARS.** Ian Broadbent G0KMT. 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.

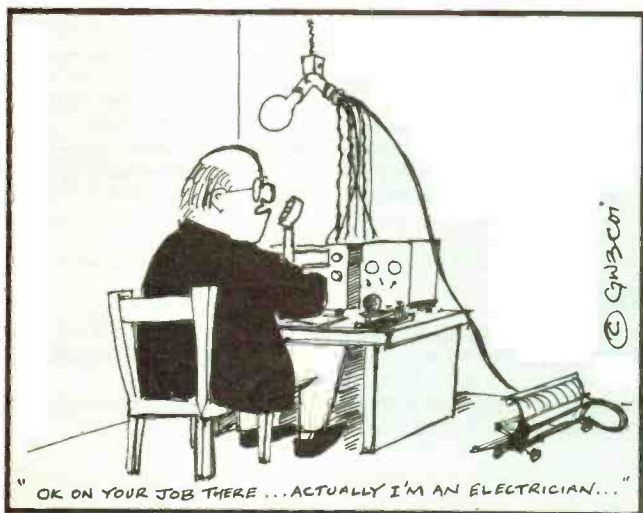
**Delyn RC.** Stephen Studdart GW7AAV. 0244 819618. Daniel  
Owen Centre, Mold, Clwyd. Alt Tues.

**Holyhead DARS.** D Richards, 5 Queens Park Court, Holyhead,  
Gwynedd. Forrester Arms, Kingsland Rd, Holyhead 2,4 Suns,  
7.30.

**Newport ARS.** GW7BSC. 0633 62488.

**North Wales:** Clwb Radio Amtatur 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.



## THE MIDLANDS

**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. 2 Tues  
sometimes 3 Tues as well ring for details. Thurs natter. BBC  
micro night last Mon. Unit 16, 60 Regent Place, Hockley  
(Jewellery Quarter), Birmingham. 7.30 Morse tuition Weds,  
7pm Raynet. 4 Tues 16 June sale; Feb 20 Project night  
G6DRN; March 20 WAB by G6OV (provis).

**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.

**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. Jan 23 Packet  
radio. A toe held S A Tompssett, Rugby; Tues 7.30; Jan 23  
Packet radio. A toe hold S A Tompssett G8LYB. Other nights:  
bring projects, etc.

**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.

**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 G0EYO 021 430 7267.

## SOUTH WEST ENGLAND

**Axe Vale ARC.** Pat Cross G0GHH. Balls Farm Cottage, Musbury  
Rd., Axminster.

**Bath DARC.** Howard G6EYI 0225 428010.

**Blackmore Vale ARS.** Stuart Brunton G0EXI. 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. Jan 10 HF Activity; Jan 17 Rally planning. Dave  
G4WUB; Jan 24 Soldering iron evening; Jan 31 Lundy  
Expedition planning. Bob GOLHD.

**Evesham, Vale of, DARS.** John G3DEF. Evesham 6407. 1 Thurs  
7.30pm, MEB Club, Community Centre, St. David's Hill, Exeter  
7.30.

**Exeter ARS.** R. J. Donno QTHR. Community Centre, St. David's  
Hill, Exeter. 7.30pm. 2 Mon. Jan 8 Data modes for radio Ray  
G3YBK; Feb 12 Video evening; Mar 12 Doingit on the cheap.  
Theo G3EQM.

**Launceston ARC.** M. Caldwell 040921 219. 4th Radio Rally April  
8 1990 More details later in year.

**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.

**Poole ARS.** G0EQV 0202 674802.

**Salisbury RES.** Neil 0980 22809.

**Salop ARS.** Fred Hall G3NSY. 0743 790457. 2,4 Thurs, The Olde  
Bucks Head, Frankwell, Shrewsbury 8pm.

**Stratford Upon Avon DARS.** A Beasley G0CXJ. 060 882 495.  
7.30 Baptist Church, Payton St., Stratford Upon Avon.

**Taw and Torridge Rally.** Feb 25, BAAC Hall, The Pill, Bideford.  
From 10.30. Trade, bring and buy, bar, refreshments. G0GFK  
02372 76401 or G0AYM 0805 23776.

**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.

**Tiverton Radio Club.** Mid Devon Rally, pannier market, Tiverton,  
10am. Free parking, talk in, refreshments. Trade stalls by  
invitation only. G4TSW, PO Box 3, Tiverton, Devon EX16 6RS.

**Torbay ARS.** G3NJA, G8HJA. Walt G3HTX. 0803 526762. ECC  
Club, Ringslade Rd., Nr. Highweek. Club nights Fris 7.30. Jan  
12, 26 Club nights; Jan 19 Construction competition judging.

**Trowbridge DARC.** Ian Carter G0GRA. 0380 830383. Most 4  
Weds, 8pm, TA HQ, Bythesea Road, Trowbridge.

**Yeovil ARC.** David Bailey G1MNM, QTHR. The Recreation Centre,  
Chilton Grove, Yeovil. 7.30pm, Thurs. Jan 11 Home  
construction techniques G3PCJ; Jan 18 Using homebrew test  
gear G3PCJ; Jan 25 Natter; Feb 1 Discussion. QRP  
Convention 13 May 1990, more details nearer the time.

## SOUTH EAST ENGLAND

**Aylesbury Vale RS.** Martyn Baker G0GMB. 1,3 Weds 8pm (July,  
Aug 1 Wed only). Hardwick Village Hall (A413 N of  
Aylesbury); 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 G0EYM. 0234 244506. 3 Tues. Victory



- Social Club, Kechill Gardens, Hayes. 7.30. 3 Tues. Jan 16 AGM.
- Biggin Hill ARC.** Geoff Milne G3UMI 01 462 2689. The Victory Social Club, Kechill Gardens, Hayes, Middx. 7.30: 3 Tues. Jan 16 AGM.
- Braintree DARS.** M Andrews 0376 27431. Braintree Community Association Centre, Victoria St. 7.30pm, 1,3 Mons. Club net C6BRH or G4JXG, 2m 2,4 Mons, 8pm.
- Bredhurst RTS.** GOBRC, G7BRC. Kelvin Fay 0634 376991. Feb 24 **Rainham Radio Rally, Parkwood Community Centre, Deanwood Drive, Rainham, Gillingham, Kent. 10.15 to 4pm.** Trade, bring and buy, snacks. Talk in S22, SU2. Bob GOLKE 0634 362154.
- Brighton DARS.** Peter. 0273 607737. 1,3 Weds, Roast Beef Bar, Brighton Racecourse, Elm Grove, 8pm.
- Burnham Beeches RC.** G6EIL. 0628 25720.
- Cambridge DARC.** D Wilcox. 0954 50597.
- 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. Jan 17,31; Feb 14,28 Natter; Jan 10 Indoor antennas; Dereck G3LXP; Jan 24 DXpedition. Roy GRUNL and Peter GOKIU. Feb 7 Computers, databases and examples. Ian GOKLU. Feb 21 Modifying PMR equipment for amateur bands, John G3WFM.
- 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.
- 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.** Des Edwards 0304 203073. Dover YMCA, Godwynehurst, Leyburne Rd., Dover, Kent. Weds.
- Dunstable Downs RC.** Tony Kelsey-Stead 0582 508259. Room 3, Chews House, 77 High St. South, Dunstable, Beds. Fris.
- Eastbourne EARC.** G1BRC 0323 29913.
- East Kent ARS.** Stuart 0227 68913.
- Edgware DRS.** Ian Cope G4IUZ, 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.
- Felxtowe DARS.** G4YQC. 0473 642595.
- Gosport: Submarine ARC.** Open to submariners, ex-submariners. RNARS. HMS Dolphin, Gosport, Hants. Write to Keith Bricknell GOMII, 1 Walker Place, Gosport, Hants PO13 0LU with SAE.
- Grafton RS.** Rod Harrigan GOJUZ. 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. Jan 17 M16 and pirate radio on the Thames, T. Aldbury; Feb 21 Wire aerials for the beginner 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. Merchistown Hall, London Rd., Horndean, Portsmouth, Hants, 7.30, 1 Thurs. Feb 1 Brains trust; Mar 1 Pathfinders part 2 G3VPO.
- 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, Coneygeare 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.
- Loughton DARS:** J D Ray G8DZH. 01 508 3434 (ev); 01-5083434 Micronet 800 mailbox, TeleGold 74:MIK1824; packet G8ZDH at GB7ESX. Room 14, Loughton Hall, Rectory Lane, Loughton 7.45pm. Fris.
- Maidstone YMCA ARS.** GOBUW. 0622 20544. YMCA Sports Centre, Melrose Close, Maidstone, Kent. Fris 8pm.
- Mid Sussex ARS.** G0GMC. 07918 2937.
- Milton Keynes DARS.** Mike GOERE. 0234 750629.
- Norfolk ARC.** Craig Joly GOBGD 0603 485784 QTHR. Norfolk Dumpling, the Livestock Market, Hall Road, Harford, Norwich. Weds 7.30.
- Northampton RC.** D J Linnell G7CMA 19 Beech Av., Northampton. Kingsthorpe Community Centre, Thornton Hall ("Kingsthorpe Hall"), Thornton Park, Kingsthorpe, Northampton, near A508. Thurs.
- Peterborough RES.** Peter G4PNW QTHR.
- 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.
- St. Albans Verulam ARC.** Andy Ince G0BZS, Cottage No 1 Rounton, 28 Nascot Wood Rd., Watford WD1 3SD. RAF Association HQ, New Kent Rd., off Marlborough Rd., St. Albans. 7.30. 2,4 Tues. Jan 9 Activity; Dec 23 Avionics from DC to light, Andy Ince G0BZS.
- Sevenoaks DARS.** Barry Leggett. 0732 741222 ext. 245 office hours. Emergency Control Centre, Sevenoaks District Council Offices, Sevenoaks, Kent. 8pm 3 Mons.
- Shefford DARS.** Tom Stellar G6RCT. 0707 372211. Church Hall, Amphill Rd., Shefford, Beds. 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.
- South East Kent (YMCA) ARC.** Brian Joyner 0304 852533. Dover YMCA, Godwynehurst, Leyburne Rd., Dover. Weds. Jan 10 TVI problems and cure G4HXE; Jan 17, 31 Natter; Jan 24 Early days of television G4ZMQ; Feb 14 Chairman's choice — debate and more GOBPS; Feb 28 Winter project update GOBPS.
- Stevenage DARS.** Pete Daly G0GTE. 0438 724991 1,3 Tues. Ridgeman Training Centre, Telford Av., Stevenage 8pm (7.30 for tuition).
- Sutton & Cheam RS.** John Puttock GOBWV 01 644 9945 3 Fris, natter 1 Mons 7.30 Downs Lawn Tennis Club, Holland Av., Cheam.
- 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.
- Wimbledon DARS.** Nick Lawlor G6AJY. 01-330 2703. 2,4 Fris, St. Andrews Church Hall, Herbert Rd., Wimbledon, London. 7.30. Jan 26 On air; Feb 9 Test your own equipment Nick G6AJY; Feb 23 EGM followed by selection of videos.

## IRELAND

- Armagh and Dungannon DARC.** J Murphy. 0861 522153.
- Carriekfergus ARG.** Geoff Pike G10GDP 09603 66109. Downshire Community Centre, Carriekfergus. Tues 6,70.
- Donegal ARC.** E13BOB. 074 57155.
- Mid Ulster ARC.** Jim Lappin. 0762 851179. 2 Suns.

## NATIONAL AND INTERNATIONAL

- AMRAC.** Phil G6DLJ. 0703 847754.
- British Amateur Television Club.** G8CJS or G8FOZP QTHR.
- British Amateur Radio Teledata Group.** Ann Reynolds G6ZTF, 169 Ball Green Rd, Coventry, Warks CV6 7GW. SAE for information. GB2ATG amateur radio news service transmits on 1 and 3 Sundays, on 3.590MHz, 14.090MHz and 144.600MHz. Operated by volunteers, GB2ATG welcomes amateur radio news for possible transmission, esp concerning radio data activity (RTTY, Amtor, packet, fax, etc.).
- British YL Amateur Radio Association (BYLARA)** G0BIR 0527 79636, c/o Half Way Lock Cottage, Upper Gambold Lane, Stoke Prior, Bromsgrove, Worcs B60 5HB. Occasional meetings.
- International Short Wave League.** Y Blain, 167 Wombridge Road, Trench, Salford, Shropshire TF2 6QA. Journal: Monitor.
- UK FM Group, Northern,** L Loughton, Claremont, Main St., East Ardsley.

# Free Readers Ads!

Please remember to put your phone number or address in the box if you want it in the ad. Free Ads are for private wants and sales only. If you are a trader, please talk to our classified Ad department.

## FOR SALE

**MANY** vintage components, some in original boxes. S.A.E. G3NHU, 2a Halt Road, Gt. Yarmouth NR30 5NZ.

**FOR SALE** President Lincoln. Identical to Uniden 2830 AM FM SSB CW boxed £200 NO HAGGLE. Phone Sunday 0244 821693 covers 26.000MHz to 29.999MHz, can be reduced easily to 10M only.

**PRO-34** h/held scanner. Nicads and charger. 5 months old excellent condition £175 ono. Pro-2021 200 ch scanner, complete with external mag mount aerial £110 ono. Phone 0923 775451 Herts.

**AOR 2002** The market leader current model specifications to be found in any radio magazine, absolutely mint and in original box needs only to be seen and heard £380 buyer collect G6MDV. Phone Derby 675816.

**FOR SALE** Racial R17P receiver + Girkit A.T.U. Immaculate HY-GAIN 2975 DX multi 25.965-28.305 no gaps + 28.155 - 28.645. Three antennas. 150W Linear. 500W matcher + 3BM MIC, SWP meter. Leson T232 desk MIC. No better set-up that I've seen. Genuine ad. £350.00 the lot. Tel: Grimsby 827717.

**MD65** Hobbymat Lathe with cutting tools, machine vice, keys, half inch chuck, three jaw chuck, gears swap 0.1 30mgh AM FM SSB TX or up to 950mgh H/H scanner to the valve of £300 phone Ashton in Makerfield 716762 Mr Noone. **FOR SALE** Plessey 1553 HF receiver solid state digital £275 ono. Buyer collects. Phone 0684 73366 after 2.00pm.

**HW 8 QRP TCVR** professionally built mint condition SWR meter and navy key plus cash for HF rig with

top band. 0484 645923 G Saxton, 16 South View, Scapegoat Hill, Huddersfield HD7 4NU.

**FOR SALE** YAESU 2600 MKII £350 also converter. TV 12in suitable for Speredic "E" 30 meters 70 for above £10 240 volt transformer to 110V 240V-12VDC for radio.

**HOMEBREW** pocketsize frequency counter 600MHz. Very sensitive £40 plus P/P. VHF/UHF version of BC221 covers 85 to 1000MHz. Rare MKI model, with calibration charts, original mains P.S.U., int modulation £40 plus carriage. Tel: 0207 544342 after 7pm. **IC22A** all channels to S20 fair condition £40. Trio 7800 XTAL controller 70cm 1 Watt £40 09552 4157. Postage extra.

**KENWOOD TS 530 5** like new £625. Collins 75 SBB outstanding condition £Offers. RTTY CWR610E very good condition £60. Wanted Drake equipment anything considered. Tel: 0836 681967 anytime.

**TRIO R2000** receiver with 500MHz filter + CD660 tele-reader communications decoder. Original packing and documentation. £475 Chesterfield 0246 854751.

**FOR SALE:** Trio R2000 Comms Receiver, mint condition, very little used, with instruction book, £445 ono. Phone after 6pm, 07374 2095, buyer collects. No cheques.

**SONY ICF2001** synthesised HF receiver. Digital readout, good condition, £120 ono. Tel (Poole, Dorset) 0202 690845. **FT290 Mk1** inc Charger, soft case and helical. £190. Tel. 0234 49402 (Bedford).

**KENWOOD TS520** h/book 2-6146Bs, 2-12Bytas, MC 35S mic, £200. "I Have Worked the World" £200. R109 AT reception set W.D., working order. Service headphones, few spare valves, 6 volt MG car battery. Photo copy handbook £100 (Buyers to collect). 0287-34397, days only. Peter (Cleveland).

**FOR SALE:** Akai 4000DS MkIII reel to reel tape recorder. Will exchange for VHF TNC or

28MHz to 144MHz transverter. Contact David 051 430 8400.

**FOR SALE:** Realistic PRO 2021 200 channel Scanner, five months old, £130; and Scansean ATS 803A SW RX 150 - 30 MHz AM/SSB £70. Tel. 0303 52479, evenings or w/ends. Ask for Chris.

**934MHz DELTA 1**, mike, boxed, just serviced £250; also 2x Reftec 934MHz sets, gwo, but need Realigh, £80 pair; Sony stereo cassette recorder, model TC525, shoulder strap, mike, mains/batt, twin meters, £75. Write, Ian, The Dormouse, Bush Estate, Eccles-on-Sea, Norfolk NR12 0SX.

**COBRA 148** converted 29MHz £100; Zetagi B300P mobile amp, 3.5 to 30 200 pep, £80; Belcom linear 2m SSB with eight element yagi £40. Telephone Livingston 32868, after 7 pm. Bob GMOLEY.

**R1155A** working, plus power pack, exchange for AR88. Write to Nigel Prince, 3 Old Farm Road, Crosby, Merseyside LZ3 2RZ.

**FOR SALE:** QQVO 3.10, new £10; QQVO 3.20A, new £20; QQVO 6.40A, new £30. Tel.

0787 280259.

**FOR SALE:** Yaesu FT77 HF, all mode transceiver, FC700 Atu, FP700 Psu. Vgc, no split, £575 ovno. Phone Dave on Bookham 59653, after 6pm.

**OSCILLOSCOPE** Heathkit Daystrom range 10KC/S-500KC/S, weight 23lb, with instructions, still works. £15. Tel. 0252 871300.

**AEA PACKET PK80** x PM1 1200-300 baud, s/ware Eprom BBC B, manuals, all leads, plugs etc. ICS AMT1 rtty, amtor, cw, Rx Tx, manual, software Eprom BBC B and CBM64, all leads, plugs etc, sell £250 lot. After 5pm. Tel 0554 757860.

**YAESU FT290R**, boxed with nicads, mic, cse, strap, Cirkit 25w linear, psu and jaybeam 10XY, £250. Mutek TVVF50C high performance 6m transverter £125. G1XYE QTHR 0603 426649.

**FOR SALE:** Pye Europa UHF (OK for 70cm conv) £50 or swap high band VHF Europa. Also T414/R414 UHF; Pye PF2 H/HS; Storno 600 high VHF. Call for details, offers? 010 35351 79150 (Rep. Ireland).

**FOR SALE:** Black Jaguar BJ200 Mk3 computerised

## CHRISTMAS MESSAGE: GREETINGS FROM HRT

Answers to last month's Christmas Crossword

D	A	S	H	I	N	G		T	O	R	O	N	T	O
E	M	S		O	E	E	I	B						
L	O	A	D	S		L	A	N	D	L	I	N	E	S
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O	N	U		I	T						E	P		
P	O	S	T	M	A	N		S	P	O	U	S	E	S



pocket scanner, frequency range 17.5 to 30MHz, 48.5 to 98MHz, 105 to 180MHz, 200 to 315MHz, and 350 to 560MHz, AM and FM modes, as new. £170 ono. tel. 0665 603627.

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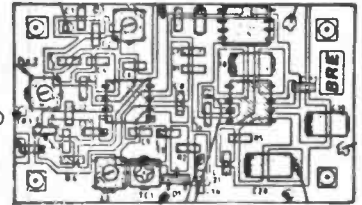
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