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NOVEMBER 1994 £1.80



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a low cost
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YAESU FT-900HF TRANCEIVER



LEICESTER SHOW SPECIAL

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KPC-9612 TNC
reviewed

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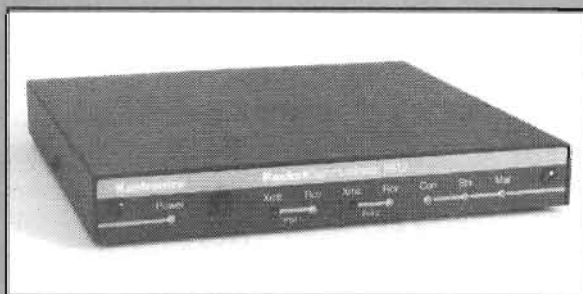
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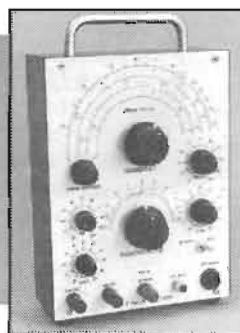
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Project - build a HF receiver


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CQ de G8IYA

Editorial

You've been drowning us with your post, but we don't mind!

HRT's free ham software copying service has been, to put it conservatively, extremely popular! Our disk copying man is certainly being kept busy, and we're very pleased indeed to be providing a service which is useful to HRT readers. Yes, it's going to continue, in fact I think I'll be 'mobbed' if I made any suggestion of limiting it to a certain length of time or number of HRT issues!

JVFAX Version 7

Last month's offering was a bumper 'rig modification' disk plus the Auto Exam 'mock licence exam'. This month I'm offering the very latest version of 'JVFX', version 7 to be precise, which has just been released, and my thanks go to Colin G1YIL for the provision of the original program copy for this service. This is an extremely powerful program, which provides full colour weather satellite FAX reception capabilities, using your PC with just a very simple home-built interface connected to your HF or VHF/UHF receiver. It provides full colour WXSAT overlays which appear on time for the Meteosat images, and you can even add place names, such as your town or areas of interest to you, onto the overlay. It also offers SSTV capabilities, including full colour SSTV plus a number of new modes. As well as the increasing amount of HF SSTV use, I suspect the 2m SSTV frequency on 144.500MHz is going to be getting very busy soon! This program can be used by listeners and scanner owners for receive-only use as well as licensed hams of course, so even if you've just got an FM scanner, or a simple HF SSB receiver, you can join in the fun. The interface you'll need, which plugs into your PC's RS-232 port, can consist of a single low-cost 741 op-amp IC plus just a few discrete components, costing in total no more than a few pounds (or pence, or nothing at all if you've a reasonably-stocked 'junk box'). Full circuit details are provided on the disk, or you can obtain a kit of all parts for the interface at low cost from HRT advertisers such as Badger Boards (Tel. 021 366 6047). This would of course make an ideal novice or club project.

SuperMorse

Together with JVFX, I'm also offering the latest version of the 'SuperMorse' Morse tutor on this month's disk. As well as being a complete Morse code learning aid, teaching you the characters, numbers, and punctuation required for today's 'QSO format' tests, it also provides an unlimited number of randomised sample QSOs for you to practice copying, in readiness for the test. While you're learning, it can test you on groups of letters and learn itself which characters you're having difficulty with, dropping these in more often to make sure you're as proficient as possible! You can vary the word, character, and inter-character spacing, this of course including Farnsworth spacing as used for the 5WPM Novice tests. For those already proficient, you can also use it to improve your Morse speed, far in excess of UK 'test speeds', and even have 'background QRM' superimposed if you wish to simulate on-air use! For example, my Consultant Technical Editor used this very program to brush up his CW to ensure he passed the US 'Extra' licence 20 WPM test, which he did, hence his 'other' callsign of AA0RX! This is the best CW shareware program he's come across to date, it's also on the disk, for you.

Where to get it

In the last couple of issues, we've asked you to send a blank, correctly formatted, 1.44Mb 3.5in disk, plus the 'corner flash' from the magazine's contents page, plus a suitable stamped self-addressed mailer for the return of your disk, to us, with a warning of "no enclosed disk, or disk faulty or not correctly formatted, or no stamped mailer or corner flash, no returned disk". Unfortunately, we've been having a large number of problems with this, with the result of a similarly large number of disappointed readers. For example, why do people ignore this and send 360k 5.25in disks? Or unformatted disks? Or non-blank disks? Or just a return mailing label? We offer so much software each month, it'll usually only fit on a 1.44Mb disk, nothing smaller, even in compressed state! So, after much feedback, here's



an alternative.

We'll provide the disk. **We'll** provide the postage. All **you** need do is tape a £1 coin to piece of card together with your name and address and the corner flash from this month's contents page. This will cover the cost of a 1.44Mb formatted disk plus return p/p within the UK to you, which you'll receive packed full of software. Does this sound better? Your phone calls have already told us it does! Overseas readers may send either 5 IRCs or two US\$1 notes plus one IRC. You can do likewise with last month's corner flash and a further £1 coin if you wish, for last month's software, we'll be pleased to send you both disks. Send to; *Nov 94 HRT Disk Offer, Software Services, 6 Wyre Close, Chandler's Ford, Eastleigh SO53 4QR. Please note this is a mail order only service by a contracted disk supplier.*

Next month, I'm offering a public domain Shortwave database, the *1994 PC HF Spectrum* program, written for UK listeners by a UK software author (GJ4ICD's son, Simon, to be precise!). It includes over 15,000 up-to-date frequencies on a wide variety of HF users such as broadcast, marine, aeronautical, military, and the like, with powerful 'search' and 'edit' facilities. There'll also be something else rather nice included on the disk, of interest to hams and listeners alike, you'll need to read next month's issue to find out!

Next month

I hope you like the reviews and Leicester Show plan I've included in this issue for you. Chris and I plan to be along at the show, to chat with readers in a more sociable area than 'behind a formal stand'. You'll no doubt see us walking around or maybe even in the bar with other readers - so do say 'hello' and join in. We'll be very pleased to hear what you think of the magazine, and what you'd like to see in future issues. Next month's theme is 'Getting started on a budget', and in this I hope to publish the long-awaited MX296 ex-PMR conversion, transforming a low-cost rig into a fully synthesized 400 channel 70cm FM transceiver. HRT's MX294 conversion to 2m was extremely popular, no doubt the 70cm version will be even more so, giving Novices a useful low-cost start.

LETTERS

Letter of the month

Dear HRT,

I noted the letter from Daniel Robinson from Chiswick in the August 94 issue of Ham Radio Today and would like to take the opportunity to reply and explain the problems that are taking place inside London as regards Novice Training. I would also like to raise a few points based on your editorial in the same issue.

I received a telephone enquiry from both Daniel's mother and also from his friend's Father asking about Novice training (in November 93). This was when I had just been appointed as the new Senior Novice Instructor for Greater London. I tried to put Daniel in touch with the only Instructor in West London at the time, but the instructor was unable to run a course for the foreseeable future.

The task of trying to place potential Novices in touch with active instructors is an ongoing problem, as there are currently 23 registered instructors for Greater London. Very few of these are active instructors due to work commitments, and also at times the lack of suitable places to either run a course or to act as examination centres. In February, so that I had an up-to-date record of all the course that had been run over the year, so that the end of the year report could be produced, I sent out a letter to all the instructors (19 at the time) with a SASE. The reply was somewhat disappointing as I only received six replies, and only two of these had run, or were in the process of running, courses. There have been some new instructors for the Greater London area join the scheme since then, and there are currently six active instructors (two of whom work with me), but unfortunately none in Daniel's part of London. I am hopeful though that Martin Lynch might soon have a course running at his shop.

I do not like telling potential Radio Amateurs that there is no course in their area. If I was to travel across London to fill all the gaps, I could end up running courses every evening of the week. As it is I am currently

running a course which is fully booked. Some of the course members who do have transport facilities, travel over thirty miles round trip every week to attend the class. The next course that I have planned was fully booked up in May. So, what am I trying to do to get more instructors?

I am currently spending time trying to visit all the clubs across London to explain informally about what running a Novice Class entails, and trying to see if there is any interest. I have also offered to anyone who is interested in becoming an instructor, the opportunity to sit in on one or two days in the course and assist, or even to join me for a complete course and act as an assistant instructor, so as to gain experience. I am also seeing if it is possible to arrange a meeting of all Novice Instructors and potential Novice Instructors in the Greater London Area, to try and sort out problems. I have started a six-monthly news sheet which I am circulating to all the instructors with hints etc. (at my own cost). Now all I can do is hope for volunteers to apply to become instructors (if anyone has any constructive ideas on what else I can do, please contact me).

I also spent two days at the London Show running the WAB stand (another of my interests in Amateur Radio) and answering questions about the Novice Scheme and also a day and a half at the Radio Days Exhibition at Kings College London, helping to answer questions on the Novice Scheme.

At the Picketts Lock on the Saturday I had some other WAB members look after the stall, so that I had a quick chance to see the show. All that I heard over the tannoy was "G4OBE to information", as there were potential Novices asking questions about the NRAE. I was pleased to talk to and answer most of these people's enquiries, even though it did mean that across the two days, I only spent 20 minutes looking at the show. The one exception, was a person who demanded that I go to their house on a Sunday to teach them, as it was the

only day possible for them to do a course. Also I was told by members of a youth organisation, that it is the duty of all radio amateurs to teach them how to become Novices (could it be some people with this type of attitude have put off the instructors, who of course are all volunteers?).

The comments of "Where are the thousands of Novices if there are all these instructors?", should have been answered by the above. It may be of interest that I am now running my sixth course and have already got the seventh, and eighth courses fully booked. These two will be running virtually simultaneously as there is such a demand for courses in the London area. Where I have previously run courses for the September and March exams, I am now having to change this to run course for December, March and June, so as to avoid a repetition of what happened this year in that I had to alter my summer holiday so as to fit around a Novice class.

Your idea of running the exam in the same way as the FCC exams I do not feel to be a good idea, as it is very open to abuse. I know for example that there are books which can be purchased and give a complete list of all the FCC exam questions, you can pass the exam if you learn all the questions 'parrot fashion', it can be done. Also, would the exam be considered as being impartial, as it would be given by Radio Amateurs for Radio Amateurs, whereas the exam is currently administered by an impartial body (City and Guilds). The only thing I feel lends merit to the idea of a locally taken exam, is to reduce the exorbitant fees charged by some of the approved examination centres. This is where clubs should be encouraged to participate, by providing more facilities to take both the RAE and NRAE at a reasonable cost.

Although I am the Senior Novice Instructor for Greater London, these remarks are my own opinion, and any comments can be addressed directly to me rather than to the RSGB.

Robert Snary, G4OBE

"TONE" BURST



RADIO CLUB ELECTIONS. Part 4

STORY: G7NBP

PICS: G6MEN



Dear HRT,

You must be fed up with me writing and pushing America down your throat, but I must do it again. Commenting on the cost and availability of Novice courses.

I wrote off to the RSGB offering my services as an instructor, I had several Scouts in my troop and district ready to snap up a course. To my dismay, I have to be nearly as well equipped as a college to be able to offer a Novice course. To offer a

course for a full licence, all I need is a blackboard and a piece of chalk. To say the least, I will be teaching slightly older boys for their full licence.

In the US, a prospective Novice can be taught by any amateur. For the test, all he/she needs are two amateurs of General Class or above, to officiate in giving the FCC test in theory and 5 WPM Morse code. This can be done at the home of the novice on an individual basis.

The amateurs giving the exam can pass the Novice and issue a pass slip

at the session. The Novice class is the only class this can be done for, all the rest must attend a VE session. The novice may also take the test at the VE session if they wish.

I know it is early days for the British Novice Licence. America has had a Novice Licence for many years. Perhaps one day we will stop pretending that we do it better (but with 40% pass grades) and take it out of the hands of the City and Guilds, at least for the Novice.

Dennis H. Barber, G0UFS/KB8GC

Dear HRT,

Having heard about the Dayton Hamfest but having no details, I was pleased to find HRT August 94 had an article about it. However, I was put off wanting to visit by the first of the '10 tips' as it tends to give a misleading impression about travel arrangements.

My wife works for a real travel agency, not a high street holiday shop, so it is her to thank for the correct information. Dayton has its own airport and a ticket from

Manchester is £333 (London £311). Accommodation, stopovers, car hire and all insurances can be organized by the travel agent before departure and paid for in £££s.

Thank you for an otherwise informative article.

Mr. A. Skaife G4XIV

Editorial Comment

We've been informed by such 'holiday shops' ('bucket' shops?)

on many occasions that getting to Dayton on a direct scheduled flight from the UK is a rather difficult business, as Dayton only has a 'domestic', i.e. non-international, airport. In the same way, it's rather difficult to fly direct into Friedrichshafen airport from the UK to attend the large annual European Ham radio event there! But, it looks like you know a different side of the story! Thanks for sharing this information with our readers, Tony.

£10 for the Letter of the Month

Do you have something constructive to say on the state of amateur radio today? Perhaps you'd like to put your viewpoint to the readers, get some discussion going, or give an answer to one of the issues raised? We'll pay £10 for the best letter we publish each month. So write in with your views, to Letters Column, The Editor, Ham Radio Today, ASP, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or fax your letter direct to the Editor's desk on 0703 263429. Please keep your letters short, we reserve the right to shorten them if needed for publication. Reader's views published here may not necessarily be those of the magazine

Yaesu FT-900 Review

G4HCL tests a full-featured HF rig complete with remote control head both in the shack and on the road



Yaesu have a well-deserved reputation for producing popular mobile HF rigs. Several years ago, their compact FT-707, followed by the FT-77 and the FT-757, were on the 'wish lists' of many HF band mobile operators. Some still are. I even remember being parked on a hilltop roadside around 20 years ago with my friend Ray G4BEE, operating 'static mobile' using a Yaesu FT-101 from the car's 12V supply, this rig being considered the 'ultimate' for HF mobile use.

As time and technology improved, and the bands grew more crowded, amateurs tended towards higher performance transceivers built specifically for base station use, and mobile operation often got the 'elbow'. You probably wouldn't consider fitting an FT-1000 under your dashboard! But there's an answer with the FT-900. This compact rig has been designed using 'base station' circuitry, from the FT-890 to be precise, but with the facility for remote mounting of the transceiver up to 6m away with just a small control panel present at your operating position. Keep the rig in your car boot, for example, out of harm's way (and the eyes of others). Or maybe in your shack but operate the set from your nearby lounge armchair - a novel way to keep an ear open for that DXpedition and not miss the cosy open fire in winter!

Facts and figures

The FT-900 gives you 100W transmit power on SSB, CW and FM, with 25W on AM, across the HF amateur bands plus general coverage receive facilities over the range 100kHz to 30MHz. For QRP use, or to save your car battery from untimely flatness, you can reduce the transmit power as needed using a front panel control. But what's novel about the FT-900 of course is the quickly detachable front sub-panel, which allows you to control the set remotely, up to 6m away which is the length of the optional remote lead.

The transceiver uses a Direct Digital Synthesizer (DDS) system, and with its front panel flywheel-weighted knob it can tune in steps right down to 2.5Hz - indistinguishable from analogue VFOs of earlier days and superb for data and even SSTV use for 'spot on' tuning. Two such digital VFOs are fitted with 100 memory channels provided on each, these storing frequency, mode, TX/RX split, clarifier on/off, and wide/narrow IF filter selection. You can if you wish 'tune away' from your stored memories using the main knob or the mic up/down buttons, which is quite a versatile 'alternative' to the usual band change function. Added

to these are ten further memories which let you limit the set's tuning/scanning ranges between their stored frequencies, which could be very useful for mobile applications as well as shack use in searching a quiet band.

An optional internal automatic ATU (Aerial Tuning Unit) may be controlled from the set's front panel, the ATU itself having 31 memories which store the last used tuner settings for quick tune-up after a frequency or band change. This was fitted to the review model I tested, there's also an optional remotely mounted ATU available, the FC-800, which can also be controlled from the FT-900's front panel.

IF shift and notch controls are built in as QRM-fighting measures, and a switchable 'IPO' function can be used to bypass the receiver front end amplifier when needed during strong signal conditions. A further switchable 12dB receive attenuator is fitted for those with monster aerial systems! Added to these are a noise blanker, audio speech processor, and an all-mode squelch, and an adjustable IF offset even lets you tailor the set's SSB audio response to your voice characteristics. Round the back of the set are controls for SSB VOX gain, delay and so on. The front panel display S-meter is a multi-function bargraph affair, giving readings of receive signal strength, and transmit power, ALC, and SWR. A 'peak hold' facility may be selected for this, where the maximum level 'dot' on the display is held for a couple of seconds to give a peak reading. The receiver AGC may be switched to either 'fast' or 'slow', but apart from the IPO and attenuator switches there's no RF gain control facility. For 10m FM addicts (as well as for transverter users) a CTCSS sub-tone encoder is built in for FM repeater access. CW enthusiasts are well catered for with a built-in electronic keyer, with front panel controls for speed, weight, and full/semi break-in. There's also a variable BFO offset to suit individual preferences (or for TNC users for optimum data decoding), plus a 'reverse sideband' facility which lets you shift the receiver's CW carrier point to help sidestep interference.

Internal IF filters are fitted giving

2.2kHz bandwidth on CW and SSB, 6kHz on AM, and 8kHz on FM. Optional narrower 250Hz and 500Hz CW filters are available, plus a slightly wider 2.6kHz SSB filter for either wider SSB or narrower AM receive use. A CAT (Computer Aided Transceiver) facility is built in, which allows you to couple the set up to your computer's RS-232 port via an optional interface, the supplied manual giving you full details on the various control codes required. If you don't fancy writing your own program, there's a array of 'off-the-shelf' programs available from non-Yaesu sources, including some PC programs which automatically tie in the rig's operation with your computer logbook and 'real time' DX Packet Cluster data. A further plug-in option for the FT-900 is the DVS-2 Digital Voice Recorder, which records the last few seconds of received audio for when you miss that vital DX signal report, as well as giving a transmit audio store facility (CQ contest, CQ contest....).

The set measures 238mm x 93mm x 253mm and weighs a reasonably light 5.3kg, and comes supplied with a fist mic with up/down and fast tuning buttons and a high/tone 'tone' switch, various connectors for the rear panel facilities, a user manual complete with full circuit diagrams, and a heavy duty DC lead. The set needs an external 13.8V DC supply, requiring up to 20A for full power operation. This can be from your existing shack or car supply, or from something like the optional FP-800 AC mains power supply which matches the FT-900 for shack use.

On the air

After unpacking the set and placing it on my shack table, it certainly didn't look like a 'mobile-capable' set at all, appearing very much like a high-tech base transceiver instead. After connecting my aerial system and having a good tune around, I found it acted like one as well, even on my favourite bands such as 80m and 40m - the latter being particularly notorious for needing good signal handling performance during the evening hours! This didn't mean it was just 'deaf' either, this morning for example I was hearing a rather weak ZL at 100% copy on a regular 80m UK morning net, when at least one other UK station in the net was hearing nothing at all of him. No doubt the set's good selectivity,

coupled with the IF shift and notch facilities, helped somewhat, and no I *didn't* have an additional DSP filter in line! Tuning around using the set's large VFO knob was a pleasure, and I quickly learned to make good use of the memories to act as a 'starting point' for my various operating interests, on both the amateur bands and for SWL use.

So, my initial thoughts were that the receiver's quite sensitive, and doesn't get overloaded, what else? What about the transmit side? In the shack, powered from my external 13.8V supply it handled itself quite well, with good audio reports on SSB from the supplied mic. Switching in the built-in audio speech processor however gave a few adverse reports, although this didn't seem to increase the overall 'spreading' of the signal by very much. Data use was a compromise, and although the IF shift and notch facilities were useful I'd have wished for a narrower bandwidth filter to help with QRM, this cannot unfortunately be used in AFSK mode even if the optional 500Hz filter is fitted. Another slight 'grumble' was that the rear panel data In/Out and TX connections didn't disable the mic, which I had to plug and unplug each time I wanted to switch modes. Even with the subsequent extended transmit time on data, the transmitter remained reasonably cool. Although I rarely needed to use the internal ATU with my band-resonant station aerials, I did find this handy at 'band edge' frequencies to keep the SWR presented to the set down, which I'm sure helped in keeping the transmitter behaving that much better.

Going mobile

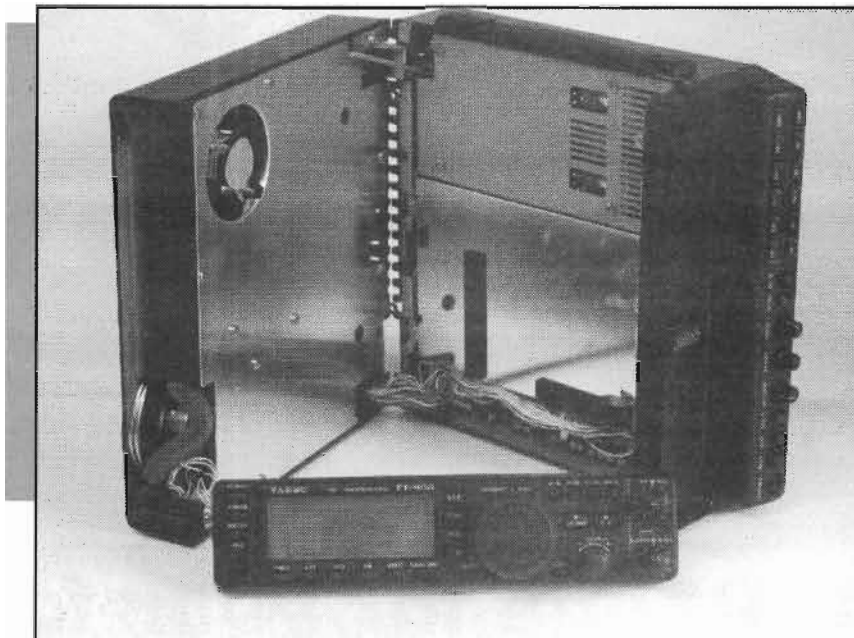
Out came the car, the G-whip suitably fitted, and G4HCL/M went on the air over several hundred miles worth of roads with the set. Yaesu (UK) had provided the optional separation kit, consisting of a 6m lead with the appropriate connectors fitted at each end, mounting brackets for the rig itself, and a neat clip-on plastic mounting bracket for the remote sub-panel (a further optional gooseneck type sub-panel mounting bracket is also available). So the set went in the back with the sub-panel unit mounted on top of the dashboard, giving minimum eye-travel distance between the display and the road ahead, without obscuring any of the windscreen. This gave rig control and remote mic facilities, but I found that I also had to add an extension speaker and suitable lead - whoops - out came the soldering iron! To save 'voices from the boot', Yaesu provide a small switch on the set's bottom panel to mute the set's internal speaker, which I must confess to forgetting about at first (read the instruction manual, Chris!). A few of the set's front panel controls are not on the remote sub-panel, for example the mic gain, transmit power, and CW keyer controls, although to be fair these would possibly be a hinderance rather than a help when mobile. The one-touch 'band select' buttons also stayed on the set's main panel, however I found the sub-panel's 'up/down' buttons acted as band change controls here.



On the move, the mic-mounted up/down buttons were great for starting an automatic 'search' of what was around the bands - the set tuning itself up or down from a given start frequency or memory until I pressed one of the mic buttons again. The 'band segment memories' were invaluable, here the set didn't eventually 'slide off' the end of the band on receive as would otherwise happen. I could even set these segments to the SWR limits of what my LF mobile whip (with its narrow 80m bandwidth for example) was adjusted to at the time, so the FT-900 would just tune around that section - even better! I had plenty of mobile contacts using the set, including many 'ragchews' on 80m. I must say this was one of the nicest-to-use mobile rigs I've come across to date, my only grumble was the relatively small receive volume control knob which I often found fiddly to use. The mic connector fitted is one of the now-common 'telephone plug' types, which I've found in the past to be extremely robust in use. Some operators bemoan the fact this type of plug is becoming common on amateur transceivers, but you can now very easily purchase suitable types 'off the shelf' for wiring up mobile hands-free mics or shack accessories.

With the transmitter putting out a potent signal with its 100W, the receiver was again sensitive enough to pull out weak signals. I found the noise blanker, surprisingly, very effective against the electronic ignition hash the Editor's 'hot hatchback' put out - which made operation on the move much less ear-straining. The auto-ATU was often quite handy in pulling that bit more operating bandwidth out of my mobile aerial system. Although naturally the aerial's radiation efficiency reduced here when used off-resonance, I could at least use the rig with full power output rather than have the rig's protection system shut the power down. Of course, I could always stop the car and re-adjust the aerial, or maybe better still use a long straight whip with instead the optional remote FC-800 ATU also controlled by the FT-900, fitted right at the bottom of it.

All in all, I was very pleased with the set, I was still even using it mobile on the way to Yaesu (UK) to give it back to them!



Insides

The receiver front end uses a pair of 2SK125 FETs in parallel, followed by an active double-balanced FET mixer using no less than four 2SK125's. Receiver IFs of 70.455MHz and 455kHz are used, with a notch IF of 8.215MHz, and a total of four microprocessors control the various operating 'bells and whistles'. On transmit, an internal thermally-switched fan comes into play with a 'duct-flow system of forced air cooling through the PA heatsink, and incidentally through the internal ATU if fitted before it's passed to the PA. This means a physically smaller heatsink does the job, which keeps the set's weight and size down that bit more.

Lab measurements

The figures say it all, the receiver performance was quite good all-round. I found that although the IPO facility improved the strong signal handling capability in 'microvolt' terms, this shifted the dynamic range limits upwards, the actual dynamic range in terms of dB difference staying about the same. However, it remained very good, it did effectively cope with strong signal overload, and I found no such problems on air, so I shouldn't complain! Interestingly, the IF and image rejection degraded with the IPO enabled, possibly due to the bandpass filtering also being switched out.

On transmit the harmonics were well suppressed, and a quite 'clean' signal was measured with a two-tone test input apart from when the speech processor was in use when, as to be expected, the IMD products started to degrade somewhat

Conclusions

It's often been said that 'you can't squeeze a quart into a pint pot' (or should that now be a litre into a half-litre jug?). The same could be true of radio gear - witness the recent miniaturisation in dual band VHF/UHF handhelds, often full of bells and whistles but having relatively poor RF performance. The FT-900 gives at least the on-air performance of a good mid-range HF base station, but with the unique capability of easy mobile operation. It offers plenty of useful facilities for this, including an internal auto ATU and a relatively tiny control panel which can be mounted very conveniently, complete with operating features normally only found on 'top of the range' HF base rigs. Both mobile and in the shack, it gave a good account of itself on air, overall I was extremely pleased with it.

The FT-900 is currently priced at £1299 for the basic version and at £1499 for the auto-ATU version, with the optional separation kit at £39.00, and my thanks go to Yaesu (UK) for the loan of the review equipment.

LABORATORY RESULTS:

RECEIVER;

All measurements carried out in SSB mode, with attenuator and IPO off, unless stated.

Image Rejection;

Increase in level of signal at the first IF image frequency, and the 1st IF itself (70.455MHz), over level of on-channel signal, giving identical 12dB SINAD signal, bracketed figures measured with IPO enabled;

Freq. MHz	Image Rej.	IF Rej.
1.8	97.7dB (87.5dB)	100.2dB (88.8dB)
3.5	102.2dB (97.7dB)	>110dB (91.5dB)
7.0	>110dB (90.4dB)	>110dB (92.5dB)
10.1	>110dB (89.7dB)	>110dB (90.9dB)
14.0	>110dB (87.8dB)	>110dB (89.0dB)
18.1	108.9dB (88.6dB)	>110dB (89.3dB)
21.0	>110dB (90.0dB)	>110dB (89.3dB)
24.9	109.2dB (90.5dB)	>110dB (89.3dB)
28.5	93.2dB (89.1dB)	>110dB (88.0dB)
29.5	102.7dB (89.8dB)	108.9dB (89.8dB)

Sensitivity;

Input level in μV pd required to give 12dB SINAD, bracketed figures measured with IPO enabled;

Freq. MHz	SSB/CW	AM	FM
1.8	0.22 (0.58)	0.51 (1.14)	-
3.5	0.14 (0.41)	0.37 (0.96)	-
7.0	0.13 (0.40)	0.34 (0.87)	-
10.1	0.19 (0.44)	0.37 (0.93)	-
14.0	0.13 (0.40)	0.34 (0.89)	-
18.1	0.14 (0.41)	0.34 (0.89)	-
21.0	0.13 (0.40)	0.32 (0.85)	-
24.9	0.14 (0.43)	0.37 (0.97)	-
28.5	0.14 (0.44)	0.35 (0.98)	0.19 (0.47)
29.5	0.15 (0.44)	0.36 (0.94)	0.20 (0.49)

3rd Order Intermodulation Rejection;

Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product, measured at 21.4MHz;

	IPO Off	IPO On
50/100kHz spacing;	90.4dB	87.3dB
100/200kHz spacing;	89.4dB	87.1dB

Blocking;

Measured on 21.4MHz as increase over 12dB SINAD level of interfering signal, unmodulated carrier, causing 6dB degradation in 12dB SINAD on-channel signal;

	IPO Off	IPO On
+/-50kHz;	104.4dB	104.4dB
+/-100kHz;	107.1dB	106.5dB
+/-200kHz;	107.9dB	107.7dB

Selectivity;

	SSB/CW AM	
-3dB	2.10kHz	6.40kHz
-6dB	2.53kHz	8.00kHz
-20dB	3.07kHz	9.90kHz
-40dB	3.44kHz	11.90kHz
-60dB	5.13kHz	14.40kHz

S-Meter Linearity

Measured at 14.25MHz;

Indication	Sig. Level	Rel. Level
S1	1.28 μV pd	-29.7dB
S2	1.39 μV pd	-28.9dB
S3	1.61 μV pd	-27.7dB
S4	2.14 μV pd	-25.1dB
S5	3.07 μV pd	-22.0dB
S6	5.04 μV pd	-17.7dB
S7	8.72 μV pd	-13.0dB
S8	16.7 μV pd	-7.3dB
S9	39.0 μV pd	0dB ref
S9+20dB	549 μV pd	+23.0dB
S9+40dB	4.67mV pd	+41.6dB
S9+60dB	33.8mV pd	+58.8dB

S-Meter S9 Level;

Freq. MHz	Sig. Level
1.8	56.8 μV pd
3.5	49.6 μV pd
7.0	45.7 μV pd
10.1	45.4 μV pd
14.0	41.2 μV pd
18.1	42.6 μV pd
21.0	42.9 μV pd
24.9	50.5 μV pd
28.5	54.1 μV pd
29.5	56.0 μV pd

Harmonics;

Freq. MHz	2nd	3rd	4th	5th	6th
1.8	-87dBc	-66dBc	-88dBc	-73dBc	-86dBc
3.5	-82dBc	-72dBc	<-90dBc	-75dBc	<-90dBc
7.0	-76dBc	-65dBc	<-90dBc	-80dBc	<-90dBc
10.1	-66dBc	-56dBc	<-90dBc	-86dBc	<-90dBc
14.0	-63dBc	-73dBc	<-90dBc	-85dBc	-84dBc
18.1	-61dBc	-73dBc	-88dBc	-79dBc	-80dBc
21.0	-69dBc	-70dBc	-79dBc	-76dBc	-72dBc
24.9	-61dBc	-71dBc	-80dBc	-72dBc	-76dBc
28.5	-64dBc	-72dBc	-71dBc	-69dBc	-71dBc
29.5	-64dBc	-73dBc	-70dBc	-68dBc	-72dBc

TRANSMITTER;

TX Power/Current Consumption;

Connected to stabilised 13.8V DC using supplied DC lead

Freq MHz;	Power;
1.8	99W (17.8A)
3.5	104W (17.7A)
7.0	103W (16.0A)
10.1	103W (17.0A)
14.0	104W (18.4A)
18.1	113W (17.5A)
21.0	112W (17.1A)
24.9	112W (17.0A)
28.5	113W (18.7A)
29.5	113W (18.8A)

SSB IMD Performance;

Measured with 100W PEP on 14.25MHz with a two-tone AF signal, results given as dB below PEP level;

	3rd Order	5th Order	7th Order	9th Order	11th Order
<i>ALC Onset</i>	-32dB/ -29dB	-45dB/ -40dB	-49dB/ -49dB	-61dB/ -57dB	-63dB/ -70dB
<i>Mid ALC</i>	-30dB/ -27dB	-43dB/ -44dB	-49dB/ -48dB	-61dB/ -56dB	-65dB/ -68dB
<i>Proc On</i>	-19dB/ -20dB	-27dB/ -40dB	-44dB/ -51dB	-53dB/ -51dB	-53dB/ -53dB


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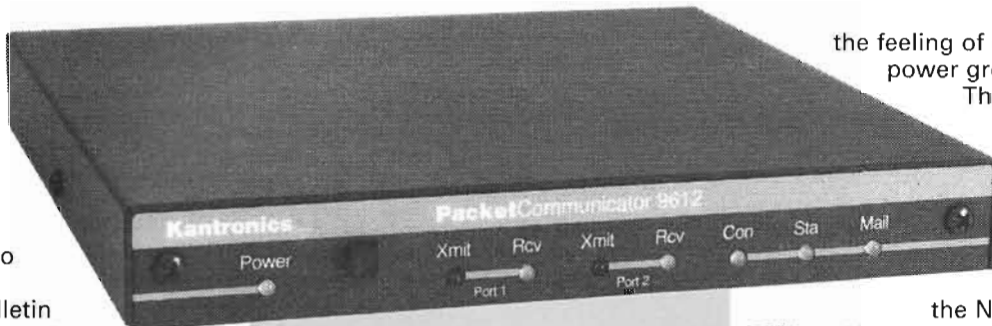
Kantronics KPC-9612 TNC Review

Chris Lorek G4HCL gets the chance to go higher in speed with Kantronics' combined 1200 and 9600 baud packet TNC

With the packet network in the UK, and indeed around the world, becoming busier, many amateurs are looking at ways to get better performance. Bulletin Board Stations seem to be getting a higher number of messages each day, and the 'files' sections on these are growing. It's no fun having to wait for ages to download just a page or two's worth of these message listings, and then hang around even longer trying to download a few selected messages. If you're attempting a file transfer, of a program for example, you often might as well start your computer doing it and then come back a few hours later! Oh, for the 'greener pastures' of higher speeds. How about an eight-times speed increase? That's 4 minutes instead of 30 minutes. You can, with 9600 baud, if your local node, BBS, or other ham packet companion also has the facility. Amateurs active on the digital satellites have been using it for years, with the G3RUH-designed 9600 baud modem which is now a worldwide standard for amateur use.

Upgrades

1200 baud is the 'traditional' terrestrial packet mode, using 1200Hz and 2200Hz audio tones which you can push through your rig's microphone and speaker connections. Easy stuff, few problems here. 9600 baud is a different matter, as you usually need to connect the TNC's modem audio directly into the set's receive discriminator and transmitter modulator circuits. In earlier days, you had to 'delve inside' your rig to modify it for suitability for 9600 baud working. Nowadays, the latest 'off-the-shelf' black boxes often have sockets fitted for this, others such as the FT-2500 have simple instructions on what to link inside to add this. Ex-



the feeling of controlled power great?

The KPC-9612 follows on from the very popular Kantronics KPC-3 1200 baud TNC (reviewed in

the Nov 92 issue of HRT), which indeed introduced their NEWUSER mode. It even looks very similar to the KPC-3, although the KPC-9612 is in fact just a shade larger at 21mm x 158mm x 155mm. The front panel sports 8 LEDs, one for power on/off indication, one each for transmit and data receive status on the 1200 and 9600 baud ports, and common LEDs for *Con* (connect status), *Sta* (transmit packets outstanding), and *Mail* (mail waiting for you in the TNC's internal mailbox storage).

It offers the capability of simultaneous 1200 and 9600 baud use, either with two separate radios, or a single radio with both 1200 and 9600 baud ports connected - the KPC9612 automatically detecting the speed of the incoming signal. The internal 'KA-Node' and software even gives other packet users the facility of a cross-connect 1200/9600 baud 'gateway' using your KPC9612 system.

The TNC also comes with an internal personal mailbox, which offers all the latest forwarding and reverse forwarding facilities to and from your local network BBS, plus remote SysOp access of your TNC. The KPC-9612 comes to the UK fitted with 128k RAM, allowing up to 100k of message storage - useful for when you're expecting a lot of mail in your absence.

Connections

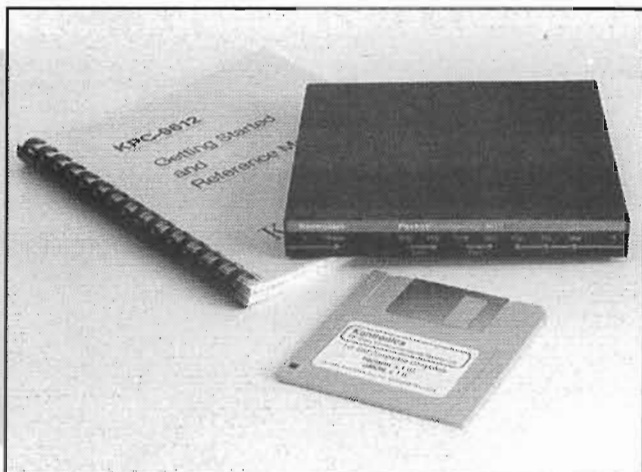
The TNC can run from any DC supply between 6-25V, or even a single 9V PP3 type battery as it can run drawing less than 45mA. Three D type connector are fitted to the rear panel; a 25 way RS-232 connector for your computer or terminal, a 9 way

PMR rig users still need to get inside their rigs for the required connections, but as they've probably already been inside to convert them in the first place this offers little problem.

The other limitation has been the need to add a 9600 baud modem to upgrade your TNC, usually making internal modifications to your existing TNC, and then set up the modem for the correct 'eye pattern' using an oscilloscope. This also poses a problem when you want to use 1200 baud occasionally after you've wired 9600 in!

A solution

Kantronics seem to have come up with the ideal answer. A single TNC, which you can use on both 1200 and 9600 baud switching at the whim of a computer command, with separate connectors on the rear panel for 1200 baud and 9600 baud modem audio connections. Plus a single RS-232 connector for your computer or terminal, and a power connector, simple as that. There's also Kantronics' 'NEWUSER' command set to help you get started on packet with a limited subset of TNC commands, rather than the bewildering list many newcomers get faced with. Another computer command to the TNC gives packet experts, and those who've become a bit more proficient after wetting their toes in NEWUSER mode, the facility of all these extra commands. Isn't



connector, wired in common with Kantronics' other 1200 baud TNCs, provided for 1200 baud audio and TX PTT connections, and a 15 way D type for 9600 baud audio and PTT use. No chance here of plugging the wrong connector into the wrong socket, there's even the required connectors at the TNC end supplied to make life that bit easier. Together with the TNC and connectors comes a 3.5in PC disk with a suitable terminal driver program, PACTERM, to get you going, and a comprehensive spiral-bound manual giving step-by-step instructions on not just the TNC but on how to get started on-air on packet for the first time.

Getting going

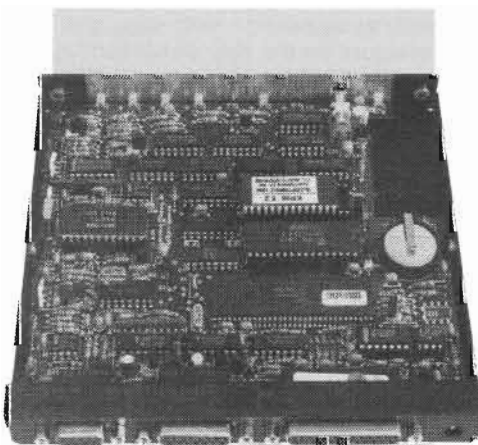
Upon connecting up the leads, loading a simple terminal driver into my computer, and switching the TNC on, it initially came up with an 'auto-baud' routine. Here, the TNC cycles through the various speeds your terminal or computer may be set to. When they match, the text *PRESS (*) TO SET BAUD RATE* magically appears on your screen, at which you press the '*' on your keyboard to set the TNC's speed. After this, the TNC asks you to enter your callsign, again easily complied with. The most common problem I've seen on packet in the past has been signals from 'NOCALL' on air, the user wondering why they can't connect to their local BBS or node. The reason for this is that they haven't read through all the instructions in the TNC manual, which tell them about the callsign command they must use before going on air! Kantronics' initialisation mode sounds most sensible, and should prevent quite a few head-scratching sessions amongst newcomers.

On air

Now comes the radio connection bit. Again, Kantronics have helped by giving details in the manual of the speaker/mic/PTT lead wiring arrangements needed for commonly found 'black box' rigs. An internal potentiometer sets the transmit output

level, which can also be linked for 'high' or 'low' range adjustment level. Likewise for 9600 baud, although here you'll need to refer to your rig's instructions on where to connect what lead. Setting up the 9600 baud side was a bit more tricky, although on transmit a simple 'digi' test with another station could be used. Although I could indeed use an oscilloscope 'eye pattern' on receive (using pins 2 and 12 on the 9600 baud connector), a simple 'adjust for maximum voltage' preset inside the TNC was provided as an alternative. This just needed to be adjusted for maximum DC voltage (around 3V on my multimeter) whilst receiving an off-air 9600 baud signal. Kantronics say this is a more accurate method than the eye-pattern adjustment, I certainly found it easier!

On initial switch-on, the KPC-9612 comes up in 'monitor' mode, receiving off-air packets and displaying them on screen (the command MON OFF disables this, MON ON restores it). These are shown with either a /1 or /2 suffix, indicating 1200 baud and 9600 baud data respectively - handy in letting you know what's about on what



speed. Switching between these for transmission requires a 'stream switch' character, which by default is a '!' for 1200 baud or a '~' for 9600, followed by the letter A-Z depending on which stream you want to transmit on. If all this gets too much for you, you can do as I did and use one of the many dedicated packet terminal programs, like PaKet 6, which do all this for you and show different incoming and outgoing data on different screens.

The KPC-9612 is also capable of 'Host' mode operation, where your program and the TNC talk to each other in 'machine language' rather than plain ASCII text. Kantronics' 'Hostmaster' program, available as an option, is superb for this - it is indeed the program I habitually use with my Kantronics KAM.

The KPC-9612 operated faultlessly in use, with plenty of 1200 baud 'connects', 9600 baud being limited unfortunately to point-to-point file transfer tests and the like due to little local activity during the review period in my area. It's ironic that I ran a heavily used 9600 baud 2m port on the six-port node system from my home around 5 years ago!

Another facility I found the TNC had, which may be of use for remote control purposes, was the capability of two hardware remotely-switched outputs on each port, these for example could be to control transmit power, aerial selection, and so on at the TNC's location from a remote site, such as another station. I'm already thinking of a number of uses for this....!

Conclusions

If you're considering getting going on packet, and want a TNC that gives you the 'best of both worlds' as well as being a little more 'future proof', I can heartily recommend the KPC-9612. It was very easy to use, and clear details are given in the manual which even raw beginners should have little difficulty in following. Kantronics are to be congratulated on making the transition to 9600 that bit easier for both new and 'old hand' packet users, whilst giving equal extensive operating capabilities for 1200 baud, all in the same compact box.

The KPC-9612 is currently priced at £275 with 128k RAM fitted, and my thanks go to the UK Kantronics distributors, Lowe Electronics Ltd., for the loan of the review TNC.



Equipment Reviews in HRT

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Description	Issue
AKD 2001 2m rig	Jul 91
Alan CT-145 2m portable	Oct 92
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Alinco ALR-22E 2m mobile	Dec 87
Alinco ALD-24E dual band mobile	Feb 88
Alinco DJ-100E portable	Dec 88
Alinco DR-110 2m mobile	Nov 89
Alinco DR-130 2m mobile	Oct 93
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Icom IC-V200T 4m PMR rig	Feb 94
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Yaesu FRG-8800 general coverage receiver	May 85

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SCANNERS

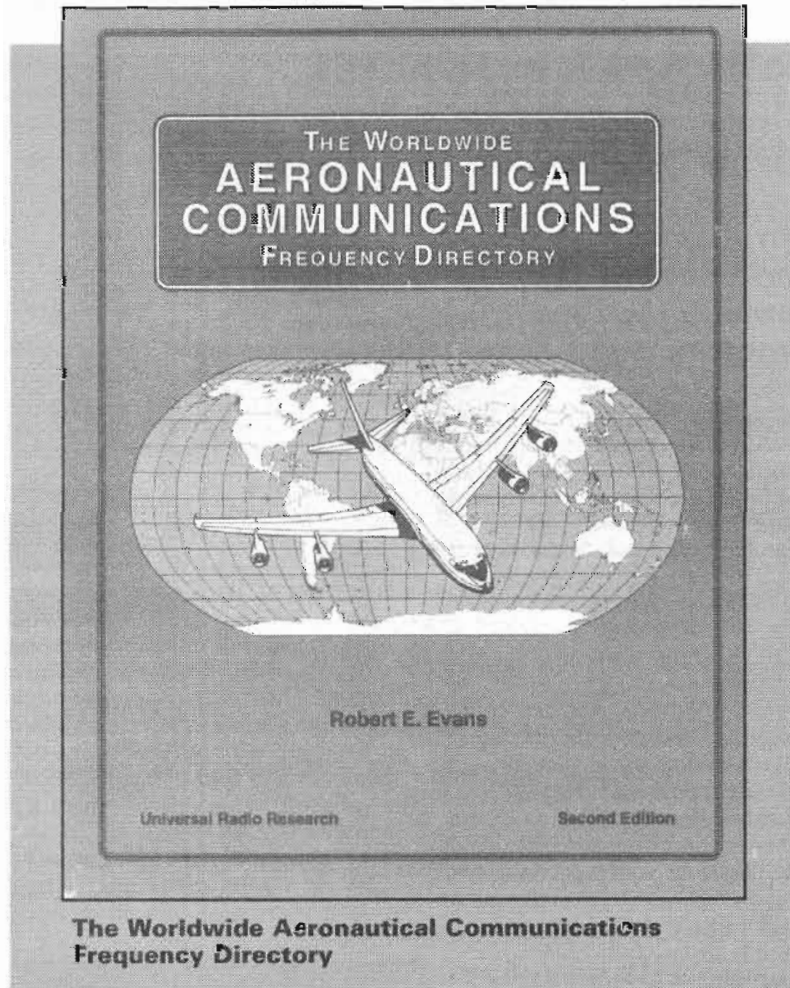
Bill Robertson shows how to receive signals on your scanner which are outside its frequency coverage

I see, from reports in the amateur press, that a (licenced) ham recently picked up a 'Mayday' call on the VHF marine band in his shack from a boat off the UK's coast, and relayed vital information to the UK coastguard until the occupants reached shore safely. Well done, it goes to show that hobby scanner listening can prove valuable. It's just a pity that the Radiocommunications Agency tell me, in writing, that such listening to the marine band from someone who's not actually at sea (i.e. a listener on land) is illegal. Ah well, maybe common sense *might* eventually prevail.

Scanner modifications

Mr. Jennings from Birmingham writes in to say he has a Bearcat 210 FM-only scanner, this having coverage of 30-50MHz, 146-174MHz and 406-512MHz, asking if there's any way in which to receive 2m amateur band (144-146MHz) signals on this. He adds that an out-of-band frequency, if entered, gives an 'E' prompt on the display, although he can receive 2m band signals around 166-167MHz.

This is a classic 'trick' with scanners, where often the 'image' frequency limitations of a scanner can give rise to two signals being received on a single given entered frequency. If the scanner's IF (Intermediate Frequency) is, say, 10.7MHz as is commonly found, the 'image' frequency will be twice the IF away from the entered and displayed frequency. So, if you enter 167.000MHz on your scanner, the image could be twice 10.7MHz, i.e. 21.4MHz, away, e.g. 167.000MHz - 21.400MHz = 145.600MHz. On some scanners, as seen in HRT review figures on UHF, this 'image' reception can actually be *more sensitive* than the entered frequency itself, thus picking up 'image' signals stronger than the entered frequency. On VHF, the effect is less



pronounced, although image reception of relatively strong signals is normally possible on the 'high VHF' range. The microprocessors in most scanners are 'hard programmed' with given frequency limits, and thus can't be 'extended' easily. But this 'image' reception is one way to receive rather more than you may have initially thought possible.

Another letter comes from Mr. Gaunt in Middlesborough, asking about any modifications to improve the performance of the AR-2002, such as memories etc. Well, I've details of several hundred

modifications for various scanners and ham rigs, including many for the AR-1000 and AR-3000, but unfortunately none designed specifically for the AR-2002. Can any readers help? If you've discovered a way to improve the performance of your scanner, of *any* type, I'll be pleased to help you share this with our readers, you'll even see your name in print! Mr. Gaunt also has a Fairmate HP-2000 which he says is very 'cloth eared' when compared to his Bearcat scanner, although he doesn't say which type of Bearcat receiver. Conversely, I've often found most Bearcat scanners to be a little

less sensitive than other wideband types, such as the Fairmate and AOR handhelds, I've also found this with the Bearcat BC-200XLT I've used for many years. Do readers have any observations to make on this? A useful reminder could be that last month's HRT Disk Offer included a bumper 'mods file' with details on plenty of scanner mods. If you'd like a 1.44Mb PC disk packed full of such software, the Editor tells me you can send a £1 coin to cover the cost of disk and return p/p, together with your name and address and the corner flash from last month's contents page, to *HRT Oct 94 Disk Offer, Software Services, 6 Wyre Close, Chandler's Ford, Eastleigh, Hants SO53 4QR.*

Worldwide Aeronautical Communications directory

Described as "the most complete and up-to-date aeronautical communications frequency directory ever published", this very interesting 260 page book which I recently received contains over 2,350 discrete HF and VHF airband frequencies. It covers both commercial and military airband, including both voice and digital modes in the HF, VHF, and UHF bands. With a US 'slant' it covers major World, Regional, and Domestic Air Route information for 137 counties, company operations for 116 world airlines, VOLMET broadcasts from 70 world cities and full military coverage for 30 world Air Forces. Together with the cross-referenced frequency lists, there's an introduction to the concepts, message content, and decipherment of aeronautical communications, plus a number of photos and 12 pages of full-sized MWRA sector maps. The appendices include AFTN, ICAO and IATA codes, designators and waypoint data described as not readily available to the 'hobbyist' monitor. In my opinion it's sure to be of interest to the dedicated airband listener - I found this directory to be extremely useful! It's a US publication, ISBN 1-882123-33-6 with a retail price \$US19.95 plus postage. You can get a copy from Universal Radio Inc., 6830 Americana Pkwy, Reynoldsburg, Ohio 43068, USA, Tel. 00 1 614 866 4267, Fax. 00 1

614 866 2339.

New Scanners

News comes from Link Electronics in Peterborough of two new scanners. The first is the Realistic PRO-50, a handheld 20 channel FM scanner at £99.95. It covers 68-88MHz, 137-174MHz, and 380-512MHz. Unlike other budget-priced handheld scanners it allows full 'search' facilities to let you look for new active channels, rather than only scanning the individual frequencies you've pre-programmed, and there's also an additional 'monitor' channel available.

The next is the 1000 channel PRO-2035, covering 25-520MHz and 760-1300MHz, with AM, FM, and wide FM receive facilities. It also has 10 'limit' search banks, 100 monitor channels, and its triple conversion receiver with IFs of 609-613MHz, 48.5MHz, and 10.7MHz/455kHz suggest good immunity from unwanted frequency reception, with specified Spurious plus 1st and 2nd Image rejections of over 40dB. This one operates from either 240V AC mains or 12V DC, and is mobile/desktop sized at 232mm x 210mm x 90mm. You can get further details on either or both



The PRO-50

new models from Gavin or Mike at Link Electronics, Tel. 0733 345731.

Please feel free to write in with your scanner news, view, and questions. I'll be glad to reply to all letters through this column, although please note I'm unable to give individual replies through the post. Write to; Bill Robertson, c/o HRT Editor, ASP, Argus House, Boundary Way, Hemel Hempstead, Herts, HP2 7ST.



The PRO-2035

Project - General

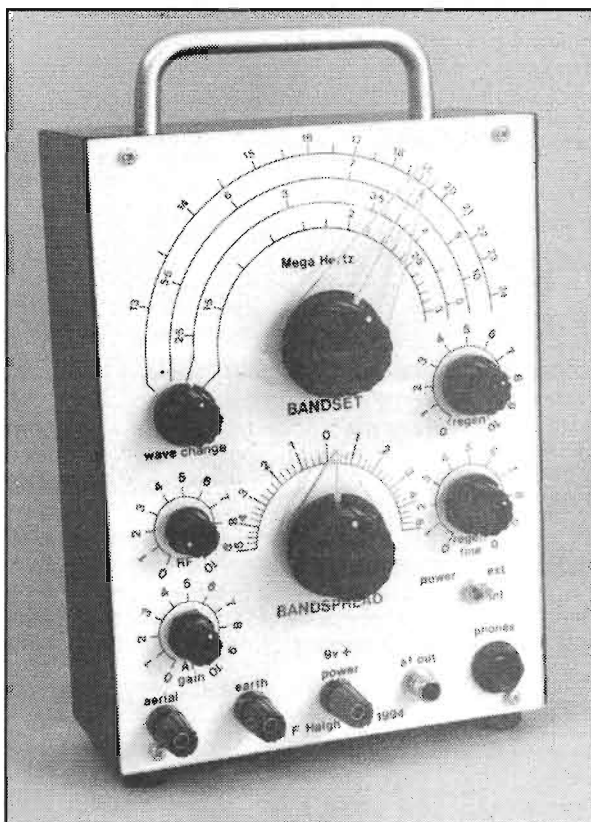
Coverage HF Receiver

Raymond Haigh describes Part 1 of a receiver project combining simplicity, low cost and good performance (concluding Part 2 in next month's issue)

Cost as well as complexity often deters would-be constructors. The component count of this receiver has been deliberately kept to a minimum consistent with good performance. Expensive items have been avoided, and there are no critical or hard-to-get parts. Many readers will be able to assemble the receiver entirely from their spares box, and alternative semiconductors and tuning capacitors are suggested to widen the opportunity to use what is to hand. There are no alignment problems, and setting up couldn't be easier.

Coverage is continuous from 1.5 to 24 MHz, making available to the listener all of the popular short wave amateur and broadcast bands. Following the principles of low cost and simplicity, output is to earphones which are arguably still the best means of linking operator to receiver when searching for weak or difficult signals. An inexpensive amplifier and speaker unit form the subject of a later article for constructors who prefer the convenience of this mode of listening.

Although extremely simple, the receiver is sensitive and has worthwhile selectivity. Unlike complex communications receivers,



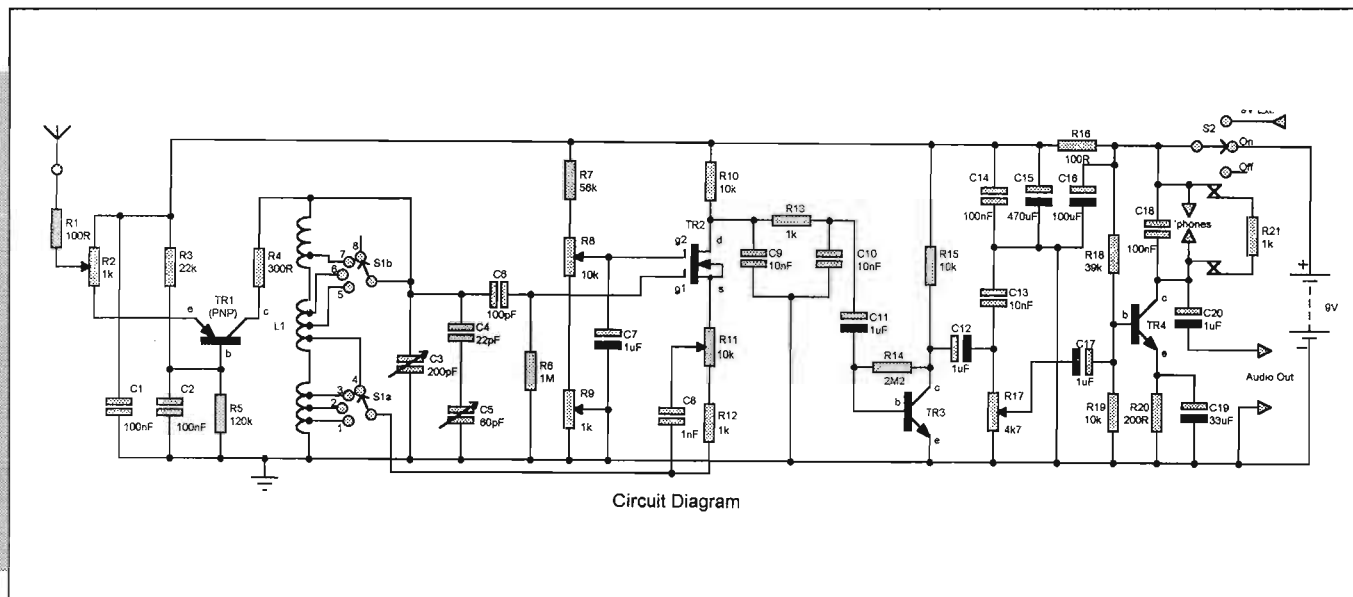
The circuit

Signals from the aerial input are coupled to the emitter of TR1 via the RF gain control, R2. Resistor R1, reduces potentiometer noise at the maximum end of the slider.

RF amplifier, TR1, is arranged in a grounded base configuration. This offers a low input and high output impedance and good voltage gain. The output impedance is high enough to permit a direct connection to the single tuned circuit, and the collector is taken to supply negative via inductor L1. TR1 must, therefore, be a PNP type transistor. R3 and R5 bias the device, R4 prevents parasitic oscillation, and C1 and C2 function as RF bypass capacitors.

The inclusion of this simple RF stage greatly enhances the performance of the receiver. Sensitivity is increased, and the detector is isolated from the aerial thereby avoiding regeneration dead spots and radiation when the stage is oscillating. It also enables a simple but effective RF gain control to be incorporated, (an essential feature if SSB transmissions are to be received) and direct coupling to the detector eliminates the need for a primary winding on L1, thus simplifying coil winding and

where functions are controlled by the touch of a button, a degree of skill on the part of the operator is called for if this receiver is to give of its best. However, after only a little practice at the controls, distant broadcast, amateur single sideband (SSB) and Morse (CW) transmissions can be tuned in and clarified without difficulty.



Circuit Diagram

switching. Bandswitch S1b shorts out sections of inductor, L1, which is tuned by band-set capacitor, C3. Series capacitor, C4, reduces the swing of C5 to make it suitable as a bandspread control.

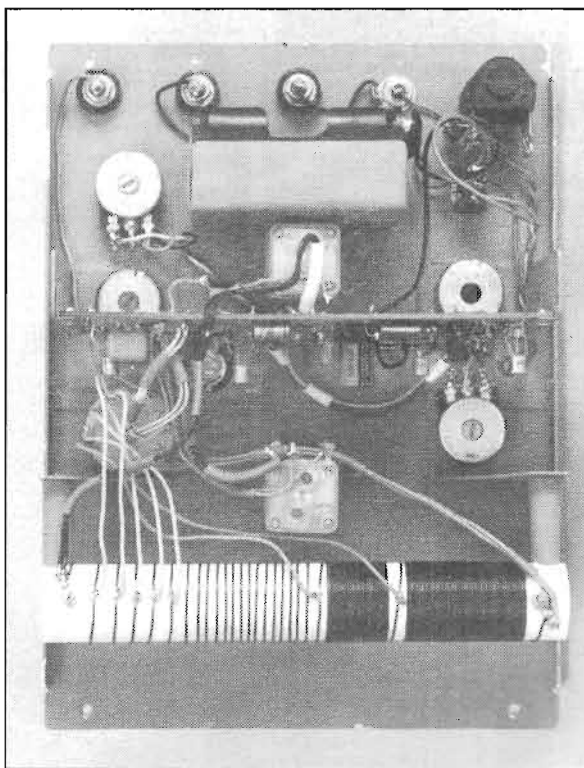
The signal is applied to gate 1 of the dual gate MOSFET regenerative detector, TR2, via C6. Positive feedback from the source to a tapping on L1 greatly increases the sensitivity and selectivity of the receiver. Thus high performance is achieved with few components. Source bias is adjusted by preset, R11, in order to compensate for any spread in MOSFET characteristics and ensures smooth regeneration on all bands. The value of RF bypass capacitor, C8, should be adhered to. Larger or smaller values may inhibit regeneration.

The main regeneration control, R8, varies the gain of TR2 by adjusting the voltage on gate 2. The lower value potentiometer, R9, acts as a fine or vernier regeneration control. The action of the main control is smooth and free from backlash, and the vernier potentiometer is a refinement which can be omitted if costs are to be kept to an absolute minimum. (Connect the 'bottom' of R8 to the negative supply line if R9 is not fitted).

Audio output from the detector is developed across drain load resistor, R10, and residual RF is filtered out by C9, C10 and R13. The audio signal is coupled to a conventional audio amplifier stage, TR3, by C11. This stage is biased by R14; R15 is the collector load resistor, and the amplified signal is connected to TR4 via AF gain control, R17, and DC blocking capacitors C12 and C17.

Bias resistors, R18 and R19, and emitter resistor, R20, set the current through this final stage at 2mA. Output to the earphones connected to the collector is more than adequate. Removing the 'phones from the jack connects collector load, R21, into circuit and a high-level audio output is available for an external power amplifier and speaker (to be featured in the follow-on project to this receiver - Ed). Constructors requiring a low-level output should delete R21 and connect the positive side of C20 to the 'top' of the AF gain control.

Upper audio response is curtailed by C9, C10, C13 and C18, and this helps to reduce the impact of atmospheric noise and interference.



R16 and C15 decouple the earlier stages from the output transistor, and C14 functions as an additional RF bypass capacitor. These components, together with C16, ensure the unconditional stability of the receiver. Toggle switch, S2, connects the supply line to the internal battery pack or to a terminal so that an external power unit can be used.

Components

There are no particularly critical or hard-to-obtain components. Almost any silicon PNP transistor will work in the TR1 position, and I found the BC177, BCY70, BC557 and BC558C all to be satisfactory. A number of dual-gate MOSFETS I likewise tested as regenerative detectors, including the 40673, 3SK51, BF981 and 3SK88. They all performed satisfactorily, with R11 adjusted to compensate for the spread in characteristics. The 40673 and 3SK51 have been superseded by the MFE201, which most suppliers claim to be a direct substitute. I didn't test this device, but I believe it should function well. The 3SK88 wasn't as lively as the other MOSFETS, and it displayed an increasing reluctance to oscillate in this circuit as the frequency of operation approached 30 MHz. It should, therefore, be regarded as a last-choice device as far as this receiver is concerned.

Almost any small-signal NPN transistors should be suitable for TR3 and TR4. A BC108 and BC109, and their plastic encapsulated substitutes

the BC548 and BC549, I tested and found satisfactory. I employed miniature plastic film dielectric tuning capacitors in the prototype receiver to keep costs as low as possible. Suitable items are listed in the Maplin catalogue as AM tuner capacitors with 140 and 60pF gangs, but similar parts could be salvaged from discarded AM-only transistor radios. Maplin do, however, supply a small spindle attachment so that a control knob or spindle extender can be fitted in place of the cord drive drum.

These miniature film dielectric capacitors perform acceptably, but when the receiver is operating on the highest frequency range with the detector set to oscillate, they can be slightly noisy when rotated. They are also prone to shorting between the vanes. If salvaged components are to be used, connect an ohmmeter between moving and fixed vanes and rotate the spindle slowly to check for shorting. Good quality air spaced capacitors are to be preferred, but if purchased new their cost may exceed that of all of the other components. A Jackson 365pF single gang type 'O' capacitor with a 470pF polystyrene capacitor connected in series would be suitable for band-set tuner, C3. A Jackson 15pF type C804A would be ideal for the bandspread control, C5, with the fixed vanes connected directly to C6 and not via fixed capacitor, C4.

One gang of a twin gang air spaced capacitor salvaged from an older valve or transistor radio can be used for C3. If a salvaged air-spaced unit is used, remove all the built-in trimmers, check the vanes are not shorting and that the component is clean and dry, and connect it into circuit via a 470pF fixed capacitor to reduce its swing to approximately 200pF.

The type of inexpensive earphones used with portable cassette players are suitable for this receiver, and the phone jack has been wired to connect both earpieces in series to give an impedance of around 60 ohms. Older, high impedance 'phones with a DC resistance much in excess of 1000 ohms will not work without a matching transformer.

Next month, Ramond Haigh completes the project by detailing the coil and PCB assembly, test and alignment, and gives some hints for successful use on air. A PCB pattern will also be given in next month's issue.

Parts List

Resistors (all 1/4W, 5% or better).

R1	100R
R2	1k lin pot.
R3	22k
R4	300R
R5	120k
R6	1M
R7	56k
R8	10k lin pot.
R9	1k lin pot.
R10	10k
R11	10k vert preset.
R12	1k
R13	1k
R14	2M2
R15	10k
R16	100R
R17	4k7 log pot.
R18	39k
R19	10k
R20	200R
R21	1k

Capacitors, all 16V working or better.

C1	100nF (0.1µF) polyester film or ceramic.
C2	100nF (0.1µF) polyester film or ceramic.
C3, C5	140 + 60pF plastic film dielectric variable (see text).
C4	22pF ceramic.
C6	100pF ceramic.
C7	1µF electrolytic, axial lead.
C8	1nF (.001µF) ceramic.
C9	10nF (.01µF) ceramic.
C10	10nF (.01µF) ceramic.
C11	1µF electrolytic, axial lead.
C12	1µF electrolytic, axial lead.
C13	10nF (.01µF) ceramic.
C14	100nF (0.1µF) polyester film or ceramic.
C15	470µF electrolytic, radial lead.
C16	100µF electrolytic, axial lead.
C17	1µF electrolytic, axial lead.
C18	100nF (0.1µF) polyester film or ceramic.
C19	33µF electrolytic, radial lead.
C20	1µF electrolytic, axial lead.

Semiconductors (see text for alternatives).

TR1	BCY70
TR2	BF981
TR3&4	BC109

Inductors

24 SWG enamelled copper wire, solder tags, and a 145mm length of 21mm outside diameter plastic overflow pipe for L1 (fully detailed in text next month).

Sundry Items

Aluminium box or chassis, 203 x 152 x 63mm.
Scrap aluminium for brackets.
Control knobs, spindle couplers, spindle bushes, PCB materials,
Vero pins, terminals, 6mm switched phone jack, earphones, battery holder and connector, hookfup wire, nuts and bolts, solder and solder tags, case finishing materials.

Switches.

S1a and b	3 pole, 4 way rotary switch.
S2	1 pole, 2 way toggle switch.

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QRP Corner

Dick Pascoe G0BPS goes 'back to basics'

As reported last month, I was looking forward to getting my hands on one of the new Ten-Tec QRP rigs. I can happily report that it duly arrived and is at the time of writing sitting on the bench. A change of name has occurred, it is not known as the Scout 555 QRP but as the "ARGO 556". Very few changes appear to have been made, but more time is needed to check it out fully. Watch HRT for an 'on-air' test.

I also have in my garden one of the Cushcraft R7 aerials for review, presently coupled to the Argo 556. Coming soon is the new MFJ multiband vertical aerial, and as a bonus for readers a review of a new rig to the QRP scene, the Index Laboratories *QRP Plus*. An all-band QRP transceiver that the Americans are raving about. Again watch this magazine for full details.

George Dobbs G3RJV called to say that he had returned safely from the massive German Rally at Friederichshafen. He had thoroughly enjoyed the trip, but a long drive from home in Rochdale of over 1000 miles and a gear box failure did not make the trip too pleasant. George took a small QRP rig with him, but omitted to take a suitable aerial. As his caravan was parked in amongst many other visitors, he decided to take a walk around and see who he could find. A group of Lithuanians made him very welcome, and in between a few cold beers an aerial was found and put to good use. Operators included several Russians and others from the former USSR. Apparently he also found a good source of cheap Morse keys from the Eastern Block countries, "From about £5 each" he said.

Back to basics

"Back to basics" seems to be the 'in phrase' at this time, but even in our hobby it has some relevance. A friend was repairing an FT790R and couldn't find the transistor required to finish the repair. His telephone call to me requested a check through my transistor equivalent book, a boon to the builder using circuits from abroad (mine is by Adrian Michaels and is published by Babani Ltd., ISBN 0 85934 060 0). The finalé to this story is that the UK equivalent, much to our surprise was a simple BC109. When

perusing a new circuit and thinking of trying it out, it can be off-putting if the devices used are not known. This book helps enormously.

Back to basics again... Most low power operators tend to be builders as well, and when trying out a circuit it may be found that the designer specifies that a particular capacitor is used such as a polystyrene. Will a disc ceramic suffice? The circuit may require a $\frac{1}{4}W$ carbon resistor, will a wirewound type be of use? Can these components be interchanged? Often the answer must be no. The use of coupling, or decoupling capacitors of 0.015 μ F may easily be changed for ones of say 0.01 μ F, as this change should have little or no direct effect on the circuit. To change the polystyrene to a disc ceramic may have a lot of effect. Polystyrene are usually of closer tolerance than disc and this may effect the end result. The replacement of a single capacitor in a VFO can cause huge stability problems if the wrong type is used. A wirewound resistor should never be used where any form of stray inductance would be a problem. *Wire Wound!* says it all. For a purely resistive purpose, it would do fine.

A circuit may call for tantalum capacitors, you may only have an electrolytic of the required value, *will it work?* For low frequency and audio work, the answer is yes. Tantalum capacitors have very little stray inductance, this makes them very useful for coupling. But remember that they both must be fitted with the correct polarity. If fitted the wrong way round, they can go *bang*. With the dearth of air-spaced variable capacitors available, there has been a tendency to try to use varicap diodes to tune VFOs. The stability of these leaves a lot to be desired.

Temperature changes from both within and without the diode cause changes. Choosing the right transistor can be a headache too. My standard ones are BC182 and its pair the BC212. Useful NPN and PNP devices that are cheap and do the job. If using another person's circuit and you can't find the exact or equivalent device, then check out what the device is actually doing. Is it an amplifier or a switch? The device may seem strange but its operation may be very obvious and a substitute fitted. Dust iron toroids or slugs will not replace ferrite devices, the correct one must used. There are

very few new circuits appearing these days, most are just variables of old ideas with new devices used.

Aerial for receivers

My friend, Peter PE1MHO, came to stay for a few days recently and brought with him an idea for an aerial that works extremely well for general coverage receivers. The circuit is very simple, with just a trifilar winding on the core. Remember that the number of *turns* is the number of times the wire passes through the centre hole. We tried this unit and it does work very well. It's essential that the wire is cut to the exact length, either 12.5m or 20m, no other length will work as well.

To enable you to try out this aerial, I also offer the following for your delight. A simple broadband receiver that can be built in a few minutes. The winding of the coil will take a little longer, but this is ideal as a weekend winter project! It is essential the high impedance earphones are used and that the unit is grounded as shown. D1 and D2 act as simple detectors and as a voltage doubler to provide greater volume in the headphones. C1 acts with L1 to provide the required tuned circuit, with C1 tuning the band. L1 should be wound on a toilet roll cardboard tube, with about 170 turns of 28 SWG gauge wire. One end of the winding is earthed, over the winding at this end wind 20 turns to make up L2. The ends of L1 and L2 are joined at the earth end and connected to the earth point. The other end of L1 goes to the aerial and the end of L2 to the diode as shown. You can build this 'ugly style', soldering the parts direct to each other. The solder points of the variable capacitor can even be used at the support. C1 should, for best performance, be a 365pF variable capacitor, but smaller values may be used including the cheaper polyvaricons found in transistor radios. If the output is too low, a simple audio amplifier could be added using a single NPN transistor. Try adding this unit, it works!

That's it once again, more of your letters please, I *do* enjoy hearing from you. Via the Editor, GB7RMS, Email to Dick@kanga.demon.co.uk or even via the post to *Seaview, Crete Road East, Folkestone. CT18 7EG.*

Radio Bygones


The vintage
wireless
magazine

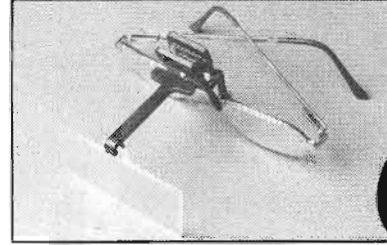
IN THE CURRENT ISSUE (No. 31)

- The Marconi CR Series of Communications Receivers
- IFF – Identification Friend or Foe
- Lissen 'Hi-Q' Short-wave Components
- Italian Field Radio Station RF4 • Crystal Sets

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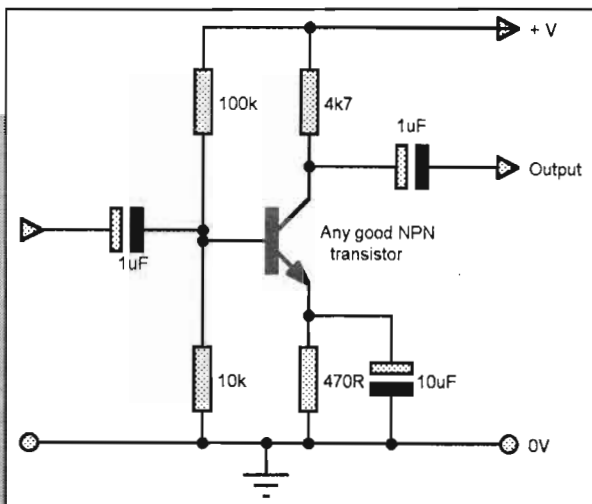
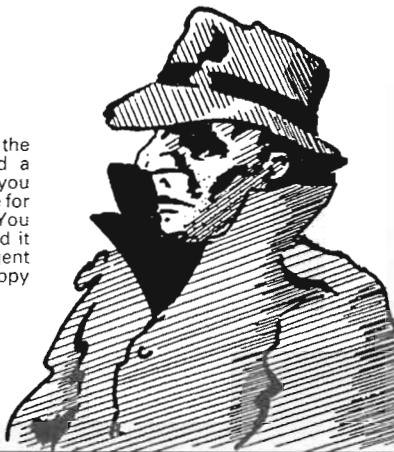
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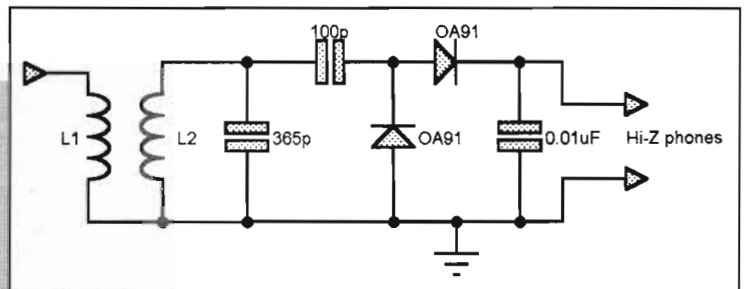
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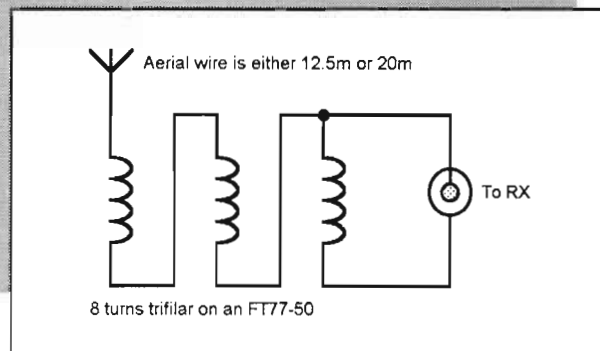
ISSN No. 0269-8269



Simple audio amplifier



Simple receiver (batteries not included!)



Simple
receiving
aerial



A few issues back, I asked if any readers might have a particular topic which they would like me to try to explain. This month, I want to deal with one of those queries, about the use of a mains isolating transformer to provide a safe area on your workbench.

Isolation

In order to suffer an electric shock, you have to complete a circuit in some way with a part of your body. It is generally considered that the most lethal situation is where the current passes from hand to hand, because it then flows through the area surrounding the heart, upsetting the natural functioning of the heart muscles. This situation might occur if you are working on a piece of equipment, holding its earthed metal chassis in one hand, and touch the live side of the mains wiring with the other hand. One of the old serviceman's rules is "keep one hand in your pocket at all times" - that way you can't get a hand-to-hand shock.

You could still get a shock from hand to foot, if you're wearing shoes that are in any way conductive and standing on an earthy surface such

need something rather better - maybe you should even go for 25kV-rated switchboard mat (though it's a bit hard on the pocket!).

Avoiding electric shock is all down to not allowing your body to provide a circuit across a supply. If one side of the supply is earthy, then you don't have to touch both actual conductors, because the earth itself and anything connected to it, provides an extension to the earthy (non-live) conductor. In this case, all the earthy material around you (equipment cases, metal fittings such as work-benches, central-heating radiators, taps and pipes, damp floors or walls) provides a return point to complete the circuit from the live side of the supply, through your body and back to the opposite side of the supply.

Reference

This idea of a return or reference is a useful one to understand. To explain it in simple terms, I'll move out of the workshop for a moment, to under the bonnet of your car. The electrical system of a car depends upon a storage battery or accumulator, usually consisting of an assembly of six, series-connected 2V lead-acid cells. To reduce the amount of wire required to connect up all the electrical services, one side of the battery is connected to the car's metal chassis or bodywork (Fig. 1), and the return connection from each lamp, motor or whatever is completed through a short length of wire running to a nearby earth-point on the bodywork.

Nowadays it's the negative side of the battery which is connected to chassis, but it has not always been so. When electric power was first used in motor vehicles, and it was decided to economise on wire by using an earth return system, the negative side was chosen to be earthed. Because of the crude voltage-control circuit fitted to the engine-driven dynamos of the time, the battery was frequently overcharged, causing it to gas quite violently. Vents had to be provided in the filler caps to let the gas escape safely, otherwise the battery could



From My Notebook

Geoff Arnold G3GSR

looks at protecting yourself with mains isolation

have exploded. The sulphuric acid spray which accompanied the gassing contained ions with a positive electric charge, and these were naturally attracted by the negative potential on the car bodywork. The result was rapidly-rotting bodywork around the battery, which did not greatly please the car-owners!

With a delightful spot of lateral thinking, the car manufacturers said: If we were to earth the positive side of the battery instead of the negative, the only area of exposed metalwork at a negative potential would be the negative terminal of the battery, and that could easily be given a covering of an insulating medium (e.g. petroleum jelly) to protect it. Problem solved!

The connections to a car battery are secured by some form of bolted clamp, requiring the use of a spanner to loosen or tighten it. If you have to do some work on or near the electrical system, it is at least wise, and often essential, to disconnect the battery first. Because the negative

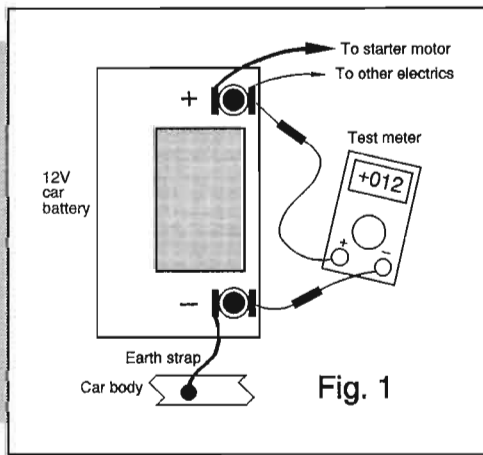


Fig. 1

as a damp floor. For that reason, some sort of insulating covering on the floor is a good idea; something like thick carpet, or vinyl tiles or sheeting, can give you a fair degree of protection against casual contact with the mains or with HT lines in valved equipment, providing the floor is dry. If your interest is in high-powered transmitters or in old TV sets, oscilloscopes, etc., with solid EHT (in other words EHT supplies derived from the mains rather than from flyback or other oscillators), you

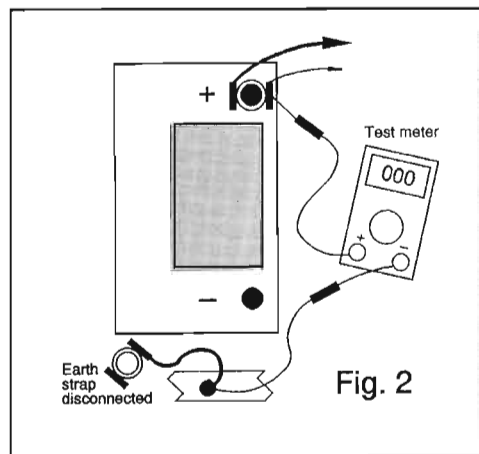
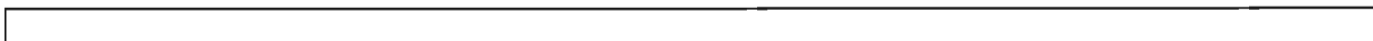


Fig. 2

side of the battery is earthed, it is more or less instinctive to make the disconnection on the other, live (positive) side. But what happens if the metal spanner slips, and bridges



the live terminal of the battery to the car bodywork - easily done in many under-bonnet layouts! The result will be at the very least a nasty splat as they touch; quite possibly a fire or explosion. Remember that the battery is no mean source of energy, perfectly capable of providing a current of several hundred amperes to turn over the starter motor!

The safe approach is to loosen and remove the earthy negative connection from the battery. Should the spanner slip and touch the car bodywork at the same time, no harm will be done, because the two ends of the spanner will be touching metalwork at the same potential. Having loosened and removed the connection from the earthy terminal, the live terminal is live no longer, because the reference connection at the opposite end of the battery has been removed (Fig. 2). The battery is now isolated from earth, and you can loosen and remove its other connection in safety - always providing that you don't let the spanner fall directly across the battery terminals, of course. The plastic cases of modern car batteries are designed with a hump between the terminals, to make it most unlikely that a straight metal object could bridge them and short the battery out.

Back to the workbench

The electricity mains arriving in our houses are another case where one

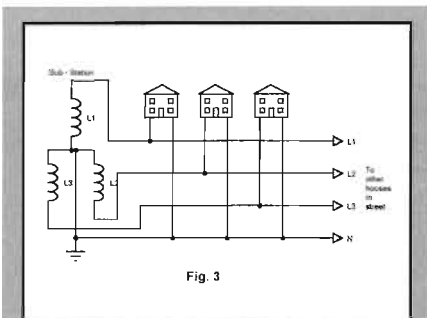


Fig. 3

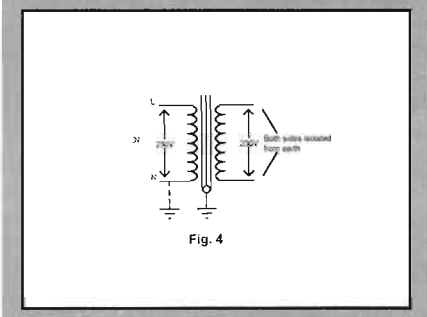


Fig. 4

side of the supply is earthy and the other side live. That earthy side is called the neutral, because it's actually the centre-point of a 3-phase supply carried by cables running down your road. It's earthy because it's strapped to earth at your nearest electricity sub-station, and, in modern installations, locally as well.

The mains supply feeding houses and other small properties is single-phase. Each of the three phases will be connected to every third house along a road, with the aim of sharing the total load evenly among the phases. If the loads connected to each of the three live conductors were exactly balanced then no current would flow in the common neutral conductor, but obviously it would still have to be there in order to provide a connection point for the neutral feed into each house.

Because your mains supply is connected to earth on its neutral side (Fig. 3), the live side will always be at around 230V above earth, and that's quite enough to kill you should you touch anything connected to it whilst touching earth at the same time. From what I said earlier, you will realise how difficult it is to create a so-called earth-free situation in a workshop, or anywhere else for that matter. You obviously can't isolate the actual mains supply itself from earth, but you can create a limited isolated version of it for the workbench, and this is what the double-wound isolating transformer does (Fig. 4).

Isolating transformer

There are a number of ground-rules (no pun intended) to be observed for safe servicing when using an isolating transformer. First, neither side of the secondary winding of the transformer itself should be connected to earth. If it is used to power some piece of equipment having a live chassis (one side of the mains directly connected to the chassis), it is nice to be able to earth that chassis so that test equipment in which one side of the signal input or output feed is earthy can be used safely. Second, the isolating transformer should never be used to power more than one item of equipment at a time.

It is still possible to get a shock from a piece of equipment powered through an isolating transformer. This could happen if you touched

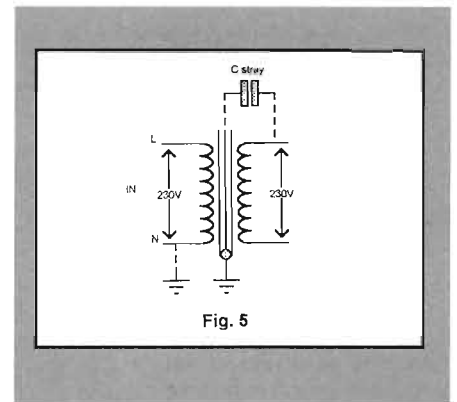


Fig. 5

both sides of the 230V transformer output, or for valved equipment the usual perils of contact with the HT rails apply. Either of these occurrences could be lethal. Less dangerous, although still unpleasant, is a tingle which may be felt when touching just one side of the transformer secondary, even when it is not connected to earth. This is due to stray capacitive coupling between the isolating transformer secondary and the transformer frame and core (Fig. 5). Such coupling can produce a voltage which is measurable on a voltmeter connected between one side of the secondary and an earth point, although the high reactance of the stray capacitance at 50Hz mains frequency will limit any current flow to a very small amount, hence the tingle rather than a numbing shock. The stray capacitances in a good-quality isolating transformer should have been carefully controlled in design and manufacture, and therefore the tingle, should be very small.

Why 230V?

You may be wondering why I've referred to 230V as the mains supply voltage, rather than the standard 240V used in the UK. In fact 230V is the new European standard - to be adopted in place of the present mix of 220V and 240V used in different countries. It is hoped that the vast majority of electrical equipment and appliances will work on the new voltage without damage or need for modification.

If you have any suggestions for topics to be covered in future Notebooks, I would be delighted to receive them. Please send them to my home address, 9 Wetherby Close, Broadstone, Dorset BH18 8JB.

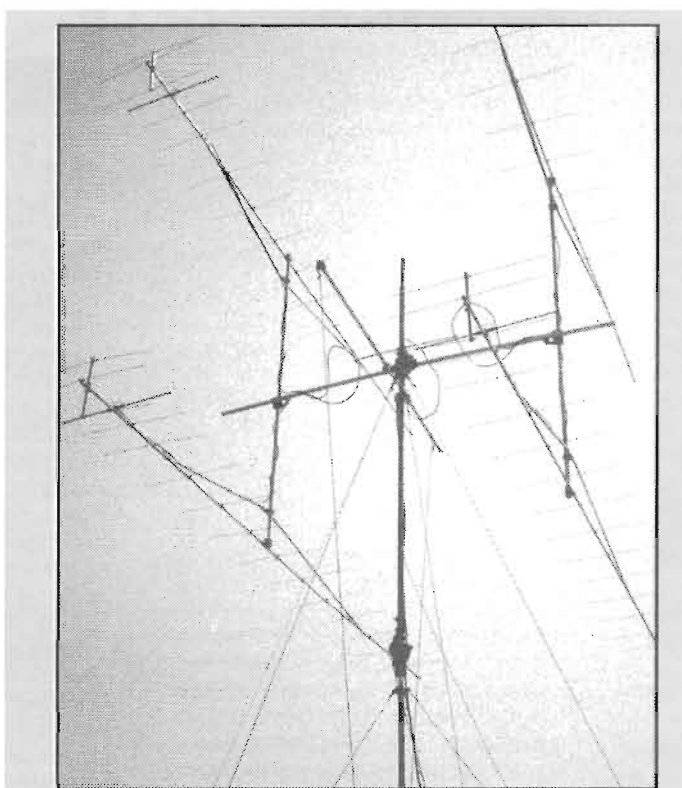
VHF/UHF Message

Geoff Brown GJ4ICD reports of good DX conditions during this year's VHF National Field Day

July started off well for VHF/UHF fanatics, and at last, VHF Field Day this year had good conditions. There was lots of activity around on all VHF/UHF bands, I even worked a new square on 23cm. Sporadic 'E' was prevalent on 50MHz for much of the weekend, with skip down to 350km at 2200z on the 2nd (a very high MUF). New ones reported on 50MHz during the weekend were RU1A (KO48), DL9GKA (JO63), 1A0KM and EW7IM (KO53). Andy GJ7RWT had a nice contact on 6m with Eric 5T5JC, using only a handheld home-made aerial, nearly 4000km!

Ken G4IGO reported an opening to Sweden on 144MHz at 1900z on the 2nd, so there should be some good scores for this year's VHF NFD entrants. Alan, GM4ZUK passed on the field day results of the Aberdeen VHF Group GM0FRT; the 144MHz station was manned by GM4AFF, GM4YXI and himself, and some fantastic DX was worked via 'ES'. For example, UR4EZO (KN78), UT5EC (KN78), UT5EU (KN79), RW2F (KO04), UT5BN (KO50), UE5PFW (KO73), and SM2CEW (KP15) on scatter. The group's final squares scores on the bands were as follows; 144MHz/85, 432MHz/49, 1296MHz/26, and the best DX on 70MHz was G7FDC/P (IO70) at 753 km. On 432MHz the operators were G3ZBE, G7ANQ, GM4TXX, Ray GM4CXM and Chris GM3WOJ. The group had a contact with UT5DL/P (KN18) at a distance of 1917km and wonders if this was a first GM to UB5 contact on 432MHz?

Still on the higher bands, and the HB9 beacon was S9+ into southern UK, and HB9STY/P was a consistent signal for hour upon hour on 432MHz. G4HWA/P in JO03 was S9+ on 1296MHz in GJ, as was



GJ4AFF/GJ4VXE's 4 x 17ele EME array

F5GYA/P in JN15.

Ken G8VR reported hearing LA1UHG on 23 cm on the 12th, although Ken reports that he often hears both LA 23cm beacons as he has a good sea path. Also on the 12th strong 'ES' was reported on 50MHz to the CIS. The 13th brought more 'ES' on 6m to EA and CT, but on the 14th came the big 'hops' or 'cordal' 'ES' with 5B4, SV, and OD5 signals reported. Other 'peak' days for Sporadic 'E' were the 17th when 9K2USA (5,000km?) was widely reported in the morning, later in the day other countries logged were I, S5, YU, 9A, 9H, SV9/B, OZ, SM, DL, and SP, a total of ten hours of 'ES'. On the 18th 4J6D (Azerbaijan, near the Caspian Sea!) was worked on 50MHz by DL's and SM's, these contacts were in excess of 5000km. Next day the band was open again most of the day to most countries around Europe.

Lawrence GJ3RAX reports a good 50MHz opening on the 19th, when he worked SP, LA, and DL. On the same day Ken G8VR reported the LA beacons again on 23cm, and John G3XDY worked LA/SM on the same band. The 22nd/23rd brought good 'ES' on 6m in the way of LA, SM, OH, and SP. Ela, G6HKM reported a few new ones on 50MHz during the month; RU1A (KO48), 1A0KM for a new country, DL3MCI (JN57), and on the 18th another new country and square with UU8JJ (KN74), and finally LA9DM in JP31. Conditions must have been very good for Ela on the 23rd as she worked SK0HD (JO68) on 144MHz while beaming south west, some people have all the luck!

Fastlog

In August's edition of HRT I previewed a logging program made for VHFers in mind. Well, you certainly kept me busy for weeks on end!. Hundreds of requests and Jiffy bags came rolling through the letter box, in fact one day alone the postman brought 24 letters. I thank you all (except a few) who played ball and sent a 1.44Mb formatted floppy and IRC's as requested. Those who didn't still got the copy as requested, but please note, in future if there is any upgrades I will only send them out if you follow the simple request. No UK stamps, sorry but there just *no good at all* in Jersey. PS, thanks to all for the nice letters about the column.

50MHz power increase

I was really pleased to receive the information that 26dBW would be

permitted from 15th July this year, Along with the UKSMG, I had been trying for some considerable time to see an increase in the power restrictions imposed on 50MHz. Do you want to see a nice amplifier design for Six using a 3CX800, ready for the F2 season in the next cycle? Although the power restrictions were increased to 26dBW this was for the first 1MHz (50-51MHz), 51-52MHz stays at 20dBW. All aerial restrictions have been lifted, now that really *does* make sense. The higher they are, the less likelihood of TVI. And finally /MM operation, that's good news for square hunters and you elite yachtsmen.

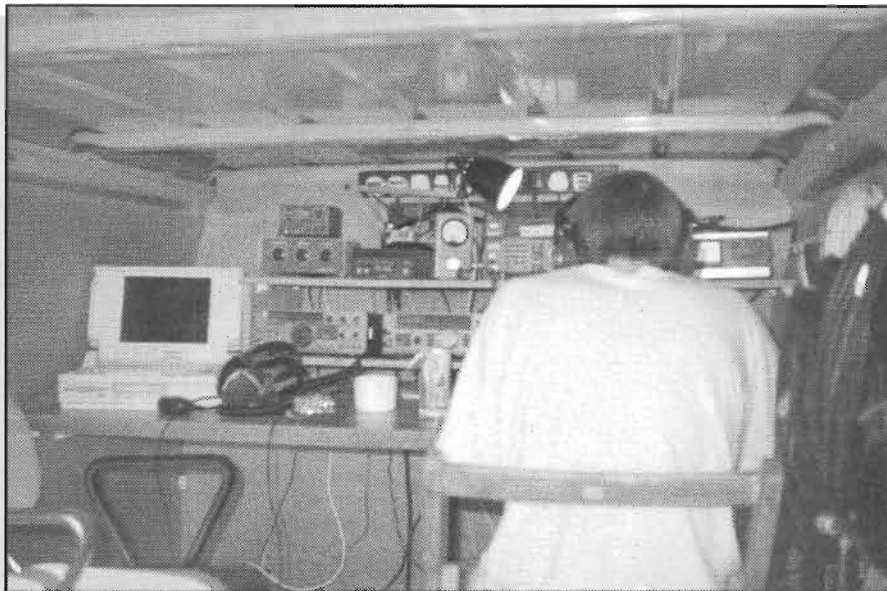
The RSGB VHF Committee and LAC (Licensing Advisory Committee) should be congratulated on such a fine job done on the behalf of all UK amateurs.

144MHz from Jersey

Some time ago I received a request from Stuart GM4AFF and Tim G4VXE to see if I could find them somewhere to operate from in Jersey, as they were planning an expedition. Well, it just so happens that the States of Jersey along with other departments have loaned to me a section of land on the north coast of the island. Copies of the paperwork were given to Stuart's friend Alan GJ4ZUK, and sure enough Stuart and Tim duly arrived.

Up went the aerials (4 x 17eles for 144MHz) plus others for HF, 50MHz, 70MHz and 70cm.

Some nice QSOs were made off the moon on 144MHz, in fact around sixteen contacts were made, or sixteen and a half if you count your own echoes as Stuart puts it! Tim had a few pile-ups on 70MHz, and even worked JY7SIX on 50MHz. A few thousand contacts were also had on the HF bands, but then disaster struck! A strong wind developed, and despite the large 144MHz array being guyed, something gave and the whole lot came down. Three out of the four aerials were a write-off, but not disheartened Stuart and Tim continued on 2m with only one aerials for the last few days of the expedition and still worked scores of stations. The evening before their departure, along with Alan GJ4ZUK I joined them for a pint or two (thanks for the meal guys).

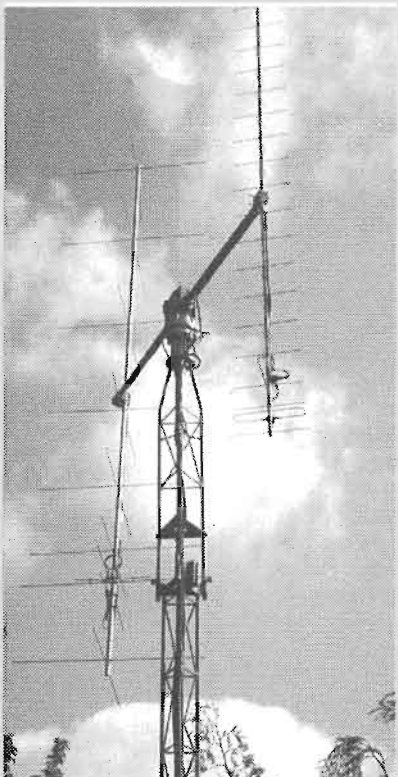


Inside Stuart GJ4AFF's converted transit van

Results of expeditions

Six News reports the following results on the Jordanian 50MHz Expedition; over 2000 contacts were made in 49 Countries, best DX on the band was WD4KDP at nearly 9800km via multi hop 'ES' or I

Graham G8HVY's home made 144MHz crossed yagi for satellite working



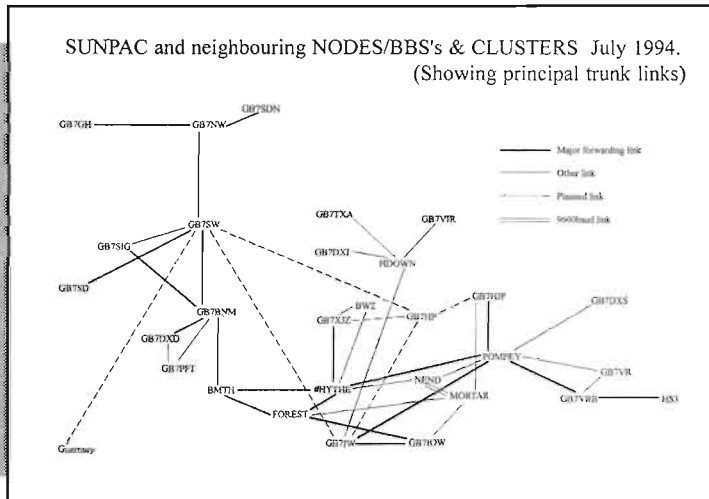
would think cordal hop 'ES'. Mohammad JY4MB is currently active on 50MHz so look out for him next Summer.

Bermuda expedition

This was a new country for most of the stations who worked Jack, WB4NFS/VP9, who reports on his Bermuda 50MHz activity in June 1994 (Tks UKSMG, Six News). Jack was using an R5 vertical plus tuner and a Kenwood TS690. The first 'G' was G0NPI, followed by another 51 Europeans. The QSL route is: Jack OMara, 14378 Shetland Ct., Woodbridge, VA 22193, USA. Stations worked between 1957z and 2144z in Europe on 25 June 1994 were: G0NPI, G6HCV, G0JHC, G4XNS, G0FYD, G4IFX, G4ASR, G3NSM, G3MCS, GJ4ICD, SM6FHZ, PA3DOL, SM6CMU, ON4KST, PA2VST, PA0OOS, G6YIN, G4KUX, DJ6NI, PA3BFM, G2ADR, DJ9KG, SM3EQY, DK3RV, G7PBY, PA3FYM, PA0JMH, PB0ALN, G1EMJ, G4AFJ, PA0LSB, DJ7SP, G0NYL, G1SWH, DL7QY, DL5FCJ, G4IGO, PE1OUC, G4SEU, G7EQM, ON7YD, PE1EBJ, PA6DYS, LA9ZV, SM7BAE, ON4PS, G0JFW, G4HBA, F6AUS, G7OEC, OZ2LD, it appears the best dx was SM3EQY.

Thanks for all your information this month, I just wish that the VHF/UHF bands were always in good shape as they have been. News and views please to Geoff Brown, TV Shop, Belmont Rd, St Helier, Jersey. C.I. or phone/fax 0534 77067 (fax after 17.30 local).

Packet Radio Roundup



Node and BBS links in the SUNPAC area

Sunpac 'Meet the SysOps'

One such active group is *Sunpac*, who help look after packet interests in the central south of England. As a fund-raising effort as well as increasing awareness, they're holding another of their 'Meet The SysOps' get-togethers on Saturday October 15th, between 9.00am and 1.00pm at South Midlands Communications Ltd. in Chandler's Ford, Hampshire. It's completely free admission, just turn up on the day. As well as several demonstration stations there's a variety of 20 minute 'mini-lectures' planned, on topics such as *'Optimising your packet station'* (9.30am), *'TNC parameters - why change them?'* (10.00am), *'Getting the most out of your local BBS'* (10.30am), *'The hows and whys of DX Clusters'* (11.00am), and *'What does a node do?'* (11.30am). You'll also be able to obtain plenty of Public Domain and Shareware packet radio software for a modest copying fee (disks provided), and the group hope to have a deviation checking service - bring your TNC and radio along with you. There'll be plenty of leaflets on packet available, and a number of local Node, BBS, and DX Cluster

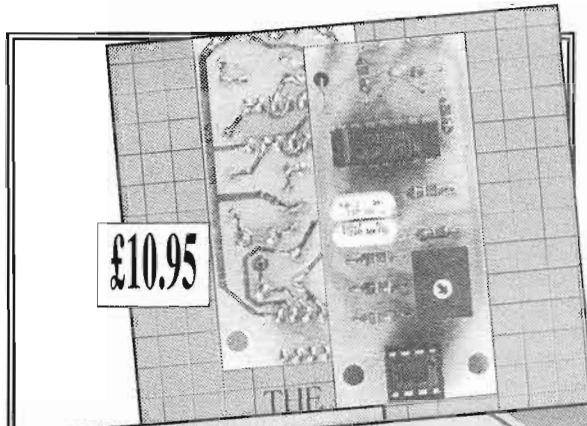
The hot 'topic of discussion' on the UK BBS networks over the last couple of months seems to have been the 'pros' and 'cons' of 9600 baud operation rather than 1200 baud. There are several 'pros', especially now that several 9600 baud-ready 'plug-in-and-go' black-box transceivers are available on the amateur market. 'Do-it-yourselfers' are also well catered for with plenty of information, both on the 9600 baud files sections of various UK BBSs and in print (such as G6AWD's 'High Speed Packet Radio Transceiver Connections' book which I featured in this column a short while ago). Dual 1200/9600 baud TNCs, such as the Kantronics KPC-9612 which I've recently been testing for review in HRT, are also seeming to attract a great deal of interest. So why the reluctance? Well, not everyone has a local 9600 baud Node or BBS to use. In fact, I'd say that it's rather a small minority of such stations in the UK who run such speeds for user access! But everyone I've heard who's tried it, wouldn't go back to 'snail's pace' 1200 baud. There's also the little problem of trying to fit 9600 baud into the new 'master plan' of 12.5kHz channel spacing in the UK. Many purpose-

designed 12.5kHz channel spacing rigs don't work very well with 9600 baud RUH type modem audio. Not forgetting the cost of the extra modem 'upgrade' that's usually required. But it'll come, eventually.

Of course, gear for thilike this also has to be installed by your local packet group, or Node or BBS SysOp, for you to use it, another problem! But if packet groups get the support of local users, even just moral support, things often get done. Why not join your local group, and maybe things could get better with a faster overall network a little sooner rather than later?



Last year's successful Sunpac 'Meet The SysOps' get-together



£10.95

✓ *Scanners 2 International*
 Comprehensive information on the use of VHF and UHF communication bands. This book gives details on how to construct accessories to improve the performance of scanning equipment and is international in its scope.



✓ *Scanners 3 - Putting Scanners into Practice*
 Now in its 4th edition, this *Scanners* has seen the largest number of changes and additions, to the point of a virtual rewrite. More detailed frequency listings, actual frequencies used by coastal stations, airfields and the emergency services. Also, for the first time a section on HF bands.

✓ *ETI Book of Electronics*
 An introduction to electronics that

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clearly explains the theory and principles involved. Each chapter includes a project to make. Projects include a loudspeaker divider, continuity tester, mini-amplifier, a burglar alarm and more.

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Wales, and can't get anything on VHF or UHF packet. Apart from HF, my only thoughts were possibly persuading a friendly packet-active amateur on a hill overlooking Pandy to act as a 'digi'. Have HRT readers any ideas? You can contact Dave with a message to GW0HHT @ IK00EM.ILAZ.ITA.EU (which obviously he uses via HF!).

If you'll be at the Sunpac meeting, I look forward to having a chat with you, otherwise as usual you can contact me on packet with a message to G4HCL @ GB7XJZ.#48.GBR.EU, or on the DX Cluster system (GB7SMC, which is now back on air with the able SysOp of Andy G4MYS), or by mail c/o the HRT Editor.

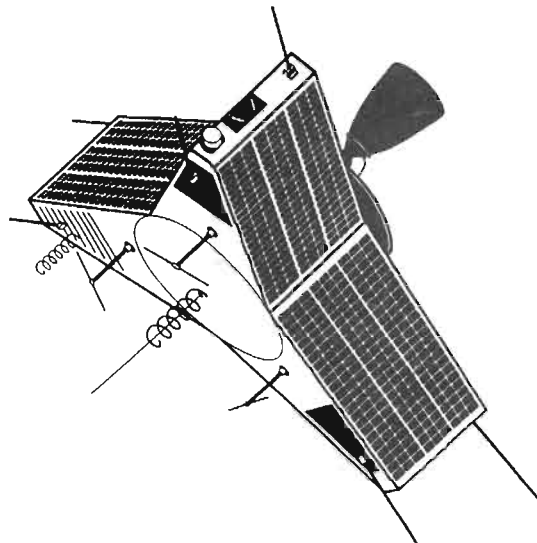
SysOps will be present to give 'hands-on' help. You can get further information on Sunpac by dropping a message to their Chairman Dave G4WPT @ GB7BNM, alternatively an SAE to your's truly c/o the Editor at the HRT address will get you an information pack on the group.

CTRL-Z, End of message

Unfortunately, not everyone is in such a well-served area for packet activity. I recently received a plea from Dave GW0HHT, who says he's right down in a valley in Pandy, S.

MORE
 PACKET
 RADIO
 ROUNDUP
 NEXT MONTH

Satellite Rendezvous



Richard Limebear G3RWL of AMSAT-UK reports on this year's annual Colloquium, and the latest Phase-3D information

Amsat-UK's annual Colloquium was held at the University of Surrey between 28th to 31st July 1994; 133 people came from 22 countries in five continents. Hot and humid weather, with a welcome meagre sprinkling of rain, accompanied the usual sociable meetings, command station tours, daytime lectures and evening sessions. The formal sessions were all well received and, at the end of the proceedings, James Miller, G3RUH, was awarded the prize for the best lecture (about AO-13) with Leonid Labutin, UA3CR, as runner-up (SAREX in Moscow). If you would like to join us for next year's meeting, the dates for your diary are the 26th to 29th July 1995.

Lectures

The University of Surrey personnel gave several talks about their equipment and the science they are conducting. Noteworthy points about their thinking include: low-cost propulsion (hybrid motors); mini-sats (up to 200kg) rather than micro-sats; higher data rates; use of S-band; GTO (or modified GTO) orbits; spread spectrum. Did you know that a single space-qualified NiCd cell costs about \$4000? Surrey buy commercial ones at around \$12 and space-qualify them in-house, with a resultant cost per cell of less than \$1000! Doug Loughmiller spoke about the S-band beacon on UO-11 which has been switched on for a considerable time; he has had *no* reports and appeals for folks to let him know if they hear the beacon (or even if they listened, but could *not* hear it).

Ray Soifer, W2RS, gave a

presentation about the US Government selling parts of their 2400MHz band - concern was expressed by many. Ray also announced a change in SAREX operations; a disconnect is no longer necessary to make the QSO valid, as long as you receive the serial number then the contact is OK.

James Miller, G3RUH, gave a resume of AO-13's status. He pointed out that, since the proton event of 13th May, EDAC counts have been consistently higher than was previously the case. AO-13 should continue working up to re-entry but the effects of drag, once perigee starts to get quite low, are uncertain. (I am trying to research this - can anyone help me? G3RWL)

Gerard Auvray, F6FAO, talked to us about ARSENE which has now been abandoned. Apparently the cable between 2m equipment and aerial was changed just before launch - the suspicion is that a connector was not tightened properly. Our French brothers have a new plan: to build a Microsat carrying a mode LS linear transponder and, maybe, a camera. This plan has a four to five year time scale (they would use the low end of 2.4GHz this time).

Amsat-OZ gave a presentation about their replacement for the Kansas City Tracker. The software takes four bits from an IBM PC parallel port and controls the rotors via opto-couplers, with a cost of around \$20-25. It works on an open-loop principle whereby positioning is determined by knowing the time

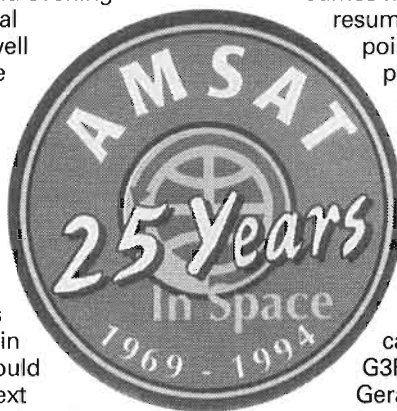
taken for the rotor to move a specified distance (you can always recalibrate by moving the rotor to it's stop). It's not precise, but it's OK for aerial beamwidths greater than about 20 degrees; the program can also use a tracking table. Amsat-OZ will be supplying these to Amsat-UK for

international distribution, with profits going to Amsat-UK's Phase-3D funds; Amsat-UK will make an announcement once stocks are to hand.

Phase 3D

The frequencies, which are subject to change, are shown in the accompanying table. The uplink power needed for 145 & 435MHz will be 50W EIRP, and 500W EIRP for 1268MHz. Where possible (i.e. not 2m) the 400kHz bandwidth will be split to have 150kHz for digital service and 250kHz for analogue service, with a proportional split on 2m. The LEILA anti-alligator equipment will initially transmit a warning in CW to reduce power, then it will insert 18dB of attenuation on the offending signal; it can handle between three and five offenders simultaneously. It will not be used on uplinks of 2400MHz and higher.

There will be two RUDAKs; *RUDAK-E* (experimental) and *RUDAK-U* (users). Rudak-U will use AX25 Pacsat protocols with six uplinks and one or two downlinks at 1200/9600/faster bps. The ramdisk should be 16 to 32 Mbits, and a mailbox is expected. Rudak-E (which will be similar to AO-21) will experiment with DSP front-ends for software modems at low and medium speeds (1200/9600/19200 bps); also on the cards is a regenerative modem faster than 64kbps and maybe a modem running at about 500 kbps (this would probably use 2400MHz for one of the links and require 10W output from P3D, and a 1m dish at the ground user). The planned solar panels (which cost DM 200000) will produce about 600W peak and 300W average. The launch is planned for Ariane 502 in May 1996, although the main payload for the flight has not yet been selected. The design, construction, testing, and transport costs are about DM three million; and they still need another DM two million for the launch (why not contribute to Amsat-UK's P3D fund?).



In a separate presentation, by G6GEJ, we heard that the 2m transmitter is designed to take 15dBm from the 10.7MHz IF and boost it to a peak of 54dBm while consuming about 6A. Unfortunately there was not enough time to incorporate HELAPS into the design. It had been rumoured that the transmitter would make internal Doppler shift compensation based on GPS data; this will not happen.

The 10m transmissions will consist of 15 minutes of digitally generated audio in CAM (Compatible AM) which is designed to be picked up on low cost receivers; the first choice of the downlink frequencies is 29.310MHz. Test transmissions from ZS6SRL using CAM can be heard on 10.125MHz at 0800utc Sundays and 1700utc Mondays; these each last for 55 minutes. Don't forget that the mode names will change once P3D gets up, e.g. Mode B will become mode-UV.

AOS/LOS

For further information about Amsat-UK contact: AMSAT-UK, c/o Ron Broadbent, G3AAJ, 94 Herongate Rd., London, E12 5EQ. Big SAE gets membership info. SWL's are welcome. All new joiners get the USAT-P tracking program on 5 1/4 in disk.

KEPLERS

SAT:	OSCAR 10	UoSat 2	AO-13	PACSAT
EPOC:	94195.81899517	94199.48919451	94196.85984906	94195.78079047
INCL:	27.0497	97.7853	57.7662	98.5977
RAAN:	317.9184	212.7468	241.7882	281.4443
ECCN:	0.6025942	0.0011606	0.7219935	0.0012030
ARGP:	194.3808	164.4932	345.8198	108.0022
MA:	135.3303	195.6634	1.7627	252.2471
MM:	2.05882029	14.69230442	2.09720171	14.29903339
DECY:	-2.39E-06	9.8E-07	2.17E-06	1.1E-07
REVN:	5538	55490	1511	23354
SAT:	DO-17	WO-18	LO-19	FO-20
EPOC:	94199.72060632	94197.73736895	94196.24430425	94196.43656308
INCL:	98.5990	98.5989	98.5998	99.0371
RAAN:	285.6692	283.7090	282.4984	342.9206
ECCN:	0.0012218	0.0012786	0.0013130	0.0539924
ARGP:	96.2295	102.3306	106.5314	275.4857
MA:	264.0280	257.9303	253.7309	78.4920
MM:	14.30043483	14.30017383	14.30113337	12.83226347
DECY:	2.3E-07	1.2E-07	-1.3E-07	-1.8E-07
REVN:	23412	23384	23364	20775
SAT:	AO-21	UO-22	KO-23	KO-25
EPOC:	94197.22316383	94198.77455892	94198.40713031	94197.23470784
INCL:	82.9454	98.4336	66.0825	98.5530
RAAN:	121.2318	272.6530	216.7082	269.7323
ECCN:	0.0036264	0.0007314	0.0015129	0.0012471
ARGP:	5.6499	193.2332	279.4774	90.3363
MA:	354.5058	166.8641	80.4534	269.9244
MM:	13.74542090	14.36923567	12.86286995	14.28060091
DECY:	9.4E-07	-1.2E-07	-3.7E-07	1.4E-07
REVN:	17357	15747	9067	4184
SAT:	IO-26	AO-27	RS-10/11	RS-12/13
EPOC:	94197.16066415	94198.16297797	94197.30647920	94198.89454776
INCL:	98.6521	98.6525	82.9266	82.9212
RAAN:	272.7178	273.6702	307.3174	348.6696
ECCN:	0.0009803	0.0009098	0.0010629	0.0030577
ARGP:	121.7855	116.6352	309.9250	25.1580
MA:	238.4287	243.5760	50.0970	335.1056
MM:	14.27733649	14.27629544	13.72339165	13.74043567
DECY:	1.1E-07	1.5E-07	2.4E-07	2.2E-07
REVN:	4182	4196	35390	17286

Phase-3D planned frequencies

(from DB2OS & UA3CR - tnx Peter and Leo)

Receivers

21.210-21.250
145.805-145.995
435.300-435.800
1268.500-1269.000
1269.000-1269.500
2400.100-2400.500
5660, b/w 25kHz

Transmitters

29.310/320/330/340/350/360 (one only), 250 W pep
145.805-145.995, 200W pep
435.400-435.800, 250W pep
2400.500-2400.900, 50W pep
5840.000, b/w 25kHz, 10W pep,
10451.000-10451.500, 60W (TWTA!)
24048, b/w 25kHz, 1W pep

Note; only transponders completed in time will fly, also frequencies may be subject to change