HRT

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JULY 1993 £1.70

KENWOOD TS-50S

A 100W HF mini-mobile rig

Summer Radio Rally Roundup

Mid-band M294 ex-PMR conversion

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NOVICE ... REVIEWS • PROJECTS • SATELLITES

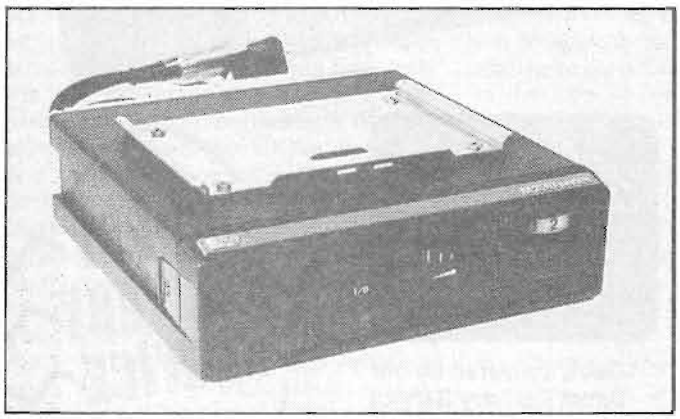
HRT
HAM RADIO TODAY
VOLUME II NO.7 JULY 1993

CONTENTS

REGULAR COLUMNS

REVIEWS

FEATURES



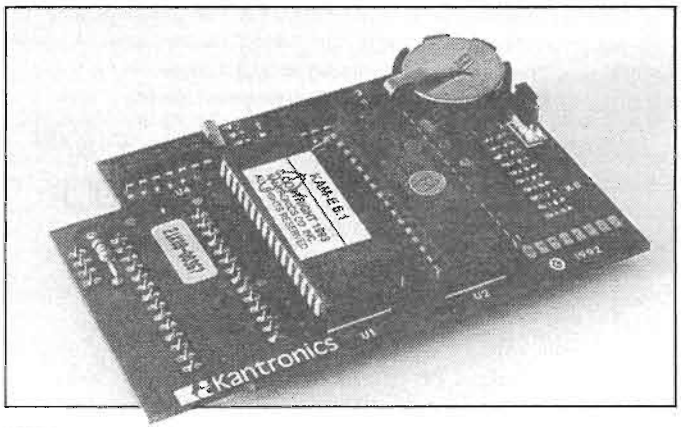
Pye M Band M294 Conversion

PROJECT

NEWS AND VIEWS

Summer Rallies Roundup

KAM Plus add-on board



CQ de G8IYA Editorial

Are you active on 380.257nHz?

Are you active on 380.257nHz? I am, and if you're a HRT reader there's a very good chance that you are too! But what was that strange frequency? It isn't MHz, it's nHz, that's right, nano hertz – super VLF! Have you figured it out yet? No, it's nothing to do with brainwave patterns, but to give you a clue this is the centre frequency used, with 'modulation sidebands' down to around 330.6878nHz and up to around 413.3597nHz. Maybe by now you're totally confused, especially if I tell you it's *multi-mode* communication! Well to let you in on a secret, it's the special 'communication frequency' shared by our regular readers, read on and you'll find the answer.

Mobile Rallies

With this 'special frequency' shared by our regular readers in mind and with the summer mobile rally season, we thought we'd give you a little 'thank you' in the form of a free T shirt to wear. It'll certainly make a change from the well-known image (amongst amateur radio traders at least) of the typical rally-goer as an 'anorak'!

Too Many Rallies?

A commonly-heard phrase amongst some traders is that there are now 'too many' rallies in the UK, and almost every summer weekend sees a number of these, dotted around the country. This, however, is *their* point of view where travelling expenses and staff overtime costs naturally precludes attending *every* rally. The inevitable conclusion to this is that it's now only the 'big' rallies, or even (some of) the major under-cover exhibitions, that are attended by the major UK rig importers and the like, leaving local rallies to local dealers and the very popular 'flea market' stalls which possibly wouldn't exist in such numbers at the 'big' events. Many, if not all, rallies are now operated by local or national amateur radio groups, where all the profits are normally 'ploughed back' into amateur radio, to keep our hobby alive, as well as giving local amateurs a 'good day out' with the chance for a spot of 'bargain hunting'.

Good news for us!

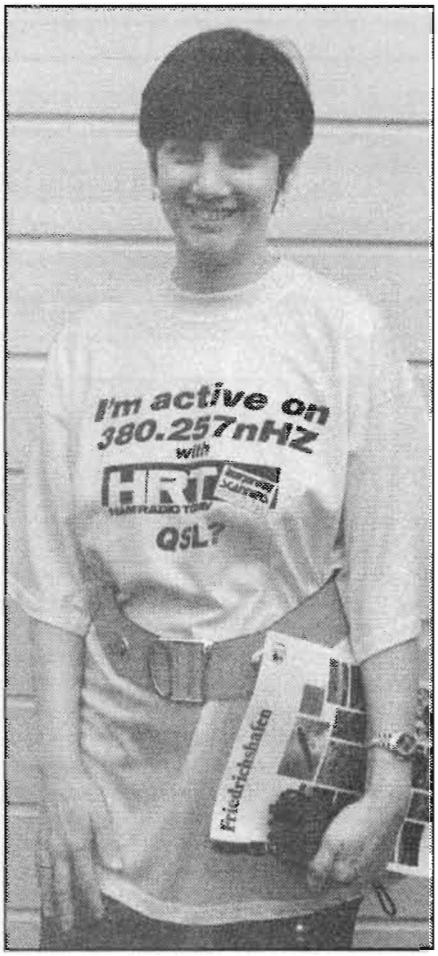
Not all amateurs can afford the high travelling costs to go from one end of the country to the other, or even abroad (but see below), and not all of us *want to find just* 'black boxes' when we get there. Smaller rallies are the favourite 'hunting ground' for low-cost ex-PMR rigs for example, offering an economic way of getting on the air, and we've tried to help by regularly featuring ex-PMR conversions in HRT. A short while ago, a rally stand trader told us he had 300 M-band M294s for sale (from several thousand currently available on the surplus market), he was selling these from his open-door van for just a few pounds each. Last week, another rally trader was reported as selling brand new and boxed A-band (2m) M294s for £25 each, complete with all accessories. With recent HRTs covering the M296 (70cm), A and E band M294s (2m and 4m), and the M-band version in this issue (convertible to 2m) you now know what to look for! In my opinion, there aren't too many rallies, they're now finding a 'happy medium' in terms of numbers and types.

Friedrichshafen

This month sees the annual massive 'Ham Radio' rally in Friedrichshafen in southern Germany. The HRT Editorial team will be wandering around with our T-shirts on – we'll have to learn how to give an explanation in German of the unusual frequency! Many amateurs from the UK go to this rally, although the imagined 'cost' of travelling puts many people off. However if you wanted to visit it could cost you just around £25 in travelling expenses *including* a meal and drinks each way, with a journey time of around 3-4 hours in each direction from the UK. That's if you plan ahead, usually drive a car, and/or have a credit card – see the Sept 92 issue, page 14, for the secret. Don't say we didn't tell you!

Organized Clubs

There are several organised club trips to such rallies, we know the annual Leicester, London Show, and NEC ex-



hibitions in the UK (as well as such delights as Friedrichshafen) attract a large number of club-chartered coaches. This keeps costs down, and makes the hobby affordable for beginners who possibly aren't as well-heeled as others.

The existence of an active local club can be a great 'boon' to the hobby, and, maybe following my 'plea' in the May issue, I'm very happy indeed to see that some clubs have taken the 'bull by the horns' and are becoming registered RAE and NRAE exam centres. Well done! The Hastings Club is a shining example (your details came *just* too late to include in Club News lads), they already run a Novice Course and RAE course plus Morse classes, and are now happily becoming a registered exam centre. Contact their Secretary Reg Kemp G3YYF for details, his phone number is Crowhurst 830454. Is your club also doing something on a similar 'non-profit' basis? Let me know, I'll be *very* pleased *indeed* to publicize it in HRT.

Finally, have you worked out what the frequency of 380.257nHz corresponds to? If I told you it's the frequency of Ham Radio Today magazine, which comes out once a month, then I'd be letting the cat out of the bag, wouldn't I? The *QSL?* which follows the 'I'm active' means, (look it up), 'do *you* acknowledge receipt?'. Our readers do, every month, on 380.257nHz!

LETTERS

Letter of the month

Dear HRT,

I would like to take this opportunity in thanking Derek GM7MVH for all the help he has given me over the last few months, it has proved to me that not all licensed amateurs are 'one above' everyone else. As I am disabled and shortwave is my most interested hobby, Derek always tries to make sure I get the best out of the hobby, without his skill and knowledge I think I'd be no further forward. As you said before in reply to a previous letter, only the 'Elite' are helpful.

Good luck with your class A licence Derek, this is the only way I can thank him, and thanks to all others who dropped me a line.

Thanks to Derek GM7MVH and to HRT, John Redmond, ISWL/GM-20450

Editorial comment;
Maybe the £10 we're sending you for the 'letter of the month' might help? Just about what a bottle of the famed GM nectar costs!

Dear HRT,

I'm afraid I'm having difficulty connecting Sandy Dick's letter (May 93 issue) with my cartoon (March 93 issue). I see no comparison with the problems an amateur may have with ill- informed neighbours, planners etc., and the following hard facts. Fact; people have been killed in industrial accidents. Fact; people have been maimed and blinded in industrial accidents. Fact; some of these people are SWLs and licensed amateurs.

I wish Sandy could have heard the callous, sneering, uncaring way in which the amateur I pictured was going on. The incident was an actual one, and I wish I could mention the operators callsign – it would teach him a lesson.

No excuses about hard cases making bad laws!

Paul Thompson, G6MEN

Editorial comment;
We've had a couple of experiences where, upon arriving at an amateur's house after the offer of help in soldering or whatever, to surprisingly find that they're disabled, making the 'need' for help even greater than originally anticipated. One case was where I'd been chatting to the amateur regularly for over a year before meeting him, totally unaware of his predicament. You often just can't tell from listening or a contact as to whether the QSO partner is disabled or not, and more to the point who else is listening to you. Not everyone's fortunate in having normal physical abilities, although as you say some may seem to think so.

Dear HRT,

May I as an electrician who for the last 12 years has specialised in low voltage electrics, cars and caravans in particular, draw the attention of your readers to the dangers of using the cigar lighter socket in their cars for high current equipment. I have in mind the inverter mentioned on page 12 of the April issue and similar devices.

These sockets are not intended for high current supplies. The wiring to them on most modern cars is only 5 amp rating, and this is usually backed by an 8 amp fuse shared with another accessory such as the car radio. A 200 watt output unit, assuming an efficiency of 80% would need around 18 amps at 13.8 volts. This is far too high for the cigar lighter socket. The wiring to the socket is often part of a loom (a number of wires wrapped together) and damage to one wire can affect others. A recent job involving one of these sockets took just over two hours, and at garage rates of between £30 and £40 per hour, repairs can be very expensive.

If you really want to run mains power from your car, then make a direct connection to the battery via a heavy duty fuse holder (the ordinary cheap plastic in-line fuse holders are unsuitable, I have had to replace a number of them that have melted due to too much current being taken through them). The cable size should be at least 28/0.3. Do not forget to keep the engine running, a standard 42 amp/hour battery will not last long with 18 or more amps being taken from it!

By the way it is nice to see a YL editing the magazine of such a male dominated hobby. You are doing a fine job lass, keep it up!
R. Wilson

Editorial comment;
You're quite right, and although the short 'trade news' item on the car inverters in question did mention that they can be wired direct to the battery, they also stated that they could plug into the cigar lighter socket, presumably for lower power types of inverters they offer. Even the thought of the possibility of an electrical fire in the engine compartment makes us shudder, and we echo Mr. Wilson's comments that you should ensure such car cigar lighter sockets are only used within their capabilities, i.e. for low-current applications. In our experience however, operating even 10W FM transceivers from such a socket isn't very satisfactory due to poor connections and the subsequent voltage drop, but we know many amateurs who ignore their transceiver instruction manuals and run high-power transceivers from such a source. You have been warned!

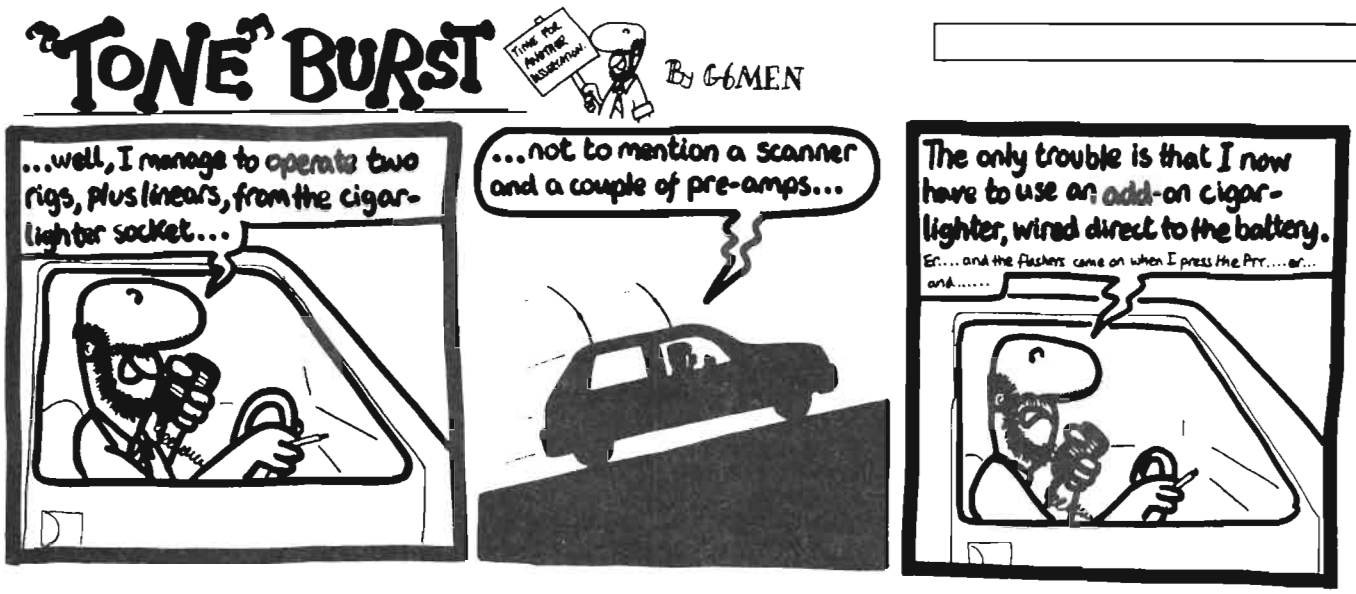
Dear HRT,

Thank you very much for publishing my letter as letter of the month in the April 93 HRT.

The copy of April 93 HRT and the RSGB Callbook that you so kindly sent to me arrived here in good condition several weeks ago. The information provided in the callbook is of great interest to me and I find

£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, P.O. Box 73, Eastleigh, Hants SO5 5WG.



reading HRT also to be an enjoyable experience. Again many thanks.
Bob Schappert, KA2BCD

Editorial comment;
Thanks for your reply Bob, and we hope that your subsequent visits to the UK become even more enjoyable!

Dear HRT,

I just have to reply to Ray Howe's letter in the May edition of HRT. The first comment I would like to make is, if we British amateur radio hobbyists are, if we follow Ray's suggestions, to become 'copy-cats', let's at least copy something with a little more success than this 'silly idea'. The present situation in the UK is a complete and utter randomised shambles, and before ever we can adopt new or used ideas, we must sort out our own house first.

We could, given some backing and 'backbone' from RSGB and from every licensed amateur in the UK, build our own incentive licensing scheme. With the start at Novice 'D' (replacing Novice 'B' all VHF/UHF bands plus 10m at 5dBW), followed by Novice 'C' (replacing Novice 'A', QRP at 10W max on HF and 10dBW on all VHF/UHF bands), followed by amateur class 'B' (with use of 15dBW on HF/VHF/UHF), then full class 'A' (20dBW on all amateur bands). An 'unlimited extra class' licence could be applied for and possibly granted, where the applicant can prove that such transmissions will not interfere with other amateurs and neighbours etc., etc. Each licensee must have spent at least one full calender year operating each of the three licences (D, C, B) without skipping, as can be done at present, before proceeding up to the next licence. Incentive or what?

The people most likely to complain are the Morse examiners, because it is to be hoped that the CW test will become redundant for a class 'A' licence. They would be far better used checking and testing that the licence applicant seeking an upgrade, has reached the targets set out for them to achieve with each licence. Let's not forget that amateur radio, for the greater majority of us, is only another hobby.
J. D. Bolton, G4XPP.

Editorial comment;
Any readers care to comment?

Dear HRT,

As a Novice instructor I have noticed two things, a high percentage of YLs and a distinct lack of 2E0s. I promised my group I would get a Novice 'A', as you can see by my callsign I did so.

At first, many Novices came on air with handhelds and rubber duck aerials. This was so discouraging, that many gave up simplex contacts and only worked repeaters. Nowadays one seldom hears a Novice on 70cm. Some are busy doing RAE courses, Morse classes (usually 12 WPM) and in our club some migrated to 23cm and 3cm.

I decided to migrate to HF since I had passed a 5 WPM Morse test, I have been amazed at what 3W of RF can do. My licence arrived on 17th September this year, I bought a G5RV half size aerial, erected it as a sloper, north end at about 10m high, and south end at about 3.5m high. Since then I have worked on 21 or 28MHz on 33 days, usually at odd times in short sessions totalling about 1 hour or less, this on 21MHz (about 2 hours total operating time) in one CW contact. No CW contacts on 28MHz for about 1 hour total over same number of days. However, 28MHz on SSB really did surprise me. From 25th September till 25th October I answered CQs. The net result over the period was 7 Russian contacts at ranges of 1200 miles to 1700 miles. Thus encouraged, I dived into the CW WW SSB contest, 3W, G5RV sloper and all.

For a total operating time of 37 minutes, over a time range of about 6 hours (I do have other things to do), I netted 4 Finns, 4 Russians, 1 Bulgarian, 1 Azores, and 1 USA contact. This gave distances from a minimum of 1200 miles to a maximum of 3750 miles, including one Russian at 3250 miles. Since then to date I have added 3 more Russians, a Croatian, a Yugoslav, a Greek and two more Americans, I have also made 6 G contacts. In general all contacts over 1000 miles had better reports than G stations, I should also point out that some of the longer contacts were answering my CQs, Finns, Russians, and Americans. I have restricted operating times, usually 8.00am to 9.00am or 8.00pm to 9.00pm, and also operate on 2m and 70cm in those periods.

So, where are the 2E0s? Why are there not more? The question I think every G contact has made is "Why don't you do 12 WPM and get a 'real' A licence". I quote the QRPers, I usually reply by asking if the caller has worked this country, that country, what power was used, what aerial etc. I find I have worked places they have not and done it on much less power, with a simple aerial! So again, where are the 2E0s? The QRP motto is "It is vein to do with more what can be done with less" (courtesy of Rev. Dobbs, I think).

L. Shooter, G1LHW/2E0ADM Proud to be a 2E0!

Editorial comment;
This sounds just like what Dick G0BPS in his monthly 'QRP Corner' has been saying for a long time, it's nice to see it confirmed!

Kenwood TS-50S Review

Chris Lorek G4HCL marvels at miniaturisation and tests a full-blown 100W HF rig about the size of some 2m mobile rigs!

The Kenwood TS-50S was first revealed 'live' to UK amateurs at this year's London Show at Picketts Lock, and by the veritable queue of people waiting to try it at the Kenwood stand, it seemed to be causing quite a sensation! The set's unique feature is it's size, it's remarkably small for a full-blown 100W all-mode HF rig, in fact about the same as some of the early 2m FM mobile rigs! Not long after the show, a review sample arrived on the editorial desk, complete with the matching AT-50 automatic ATU, onto the G4HCL aerials it promptly went!

Remote operation of four functions plus up/down tuning is provided with the supplied microphone

What's in the Box?

Within its 179mm x 60mm x 233mm case there's a HF transceiver covering all WARC bands together with general coverage HF receive capabilities, and operation modes of CW, LSB, USB, AM and FM on transmit and receive. Separate receive filters are provided for SSB/CW, AM, and FM, and there's even room left for an optional 500Hz CW filter which may be fitted. The transmitter is capable of 100W maximum output power (25W on AM) with switchable lower power levels of 10W and 50W (2.5W and 12.5W AM), a fan-assisted heatsink being provided to cool the PA.

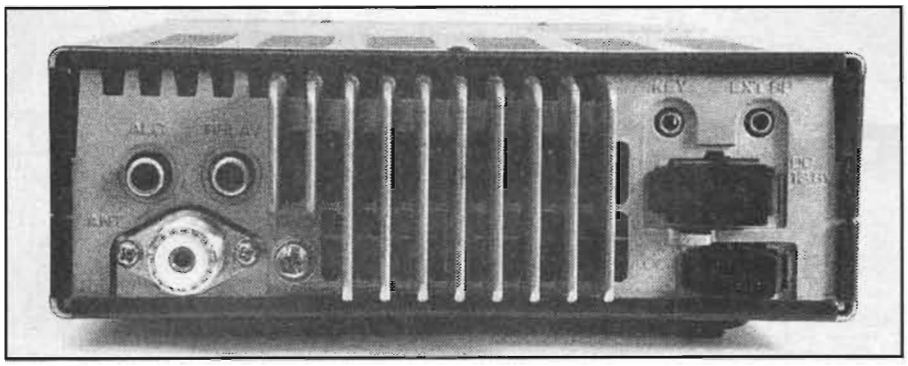
Although it would unquestionably make a handy 'go anywhere' mobile or portable set (it's supplied with a mobile mounting bracket as standard) it offers quite a few 'DX chasing' operating features. These include an IF shift control, easy split transmit/receive operation, and 'TF-Set' for quickly keeping a watch on the split transmit frequency and tuning for a 'gap' when needed.

The simple front panel is complemented by a comprehensive 'menu' system, similar to that of the TS-950SDX, which uses the main LCD together with a 'look-up' table of no less than 72 functions. These are used for switching between, for example, slow/fast AGC, transmitter power level, narrow/wide filter, high/low microphone gain, full/semi break-in CW with variable delay, and so on.

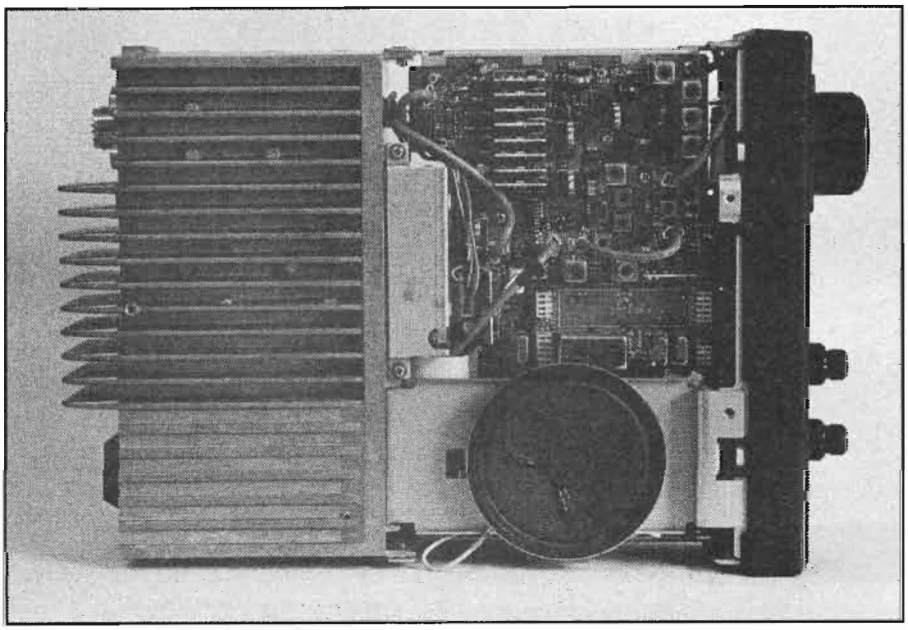
A direct digital synthesizer is used, which apart from making sure there's no synthesizer microphony while you're on the move in a bumpy car, gives a degree of flexibility such as allowing you to switch in 'reverse CW' which shifts the injection point to either side of the wanted signal for QRM rejection, an transmit IF shift to tailor your transmitted passband. Interference-fighting measures include a switchable pulse noise blanker, receiver attenuator, and 'AIP', standing for Advanced Intercept Point, to improve the strong-signal handling performance under crowded band conditions, Kenwood state a dynamic range of up to 105dB is possible with this enabled.

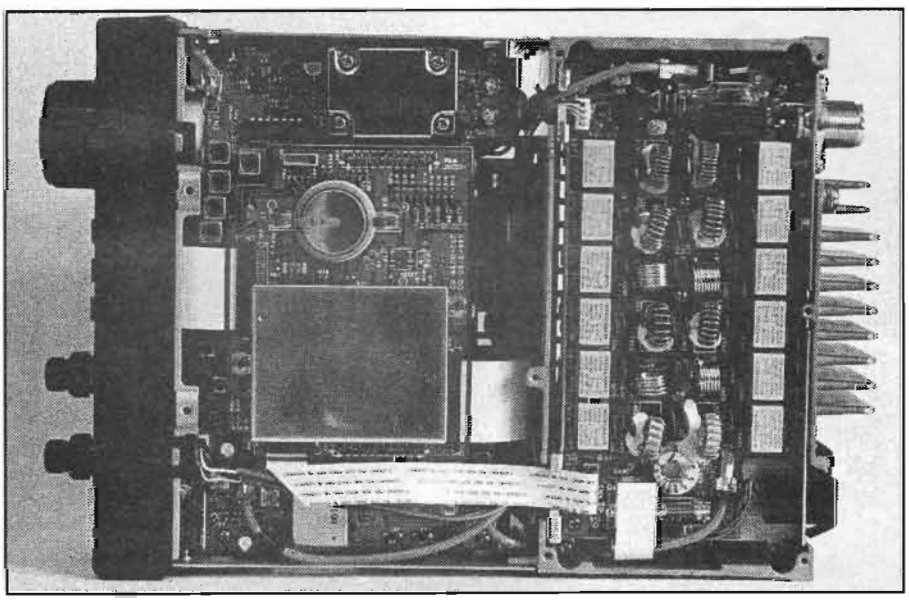
Out and About

The size of the set naturally lends itself to 'out and about' mobile and



Rear panel connections





Inside the set

portable use, and the set's controls are designed to make this type of operation as easy as possible. For use on the move, as well as the 'usual' up/down buttons on the microphone for changing frequency or memory channel, four additional buttons are fitted which you can 'customize' to switch virtually whatever you want from the 'menu' system. Thus you should be able to quite happily use the set for many purposes with just the microphone-mounted controls, rather than fumbling around underneath the dashboard or across the car for this or that button or knob. Together with the 100 memory channels, these being arranged into 'groups' for selection, you'll be able to recall that WAB frequency or whatever quite easily.

For either local or 'DX' FM use both simplex and through worldwide repeaters, the set has a built-in CTCSS encoder as well as offering split TX/RX operation for repeater shift, and an all-mode squelch is provided to give your ears a bit of a rest. Another tone feature is a 1750Hz 'burst' facility, which could be useful if you wish to run the set with a HF to 2m transverter for combined HF and VHF mobile operation on the move. You can store the various split frequencies along with their tone combinations into memory channels for easy use on the move.

An optional Kenwood external ATU (Aerial Tuning Unit) can be connected and operated under remote control from the TS- 50S, very handy for use with narrow-band mobile whips and the like without needing to stop the car each time you QSY more than a few kHz. Two types may be connected for automatic remote operation, the AT-50 (pictured here) which is a 'desktop' type designed to match amateur band aerials rather than, say, long wires, or the ruggedised AT-300 designed to also handle random-length aerials such as non-resonant mobile whips.

In the Shack

After coupling up the set in the shack to my external 13.8V heavy-duty power supply and aerial system, I found I was happily switching bands, modes, listening around, and even having my first QSO within a minute of switching on. This must say something about its ease of use!

It took me a short while to get used to the fact that the tiny set I had in front of me was putting such a potent signal out with its 100W, the 20A power supply (beneath my desk) being several times the size! Although the TS-50S has short rubber feet for desktop use, I found that I needed to raise the front with a small book or similar to allow me to operate the set comfortably, the main tuning knob being otherwise too low – I felt a tilt-up 'bail' would have been useful here (fitting the mobile bracket to raise the set made it slide around when I used it).

Even at the beginning I received some very complimentary reports on my transmitted audio, and I found this to be reliably the case as long as I didn't 'shout' down the microphone. Although the set didn't have a built-in speech

processor, connecting an external RF processor (which controlled the audio level to the rig) gave me a quite punchy, but very clean, signal. But in 'ragchews' the set did get hot, very hot, *extremely* hot! The higher-than-usual average SSB power by using the processor no doubt had an effect here, but during a lengthy FM QSO (i.e. using the set as intended) it decided 'enough was enough' and switched itself down to low power. Mind you, the power supply was also noticeably suffering so maybe it wasn't such a bad move!

I was fortunate in being able to test the set during the recent CQ WPX contest, giving it a 'real' test of on-air performance in very crowded band conditions as well as 'ordinary' day-to-day use. Amongst the large numbers of 'funny' prefixes (which kept me busy referring to my prefix allocation lists!) I found that the set's receiver did suffer from closely-spaced strong signals, giving the effect of 'splattering' SSB stations, although the 'AIP' helped a little here. However, the 'ultimate' rejection of a nearby 'monster' signal (from a participant local to me) was very reasonable, quite good in fact as long as I was tuned 50kHz or so away, the 'AIP' making no difference whatsoever.

Going Places

Well, after having my 'ears bent' after listening to all the monster signals that weekend I was glad of a bit of a rest, so I thought I'd have a bit of fun by using the set for what it would be really ideal for. On went the G-whip, and G4HCL/M went on the road. By programming the four microphone mounted buttons for mode change, band change, M/V (memory or VFO selection), and M>V (memory to VFO selection), I could quite happily use the rig without even taking my eyes off the road apart from a quick glance to check what frequency I was on. The set has the capability of a CW ident when you change mode, i.e., 'L', 'U', 'C', 'F' and so on, and although these almost drove me mad in the shack (they can be changed to a simple 'beep') I initially found them quite handy when on the move, as the only visual mode indicator was a small display of this on the set's LCD. Eventually, I found it more useful to use a group of memory channels to store different band frequencies and their corresponding modes, FM splits etc. on, then QSY from these by transferring them by a single-button microphone push into VFO mode. This was superb for 'on the move' use, and also made sure I was on the centre frequency for my narrow-bandwidth mobile whip (very narrow on 80m for example!).

The main tuning knob has an au-

LABORATORY RESULTS:

RECEIVER;

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

Sensitivity;

Input level in µV pd required to give 12dB SINAD;

Freq. MHz	*SSB/CW*	*AM*	*FM*
1.8	0.14	0.45	0.26
3.5	0.13	0.38	0.22
7.0	0.11	0.34	0.19
10.1	0.13	0.36	0.21
14.0	0.11	0.36	0.23
18.1	0.10	0.31	0.18
21.0	0.13	0.32	0.20
24.9	0.14	0.36	0.22
28.5	0.12	0.36	0.21
29.5	0.13	0.34	0.22

Selectivity;

	SSB/CW	**AM**	**FM**
-3dB	2.3kHz	7.0kHz	12.3kHz
-6dB	2.5kHz	7.4kHz	13.6kHz
-20dB	3.0kHz	10.4kHz	16.2kHz
-40dB	3.7kHz	16.5kHz	21.3kHz
-60dB	5.8kHz	25.7kHz	35.0kHz
-80dB	6.7kHz	45.4kHz	54.0kHz

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;

	AIP Off	*AIP On*
+/-50kHz;	100.9dB	100.9dB
+/-100kHz;	105.6dB	104.8dB
+/-200kHz;	106.9dB	107.2dB

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;

	AIP Off	*AIP On*
10/20kHz spacing;	63.1dB	66.4dB
20/40kHz spacing;	73.8dB	77.0dB
50/100kHz spacing;	93.2dB	97.7dB
100/200kHz spacing;	95.7dB	100.8dB

Image Rejection;

Increase in level of signal at the first IF image frequency, and at the IF itself, over level of on-channel signal, giving identical 12dB SINAD signal;

Freq. MHz	**Image Rej.**	**IF Rej.**
1.8	92.2dB	104.4dB
3.5	98.2dB	>110dB
7.0	100.8dB	>110dB
10.1	98.3dB	>110dB
14.0	100.7dB	>110dB
18.1	100.7dB	>110dB
21.0	100.8dB	>110dB
24.9	96.4dB	>110dB
28.5	96.7dB	>110dB
29.5	96.1dB	>110dB

S-Meter Linearity

Measured at 14.25MHz;

Indication	**Sig. Level**	**Rel. Level**
S1	1.04µV pd	-28.3dB
S2	1.14µV pd	-27.5dB
S3	1.48µV pd	-25.2dB
S4	1.86µV pd	-23.3dB
S5	2.73µV pd	-20.0dB
S6	4.18µV pd	-16.2dB
S7	7.53µV pd	-11.1dB
S8	12.7µV pd	-6.6dB
S9	27.1µV pd	0dB ref
S9+20dB	224µV pd	+18.4dB
S9+40dB	2.89mV pd	+40.5dB
S9+60dB	22.1mV pd	+58.2dB

tomatic 'speed-up' facility which varies the step rate depending on how fast you twist the knob. Although this was sometimes quite useful in the shack, I often found it very irritating on the move. For example I'd be tuning back and forth, would find a signal which I'd 'tuned past' an eighth of a turn back, but then have to twist the knob a few revolutions to correctly tune in, which disorientated me many times. Eventually I just used the mic up/down buttons!

I only briefly tested the auto-ATU in the car, preferring to use a whip at its resonant point whenever possible to extract that last bit of ERP. This operated quite quickly, having a band 'memory' to retain the last-used tuning settings for each band. The set-mounted 'ATU' button (which could of course also be programmed as a mic button) meant that I could site the ATU wherever it was convenient in the car.

Back in the shack, testing the set on data modes showed it had a perfectly adequate TX/RX switching speed, and although there wasn't a 'data' position on the mode selection (to mute the microphone for example) the front panel mic socket had the receive audio available, making it a 'one plug' changeover. No doubt with the optional 500Hz filter and an appropriate twist of the IF shift to centre the required tone frequencies would make the set an even better performer in this respect.

All in all, I found the TS-50S operated quite well on air for day-to-day use, apart from getting rather hot during long transmit periods!

Technicalities

The accompanying photo shows the neat internal layout of the set, and that there is still a little room in there for the optional CW filter and add-on high stability TCXO. The set gives a frequency readout to 100Hz, this may also provide 10Hz and 1Hz digits with a button push (using the RIT display) for those who want to tune to that last increment! The set steps in 5Hz increments, although you can shift the actual 'Hz' digit by quickly waggling the tuning knob back and forth, to enable Kenwood's (peculiarly termed!) 'fuzzy logic' to get to that last 1Hz.

The receiver uses IFs of 70.045MHz (giving roofing selectivity) and 10.695MHz (the main selectivity), plus a 3rd IF of 455kHz for FM. The transmitter frequency range is controlled to the exact amateur band limits for the country intended, i.e., starting at 1.810MHz on 'Top Band' for UK use rather than 1.800MHz, so there's no danger of accidentally transmitting a few kHz out of band after QSYing on the move!

Lab Tests

The tabulated results show that, with the transmit level kept below or just at the onset of ALC, a very 'clean' SSB signal was generated, confirming the on-air reports. The transmitter harmonics were well suppressed, very good considering that there can't be that much space in there for multiple switched banks of low pass filters! On receive, a good blocking performance was measured, but closer in (probably within the bandwidth of the roofing filters) the strong signal handling degraded somewhat, the overall filter bandwidth also 'opening up' around the lower part of the skirts.

Conclusions

The TS-50S packs a remarkable amount of circuitry into its small case, offering virtually a 'go anywhere' set. In my opinion it may not match up in terms of 'DX potential' to be, for example, at either end of a DX pileup, although this must be offset by its facilities of being a basic 'easy to use' set, undoubtedly intended for all-round use. The 'menu' facility is useful in programming the microphone mounted buttons for varying functions, e.g., fast/slow AGC switching (which isn't on the front panel) for shack use, or for duplicating some of the commonly-used front panel buttons for mobile use. The set's PA gets very hot during lengthy operation, and care should be taken to keep it well ventilated in use.

The TS-50S is currently priced at £999.95, the optional AT-50 ATU at £299.95, and the CW filter at £54.95, and is available from Kenwood dealers. My thanks go to Trio-Kenwood UK Ltd. for the loan of the review equipment.

TRANSMITTER;

TX Power/Current Consumption;

Connected to stabilised 13.8V DC using supplied DC lead

Freq MHz	Low	Medium	High
1.81	8.2W (6.3A)	47.0W (12.4A)	106W (17.1A)
3.5	8.8W (6.4A)	49.5W (13.1A)	108W (18.0A)
7.0	8.8W (5.9A)	51.0W (12.0A)	109W (16.8A)
10.1	9.0W (6.0A)	51.5W (11.9A)	108W (17.0A)
14.0	8.9W (5.7A)	52.0W (11.4A)	107W (16.2A)
18.1	9.0W (6.0A)	52.0W (11.4A)	106W (18.9A)
21.0	9.0W (5.6A)	52.5W (11.8A)	105W (17.2A)
24.9	9.0W (5.5A)	51.5W (11.6A)	104W (16.8A)
28.5	9.0W (6.2A)	51.5W (13.0A)	100W (18.5A)
29.5	9.0W (6.5A)	51.0W (13.8A)	97W (19.3A)

Harmonics;

Freq. MHz	2nd	3rd	4th	5th	6th
1.8	-62dBc	-80dBc	<-80dBc	<-80dBc	<-80dBc
3.5	-59dBc	-61dBc	<-80dBc	-72dBc	<-80dBc
7.0	<-80dBc	<-80dBc	-78dBc	<-80dBc	<-80dBc
10.1	-65dBc	-61dBc	<-80dBc	<-80dBc	<-80dBc
14.0	-77dBc	-80dBc	<-80dBc	<-80dBc	<-80dBc
18.1	-67dBc	-64dBc	<-80dBc	-78dBc	<-80dBc
21.0	-78dBc	-67dBc	<-80dBc	<-80dBc	<-80dBc
24.9	-75dBc	-66dBc	<-80dBc	<-80dBc	<-80dBc
28.5	<-80dBc	-70dBc	<-80dBc	<-80dBc	<-80dBc
29.5	<-80dBc	-71dBc	<-80dBc	<-80dBc	<-80dBc

SSB IMD Performance;

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

IMD Order	*3rd*	*5th*	*7th*	*9th*	*11th*
ALC Onset	-23dB/ -24dB	-51dB/ -42dB	-52dB/ -47dB	-53dB/ -55dB	-57dB/ -57dB
Mid ALC	-18dB/ -22dB	-32dB/ -36dB	-60dB/ -41dB	-56dB/ -47dB	-52dB/ -55dB

Pye M Band M294 Conversion to 2m

Pete Shepherd G7DXV converts the M Band M294 to a fully functional 2m rig

This article is being put together as an accompaniment to the articles by Chris G4HCL in the January and May 1993 issues of HRT. It's strange how things occur, because just as I was working on this project, the first article appeared in HRT! The main difference is that this article deals with the M band, or 'Mid Band' variant, i.e., TX 105-108MHz and RX 138- 141MHz. The M band version can be obtained for a respectable cost, and with relative ease, can be operational on 2m within about six hours, and the project is within the grasp of those with limited knowledge and with limited test equipment.

Find your radio

All M band versions I've seen to date have been 12.5kHz channel spacing, this did not appear detrimental in use. Receiver sensitivity appears to be good, and you will get a good 25W out of the PA. All models I have seen to date have been supplied with an external interface, in order for a modem to be fitted.

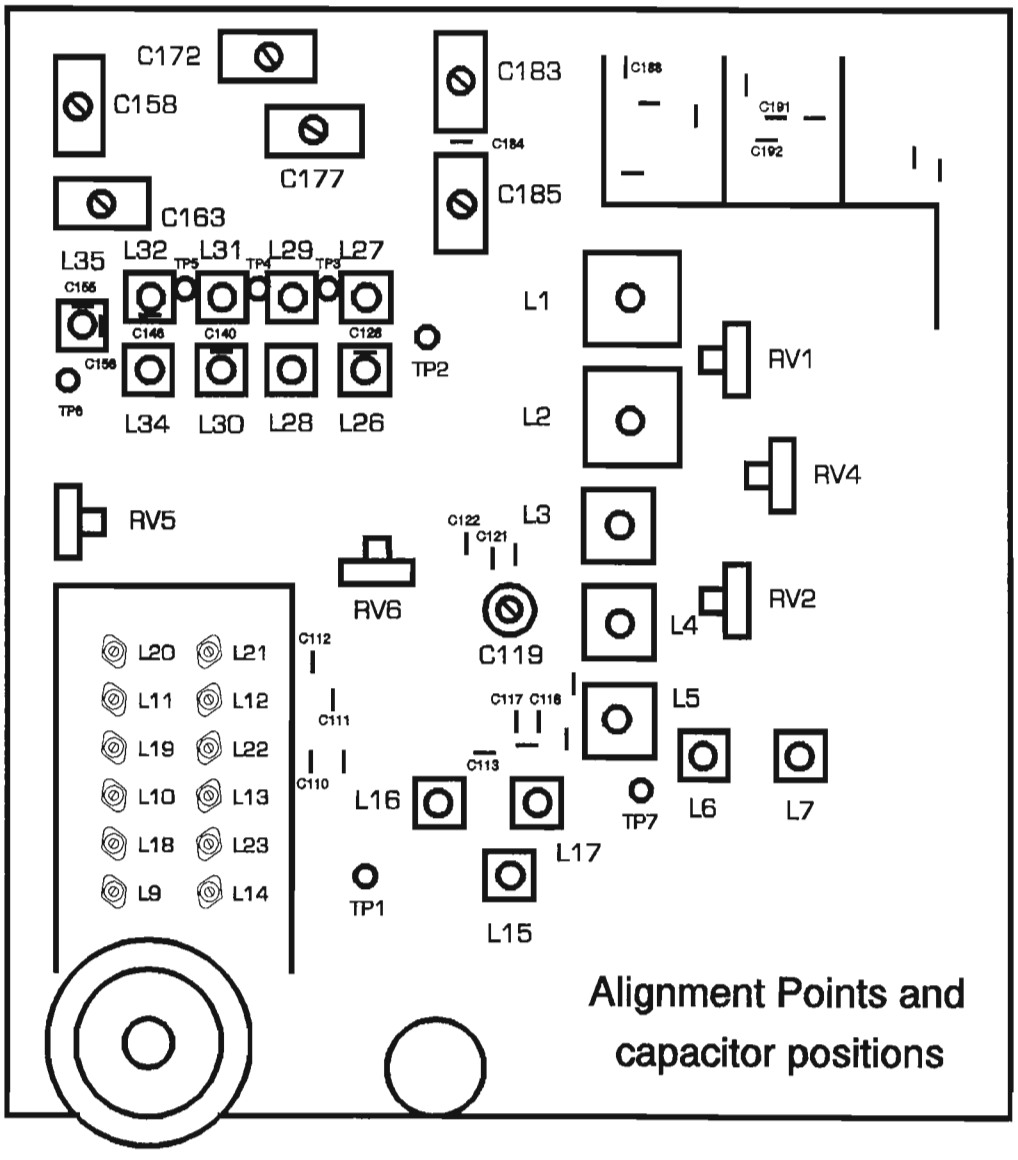
Upon obtaining your M band rig, first remove the four rear panel screws, which will allow the case to be removed complete with the front panel. Check the PCB for burn-outs etc., and check that the fuse on the board is OK. On the PCB, connect pin F1 to link with pin S (my set was supplied with pin G1 to pin F1, this should be rerouted), this will redirect the RX audio from the remote socket. To allow for microphone PTT action, pin 3 of the mike socket is to be routed to pin L2 on the PCB. In my particular application, this entailed removing the connection currently on pin L2, and transferring the connection on pin K3, to pin L2 (blue wire). This will redirect the remote socket PTT action. A loudspeaker is connected between chassis and the external wiring from PCB pin W.

Apply 13.8V, negative ground, 6A rated, to the set. Turn on, set the volume half way, and open the squelch via preset VR4. Do we have audio? Good. If the original crystals are fitted, then a check with a signal generator or similar could prove receiver operation prior to modification. If the original TX crystal is available, then connect the power meter and a dummy load to the aerial lead. Press the mic PTT and check for RF power. 'No mic' I hear you say? No problem, just short out pins 3 to 5 on the mic socket. OK that's the preliminaries out of the way, and I'll assume you have a working set.

Let's get it on Two

A word of warning. The ferrite cores of the RF stages break very easily, use a non-metallic trimming tool. If the ferrites are tight, it may pay to first remove them, clean the threads with a suitable solvent, and run a screw of the correct format down the formers.

The crystals used for this project will make use of those spares from other rigs. There is no need to apply for 'specials', just standard supply HC25u from QSL Ltd. The following calculations for the crystal frequencies, (which differ from the original M band formula), apply;



$$\text{TX Xtal} = \frac{\text{TX Freq}}{12}$$

$$\text{RX Xtal} = \frac{\text{RX Freq} + 10.7\text{MHz}}{3}$$

The Receiver

Locate capacitor C58, it's the 4n7 at the front of the crystal section. Remove this and replace it with a 47pF ceramic plate. Insert a receive crystal, and we're ready to retune.

Start by switching the rig on, with a multimeter set to a range of 2.5V, connect its positive lead to TP1, negative to chassis. Adjust L15 for maximum reading, and L16 for minimum reading. Set the multimeter to a 10V range, and transfer its positive lead to TP7. Now adjust L16, L17, L15, L16, L17, in that order, for maximum reading. That's the Local Oscillator tuned.

The RF stages should now be adjusted. Start by setting the cores of L2, L3, L4, and L5, flush with the screening cans, set the core of L1 about 2 to 3 turns above the can. If you have one, connect a signal generator to the aerial input, set it on frequency, and trim L1 to L5 for maximum signal. Otherwise, you'll need to use an off-air signal. Remember to also adjust the crystal trimmer for best audio.

The IF coils, L6, L7 and L8, should not require attention, assuming the set worked originally. That's the receiver completed, just adjust RV4, the squelch preset, under open channel conditions.

Transmitter Modifications

The transmitter is the main bulk of the modification. The mods required are simple to carry out, but do require a few hours of patience to undertake. Included in this transmitter section are details for the bandpass filter, this requires modification even for receive only.

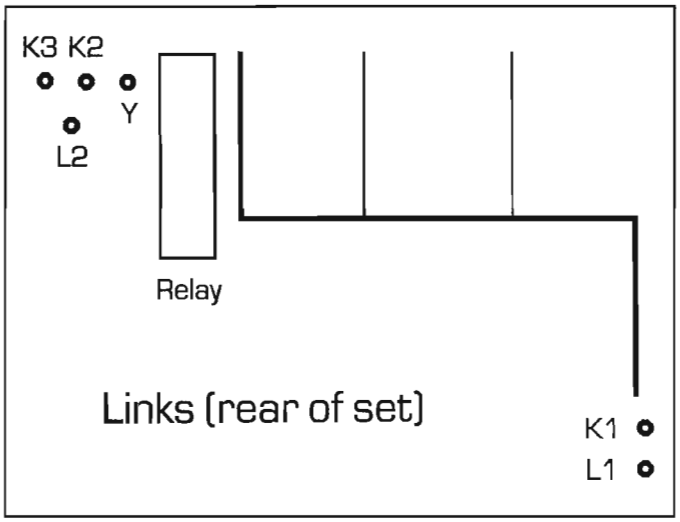
The original TX crystal frequency was approximately 6.7MHz. The four doubler stages took the TX through the following; 6.7 to 13.4 to 26.8 to 53.6 and finally up to 107.2MHz. In order to keep the modification simple I found that using all the original coils, a 12MHz fundamental could be employed, and the following format could follow; 12MHz buffered at 12, doubled to 24, tripled to 72, and finally doubled to 144MHz. This is how it's done;

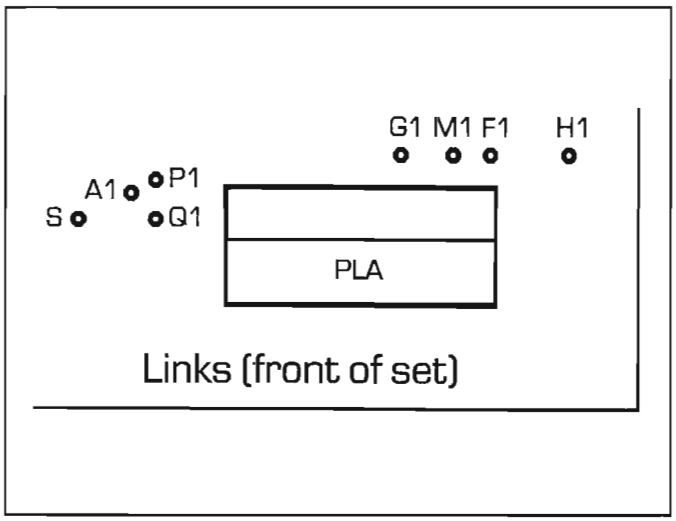
Disconnect all power, and remove the three underside metal screens, plus the lid of the filter network. You will need a fairly large soldering iron, plus care not to pull track off the PCB. Be careful of solder splashes. Continue by removing the screening cans of the following coils; L26, L30, L32 and L35, these are removed by unsoldering the two fixing ears of each can, use care not to damage the coils, nor the PCB track. That's the worst of the job done.

Locate the following capacitors in the filter network, and change the values as given; C188 was 6.8pF, change to 3.9pF; C191 was 10pF, change to 4.7pF; C192 was 27pF, change to 18pF. That's the filter out the way, now for the oscillator. Locate C110 at the front of the crystal section, its value is 1nF, change this for a value of 56pF (early versions had this positioned between L16 and TR23). Next locate the following capacitors, and change the values as given; C111 was 330pF, change to 47pF; C112 was 100pF, change to 33pF; C113 was 470pF, change to 180pF; C116 was 120pF, change to 56pF; C117 was 56pF, change to 27pF; C121 was 33pF, change to 10pF; C122 was 33pF, change to 10pF. Right, that's the oscillator, and phase modulator stages out of the way. Now for all the screened coils.

Locate and change the following capacitor, within the respective screens; L26, C128 was 120pF, change to 220pF; L30, C140 was 47pF, change to 33pF; L32, C146 was 22pF, change to 8.2pF; L35, C155 was 27pF, change to 12pF; L35, C156 was 56pF, remove. OK that's the multipliers sorted, we're at 2m, now for the PA mods. Start by removing variable capacitors C172 and C183 (120-350pF). These are replaced by variables with a capacitance range of 60-180pF. If you don't have the correct types you could always utilise those just removed (I did). With care you can pull the trimmers apart, undo the top nut, desolder the fixing legs and carefully remove the ceramic base. With the aid of a soldering iron it is now possible to separate the fours sets of plates, taking care not to damage the mica separators. The capacitor can now be remade to the correct value by using two sets of plates, don't forget the insulators. Once rebuilt, check with your ohmmeter for shorted plates, and replace.

Now fit C184, a 47pF ceramic in the vacant position between the two variables C183 and C185. Finally remove C203, this is the 18pf ceramic on the underside of the board, trapped across the PA transistor emitter and collector. Before applying power, a check on workmanship should be carried out. Check for solder splashes and bad solder joints. Once satisfied, the coils screen etc. need to be replaced.





Transmitter Alignment

Insert your crystal in the respective location, connect your power supply, power meter, and dummy load, and we will tune up. Increase the ALC preset RV7 fully clockwise. When required, turn the transmitter on via the previously tested PTT, short transmission periods only. With a voltmeter set to the 2.5V range, its negative lead to

chassis, positive lead on TP2, turn on and tune C119 for a small peak in reading. Transfer the meter to TP3, set the core of L26 flush with the former, L27 about mid travel. Tune L26 outwards for a peak reading. Then tune L27 and return to L26 to obtain peaks on both coils.

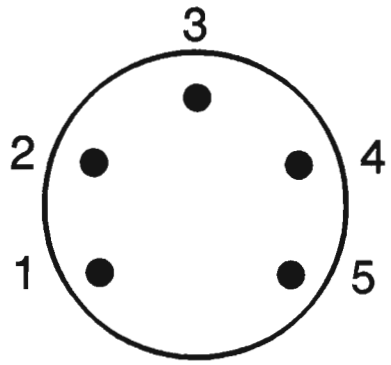
Transfer the meter to TP4, set the cores of L28, and L29, mid travel. Tune l28 for a peak reading. Then tune L29 and return to L28 to obtain peaks on both coils. Transfer the meter to TP5. Set the top of the core of L30, 2 to 3 turns down inside the former, set L31 flush, and tune L30 for a peak meter reading. Tune L31 and retune L30 to obtain peaks on both coils. Remove your voltmeter, and set the following coils. The core of L32 should be mid travel, L34 is flush, and the top of the core of L35 should be 4 turns inside the former.

At this point you may notice a reading on your power meter. Tune L32, L34, and L35 for maximum reading. If RF is not evident on the power meter, a check with a diode probe connected between your voltmeter and the top of C163 should indicate RF. You can tune L32, L34 and L35 at this point. If RF is shown on your power meter, then it's a simple case of trimming capacitors C158 and C163, C172 and C177, C183 and C185 for maximum RF reading. Keep an eye on the power, and if need be, trim RV7 back. If RF is not shown on the power meter, then with your diode probe connected to the top of C177, trim capacitors C158 and C163 for a maximum. This should now result in a power meter reading.

A final trim of all stages from L26 to C185 including RV7 should be carried out, with your voltmeter and power meter, trimming for maximum power, under minimum current conditions as monitored on your power supply. You can set RV7 for your power output, but retune after. Once completed, apply a small amount of silicon compound between the nut and top plate on the variable capacitors C158 to C185.

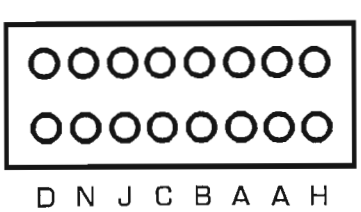
The transmit frequency should now be adjusted. Ideally a frequency counter, close coupled, should be used, alternatively another receiver may be pressed into service, monitoring the final frequency or one of the crystal multiples, although this will of course not be as accurate.

Finally set the deviation preset, RV6, to approximately 60% clockwise, and the transceiver is now ready to air test. If you can monitor your own signal, adjust C119 to give minimum distortion, and possibly adjust RV6 for deviation, and RV5 for microphone gain. That's it.



Microphone Connections

Table 1 – Mic Connections	
1	Mic live
2	Ground
3	10V PTT line
4	RX low level audio
5	10V output



Facility plug connections (viewed from front of set)

Final

OK, you now have a transceiver to use. The rig will cover the entire 2m band, but you will have to decide where you want to use it. You can only expect a 1MHz working range before a retune is necessary.

Before we finish, there are a number of additions that can be added, some of which are given here. A front panel squelch switch could be fitted, switch between the wiper pin of RV4 and it's anticlockwise leg. Headset operation is possible, pin 4 of the microphone lead is suitable for headset RX audio. The TX currently has aa 10V PTT, this can be changed to 0V switching if required, simply connect PCB pins H2 to L2, cut the thin PCB track that links the PTT relay to ground, and 0V switch from pin Y. A channel busy lamp can be installed, an LED can be grounded via pin P2 on the PCB. Pin P2 is normally linked to pin M1, with an output taken from pin M of the inboard facility socket. RX audio is also taken to the internal facility socket, pin E. This is for modem use and its output level is set by RV2. If your transceiver was fitted with a remote 15 way D type connector, then the original PCB pins could be reconnected. Fit a mating D connector, suitably linked out, when a modem is not required. Connect pins 7 to 8 for RX audio path. Pins 11 and 15 are for remote PTT. You could also fit a front panel PTT, switch between pins H and L on the PCB link pins. The mods are endless!

If you need a circuit diagram of the M294, send an SAE marked 'M294 circuit' in the top left hand corner to the Editor, HRT Editorial Office, P. O. Box 73, Eastleigh, Hants, SO5 5WG. If you have any queries on the M-band conversion details, you can contact the author, Pete Shepherd at 25 Tomkins Close, Stanford le Hope, Essex SS17 8QU remembering to enclose an SAE if you wish a reply.

Table 2 – Facility Module Connections (correction from Jan 93 article)			
A	-ve	J	TX 10V
B	Mic preamp gating	K	10V via TX PTT
C	In band TX encode	L	TX relay coil
D	Sub audio TX encode	M	Undedicated
E	RX audio for decoders	N	13.2V
F	RX squelched audio	P	Undedicated
G	Undedicated	Q	Undedicated
H	10V		

Table 3 – 15 way D type connections (if fitted)	
15 way D Type	Internal Fac. skt.
1	B
2	C
3	K
5	N
6	A
7	G
8	S (on PCB)
9	D
10	E
11	H
13	J
14	M
15	L

QRP CORNER

Dick Pascoe G0BPS tells us where to find QRP activity on the bands

Readers may remember my recent comments and mini-review of the Jim SSB & CW HF handhelds, well a recent letter from America from Byron, WU2J, gives even more information. In less than 21 months using his 18MHz version, he has worked 87 DXCC countries, all on SSB except for OD2, UC2C2 & LZ1 who were on the key *(yes, 18MHz! – Ed).* What amazes me is that Byron also states that he gained these contacts without resorting to nets or contests. This just goes to show that QRP operation should not be confined to just CW.

I have met Byron on several occasions and have no reason to doubt his claims, his aerial by the way is a narrow spaced wire beam at 9m AGL.

Whilst we are 'in America', the March edition of QST had a marvellous leader written by David Summer K1ZZ. He reminds us of the early experiments of the amateurs and the professionals who were experimenting with spark transmitters. (These are not so antique as you may think, the first ship I sailed on had one of these as the reserve transmitter!). These spark transmitters were often generating over one kilowatt of RF. It was amateurs who showed that huge distances could be covered by using simple equipment. We were reminded that Loren Windom W8GZ (he of the famous Windom aerial) made contact with Australia from his home in Ohio running just one half of one watt input power! And this was 1926! Truly an early beginning to QRP.

Moving over to Holland for a brief 'visit'. I was very pleased to be offered the honorary membership of the *Dragonslayers QRP Group.* This is a group of like-minded amateurs in the far flung reaches of Holland close to the German borders. One member originally hails from the UK, Peter PE1MHO has been over there so long he now speaks English with a Dutch accent! I have met Peter and the gang, including Marinus, Harm and several others whilst they stayed at my house on the way to Rochdale for the QRP Convention. I was aware of their clandestine group and asked for more details last autumn, the reply made me an honorary member I am pleased to report. The QSL front is a great design which I shall be showing you at a future date.

QRP Frequencies

I am often asked 'What are the real QRP frequencies?'. In truth there are none, just *centres of activity.* If I said that all low power operators should be on 3.560MHz when on the 80m band it would get very crowded. However if we gather around this frequency, as high as 3.570MHz (to gather a few novices) and perhaps even as low as 3.550MHz we will all be able to enjoy a QSO, subject to the high power stations of course (and the German SSB station).

The frequencies stated do vary from country to country, but are mainly as we are used to. I make no apology for repeating these frequencies, to remind those interested in where to find the activity, and to also remind the high power operator that we would be grateful if they would remember our sprat-sized signals and give us some room.

There has been one major change in the SSB QRP band plan in recent years, the 10m frequency used by SSB QRP operators for so many years has been taken over by the VHF operators as a talk back frequency, as we couldn't compete with their higher power we have moved. The centre of activity is now within the Novice section of the band on 28.360MHz.

In the UK, 3.570MHz is also used as the centre of activity for Novices, and many of the G-QRP club novice members may be found here. In the USA many operators will be found on 7.040MHz and several nets will be found on or around this frequency.

QRP???

I am often amazed at comments made about low power operating, and that many comments are along the lines that QRP operating is confined solely to HF CW operations. This is of course just not true!

Any contact between two stations using under the accepted QRP limits of 5W output for a carrier type signal (CW, FM, RTTY etc.) or 10W PEP for a non carrier signal (SSB etc.) qualifies as a QRP contact and may be entered for club awards. Yes! 5 watts of RTTY or even packet is a QRP signal and thus qualifies. It may even horrify the purists that even computer generated Morse, both sent and received, will qualify if the transmitter output is under this required power level!

I can hear the cries of woe.... Horror, shock horror, but so what? It's only a hobby and if an operator cannot read Morse at high speed (or even low speeds) does it really matter? These purists may also throw their hands in the air that a packet contact may qualify. I must say that I can see difficulties with this, as so much of packet operation is carried out with unattended stations. Do you send a QSL for a contact just because you find a message from the other station in your mailbox while you have been shopping?

Talking about Morse code, the G-QRP club does also have some Morse training tapes available, these were prepared by Gus G8PG, the aerial and code specialist of the club. They are firstly for the Morse code test preparation at 0-14WPM, and the other a CW 'improvers' tape for 14-20WPM. These are only available to club members of course and a quick check in Sprat will give the address to contact for these.

Courtesy on the Bands

One of the main problems mentioned to me is the speed of operators on the bands. I have just come off the air on 14.060MHz after calling CQ QRP, (leaving a gap between my callsign and the 'QRP' part of course). Most activity on the HF bands using lower power is at about 20WPM, but after being off the air for several months I was back down to my more usual speed of about 12WPM. My CQ call was answered by an IK5 at about 25WPM. I could barely read his callsign. My CQ call had been at about 12WPM so his reply by all standards should have been at the same speed. He called me several times and even after my ? and *QRS pse de G0BPS,* he still maintained his speed.

He may be complaining of the one that got away, but a courtesy lowering of his speed would probably made an enjoyable QSO. Courtesy *demands* that we answer a CQ call at the same speed that it is sent, imagine a Novice being answered at 25+ WPM. Yes I do realise that some would read it with ease, but most couldn't. One more QSO down the drain because of a lack of courtesy.

Recommended QRP centres of activity

	CW	SSB
160m	1.843	1.990
80m	3.560	3.690
40m	7.030	7.090
30m	10.106	none
20m	14.060	14.285
15m	21.060	21.285
10m	28.060	28.360

SCANNERS

From the Editor's Desk

INTERNATIONAL

New Products

AOR airband filter for civil airband enthusiasts

The ABF125 is a small encapsulated and chrome plated bandpass filter, which plugs onto your scanner's BNC aerial socket and can help improve the strong signal handling of your scanner over the civil airband range by filtering out-of-band signals. Such signals often get the 'better' of scanners, and the ABF gives around 25dB rejection over 0.3-75MHz and 190-400MHz to help overcome this. As well as for base and mobile scanner use, it's small and neat enough to fit onto handheld scanners, fitting between the set-top helical and the scanner itself. A quick check in the *Scanners* Editorial office showed there was no noticeable weakening of on-frequency signals with the filter used like this. Priced at £24.50, it's available from AOR dealers, or by mail order with a p/p charge of £1.50 from AOR (UK) Ltd. (Tel. 0629 825926).

The ABF125, actual size

Netset PRO-44 review

Chris Lorek reviews Netset's new 50 channel handheld scanner

The name 'Netset' seems quite new in the UK, this being introduced by the Tandy Corporation to undoubtedly complement their 'Realistic' range of scanners. The new Netset PRO-44 has very similar styling indeed to the Realistic PRO-43, reviewed in the Feb 93 issue, so there must be *some* connection! Although it's a 'higher' model number, the PRO-44 is a lower cost model, offering 50 channels programmable over the range 68-88MHz (FM, 5kHz steps), 108-136.975MHz (AM, 25kHz steps), 137-174MHz (FM, 5kHz steps) and 380-512MHz (FM, 12.5kHz steps).

It's powered from six internally fitted AA size batteries, either standard or rechargeable, and a socket for an optional charger is fitted on the side of the case if you use the latter as well as a further DC socket for powering the set from an external 9V DC source. The smart grey case is rounded to fit your hand comfortably, with moulded ribs on each side of the case to allow a firmer grip, a plastic belt clip on the rear panel lets you carry the set around with less fear of dropping it. Rotary on/off/volume and squelch knobs are fitted to the top facia, with 'reversed' legends which thus appear the 'right way up' when you have it clipped to your belt! For use when out and about, a 3.5mm jack is provided for an optional earphone or external speaker, and an external aerial can be plugged in for mobile or portable use as an alternative to the set-top helical. The set itself measures 145mm x 58mm x 42mm and weighs around 375g with nicads and the supplied aerial fitted.

On The Air

Programming frequencies in was a simple matter of pressing the 'Prog' button followed by the frequency, and I could select the various memory channels simply by tapping in the channel number followed by the 'Man' button. On switch-on, the set starts automatically scanning through its 50 channels, a 'lockout' facility being available to skip channels you don't wish to be included, and you can program in a two-second 'delay' on any of the channels to save missing replies.

Well, that's OK for listening to frequencies you've already programmed in, how about finding some 'new' frequencies? Although the PRO-44 doesn't have the facility to automatically search between any two pre-programmed frequencies, you can set it searching either up or down from the displayed frequency with a press of the 'up' or 'down' arrow buttons, the set halting when the squelch lifts. This also works after you've selected any of the memory channels, handy for having a 'look around' already-active frequencies, and again, a two-second 'delay' can be programmed to save the set whizzing off again before you've had a chance to note the frequency it's stooped on. When the set does halt on finding an active channel, you can temporarily store this into an extra 'monitor' memory, which you can then transfer if you wish to one of the 50 memory channels before searching away for more frequencies.

I found the set a little less sensitive than some of the 'scan everywhere' handhelds available on the market, particularly on UHF. However, when I coupled it to my rooftop aerial system I didn't have anywhere near the problems I sometimes have with other strong signals on the band either! These often 'overload' scanners designed primarily for portable use with their small set-top aerial, sometimes even causing reception and scanning to be hopeless. The PRO-44 hardly suffered at all here, likewise I found the set never had any problems with strong signals on even the very next channel. What I did find though was that the set often received UHF signals in two places – a check in the lab showed that it was in fact more sensitive on the unwanted 'image' frequency (21.4MHz lower in this case) on UHF than the tuned frequency! Maybe they hadn't quite tuned it up correctly in the factory, but I resisted the temptation to go inside with my trimming tools!

In use, I found the nicads I'd fitted gave me a full day's listening without going flat, very good, although the side-mounted 'DC' and 'Charge' jacks both used the outer of the required plug as positive – a possible problem when used in a negative earth car. For private listening, I found that if I used a 'hi-fi' earphone the set gave an enormous 'pop' each time the squelch opened – using one of the cheaper plastic earphones (with its restricted frequency range) solved this. The sliding 'key lock' facility was quite handy, this locking all the buttons apart from the 'Scan', 'Manual', and 'Light' buttons, which I found was very handy when 'fumbling about' with the set on the move thus making it even easier to operate after I'd programmed the channels up.

The Netset PRO-44 is currently priced at £149.95, and my thanks go to *Link Electronics in Peterborough (0733 345731)*, who are stockists of the Netset range, for the loan of the review scanner.

LABORATORY RESULTS:

Sensitivity;

Input signal level required to give 12dB SINAD;

Freq.	Sensitivity
68MHz	0.20 µV pd
78MHz	0.18 µV pd
88MHz	0.20 µV pd
118MHz	0.31 µV pd
130MHz	0.29 µV pd
137MHz	0.44 µV pd
145MHz	0.44 µV pd
160MHz	0.39 µV pd
174MHz	0.40 µV pd
380MHz	0.44 µV pd
400MHz	0.23 µV pd
435MHz	0.70 µV pd
450MHz	0.70 µV pd
500MHz	0.62 µV pd
512MHz	0.64 µV pd

Adjacent Channel Selectivity;

Measured on 145MHz FM as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;

+12.5kHz;	11.4dB
-12.5kHz;	11.4dB
+25kHz:	68.2dB
-25kHz;	70.3dB

Blocking;

Measured on 145MHz FM as increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

+100kHz;	61.4dB
+1MHz;	85.7dB
+10MHz;	86.5dB

Intermodulation Rejection;

Measured on 145MHz FM as increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;

25/50kHz spacing;	56.3dB
50/100kHz spacing;	56.9dB

Current Consumption

Scanning, no signal;	44mA
Receive, mid volume;	78mA
Receive, max volume;	131mA

Maximum Audio Output

Measured at speaker/earphone socket, 1kHz audio at the onset of clipping (10% distortion), 8 ohm resistive load;

105mW RMS

Image Rejection

Difference in level between unwanted and wanted signal levels, at 1st Image (-21.4MHz) and 2nd image (-910kHz), each giving 12dB SINAD on-channel FM signals;

	145MHz	435MHz
1st Image;	27.7dB	-6.3dB
2nd Image;	67.1dB	57.3dB

Netset PRO-46 Review

Chris Lorek tests Netset's new 'up-market' scanner

The PRO-46 is the second new scanner under the 'Netset' name, this offering 100 memory channels arranged into 10 banks of 10 channels each, together with a number of 'convenience' features for operating. It covers the frequency ranges of 68-88MHz (FM, 5kHz steps), 108-136.975MHz (AM, 25kHz steps), 137-174MHz (FM, 5kHz steps), 406-512MHz (FM, 12.5kHz steps), and 806-956MHz (FM, 12.5kHz steps) with 'gaps' at 824-851MHz and 869-896MHz which correspond to US cellular bands.

Controls

A large LCD gives information on the tuned frequency, channel selected, memory bank, scan/delay/lockout status, and the like, and a raised keypad with rubberised button provides control of the set – a recessed 'key lock' button saving any accidental operations. The set's top facia houses the usual rotary on/off/volume and squelch controls, a 3.5mm jack for an external earphone or speaker, and

the set-top BNC aerial socket for either the supplied helical aerial or connection of an outdoor aerial.

Four AA sized batteries power the set, and opening up the rear compartment reveals a removable battery holder into which these fit. External DC and nicad charge connectors are fitted to the side of the set, which let you either power the set from an external 9V source, or charge your nicads if you've fitted these – the set tells you your batteries are getting low by bleeping every 15-30 seconds.

The PRO-46 comes in a black plastic case and is reasonably slim and pocket sized, measuring 151mm x 66mm x 37mm and weighing 350g with nicads and the set-top aerial fitted. A metal belt clip is also supplied which you can fit as a carrying aid if you wish.

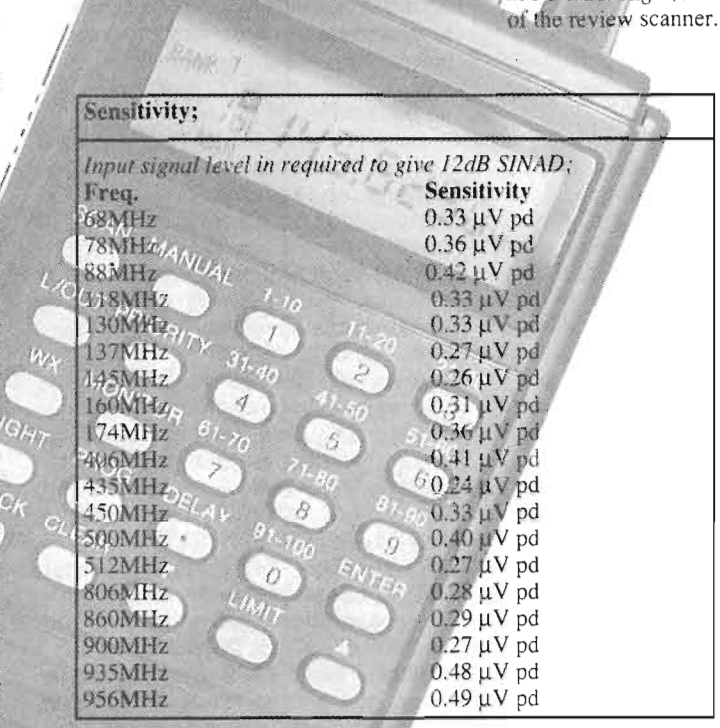
Direct entry of receive frequencies using the keypad is of course possible, and these can be programmed into any of the 100 memory channels which can then be scanned in any combination of ten memory 'banks' each holding 10 channels. After a press of the 'scan' button, banks can be switched in and out of the scan simply by pressing the relevant numbered button on the keypad – very easy! A two-second 'delay' and a 'lockout' facility is available on a channel-by-channel basis, and any channel may be allocated as a 'priority' which can then be automatically sampled for activity every two seconds. A 'limit search' is also available, where you can program the set to repeatedly search all frequencies between any two limits, the set halting when the squelch raises. 10 'monitor' memories are provided, these you can use for temporary storage of active frequencies you find whilst in 'search' mode, and then if you wish transfer them into a bank of 'normal' memories.

I busied myself in filling up the various banks of memory channels with my different 'groups' of favourite frequencies, leaving a couple of banks 'free' to use when needed. I found the 'search' combined with the ten 'monitor' memories quite handy, and I felt these would be very useful for day-to-day use when, for example, I was in a new area and wanted to check where the local 'action' was.

Out and about with the set top aerial connected, I found the set managed to pick up weak signals quite well. I also found that replacing the supplied aerial with a short 10cm long whip made it even better on UHF. With this good sensitivity I expected a few problem when connecting my rooftop aerial, and although my local 144MHz packet radio 'node' caused me a few problems on listening to other signals within the same band, I experienced few other problems. One of these however (which, being a reviewer, I confess to deliberately looking for), was image reception, this wasn't too good at UHF, the set receiving signals 21.6MHz below the tuned frequency just a bit weaker. I also found I could receive relatively weak 934MHz CB signals (from enthusiasts operating portable on a semi-local hill top one weekend) at about the same strength on the lower channel numbers, by tapping in a frequency 21.6MHz higher up, this being just below the set's upper frequency limit.

Overall, I found the set quite easy to use when walking around, although as with the Netset PRO-44 I again found a loud 'pop' from the earphone socket when I connected 'hi-fi' headphones, which quickly gave me a headache! Again, plugging in one of the lower-cost plastic type earphones gave an instant cure! At night, I found the LCD backlight illumination was very good, although operating the many buttons was, not surprisingly, rather difficult until I'd got used to the positions of the more commonly-used ones. The recessed 'key lock' I found a little difficult to use (maybe it was my 'big fingers'), however this facility still allowed use of the 'Scan', 'Manual', and 'Light' buttons without accidentally erasing any frequencies or whatever!

The Netset PRO-46 is currently priced at £199.95, and my thanks go to *Link Electronics in Peterborough (0733 345731)*, for the loan of the review scanner.



Sensitivity;

Input signal level in required to give 12dB SINAD;

Freq.	Sensitivity
68MHz	0.33 µV pd
78MHz	0.36 µV pd
88MHz	0.42 µV pd
118MHz	0.33 µV pd
130MHz	0.33 µV pd
137MHz	0.27 µV pd
145MHz	0.26 µV pd
160MHz	0.31 µV pd
174MHz	0.36 µV pd
406MHz	0.41 µV pd
435MHz	0.24 µV pd
450MHz	0.33 µV pd
500MHz	0.40 µV pd
512MHz	0.27 µV pd
806MHz	0.28 µV pd
860MHz	0.29 µV pd
900MHz	0.27 µV pd
935MHz	0.48 µV pd
956MHz	0.49 µV pd

Adjacent Channel Selectivity;

Measured on 145MHz FM as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;

+12.5kHz;	13.2dB
-12.5kHz;	13.3dB
+25kHz;	64.9dB
-25kHz;	63.9dB

Blocking;

Measured on 145MHz FM as increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

+100kHz;	63.2dB
+1MHz;	78.6dB
+10MHz;	88.9dB

Intermodulation Rejection;

Measured on 145MHz FM as increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;

25/50kHz spacing;	60.3dB
50/100kHz spacing;	59.1dB

Current Consumption

Scanning, no signal;	51mA
Receive, mid volume;	60mA
Receive, max volume;	112mA

Maximum Audio Output

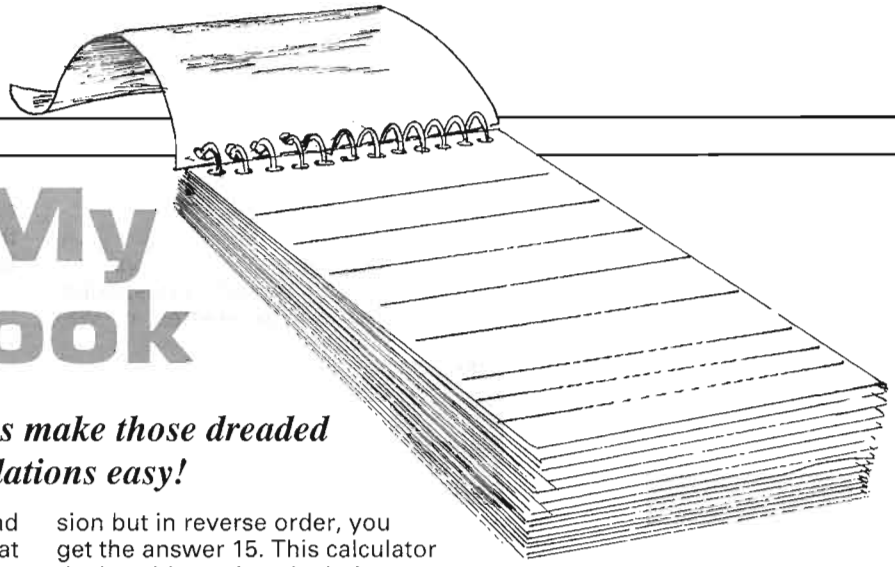
Measured at speaker/earphone socket, 1kHz audio at the onset of clipping (10% distortion), 8 ohm resistive load;

101mW RMS

Image Rejection

Difference in level between unwanted and wanted signal levels, at 1st image (-21.6MHz) and 2nd image (-900kHz), each giving 12dB SINAD on-channel FM signals;

	145MHz	435MHz	935MHz
1st Image;	18.9dB	8.1dB	-0.9dB
2nd Image;	41.9dB	40.3dB	44.9dB



From My Notebook

Geoff Arnold G3GSR helps make those dreaded electronics calculations easy!

This month, I shall be wandering around the edges of the radio field, to look at some of the numbers we use. Numbers obviously become involved in calculations, but before you turn the page in terror, let me hasten to add that there won't be anything at all deep. The aim of this article is to make you feel more at ease with the simpler calculations you'll encounter in following the radio hobby.

Dealing with the calculations involved in any line of activity, whether it's a job or a hobby, depends on two things. First, you should have a grasp of the basic principle behind the calculations, and from that a rough idea of what the answer should be. For a lot of the time you may get by without this rough idea, doing your sums 'by rote' without understanding what you are doing, but there's always the risk that you may not realise until too late that something has gone astray – that you hit a wrong button on your calculator, for example.

Electronic Calculators

If you use a variety of different calculators at home and work, they may not all treat calculations in the same way where a mixture of additions, subtractions, multiplications and divisions are involved. This means that you can punch in exactly the same sequence of numbers and operators (called a mathematical expression) on two different calculators and get different answers.

Basic mathematical rules decree that in dealing with any expression, you should calculate powers and roots first, then multiplications and divisions, finishing up with additions and subtractions. Putting brackets round any group of terms within the expression says that the terms within the brackets should be dealt with first.

Let's take the simple sum 3 + 6 x 2, for example. Punching that into a basic 4-function Texas Instruments calculator (no brackets facility), you get the answer 18. It has said to itself '3 plus 6 is 9, times 2 makes 18'. Under those basic mathematical rules, it should be thinking '6 times 2 is 12, plus 3 makes 15'. If you punch in 6 x 2 + 3, the same expression but in reverse order, you get the answer 15. This calculator deals with each calculation as you enter it, and seems unaware of the rules of maths. If you watch the updating of the display, this fact becomes obvious.

Punching 3 + 6 x 2 into my Tandy Scientific Calculator, on the other hand, produces the answer 15. It has been programmed to observe the basic rules of maths, and if you watch the display updating itself you will see that, unlike the TI calculator, it pauses when you press the 'x' after the '6', waiting for you to enter the '2'. Try punching in 3 + 6 x 2, then 6 x 2 + 3, to any calculators you have access to, and see what the answer is in each case. It can be a very revealing test!

There is another class of calculator using a calculation system called 'Reverse Polish Notation' or RPN. Does anyone out there still have one of the original Sinclair Scientific calculators from around 1975? They used RPN. I don't recall too much of the detail now, but basically it involved keying in the numbers and their operators in 'back to front' order, hence the name 'reverse'. RPN is (or was) favoured by scientists as being more versatile than the standard way a calculator operates, but I always found it very limiting, with some calculations having to be transposed on paper before they were entered into the calculator.

The electronic calculator has made life a lot easier in many ways, but always check that the answer it gives you is at least in the right 'ball-park'. With the calculator's predecessor, the slide-rule, that rough idea of the answer was an absolute necessity before you could read the right part of the rule. Never forget that the mental arithmetic you needed then is just as important now.

The Memory Factor

The second essential in dealing with calculations is that certain facts, and also certain numbers – physical constants or conversion factors that you need to use frequently – should be engraved upon your memory. You can look the lesser-used ones up in a reference book as you need them, of course, but those which you use regularly should soon come to mind almost without thought. Remembering these facts and numbers is much easier if you can find some 'hook' in your memory upon which to hang them.

We use exactly the same sort of 'hooks' to remember car registration, 'phone or PIN numbers, and sometimes facts that don't involve numbers. For example, on the circuit symbol for a battery; is it the short fat stroke or the long thin stroke which represents the positive terminal? As a young student, my 'hook' was to say to myself 'long is poz', using the similar vowel-sound in both words to tie them together. Years of use mean that I now know without thinking.

Another sort of 'hook' is finding some way in which all the longest words describing a set of things are linked. An example from the field of ships and boats is that 'right' is longer than 'left', 'starboard' is longer than 'port', and 'green' is longer than 'red'. So the green light is on the starboard side, which is to your right. The only fact that you must then remember is whether the 'right' and 'left' are as seen when you are watching the ship sailing towards you, or when you are standing on the ship looking in the direction it is sailing. (In fact, it's when you're standing on the ship, looking towards the bow.)

Still on the subject of colours, and returning to radio and electronics once more, there is that vital item, the standard component colour-code giving values from 0 to 9. There are various mnemonics or memory-aids for this. The most common used to be: 'Bye-Bye Rosie, Off You Go, Birmingham Via Great Western', for Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Grey, White. What happens for present-day students, who will probably never have heard of the Great Western Railway, I don't quite know.

When I was at marine radio school, they just hammered the code into us, basic and unadorned, without using any mnemonics. Some of the ex-services types on the course would use the most lurid mnemonics imaginable,

most of which could not be repeated here! With repeated practice over the years, I gradually reached the stage where my brain instantly associates the digits with their corresponding colours. As soon as anyone says the word 'five', for example, I see the colour green.

The sort of things which you use as 'hooks' are very much up to the individual. What works for me may be totally useless for you. Don't think that, by using 'hooks', you can get away with not remembering any fact or number directly, because every 'hook' must be anchored to something which is firmly embedded in your memory. The 'hook' simply gives a means of associating an easily-remembered fact or number with one that gives you trouble. Sometimes, you just have to remember a figure without benefit of a 'hook'.

Later in this article, I shall describe some of the 'hooks' which I've found useful, in the hope that they may help you too.

Dealing With Conversions

One particular area of numbers and calculations we've had to cope with in the UK in the past twenty years or so has been the gradual change from Imperial measure to Metric. In some ways, it would have been better if the changeover had been made more decisively, as we're now left with a terrible hotchpotch of two systems, with feet and metres, pounds and kilos, gallons and litres, etc., cropping up alongside each other. A classic British compromise which pleases neither the traditionalists nor the progressives!

It's many years since my daughter, then at school and being taught almost exclusively in Metric, came to me one day asking 'Daddy, how many inches are there in a foot?' Nowadays, youngsters are said to be totally baffled by the old Imperial measures, but they seem to have no difficulty appreciating just how big a 'quarter-pounder' will be at the local burger-bar. It's a typical case of understanding what you want to understand!

I sometimes wonder how those of us involved in technical jobs or hobbies would have coped with Metric/Imperial conversions if the pocket calculator had not been developed. Instead of having to remember whole series of equivalents, we can now remember one and let the calculator do the rest, calculating multiples, reciprocals, etc.

Length

The most frequently-used dimension in radio and electronic engineering is undoubtedly length. Where Metric/Imperial conversions are concerned this is lucky, because the most basic equivalent is 25.4 millimetres to 1 inch. Knowing that fact, you can convert between feet or yards and metres, or between miles and kilometres, or vice versa, at the touch of a few buttons on the calculator.

I'm lucky in having a 'hook' for that figure of 25.4, as it corresponds to my birthday – 25th April, though I no longer need it as it's engraved on my memory anyway. I guess there's a law to describe that sort of thing!

It's sometimes essential to retain a high level of accuracy in conversions, as for example, in measuring out a printed circuit board in preparation for drilling holes to mount a tuner or amplifier module. If the maker's spec tells you that the module has terminal pins spaced 125mm apart, it's no good you thinking: 'Oh, that's about five inches', and marking the board out accordingly. The holes you drill will be getting on for a tenth of an inch too close together, and the result will be a board that won't fit the module, and maybe a damaged module in the process.

That sort of accuracy isn't always required. If you don't have a calculator with you, and you need approximate conversions of lengths of upwards of around a yard or a metre, remember that a metre is almost exactly 10 per cent longer than a yard. In fact, a metre is 3.281 feet to three decimal places, so you would be less than a quarter of an inch (or 6mm) out per metre, less than a 1 per cent error.

That 10 per cent factor is handy in working out lengths of harmonic aerials. Say you're cutting a length of wire to make a half-wave dipole for the 7MHz (40m) band. Half of 40 metres is 20 metres, which multiplied by 1.1 (to increase by 10 per cent) gives 22 yards, equivalent to 66 feet. You can also calculate that you'll need 132 feet for the 80m band, and pro rata for other harmonically-related bands. *(This is a good 'rule of thumb' which even works precisely for non-WARC HF bands, although the 'metre' notations for amateur bands often don't tie up exactly with the actual frequencies, see below – Tech Ed.).*

When we talk about frequency and wavelength like this, we are extending the idea of length to cope with velocity, distance travelled per unit time. We are using the fact that radio waves in free space travel at approximately 300,000,000 metres per second (300,000km/sec), or 186,000 miles per second in 'old money'. Knowing the frequency (in hertz) or wavelength (in metres) of interest, you simply divide it into 300,000,000 to derive the other.

Using the full 300,000,000 factor and converting all frequencies to hertz (rather than kilohertz or megahertz) is the proper way to do the calculation, but it is far less cumbersome to use just a '300' factor, and place the result in the right part of the spectrum by other means. To do so, you must have a rough idea of the answer when you start. A few well-remembered points in the spectrum are essential here. On the long-wave broadcast band, 200kHz is 1500m; on the HF bands 3MHz is 100m and 30MHz is 10m.

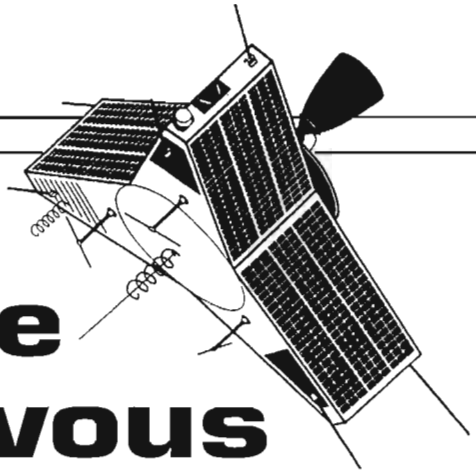
When talking about the names of amateur bands you have to remember that some rounding-up or rounding-down has usually taken place. On HF, the 20m and 15m bands are the furthest out – by rights they should perhaps have been called the 21m and 14m bands. On VHF, the real equivalent of 2m is 150MHz, but in percentage error terms, 2m isn't too far out, even for the bottom edge of the band at 144MHz

When I was being trained in radar maintenance, another figure relating to the velocity of radio waves that was drummed into us was '328 yards in a microsecond'. Nowadays it would be '300 metres in a microsecond' (notice the difference of roughly 10 per cent again). Although not many of you are likely to get involved in calculations relating to radar ranging, it can be a useful factor in trying to track down the source of 'ghosts' in TV reception. How so?

Well, remembering that each line-scan of a 625-line TV picture occupies 64 microseconds over all, you simply estimate how far to the right of the true picture-object the 'ghost' appears, calculated as a proportion of the total screen width. Say, for example, that it's one inch on a screen 10 inches wide – around a tenth of the width (ignoring the proportion of the line-scan time taken up with the blanking and sync pulse). A quick calculation shows that the 'ghost' is arriving about 6 microseconds after the direct picture, corresponding to an extra 1800 metres travel. Remember that this is the sum of the extra distance the wave has travelled to the reflecting object, and back again to your TV aerial. A bit like radar, really – you didn't know your TV could act as a radar set, too, I'll bet!

Until Next Month

Once again, I've got a bit carried away, and I shall have to stop here for now, or the Editor will be wielding her scissors. Next month, I want to look at dimensions other than length, and also to talk a bit more about tolerances, and when you can afford to take liberties with calculations without them biting back at you.



Satellite Rendezvous

Richard Limebear G3RWL with this month's collation of AMSAT-UK News

Oscar 13 ZRO Tests

The ZRO Memorial Technical Achievement Award Program, or just 'ZRO Test' is back with a new schedule, this activity is a test of operating skill and equipment performance.

For newcomers, during a typical ZRO run, a control station will send numeric code groups using CW at 10 wpm. At the beginning of the run, uplink power from the control station is set to match the beacon downlink strength. This is level 'zero'. The control operator will send and repeat a random five-digit number, then lower his uplink power by 3dB (half power) and repeat the procedure with a new random number. This will continue to a level 27dB below the beacon (level 'nine').

A participating listener monitors the downlink signals till he can no longer copy the numbers. Those who can hear the beacon will qualify for the basic award by copying the code group heard at level 'zero'. The challenge is to improve home-station performance to a point where the lower-level downlink signals can be copied (levels 6 through 9).

The schedule of Mode 'B' and 'JL' ZRO tests are chosen for convenient operating times and favourable squint angles. The 'B' tests can be heard on 145.840MHz and the 'JL' tests on 435.945MHz. N5EM will run the 'JL' tests while WA5ZIB will do the 'B' runs.

Recently updated ZRO brochures are available from WA5ZIB, Andy MacAllister, AMSAT V.P. User Operations, 14714 Knightsway Drive, Houston, TX 77083 USA for an S.A.S.E. with two units of postage. The brochure characterizes test procedures, means for obtaining certificates and gives some historical background about the program.

All listener reports with date of test and numbers copied should be sent to WA5ZIB at the address above or via Amsat-UK. A report will be returned verifying the level of accurate reception.

Oscar 10

It's currently available for Mode B operation when it is view. Please do not attempt to use it if you hear the beacon or the transponder signals FMing.

Russian Satellites

AO-21 currently has 5 minutes of FM repeater operation, 3 minutes of recorded voice message, and 2 minutes of 1200 baud AFSK packet, the downlink is on 145.987MHz FM. Recently the satellite was transmitting a message of peace from PY2BJO on the voice mode.

On 3rd March G4CUO, G4ZHG, G0NKA, G6HMS and G7MUB successfully conducted a trans-satellite qso through RS-14/O21 to Fuji/OSCAR-20. Other stations using RS-14 were also heard, and the synthesized voice message was received at 57 via FO-20.

The MIR cosmonauts have recently had DL2MDE's digital memory microphone going, repeating a greetings and information bulletin every three minutes. It isn't known if this will be a regular occurrence or not.

4800 bps on MicroSats?

The question of 4800 bps downlinks on AO-16/LO-19 has recently arisen. While the microsats are capable of 4800 on both the uplinks and the downlinks from a hardware perspective, there are many things to be considered in order to make that happen.

First, there would be considerable software work involved. The spacecraft software would have to be modified to allow 4800 either up or down, and probably some of each. For example two uplink channels at 4800 and two at 1200. The downlink could conceivably be switched between the two speeds, but that presents operational problems. The command software would have to modified to allow switching and while manual switching is relatively easy to program, its unlikely that any command station wants to be stuck switching the bird back and fourth regularly.

But probably more difficult is the question of how to bring the user community up to 4800. The most serious show stopper is the software work that would need to be done by Harold and possibly Jeff. Their time is at a premium.

But, if there is enough interest in the user community, perhaps we can at least get the effort started.

WeberSat

WO-18 has had new software loaded and put into operation. It is again sending pictures as *PHOTO* packets and now spectra as *SPECT* packets. AO-16 file 37D9 contains a preliminary SPECT packet extract, decode, and display program.

Sometime in the early part of February the Weber ground station computers became infected with a strain of the Michelangelo virus. WeberWare 1.2 serial numbers 398 and 419 to 437 are infected with this virus. If you receive any of these serial numbers, and have not installed them, set the disks aside and contact Weber. If you have already installed WeberWare 1.2, or even done a directory of the disks, you are infected; if so, contact Weber.

Arsene

If all went to plan, Arsene should have been launched by the time you read this. The French authorities allocated the callsign *FX0ARS* to the satellite, but the AX25 frames will be labelled *ARSENE-1, ARSENE-2* or *ARSENE-3* depending on which TNC is in use. The French group have decided that the name of the satellite *ARSENE* should be kept when it is in use but did not disagree that other AMSAT organisations could give it an OSCAR number; so it will probably end up being called *Arsene-Oscar-24.*

At the time of writing (with it still on the ground), the satellite itself has been declared good for service. It successfully passed all tests, and the last link performances measured showed that it should behave nominally. ARSENE was planned to be sent to Kourou on the 31st of March and will have been launched with ASTRA-1C, a direct TV satellite to be positioned over Europe.

Following launch, FF1STA will be one of the receiving centres for ARSENE telemetry with others being at La Reunion island in the Indian Ocean. During the first three orbits, ARSENE will have

been on a geostationary transfer orbit, with a period of 10h30. The engineering telemetry sent in PSK will give information about the satellite modules' health and tell if ARSENE is rotating and oriented as needed. The order to fire the apogee motor will be sent from FF1STA and this will raise the perigee from 200km to 20000km altitude due to a speed increase of 1200 m/s.

The final orbital period should be 17h30 and inclination 0 degrees. At the fifth orbit, rotational speed will be decreased to 60 rpm and the Z axis shifted 90 degrees in order to put it vertical, i.e., perpendicular to the equatorial orbital plane. After later checks, the satellite will be opened for traffic for an expected lifetime of at least 5 years. The pressure of nitrogen tanks has been increased to 230 Bar in order to give longer life for the attitude corrections that will be necessary every 6 months.

A reminder that ARSENE will be a *packet radio 'relay' satellite, a* **digipeater,** and that it does not have a BBS capability. All three uplink link frequencies will only accept AX.25 1200 baud FSK packet. However, when ARSENE is in Mode S, you can transmit on 435.100MHz and listen to your downlink on 2446.500MHz. During Mode S, you can use this 'analog' transponder for CW or SSB, the downlink passband is 16kHz wide.

All amateurs are invited to decode and analyze the telemetry from the 2m beacon located on 145.975MHz. Using a 'standard' AX.25 1200 baud FSK TNC, one should be able to copy this all of the telemetry quite easily. The 2m telemetry beacon will have an output power of 15 watts! The ARSENE packet beacon will transmit 30 analog telemetry channels providing information about the condition and function of the different onboard modules on the satellite.

New Argentinean Satellite

AMSAT Argentina have announced that they are working on a new Satellite as an addition to LUSAT-1, it should be launched by the end of the year.

This new satellite will include a programmable digitalker, with up to 2 minutes of digital voice recording time available, an FM transponder/ repeater operating in Mode B (with uplink on 70 cm and downlink on 2 m), and will downlink telemetry via a 1200 bps AX.25 beacon (standard packet).

Current plans call for attaching the AMSAT-LU satellite to a Russian Satellite as a secondary mission (the same as the RS 10-13 satellites), with an agreement similar to the one used by AMSAT-DL/UA, OSCAR-21/RS-14.

Further details will be published as they are made available. Please address any comments, suggestions, request or proposals to: AMSAT Argentina, LU7AA @ LU7AA.CAST.ARG.SOAM or @LUSAT, @PACSAT or UO-22.

AMSAT-NA Annual Meeting

AMSAT-NA President Bill Tynan W3XO has announced that the time and place of the organization's 1993 annual meeting have been set. The meeting will be held October 8th to 10th in Arlington, Texas, halfway between Dallas and Fort Worth. The meeting is being coordinated by the Dallas/Fort Worth AMSAT Group.

AMSAT-UK News

Amsat-UK, in addition to their earlier donation to Phase 3D, have recently spent £4500 for the nicad batteries for the ITAMSAT Microsat due for launch later this year.

The dates for your diaries for the Amsat-UK Colloquium, are from Thursday 29th July to Sunday 2nd August. It is likely this year that the Colloquium will finish at lunchtime on the sunday and the Amsat-UK AGM will be held during the sunday afternoon.

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, and SWLs are welcome.

Oscar 13 Transponder Schedule, May 31 – Aug 02

Mode-B	: MA 0 to MA 256	Attitude changes;	May 31 – 120/0
Mode-S	:		Jun 14 – 130/0
Mode-LS	:		Jun 28 – 140/0
Mode-JL	:		Jul 12 – 150/0
Mode-B	:		
Omnis	: MA 170 to MA 10		

Note that these schedules are provisional, continuous up-to-date information about AO-13 operations is always available on the beacons, 145.812MHz, 435.658MHz and 2400.646MHz in CW, RTTY and 400 bps PSK.

ARSENE transponder frequencies

UPLINK FREQUENCY	#1:	435.050MHz	
UPLINK FREQUENCY	#2:	435.100MHz <—	Mode S Combination (CW/SSB)
UPLINK FREQUENCY	#3:	435.150MHz	
DOWNLINK FREQUENCY	#1:	145.975MHz	
DOWNLINK FREQUENCY	#2:	2446.500MHz <—	

KEPLERS

SAT:	OSCAR 10	UoSat 2	AO-13	PACSAT	DO-17	WO-18	LO-19
EPOC:	93078.29105695	93084.58379548	93082.65538582	93080.74052899	93078.77900803	93084.76501357	93077.21841547
INCL:	27.0753	97.8193	57.6036	98.6241	98.6285	98.6263	98.9289
RAAN:	34.6420	114.6541	326.0300	166.7852	165.0385	170.9940	168.9820
ECCN:	0.6014476	0.0010496	0.7253801	0.0011935	0.0012089	0.0013018	0.0012347
ARGP:	66.4423	266.6006	311.2856	79.8469	86.7587	68.4482	89.5928
MA:	344.1607	93.3996	6.0998	280.4060	273.4979	291.8085	270.6678
MM:	2.05881390	14.68922379	2.09724032	14.29810587	14.29943209	14.29928420	14.30013189
DECY:	-1.36E-06	8.25E-06	-1.98E-06	2.24E-06	2.19E-06	1.93E-06	2.09E-06
REVN:	4544	48444	506	16494	16467	16553	16449

SAT:	FO-20	AO21	UO-22	KO-23	RS-10/11	RS-12/13	Mir
EPOC:	93080.61382554	93084.62664066	93081.75436579	93084.53721104	93084.67363164	93077.16853936	93085.01106985
INCL:	99.0557	82.9403	98.4815	66.0783	82.9238	82.9127	51.6198
RAAN:	313.3439	114.6759	159.2404	139.3259	300.3478	349.6167	276.6796
ECCN:	0.0539952	0.0033769	0.0007317	0.0009074	0.0011071	0.0029660	0.0001884
ARGP:	285.0751	254.6687	196.5450	209.3839	183.3365	300.4359	124.6241
MA:	69.1261	105.0737	163.5499	150.6670	176.7725	59.3878	235.1686
MM:	12.83218206	13.74512879	14.36797698	12.86277591	13.72311759	12.87427049	15.57404569
DECY:	-1.3E-07	8.2E-07	2.72E-07	-1E-08	6.7E-07	6.4E-07	7.2826-06
REVN:	14608	10796	8825	2908	28839	10602	40618

VHF/UHF Message

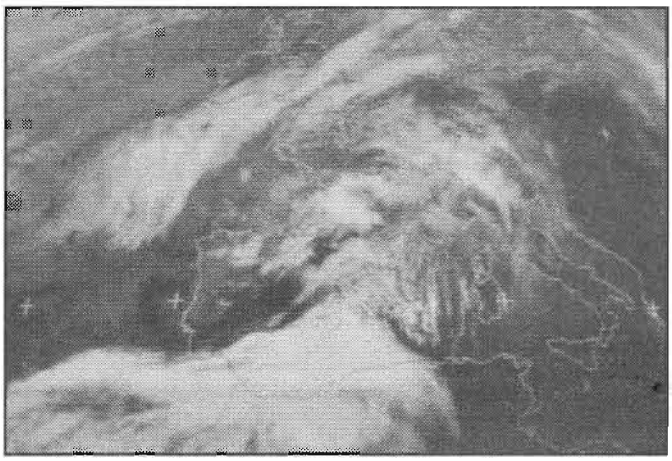
Geoff Brown GJ4ICD takes a look at a wider range of VHF/UHF transmissions!

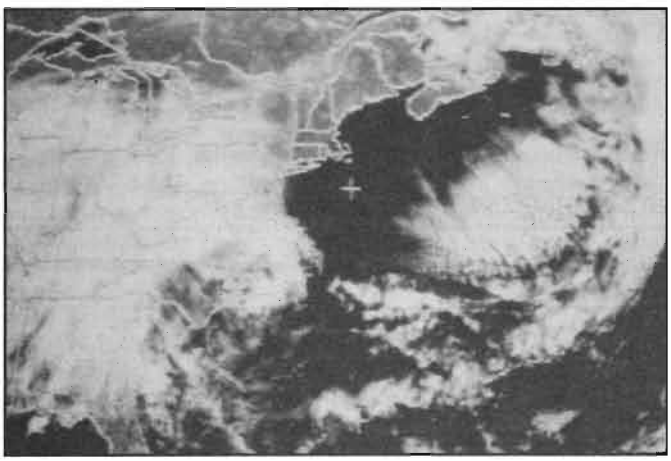
As usual, the VHF Convention was held at Sandown Park in Surrey again this year, and a few changes had taken place.

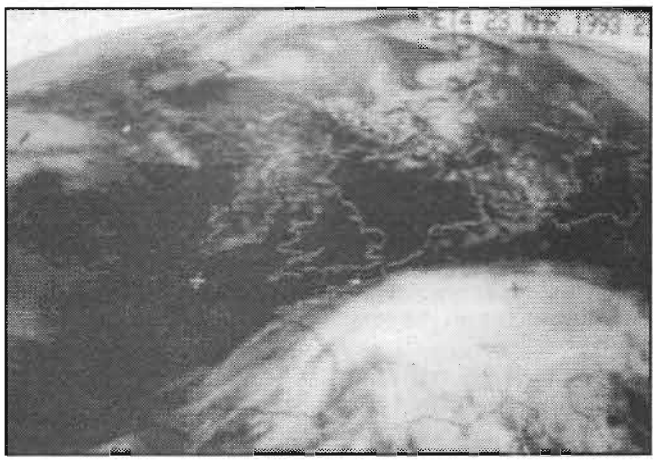
All the usual stands for the various dedicated groups had been relocated downstairs in the main hall, this I am sure helped those disabled members of our hobby. A few long distance VHF operators put in an appearance, one of which was Bob WA6BYA (ARRL DXCC 50MHz #50) who came especially from California, and another well known VHF DXer was OZ9QV from Denmark.

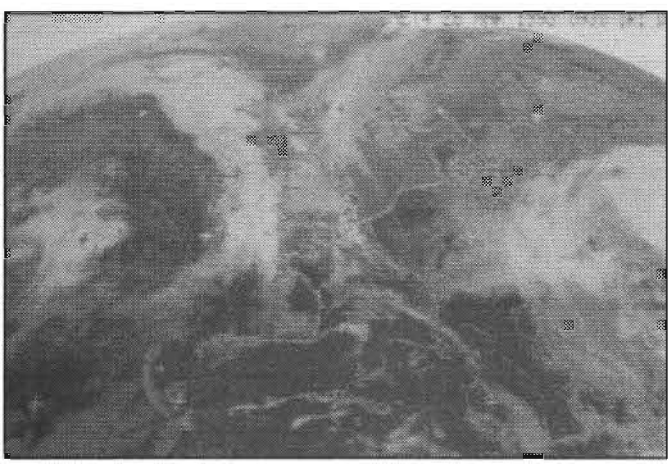
One of the most eye-catching stand displays were those of the weather satellite companies and also the Remote Imaging Group, even *I* could not stay away from their stands with all the animated weather sequences running. This is a fascinating VHF/SHF hobby that continues to attract the crowds, and to add to the introductory article (by Bill Robertson in the May 93 issue – Ed), I would like to run through a few of the basics of VHF/SHF satellite imagery.

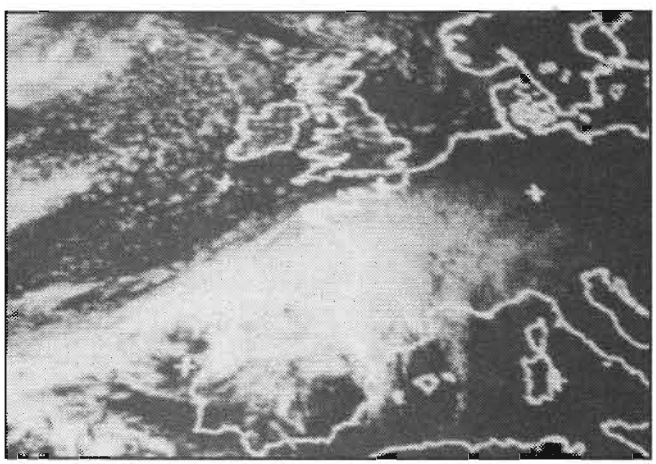
A selection of Weather satellite received images using the Comar system





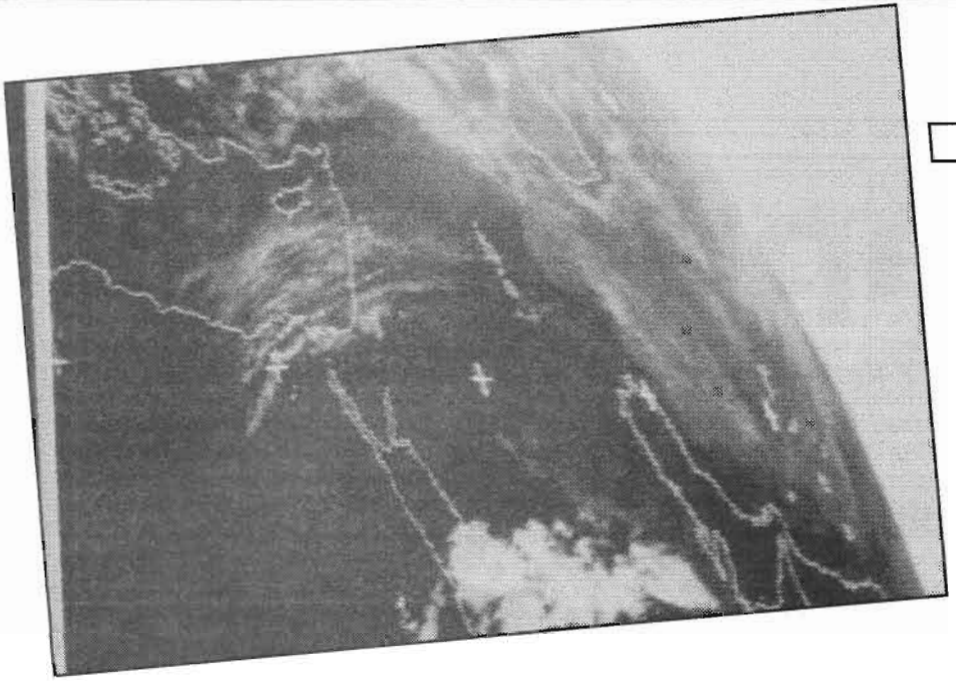






Meteosat vs NOAA

There is no doubt that weather imagery is growing day by day, many people are fascinated with weather pictures and weather movements. To see these of course you will need a little sophisticated equipment, such as a dedicated receiver for VHF (137MHz) with a bandwidth of 30-40kHz. Icom's R-7000, R-7100 and R-9000 will cope with these bandwidths but are much more expensive than a dedicated weather receiver at about £200, but



nice if you already have one. On the SHF front, a down-converter such as that made by Martelec can be used.

The two main weather satellite systems used are NOAA (137.500 & 137.620MHz) which has a standard resolution of 4km and Meteosat 4 on 1691 & 1694.5MHz. Apart from the aerials (e.g. crossed dipoles for NOAAs 9, 10, 11 and 12 and/or long yagi/dish for Meteosat). The other component you will require of course is an image converter and display system.

PCs seem to be the most popular for this these days, as they are used for Packet and other amateur radio chores. If you are using a PC then you have two options regarding software/hardware; *a)* an internal card can be fitted, or b) a software package and external interface. A version of the latter, just released by Comar on the Isle of Wight called Geos/Wefax, is simply placed on your hard disc and a simple demodulator/interface (a 741 IC?) plugs into the serial port. In my opinion this is by far the easiest approach if you are worried about computer DMA/IRQ tuning/timing conflicts or have no room for add-on cards (as in a laptop), and believe me it works perfectly despite other people's comments!

This software is superb, it includes a full colour orbit predictor that bleeps at you when a satellite is in view, and also caters for HF fax broadcasts as well by using a dual interface unit (double 741s?), in the column this month are a few of the different charts obtained by this package.

You can of course really go mad and invest in the new high resolution packages around for both systems. The polar orbiting system is called HRPT (High Resolution Picture Transmission) which has a ground resolution of 1.1km and will quite clearly show lakes, cities, rivers etc. But for this you will need a high gain aerial and a way to track the NOAAs. The Hi-Res Meteosat system is called PDUS (Primary Data User System) and the system ground resolution is 2.5km. For this you will need a fixed 1.6m dish and of course the necessary hardware and software, which is a little specialised for both systems and costly too.

There are many companies now manufacturing equipment for weather satellite reception, and the UK's Remote Imaging Group have a wide following. They produce an excellent journal on all aspects of weather satellite and fax reception, whether it be HF or VHF/SHF, details of membership can be obtained from; Ray Godden G4GCE, Wayfield Cottage, The Clump, Chorleywood, Herts, WD3 4BG, and don't forget to tell him you saw it in HRT!

For most people's needs the polar orbiters are quite sufficient and stunning results have been obtained during the summer months. Remember the NOAAs transmit visual and infra-red images side by side and so need daylight viewing times. There are morning passes which travel southbound, and evening passes by NOAAs 9, 10, and 12 which travel northbound and so appear reversed on your screen, although software allows you to reverse this effect. NOAA 11 is usually receivable between 1400z-1500z, and full timetables for three months are available in the centre pages of R.I.G.'s *Journal.*

Band Reports

Things have been a little quieter during March, on the 11th CX4HS was into Europe on 50MHz, as was 3X0HNU (Republic of Guinea) also that day a large aurora was reported in GM, DL, OZ, and SM. Other auroras followed during the next few days but no significant DX was reported.

Ela G6HKM in Essex reported a very poor month with only the 11th March being of real significance when an aurora took place and thirteen QSOs were made on 50MHz, and that was about all the DX reported for March.

The Challenge is On!

A few months ago you may remember that I was awaiting printed circuit boards for the G4WIM 50/70MHz TX/RX project. Well, they eventually arrived, but I am sorry to say that in my opinion the quality is very poor, and I wouldn't recommend this project until somebody comes up with plated-through hole boards. However, I am at present trying to twist the arm of an old friend in Jersey, Lawrence GJ3RAX, who's design and construction expertise is impeccable on such projects. Lawrence has designed an exciter, which is used in many of the new beacons on 50MHz that I am currently shipping around the World, and the reliability is superb. Lawrence has indicated that he is prepared to have a go at designing such a transceiver for 70MHz but it will be SSB only, is there anybody else out there with any ideas?

Other News

The RSGB Chairman has been in touch to indicate that, at long last, an application for an increase of power levels is going to be requested for. At present I am putting together comments from UK 50MHz operators and listings of the 50MHz limitations of other countries, as the UK falls far short of EIRP compared with these, more news later.

The first Norwegian 50MHz repeater came on the air recently. It is located in JO59 near Oslo, the input is on 51.200MHz and the output is on 51.800MHz, and the standard 1750Hz access tone is required. It runs about 13W output, reports please to LA5UR.

Nabil 7X2KT (Algeria) hopes to become operational on 50MHz soon, he is at present building some equipment and should be active by June/July from JM16 locator. Many readers should be able to work this country very easily, as five years ago two French stations operated from Algeria and were into the UK every day during June/July.

ARRL QSL rejections have led to a few people being disappointed, EA8/DJ3OS and FR/DJ3OS, who also operated from D68, have all been rejected by the ARRL DXCC desk as no permits have been obtained. A real shame after all that hard work and travelling.

Well that's it for another month, my thanks to the UKSMG for the latest happenings and others of course, if you have any news or views then please drop me a line to; The TV Shop, Belmont Rd, St. Helier, Jersey. C.I. or phone during the day on 0534 77067 (or fax at night).

Packet Radio —Roundup—

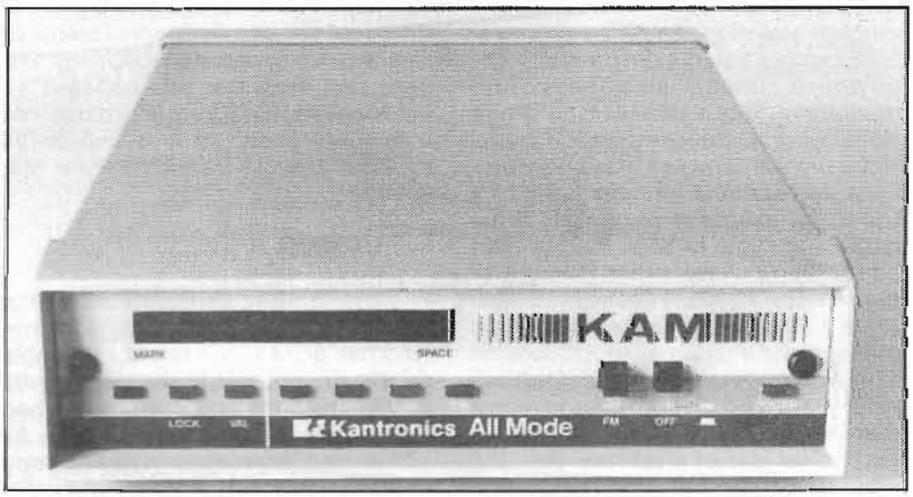
Our packet SysOp G4HCL upgrades his memory with the Kantronics KAM Plus

Well, the small package I was hoping for in last month's column *did* arrive, direct from the USA by airmail no less (thanks Phil!). I'm talking here of course about the Enhancement Board for the Kantronics KAM, this adding a whole host of features including Pactor, 128K RAM, EPROM space of 1Mb, expanded personal mailbox, a socketed lithium battery, real time clock, on-line help for each command, the list goes on and on!

Kam Plus 'Mini Review'

In case you didn't see last month's issue, Kantronics have now brought out the *KAM Plus,* an 'upgraded' version of their all-mode data controller (Kantronics All Mode), which should be available by the time you read this at £399. For existing KAM owners (like myself), a plug-in 'Enhancement Board' is available at £99 to perform the required 'transformation'. And what a transformation it is!

One of the 'best' features in my mind for newcomers is that of a 'new user' limited command set, to save you getting 'bogged down' with all the numerous commands possible, plus a very easy-to-use one-line 'help' facility for each command. If, for example, you need a memory-jogger as to what 'BTEXT' is, just type in 'HELP BTEXT' and it tells you! For 'expert' users, the command set can be extended to the full set available of course.

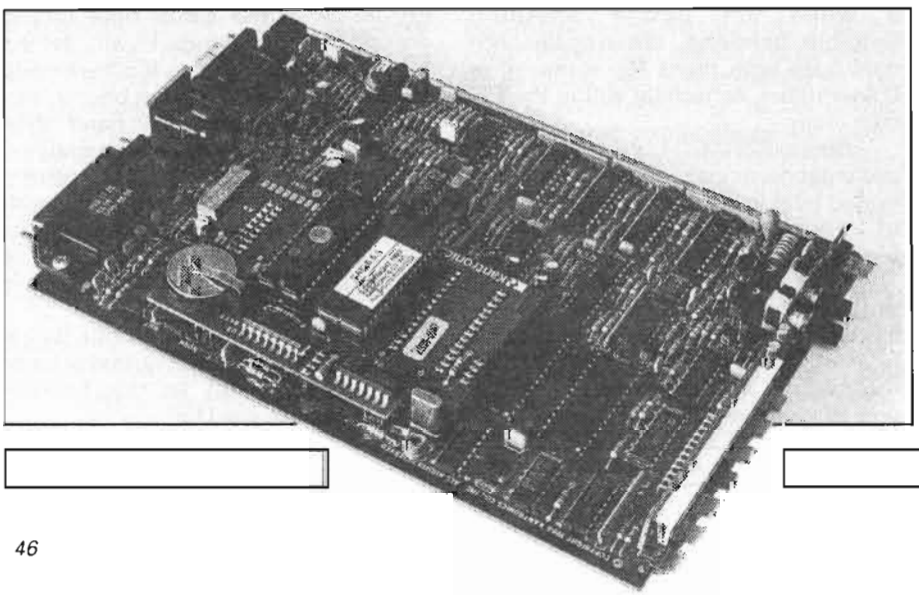


The KAM is now also available as the KAM Plus

More PBBS Facilities

The PBBS (Personal Bulletin Board System) can now have a memory capacity of up to 119k, no more 'lost messages' when your PBBS fills up from auto-forwarded messages from your local friendly BBS while you're on a fortnight's holiday! Other 'add-ons' allow you to edit the text of stored messages, let's users list a 'range' of messages, and kills messages that have been auto-forwarded by the KAM onto your local BBS. Yes, you just enter the message in your TNC, with the usual '@ GB7xxx' remote BBS address field, then every hour (or whatever No. of hours you decide), it automatically logs onto your local BBS, forwards the messages, disconnects, and deletes the forwarded message to leave you even more room. In other words, you don't need to arrange for the BBS to 'poll' you.

The add-on enhancement board fits onto the main KAM board



Multimode Capabilities

As well as all the usual AMTOR, PACTOR, CW, NAVTEX, RTTY modes and the like, and added 'code' command allows you to select the alphabet used to send and receive RTTY and AMTOR. When set to the default of ITA2, the International Telegraph Alphabet No. 2 will be used. However if you set it to LCRTTY, a complete printable character set achieved by cooperation with Peter G3PLX will be used – similar to that used for international HF AMTOR forwarding of packet mail – lower case as well on AMTOR! When set to APLINK, the code used on

APLINK BBSs is enabled, and a 'US' command provides the US alphabet for RTTY use.

CW enthusiasts and even those learning Morse aren't forgotten, as you can now also use Farnsworth spacing which provides a greater time period between characters (as used for all UK Novice CW exams), and variable 'weighting' to adjust the dot/dash ratio if required for on-air use. 'Tone CW' lets you key an audio tone for CW, useful for on-air use on 2m/70cm FM for example, or even to drive a speaker for in-shack practice! There are plenty of other 'add ons' of course, far too many to detail here.

Installation

Fitting the enhancement board took me just a few minutes, although I found that I had to bend an existing capacitor out of the way and fit the board at a slight angle (to make sure all the pins connected). A short grounding wire was also provided, no doubt to reduce the level of RF 'hash' generated – important when mixing potentially 'noisy' microprocessors with HF operation! On-air, the system worked superbly, and even though I'd been a KAM owner for many years I surprised myself by making good use of the 'help' facility. Another 'nice point' was the real-time clock, no more setting the time from the computer for logging purposes each time I switched on. I feel the enhancement board is well worthwhile at £99, this comes with a KAM Pactor manual and a few pages detailing the 'new commands', especially as just the Pactor upgrade for early KAM versions (pre-version 5) is £95, although the latter does include a complete KAM manual set which you'll need to otherwise pay extra for if required. My thanks go to Kantronics for the speedy dispatch of the unit for review, and their UK distributors are Lowe Electronics (0629 580800) from whom you can get further details.

Newsletters Received

For DX PacketCluster users, the quarterly *Cluster Duster* edited by Maurice G3XKD provides plenty of information from around the network. This is the newsletter of the UK Cluster Working Group, and the March issue includes network reports, 'Who's Who' on the Clusters, a review of the CMOS Super Keyer II, readers letters, details on the new 'Go Lite' W6GO/K6HDD QSL list, and plenty more, all professionally produced and complete with photos. You can get a year's subscription from Maurice King G3XKD, 15 Glebe Road, Prestbury, Cheltenham, Glos, GL50 3DG for the modest sum of £4.00 UK, £5.00 EC, or $10 airmail North America. Cheques should be made payable to the 'UK Cluster Working Group'.

If you're a DX Cluster user and you need a complete (and very useful!) user's manual to guide you through the many commands and functions, these are often available from your local Cluster SysOp for a modest fee (which goes towards funding the cluster – the software for this, unlike most BBSs, *isn't* free!), just leave him a message if you're interested.

The second newsletter received this month is *Digicom* from Maxpak, the Midlands AX25 Packet Group, who operate several user nodes and the GB7MAX BBS, and support three other BBSs within the Midlands area. This issue contains comprehensive user information on the v5.15 update for FBB BBSs, provided by Any G1DIL, plus news, 'virus' information, readers and trade adverts, and 'Who's Who' in Maxpak. As well as this, they provide a TNC kit service (see the review in the March issue of HRT of the TNC-DL from Maxpak). You can get membership details from Richard Nicol G1NZZ, 37 Thicknall Drive, Stourbridge, West Midlands, DY9 0YH, Tel. 0384 373682.


DC

MAXPAK
DIGICOM
NEWSLETTER

APR/MAY 1993

LATEST NEWS

The DY nodes at Sedgley have been upgraded with the new X-1H NetRom software, and so joins the Bridgnorth nodes which were upgraded a few weeks previously. The network link from the DY site to the WV (Mander) site is nearing completion, and this will eventually result in really fast access to the MAXPAK Local Area Network.

The WV trunking site is about to be upgraded to 9600 baud for linking to G6IFS and GB7SAM. G6IFS will also link to NUPUG, using 9600 baud for onward transmission into their area network. This should show a considerable increase in the speed of movement of mail, in and out of our area. The path south to Fourpak is still awaiting further improvements at their end of the proposed link.

GB7MAX, will by now, have been loaded with FBB 5.15 and you will be able to use the excellent white pages server that is currently available. Check in the FBB supplement, which is enclosed with this issue, for all the details.

As you can see, there has been a considerable amount of work done during the past six weeks and our thanks go to Mick GIDKI and Richard GINZZ who have been working on these improvements to our network. Thanks also to Andy GIDIL, who beta tested the FBB 5.15 software, prior to its release. Altogether, a very busy time for engineering within the group. [ed]

MAXPAK at the NEC

Maxpak are once again exhibiting at the RSGB convention to be held in the National Exhibition Centre Birmingham on Sunday 16th April 1993. We are proud to have been present at every one of these most important Amateur Radio events, which must be a bit of a record for a specialist group. A special effort is being made by the committee to put on the best stand presentation possible and we would hope that many of our members will call at the stand to give us their support. All the Maxpak products will be on sale and we hope a few new 'bits and bobs' will also be available for members to peruse. Bob Evans G8KHV will, as usual, be wearing two badges (hats), the RSGB Rec committee as well as his Maxpak committee badge, so look out for him at both locations. Andy GIDIL will be there, representing FBB in the UK whilst wearing his Maxpak committee badge. Mick GIDKI, our chairman will be there, as usual, to answer any questions about GB7MAX, and the 23cm trunking nodes. Richard GINZZ will be ready to take 'your money' should you decide to spend any Hi. Joe G4VYA will hopefully be 'driving' his latest idea, a brand new video presentation which will be running continuously on the stand in the hope that it will interest the people passing by, and give them some idea into the workings of our group.

Remember, it is only a one day show this year.

Maxpak Digicom

Issue 6 (Apr/May 1993)

Relay Changeover TXDelay?

Malcolm G0LMD recently asked whether any modifications to the TXDelay on a TNC were necessary for his relay-changeover Pye Westminster or other 'old' and possibly 'slow changeover' rigs due to their relays. The transmit/receive switching time of modern rigs is limited by the synthesizer switching, and modern synthesized portable rigs, often used for packet, commonly have a very slow receiver 'wake-up' period due to power requirements. Ironically, older crystal-controlled rigs, e.g. some ex-PMR types on the amateur market, don't suffer from this! Relay changeover rarely takes more than 100mS, if it did then the contacts would certainly be arcing with all the 'hot RF' they'd have to pass. You'll often find that the 'older' rigs can be even more suitable for packet than new sets, especially as they're normally a lot cheaper! You shouldn't normally find the need to make any allowances for such relays, unless of course the rig is 'slow' otherwise!

Pye Westminster Packet Modifications

Whilst on the subject of Pye Westminster mods, the following 'packet


CLUSTER DUSTER

THE NEWSLETTER OF THE UNITED KINGDOM CLUSTER WORKING GROUP

Vol. 3 No. 1 March 1993 ISSUE 9

CONTENTS
ALL
THE
USUAL
FEATURES
INCLUDING
NETWORK REPORT
WHO'S WHO
SPOTS CHARTS
LETTERS
W6GO INFO
KEYER REVIEW

Maurice G3XKD reviews the CMOS Super Keyer II

upgrade' details, circulated on the network by my old friend Geoff G0DDX (the Sysop of GB7DDX), may be useful. These improve the rig's deemphasis on receive and improve the transmit performance, although the microphone is subsequently disabled in the case of the TX mod.

RX mod; With the front panel facing, radio upside down, bottom panel removed, locate the RX board on right hand side (the one with lots of metal boxes!). Locate the two capacitors nearest the front, adjacent to nearest metal box. Replace the capacitor nearest the metal box with a 47nF in parallel with a 1k resistor.

TX Mod (to relocate the feed from TNC to a better input); With front panel facing, radio top case removed, locate the TX board on centre right (2nd board from right). This has the deviation pot on it – 10k, usually red, near rear of board. On the centre right of this board, there's a row of seven resistors, with three (green) capacitors behind. The feed should be taken to the rearmost of these three capacitors. Additionally put a 10nF capacitor and a 68k resistor in series with the feed, although if the TNC output is high, the 68k value may need to be increased. Locate pins 3 & 4 at the front edge of the board, with a coax attached. Remove the centre (pin 4) of the coax, and short pin 4 to pin 3.

Reverse Forwarding Problems?

Andrew GW0OZB @ GB7IMB has just recently become active on packet, and tells us he's having problems with reverse forwarding from his KPC3, and asks if some light could be shed on this. He'd been advised by a local 'expert' that although it's supposed to work, it doesn't, due to incompatibility with our NTS BBSs in not recognising the 'flags'. Well I'd tested the reverse forwarding in my review of the KPC3 (HRT Nov 92), and yesterday as a 'check' I sent another from my KAM (same PBBS system) addressed to another local amateur, this automatically auto-forwarded onto my local FBB BBS GB7XJZ, which accepted it and auto-forwarded it onto my friend's KPC-3 PBBS. He replied, this was auto-forwarded successfully to GB7XJZ, which in turn auto-forwarded it back to me!

I phoned a couple of UK KPC3 dealers to check, this revealed that no problems had been reported to them, however, a recent VK feature in *Packet Racket* written by John VK3ZFJ could explain things. In a test with VK3YZW, if the FBB system was set up to forward mail to simple, older-style personal mail systems it didn't work. If however the FBB system was set up to talk to the remote TNC as if was another BBS, everything started working! John VK3ZFJ would like to hear from anyone who can supply hints on how this could be optimised so he can publicise the information in VK land, and he believes the MFJ1278 (release 3.6) and the MFJ1270B/1274 (release 1.2.9) will also work in the same way. Any FBB experts out there? You can contact John by a message to VK3ZFZ @ VK3BLW.

CTRL-Z, End of Message

That's it for another month. Please do keep me in touch with what your local packet group's doing, I'll gladly publicise it here. Remember also, that in the UK you *are* allowed to send advertising messages *on behalf* of such non- *profit organisations established for the furtherance of amateur radio* over the network, it *isn't* illegal no matter what some 'backroom packet lawyers' may want you to believe! (read your licence).

Have fun rally-hunting for your Pye M290 series rigs for packet, the network as I write this seems filled with messages about the recent HRT conversion projects for these! Until next month, 73 from G4HCL @ GB7XJZ.