FEBRUARY 1996 £2.00

Ham Radio TODAY

9 770269 826086 02 >
NEXUS

Icom's high power 2m/70cm mobile reviewed

Kenwood's digital TS-870S - full technical review!

Ham Radio TODAY

HAM RADIO TODAY
VOLUME 14 NO.2
FEBRUARY 1996

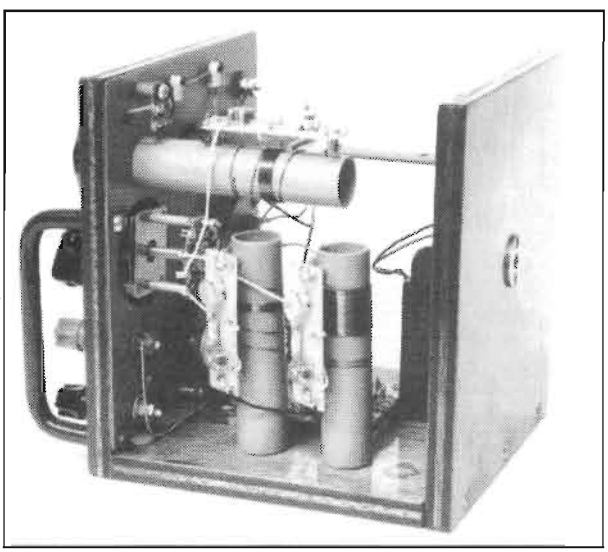
REGULAR COLUMNS

REVIEWS

FEATURES

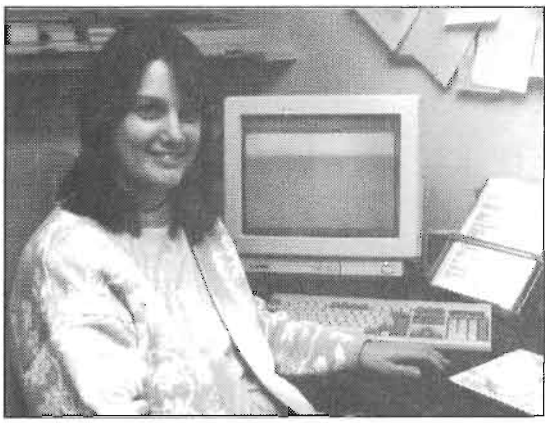
CONSTRUCTION PROJECT

NEWS & VIEWS



Construction project - 'Q' Multiplying pre-selector for 80, 40 and 20m (see page 28)

'Instant Morse' CD-ROM review (see page 20)



CQ from G8IYA

Editorial

Is our hobby changing shape for the better, or for the worse?

Each month. I try to make the content of this Editorial reasonably different, hopefully interesting, but I always try to choose a subject to promote discussion. Is our hobby changing shape? The answer to this is, of course, yes, as it has been doing for nearly a hundred years.

A comment I've heard throughout the past year, whenever radio rallies are discussed on the air or 'down at the club', is that there's too much 'computer rubbish' instead of 'amateur radio stuff'. But then, what *is* amateur radio stuff? Is it black box transceivers? Many amateurs don't consider off-the-shelf Japanese transceivers to be 'true amateur radio'. How about junk, sorry, surplus and second-user equipment and components? For many, *this* is what radio rallies, at least, are all about. Being able to hunt around for a 'bargain' to complete that latest project is half the fun of buying things in the first place for many amateurs. How many come away from a rally with a nice new 'top of the range' transceiver costing over £1000, or equally (with the complaint of 'too many computers' in mind) a top of the range multimedia Pentium PC? Certainly not as many as those who come away with small add-ons, often bits and pieces bought from dealers selling surplus goods and components.

Bits and pieces

But it's still true that many rallies are increasingly offering computer 'bits and pieces'. Not just complete new 'ready-to-go' PC systems, in a similar way to expensive Japanese black box transceivers, but the 'bits and pieces' as well, e.g. disk drives, motherboards, plug-in cards, software, and so on. "Junk" to some people, but a veritable "Aladdin's Cave" to others. A new breed of 'bargain hunter' is now found, one who goes round looking for a 486DX-100 plug-in processor for his machine, or an add-on multimedia card.

On the other hand

But there's another twist to this tale. With the phenomenal growth of the Internet, i.e. landline modem-based communication, is amateur radio communication going to be dying a slow death? Who needs amateur radio any more to communicate with, say, Australia, when you can connect up your computer to your local cable operator's telephone line service which offers free local calls during the evening, and communicate away around the world with other like-minded hobbyists using this 'local call' line?

What's the answer?

I suppose one answer here is that *our* hobby has an element of experimentation, that of 'doing it yourself', of being 'let loose' on the air after you've successfully proven to the authorities that you're capable of having this responsibility. It offers some degree of uncertainty, a challenge, a feeling of achievement when you've met one of the many challenges, whether these be a contest, gaining an operating certificate, or just making that first contact with a new country or on a new mode. But the Internet still offers a powerful alternative to 'Joe Public'.

Which is why I was very pleased to have been complimented recently, by a major name in amateur radio, on Ham Radio Today's Internet World Wide Web Page. Why? Well, in their words; "While others are promoting the Internet, Ham Radio Today are using computers and the Internet to actively promote amateur radio. For example, on your Internet Web site you have a beginner's guide to starting out in the hobby, a guide to choosing a receiver, lists of reviews as well as reviews themselves, even an ex-PMR conversion 'on line' so prospective amateurs know how to become operational on the bands at low cost. Each month you offer a new collection of amateur radio software, this also being detailed on the Internet site, so computer users can see how exciting amateur radio can be". Their words, not mine.

Meeting many needs

Don't worry, Ham Radio Today certainly isn't just for the 'computer literate', neither is it going to be in the foreseeable future. Just take a look in this month's issue if you need proof of how we're featuring articles 'across the board', including modernising old receivers, a do-it-yourself add-on project for receiver use (both using rally-bought surplus components?) and so on. But I'll continue to feature relevant PC 'add-ons' for amateur radio. Like simple one-IC construction projects to turn your PC into a multimode communications tool on the air (e.g. Ham Radio Today March 95, p25, it even came with a software disk on the front cover for this).

Maybe instead of fighting against things, like computers in our hobby, people should use such change to help our hobby grow. Some of us are trying to.

Icom IC-2350H Review

Chris Lorek G4HCL finds an easy-to-use rig which has an occasional surprise to offer

The IC-2350H offers much the same in the way of facilities as that of its predecessor, the IC-2340. So what's new? Well for a start there's certainly been a redesign, especially of the operating controls. For example, from the photo you'll see there are two tuning knobs, one for each band, together with two pairs of 'mirrored' buttons next to these which separately control VFO/MHz switching and Memory/Call channel switching for each band. The left side controls are for VHF, those on the right for UHF, very simple. If you want to switch between transmit bands, just give the relevant tuning knob a quick press - what could be easier? No more looking down at a tiny display to see which is the 'selected' band when you're hurtling down the motorway! The middle two buttons are used for repeater shift/sub-tone and low power/scan control switching, and to keep the front panel uncluttered, each of these buttons have a 'double role', depending upon whether you push one momentarily, or keep it pushed for a couple of seconds.

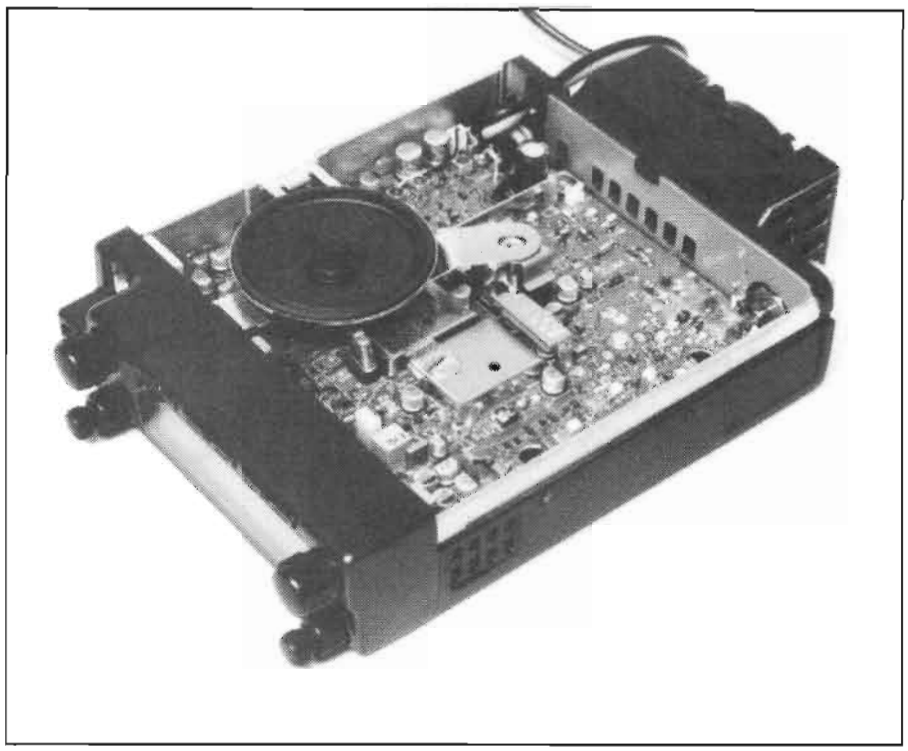
Gone is the earlier flying lead microphone connector coming out from the rear panel, this being replaced with a modular 'telephone type' mic connector on the front of the set. This also provides receiver audio output (e.g. for packet use) and an 8V DC output for use with amplified base mics and the like. The supplied mobile fist mic has a 1750Hz tone button on the rear for repeater access, and a handy facility is that you can program the up/down buttons on the mic to instead act as a front-panel function, for example a monitor facility including repeater 'listen on input'.

All the 'basic' facilities such as programmable tuning steps, memory channels (50 of them plus a quick-access 'call' channel, on each band), memory and selected range scanning, are there for your use. The transmitter offers the 'now usual' high power level of 50W on 2m and 35W on 70cm, with switchable low power levels of 10W and 5W on each band. On receive, besides covering 2m and 70cm the set is technically capable of tuning across 118-174MHz (including AM reception on the airband range), 320-480MHz, and 830-950MHz, with suitable internal linking.

A possibly quite useful feature

for a mobile rig is that of a 'power off' timer function on the set. Here, you can program the rig so that after a period of either 30 minutes, 1 hour, or 2 hours, of no operation, it goes into 'power down' mode, i.e. electronically switches itself off. No more flat car battery problems after accidentally leaving the set switched on with the car parked all day, or in the garage over the weekend!

The set comes with a sturdy mobile mounting bracket, suitable for mounting either above or below the rig. With the internal speaker being fitted on the underside of the case, this would also thus be useful in the shack for 'lifting the set up' above your shelf or table top, so you can actually hear what's being received. Alternatively, there are two external speaker sockets, which provide either combined receive audio from both 2m and 70cm, or separate audio from each band into different speakers. You can also have audio from 2m to an external speaker and 70cm audio from the internal speaker if you wish.



Selective calling

Adding an optional DTMF unit inside the set lets you use 3-tone paging and selective calling with the set, as well as some interesting remote control facilities, including off-air control of the set's channel change and the like. With an optional DTMF mic plugged in, remote control of many of the set's functions via the mic is also possible. The IC-2350H has a CTCSS (sub-tone) encoder fitted as standard, i.e. for repeater access, a further plug-in option of a CTCSS unit adds sub-tone selective calling and 'CTCSS scan' (where you can see which sub-tone is being used on a received signal).

The IC-2350H measures 140mm (W) x 40mm (H) x 205mm (D) and weighs 1.2kg. The rear heatsink size is kept small by the use of a small cooling fan on the rear panel.

In the shack

I found a handy facility of the set, when programming up memory channels, was that it could automatically increment the memory channel each time for me. OK, it's a small point, but it's a nice operating feature, which I feel would be quite handy for use on the move when finding a 'new' active channel whilst travelling into a different area.

Connecting the set up to my rooftop 2m/70cm colinear showed the receiver to be nicely sensitive, and with the set's high transmit power I could get into distant repeaters quite well. For local contacts I usually switched to low power, and in all cases, even during extended contacts, I found the set stayed reasonably cool. This is because the rear fan came on each time I pressed the PTT, and stayed on for a couple of minutes following each 'over' (it can also be set to stay on continuously), to cool the set down. In a quiet shack, I did often find this a little annoying, but the alternative would probably be a rather large and heavy rear panel heatsink to dissipate the resultant heat from the high power PA.

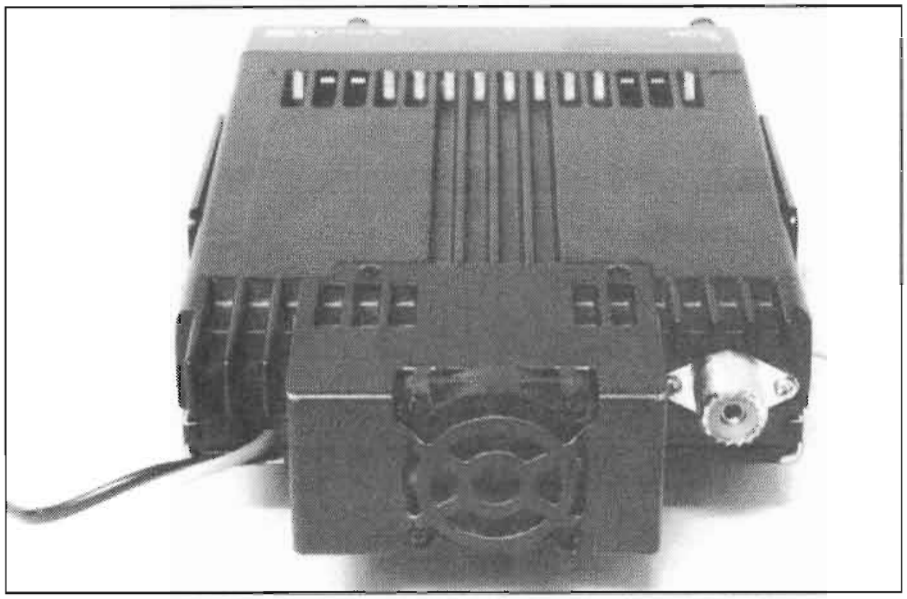
I found controlling the set was very easy, and besides a press of the tuning knob to switch bands, a press of the volume knob for either band momentarily listed the receiver squelch on that band. When I'd switched to a repeater channel, this also gave a one-touch 'listen on input' facility, which I found very handy.

The receiver appeared to reject strong, unwanted signals, reasonably well, although I did have one problem of 'intermodulation' (where strong off-channel signals mix to cause further unwanted signals in the receiver). But the set has a 'secret weapon' here, with a handy receive attenuator function that's virtually hidden away from view. When the squelch control on either band is turned up above the 12 o'clock position, receiver front-end attenuation is automatically brought into circuit - what a good idea! This nicely reduced the problem to inaudibility - very handy and with a very sensible way of 'switching it in' in my opinion.

On the move

Besides the various memory channels and scanning facilities, as found on virtually all sets nowadays, the IC-2350H provides two 'scratch pad' memories on each band - one for the last simplex channel selected, one for the last repeater channel selected. So a couple of quick button pushes when on the move were all I needed for a quick QSY to my 'last used' channels, without the need to start rotating tuning knobs and looking down at the display.

Overall, I found the set was incredibly easy to use on the move, it almost brought me back to the 'good old days' of operating a click-step tuning transceiver, where I knew exactly where I was at any



time. The same is true of the IC-2350H, and it's significant that the large uncluttered display occupies a large percentage of the front panel area of the set!

I found there was quite enough audio from the set, *plenty* of it in fact, without running into distortion or 'rattles' from the internal speaker (unlike many other mobile rigs I've tested!) for use when travelling along even in noisy conditions. With the set mounted beneath the car dashboard (rather than on top of it, as I usually prefer), an external speaker did however help, if only in directing the audio to my ears rather than onto the car's carpet from the set's downward-facing speaker. Reports on my transmit quality were very good, I can confirm this as I also heard the set 'first hand' when my wife, G8IYA, used the IC-2350H on a few occasions whilst I was out and about portable with a handheld.

Lab tests

A check of the set's technical performance showed it to be a 'good, honest worker', with no nasty surprises, RF wise. The maximum squelch threshold was noticeably quite high in terms of signal level, to usefully allow weak distant signals to be effectively 'squelched out' if you wish. This was because of the very useful internal attenuator that's automatically switched in, the 'threshold' squelch setting still allowing a very sensitive level to be provided when you *do* want to hear everything possible on the band.

The other noticeable result was that of quite a high level of undistorted receive audio, confirming the good results I found when using the set on the move.

Conclusions

The IC-2350H is a good, honest, down-to earth set that's very easy to use. It offers a sensitive receiver with plenty of available audio, a high power transmitter, and small size combined with a large display. You're not paying for the set to be filled with many 'bells and whistles' that you possibly won't ever use, although optional plug-in modules can easily add facilities such as DTMF, code squelch and the like, if you wish.

I found the set was a pleasure to use, especially when mobile, it's easy operation being quite unlike some of the 'mission control mobiles' found nowadays.

My thanks go to Icom UK for the loan of the review transceiver.

LABORATORY RESULTS:

All measurements taken using stabilized 13.2V DC power supply and supplied DC lead, high power TX, otherwise stated.

RECEIVER;

Squelch Sensitivity;

	145MHz	*435MHz*
Threshold;	0.10µV pd (7.5dB SINAD)	0.10µV pd (6.0dB SINAD)
Maximum;	1.35µV pd (16.5dB SINAD)	0.81µV pd (16.5dB SINAD)

Sensitivity;

Input level required to give 12dB SINAD;

144MHz:	0.13µV pd
145MHz;	0.12µV pd
146MHz;	0.12µV pd
430MHz;	0.14µV pd
435MHz;	0.14µV pd
440MHz;	0.14µV pd

Adjacent Channel Selectivity;

Measured 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;

	145MHz	*435MHz*
+12.5kHz;	32.4dB	28.1dB
-12.5kHz;	28.7dB	28.7dB
+25kHz;	75.8dB	72.4dB
-25kHz;	77.2dB	72.1dB

Blocking;

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;

	145MHz	*435MHz*
+100kHz;	82.9dB	85.9dB
+1MHz;	89.8dB	94.7dB
+10MHz;	96.9dB	94.9dB

Intermodulation Rejection;

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

	145MHz	**435MHz**
25/50kHz spacing;	60.0dB	68.1dB
50/100kHz spacing;	60.1dB	67.2dB

Maximum Audio Output;

Measured at 1kHz on the onset of clipping, 8 ohm load;

145MHz	*435MHz*
4.72W RMS	4.68W RMS

S-Meter Linearity;

	145MHz		*435MHz*	
	Sig Level	**Rel. Level**	**Sig. Level**	**Rel. level**
S1	0.45µV pd	-9.7dB	0.33µV pd	-17.3dB
S3	0.62µV pd	-6.8dB	0.57µV pd	-12.6dB
S5	1.00µV pd	-2.7dB	1.12µV pd	-6.7dB
S7	1.15µV pd	-1.5dB	1.57µV pd	-3.8dB
S9	1.36µV pd	0dB ref	2.43µV pd	0dB ref
S9+	1.74µV pd	+2.1dB	3.09µV pd	+2.1dB
S9++	2.18µV pd	+4.1dB	4.12µV pd	+4.6dB

TRANSMITTER;

TX Power and Current Consumption;

Freq.	*Power*	*10.8V Supply*	*13.2V Supply*	*15.6V Supply*
145MHz	High	37.2W/8.85A	48.7W/9.70A	49.0W/9.65A
	Low 2	8.22W/4.20A	8.27W/4.30A	8.22W/4.20A
	Low 1	3.93W/3.25A	3.95W/3.30A	3.88W/3.25A
435MHz	High	20.4W/6.90A	34.7W/9.25A	34.7W/9.85A
	Low 2	9.70W/4.90A	9.75W/4.90A	9.75W/4.90A
	Low 1	4.18W/3.55A	4.21W/3.55A	4.20W/3.55A

Harmonics;

	145MHz	*435MHz*
2nd Harmonic;	-68dBc	<-70dBc
3rd Harmonic;	<-70dBc	<-70dBc
4th Harmonic;	<-70dBc	<-70dBc
5th Harmonic;	<-70dBc	-
6th Harmonic;	<-70dBc	-
7th Harmonic;	<-70dBc	-

Peak Deviation;

145MHz	*435MHz*
5.02kHz	4.94kH

Toneburst Deviation;

145MHz	*435MHz*
3.01kHz	3.03kHz

Frequency Accuracy;

145MHz	*435MHz*
-209Hz	-627Hz

Direction Finder Kit Test

Our Technical Editor goes DF hunting

The kit of parts

Amateur direction finding, or 'foxhunting' as it's commonly called in our hobby, has for many years proved to be a popular 'sport'. Many friendly 'DF' competitions are organised throughout the UK, and indeed Internationally.

There's usually also the occasional need to try to find an unknown transmitting source, either by yourself or with a group, such as that of a 'stuck' transmitter or an interference source. This little handheld DF unit, used with a VHF or UHF handheld, could be just the job for all this.

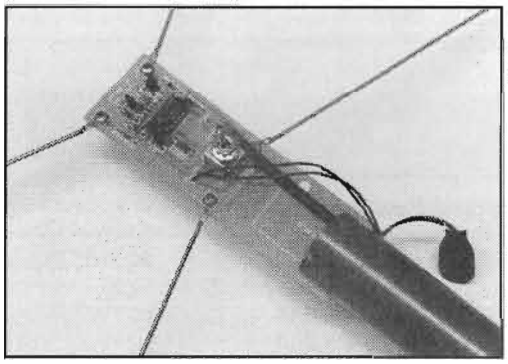
Launched at the Leicester Show this year, it's a joint effort between Ernie G4LUE of the S. Yorks Repeater Group, and John G4YZO of Badger Boards. It comes as a kit, with absolutely everything supplied apart from a receiver, a 9V battery, and a drop of glue (to fix the handle on with!), to get you going and DFing away, at a cost of less than £20.

Theory of operation

With the unit, the left and right hand aerials are alternatively switched, electronically via board mounted diodes, at a rate of around 1kHz. If one aerial is closer to the unknown signal source than the other, then that aerial will receive the signal a few microseconds before the other. This will result in a phase difference which will appear on the incoming signal as a phase modulated tone on the received audio. As the unit is rotated, a point will be reached, where both aerials are at an equal distance from the signal source. At this point, they will be 'in phase', and the tone will disappear. This will happen when you are either pointing away, or at, the signal source, so a combination of readings a distance apart will allow a 'triangulation' to be made. The 'crossover' point of directions on a map will then give the location of the source.

Construction

The instructions that come with the kit are very comprehensive, and I feel the newcomer with even just a basic knowledge of soldering should have few problems. The components are identified precisely, i.e. "Resistors R4, 5 & 6, Qty 3, wire at each end, colour coded brown/black/orange, value 10k"



Close-up of the PCB after assembly

followed by a 'check' box for your use. The PCB is silk-screen printed with the component placement overlay, and the solder side is coated with solder-resist to help prevent solder 'bridges' in construction. Even the coax comes ready stripped and prepared at each end in the exact length and form required, one end mating with the supplied screw-on PL-259 plug, the other with the PCB.

Armed with my 25W soldering iron and following the instructions step-by-step (rather than 'diving in' as I usually would to save time and thus possibly regretting it later!), it took me just less than 30 minutes to build the unit. Badger even supply a ready-slotted fibreboard 'handle' for the unit, this I found was also a handy place for the 9V battery, this being a 'push fit' inside the handle. Badger Board's claim of the kit being "carefully laid out for many a newcomer to the hobby" and "It could be built in an evening and could possibly be a good club or group project" I feel are certainly true!

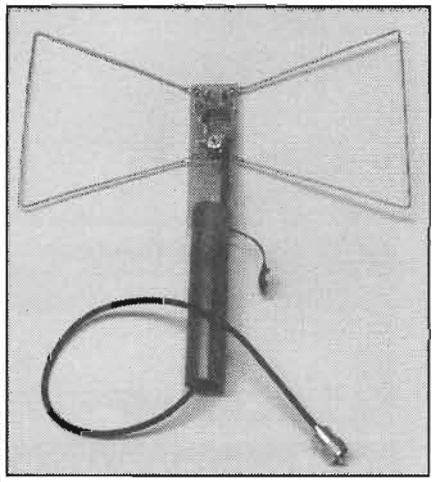
In use

I checked my soldering, re-checked that I'd put all the components in the right places, then with trepidation connected my 9V battery and 2m/70cm handheld to the unit. I tuned to a signal, flicked the switch on the PCB to 'On', and there was the 1kHz tone superimposed on the received signal! Moving the DF unit through 360 degrees immediately gave two precise 'nulls' - yes, it certainly worked! Further experiments in using the unit in built-up areas showed that I had to be careful due to reflections from buildings, these (quite correctly) giving multiple 'nulls', although when used in the 'open' much more precise readings could be taken.

In all, I had great fun with the unit. Besides being useful for club competitions I feel it could also be very useful in the typical amateur's shack. For example, how often have you wanted to find out which location that interfering computer 'spurii', or wide band 'hash' at a certain time each day, was coming from on 2m? A few minutes of detective work with a unit like this and you could pinpoint it!

The kit costs just £17.50 plus £1.50 p/p. from Badger Boards in Birmingham (Tel. 0121 384 2473), to who my thanks go to for the provision of the review sample.

The finished unit, ready to use



Kenwood TS-870S Review

Chris Lorek G4HCL takes a careful look at a set with the latest in digital signal filtering built-in

What, no crystal filters? No sir, it's all done with ICs! That's the phrase I heard a number of times on the Kenwood UK stand at the 1995 Leicester Show, when David G5HY of Kenwood UK demonstrated the TS-870S line-up to the many visitors.

Chips with everything

To do this, the set's 3rd receiver IF of 455kHz is converted down to 11.3kHz, where two 24-bit digital signal processors come into action before signal demodulation. These can then offer total bandwidth control, with switchable upper and lower passband frequencies, as well as full digital filtering such as beat cancellation and noise reduction both before, and after, demodulation. Thus, no crystal filters needed, as well as the benefits of DSP audio processing! But, you might think, there must be a limitation. Well, the DSP chips operate at 20 million instructions per

second, and have a dynamic range of 144dB. Which means you should be able to pick out those weak signals that might otherwise have been impossible to resolve. Indeed, Kenwood don't call this rig a transceiver, they call it an "Intelligent Digital Enhanced Communication System".

Temptations

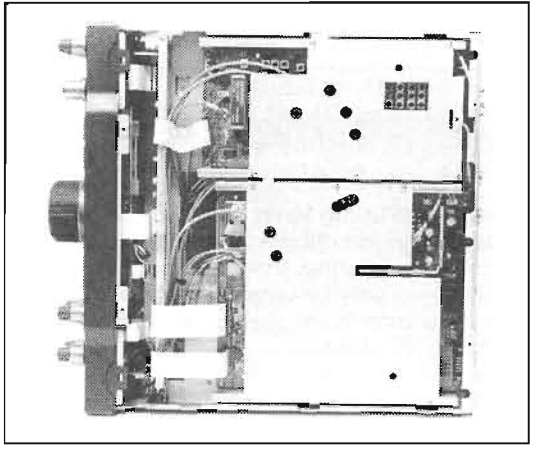
Being somewhat of a 'bit freak', all the above interested me considerably, and when David himself turned up at my door laden with the complete TS-870S lineup, I was 'over the moon'. Being a hardened 80m 'grey line DXer', i.e. one who constantly struggles against noise and QRM, I was very interested indeed in trying out the set's adjustable filtering and interference-fighting capabilities for myself.

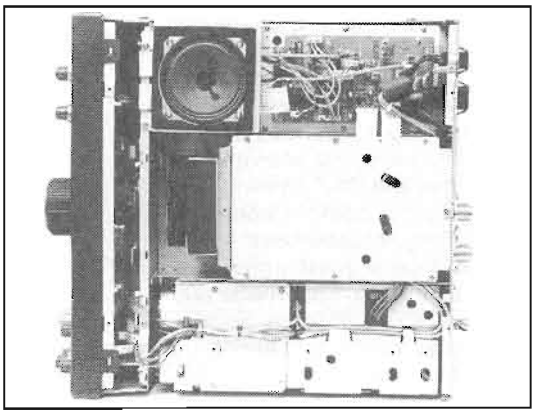
For those who'd like a brief insight, I don't have a 'monster' aerial system or station, living as I do on a modern housing estate. However, in order to try to replicate a variety of systems which readers may have, I've managed to achieve a 40/80/160m trap dipole system with around 2 miles worth of buried copper wire 'earth mat' beneath the lawn, and a tower mounted rotatable 3 element HF yagi (plus various 2m/70cm/23cm azi/ele steerable beams - complete with planning permission - who says DX can't be worked from 'modern' locations!). The tower can also be loaded up via a gamma match as a HF vertical (the earth mat radiates from the base of this). I also have various other aerials, both outdoor and loft mounted, including loft-mounted HF aerials for 20m, 17m, 15m, 12m and 10m, to again hopefully replicate varying on-air situations. I also have several neighbouring amateurs, two being less than 100m away, another 200m away, plus 50 more within a mile or two. All of this hopefully includes at least one aspect of 'typical' usage by amateurs who may read my reviews. But from this, you may also guess that I can also suffer rather badly from various forms of noise, such a TV timebases, neighbouring computer 'hash', and the like, as well as strong signal local QRM. Like many amateurs do. So, let's see how the TS-870S coped....

Facilities

The set offers 100W transmit output on all the HF amateur bands, with CW, SSB, AM (25W max) and FM capabilities, plus direct FSK transmission for data modes. A variable transmit power control lets you reduce the output down to below 20W in each case. The set requires an external 13.8V DC supply for operation, drawing around 2A on receive and up to 22.5A on transmit.

On receive, besides giving continuous wideband receive coverage, all the usual QRM fighting capabilities are provided, including a switchable 6/12/18dB RX attenuator, 'AIP' (Advanced Intercept Point') optimisation which switches out the RF amp stages, a variable analogue noise blanker, plus fully variable RF gain control and AGC controls. Together with these come the DSP enhancements of an auto notch operating prior to demodulation, an audio 'Beat Cancel' which can notch multiple interfering tones at the audio stage, and an adaptive 'Noise Reduction' DSP filter system to improve the signal-to-noise ratio of received signals under weak signal conditions.





On transmit, besides a speech processor, which you can tailor the audio response of, there's also a DSP transmit equalisation facility to likewise tailor your transmitted audio, for either low boost, high boost, or 'comb' filtering. If all this sounds a little worrying, a handy transmit audio monitor facility is available so you can hear exactly what your transmitted signal sounds like whenever you wish.

Two aerial connectors are fitted, with a front panel control to switch between the two. Also, the set 'remembers' which aerial socket you last used on which band, automatically selecting this when you switch bands. A separate receive aerial output socket is also fitted, which can be electronically switched in from the set's 'menu'.

An internal automatic ATU is fitted, this having several 'band memories' which memorize the internal settings last used on a given frequency, for fast operation when tuning around the bands. Besides the aerial selection and ATU conditions, also memorised by the set are the last-used frequency, mode, attenuator, AIP etc. settings for each band. For example, the default setting for AIP is with it enabled on 40m and below, but switching this on or off on any band remembers the setting for the next time you select that band.

SM-230

As well as the TS-870S itself, I was also pleased to be offered the full 'line-up' of the matching PS-53 power supply, SP-31 speaker, and (best of all in my opinion) the SM-230 monitor scope, for this review. I've used the earlier SM-220 monitor scope in my own station several years ago for some time, and learned to appreciate its benefits. The SM-230 is even better, having a large 14cm monitor screen as well as more facilities. Basically, the SM-230 can be used as an 'RF oscilloscope' to monitor the transmitted signal envelope, having a built-in two tone oscillator, and on receive it can also act as an analogue 'bandscope'. For this, it takes a sample of the 8.83MHz IF from the TS-870S's rear panel, and gives a panoramic display over +/-25kHz, +/-100kHz, or +/-250kHz, of activity on the band centred on your tuned frequency.

Other available options for the TS-870S include an internally-fitted digital recording unit, which lets you store up to 4 messages of 15 seconds each for either automatic or manual replay (i.e. test messages, CQs etc.). You can also internally fit an optional speech synthesizer, which gives a spoken output of operating frequency, memory channel etc.

The set has the facility of external computer control, an RS-232 connector being fitted on the rear panel for this with an RS-232 interface built into the set - all you need is a computer and suitable program (Kenwood tell me they will be providing a suitable 'Windows' program free of charge). The set also has the capability of 'quick data transfer' directly to other current Kenwood transceivers via this connector, e.g. for a 'spotting' transceiver in a contest station.

CQ contest, dah-di-dah

The CW keyer built into the TS-870S is a 'K-1 Logikeyer', which gives you lambic operation with dot and dash memories, emulation modes for other keyer types, automatic contest serial number generation, digital and linear speed control over 6-60WPM, adjustable weighting, selectable automatic character spacing, and message storage together with message loop capability for continuous reply. Phew! The keyer is programmed via CW commands you send to it from your key, messages can 'call' each other if you wish, and can even contain other clever embedded functions. You could indeed spend a happy time just exploring the various modes available, the transceiver's keyer 'talking back' to you following your various key commands!

DXing

Enough of all this, "How did the set perform on the air?" you may well be asking. My very first impression, on initially tuning around the bands, was that I found signals came and went very 'cleanly' indeed. With the AIP enabled, even usually 'noisy' bands such as 80m and 40m seemed fairly quiet, at first, until I tuned into a signal. The set then almost burst into life, I'd tune away and the signal would cleanly go. Right now as I write this, a late autumn evening, a JA station is coming through nicely on 80m SSB, working into Europe. The DSP filtering is narrowed, the adaptive noise reduction is in, and I'm wondering what, if anything, I'd be receiving on a 'standard' rig. But then, the moral is 'work them first and worry later'! It's now the following morning, and YV4 and VP2 are coming in at readability 5, again on 80m SSB.

I found it rather novel, but extremely useful, to be able to individually tailor the upper and lower bandpass filter responses. Oh, a bit of high frequency 'splatter' has just appeared from an adjacent station. No problem, a quick turn of the 'Hi/Shift' knob and the spatter totally disappears whilst the wanted station is still readable, ableit in a rather 'constrained' bandwidth. Oh dear, that weak DX station is right underneath a line timebase signal from next door's TV. A press of the 'NR' to switch line enhancement noise reduction in, and he's a lot easier to copy.

Comfortable QSOs

Enough of noisy DX working, how about tuning into a few leisurely 'ragchews'. Besides having the usual features of plenty of memory channels for frequency and mode storage, five 'quick memo' channels are fitted. So, on first tuning across a band, repeated presses of the large 'M In' button for this stored the first five interesting frequencies I came across, for subsequent quick recall.

For normal listening, I found I preferred to use the 'traditional' RF attenuator and RF gain controls to quieten background noise on the band, rather than the DSP facilities, as the latter usually gave an unnatural

sounding, although still fully readable, signal from the speaker. But the DSP did still have a very useful benefit. An often annoying occurrence on the bands is when someone decides to 'tune up' right on top of the station you're listening to. A quick press of the 'Auto Notch' button, and the offending carrier was nicely notched, right down to inaudibility. The 'Beat Cancel' did almost the same, except that it could handle multiple heterodynes, however this filtering was at the audio stage, so the wanted signal did have to be reasonably strong in respect to the interference.

Viewing all this on the SM-230 monitor scope did give a 'real' picture (if you'll excuse the pun) of what was going on. I could instantly see the source of adjacent frequency QRM, or a strong interfering carrier, even if I couldn't always hear it. This also showed, very clearly, the superb effect of the DSP system in cancelling such unwanted interference! I found the SM-230 quite useful as an operating aid, although in 'fast' sweep mode the signals displayed seemed very 'rounded', changing to 'slow' sweep sharpened them up but gave a very noticeable sweep.

Changing personalities

With the transceiver's many facilities and available 'default' settings, 68 of them in fact including things like default AGC time constants for each mode, transmit filter bandwidth, shift, and equalizer, plus various DSP response times, one operator could easily prefer a completely different set to another, and the set can easily be 'personalized' to your exact operating preference. For example I've used a graphic equalizer desk microphone on HF for some time now, to provide maximum 'punch' and readability of my own voice characteristics on SSB. But the TS-870S has variable high/low equalization built in! It even has two switchable 'personalities', A and B, i.e. for two operators using the same set, or maybe 'A' for your own preferences plus a revert to 'default parameters' in 'B' for visitors to your station.

It's impossible to describe all the set's many features in the space available here. I'd need an entire book to do this! But suffice to say I was very pleased, very pleased indeed, in using Kenwood's latest 'flagship' on the bands.

Lab tests

In measuring a number of the set's parameters, I must say I was in a bit of a quandary. For example, with the wide range of DSP facilities, such as signal bandwidth settings, which should I use? In the end I decided to 'play safe' and measure a wide range, including 200Hz and 600Hz bandwidths for CW, together with the default bandwidths for SSB (300-2600Hz), AM (100Hz-6kHz) and FM (14kHz width).

A test of the Auto Notch, with an interfering carrier 'slap bang' in the middle of the receive passband on SSB, reduced this to absolute inaudibility, with zero 'S' meter reading - very impressive! A further test using the 'beat cancel' with three in-band interfering tones reduced these also to inaudibility, although being audio filtering, the wanted signal could only be received in this case if the interfering signals weren't substantially stronger.

The adaptive noise reduction gave a slight improvement in strong signal blocking conditions, although here I feel that the resultant audio equalisation (rather than any improved signal bandwidth filtering) accounted for at least some of the attained readings.

Measuring the various bandwidths showed a very impressive result each time, the DSP filtering obviously not being a 'compromise' or anything 'second best' at all. Instead it gave good, solid, and very flexible filtering. The image and IF rejection was extremely good, in fact beyond measurement limits in most cases, the blocking and intermodulation also being very good and certainly matching the demanding conditions sometimes found on air nowadays.

Conclusions

Kenwood should be justifiably proud of their new DSP transceiver. The ability to vary the signal bandwidth settings to suit one's individual needs, and to quickly change these in use as required, I believe is a 'first'. It's a very useful 'first' as well. In all, I found the on-air receive performance impeccable, reports on my transmission similarly impeccable, what more could one ask for? Please, Mr. Kenwood, do you *really* want to take it back?

LABORATORY RESULTS:

RECEIVER:

All measurements carried out in 300-2600Hz bandwidth SSB mode, with attenuator and IPO off, unless stated.

S-Meter S9 Level:

Freq. MHz	*Sig. Level*
1.8	28.2µV pd
3.5	22.1µV pd
7.0	34.8µV pd
10.1	24.0µV pd
14.0	27.6µV pd
18.1	25.2µV pd
21.0	33.9µV pd
24.9	16.3µV pd
28.5	25.1µV pd
29.5	26.8µV pd

Sensitivity;

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

Freq. MHz	*CW 600Hz*	*SSB*	*AM*	*FM*
1.8	0.06 (0.18)	0.14 (0.45)	0.56 (1.70)	0.23 (0.71)
3.5	0.05 (0.14)	0.11 (0.34)	0.41 (1.39)	0.18 (0.55)
7.0	0.05 (0.19)	0.17 (0.61)	0.65 (2.32)	0.24 (0.95)
10.1	0.05 (0.15)	0.13 (0.39)	0.47 (1.43)	0.23 (0.65)
14.0	0.06 (0.17)	0.13 (0.43)	0.53 (1.67)	0.21 (0.71)
18.1	0.06 (0.13)	0.12 (0.37)	0.46 (1.44)	0.22 (1.00)
21.0	0.06 (0.23)	0.15 (0.64)	0.56 (2.24)	0.13 (0.79)
24.9	0.05 (0.17)	0.08 (0.51)	0.31 (1.91)	0.14 (0.79)
28.5	0.05 (0.19)	0.09 (0.55)	0.35 (2.10)	0.14 (0.80)
29.5	0.05 (0.24)	0.11 (0.57)	0.39 (2.27)	0.16 (0.95)

Selectivity;

	CW 200Hz	*CW 600Hz*	*SSB*	*AM*	*FM*
-3dB	0.20kHz	0.60kHz	2.13kHz	11.49kHz	12.89kHz
-6dB	0.21kHz	0.63kHz	2.33kHz	12.10kHz	13.78kHz
-20dB	0.26kHz	0.79kHz	2.68kHz	13.67kHz	15.25kHz
-40dB	0.34kHz	0.85kHz	2.96kHz	14.66kHz	16.25kHz
-60dB	0.35kHz	0.99kHz	3.12kHz	14.99kHz	16.60kHz

Blocking;

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

	IPO Off	IPO On
+/-50kHz;	104.0dB	103.7dB
+/-100kHz;	106.6dB	105.7dB
+/-200kHz;	107.7dB	106.8dB

3rd Order Intermodulation Rejection;

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

	IPO Off	*IPO On*
10/20kHz spacing;	73.7dB	76.3dB
20/40kHz spacing;	93.1dB	96.3dB
50/100kHz spacing;	89.7dB	92.5dB
100/200kHz spacing;	88.6dB	91.6dB

Image Rejection;

Increase in level of signal at the 1st and 2nd IF image frequencies, and the 1st and 2nd IFs (73.05MHz and 8.83MHz respectively), over level of on-channel signal, giving identical 12dB SINAD signal;

Freq. MHz	*Image Rej.*	*1st IF Rej.*	*2nd IF Rej.*
1.8	>120dB	>120dB	>120dB
3.5	>120dB	>120dB	>120dB
7.0	>120dB	>120dB	>120dB
10.1	>120dB	>120dB	75.5dB
14.0	>120dB	>120dB	>120dB
18.1	>120dB	>120dB	107.8dB
21.0	>120dB	>120dB	>120dB
24.9	>120dB	>120dB	>120dB
28.5	>120dB	>120dB	>120dB
29.5	>120dB	>120dB	>120dB

DSP NR Performance;

Measured (as blocking) on 21.4MHz as increase over 12dB SINAD level of interfering signal, unmodulated carrier, causing 6dB degradation in 12dB SINAD on-channel signal with DSP NR enabled;

	IPO Off	*IPO On*
+/-50kHz;	108.2dB	108.8dB
+/-100kHz;	112.4dB	111.7dB
+/-200kHz;	113.7dB	114.1dB

TRANSMITTER;

TX Power;

Connected to stabilised 13.2V DC using supplied DC lead

Freq MHz;	*Min Power*	*Max Power;*
1.8	9.8W	108W
3.5	10.3W	112W
7.0	10.8W	113W
10.1	10.7W	112W
14.0	10.6W	111W
18.1	10.3W	110W
21.0	10.1W	108W
24.9	10.1W	109W
28.5	10.0W	108W
29.5	10.0W	108W

S-Meter Linearity;

Measured at 14.25MHz;

Indication	*Sig. Level*	*Rel. Level*
S1	1.13µV pd	-27.8dB
S3	1.68µV pd	-24.3dB
S5	2.83µV pd	-19.9dB
S7	6.95µV pd	-12.0dB
S9	27.6µV pd	0dB ref
S9+20dB	231µV pd	+18.4dB
S9+40dB	2.11mV pd	+37.6dB
S9+60dB	19.8mV pd	+57.0dB

Harmonics;

Freq. MHz	2nd	3rd	4th	5th	6th
1.8	-71dBc	-68dBc	<-80dBc	<-80Bc	<-80dBc
3.5	-73dBc	-77dBc	-78dBc	<-80dBc	<-80dBc
7.0	<-80dBc	-70dBc	<-80dBc	<-80dBc	<-80dBc
10.1	-75dBc	-78dBc	<-80dBc	<-80dBc	<-80dBc
14.0	-68dBc	-76dBc	-78dBc	<-80dBc	<-80dBc
18.1	-63dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
21.0	-66dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
24.9	-65dBc	-74dBc	-72dBc	<-80dBc	<-80dBc
28.5	-62dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
29.5	-61dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc

SSB IMD Performance;

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

	3rd Order	*5th Order*	*7th Order*	*9th Order*	*11th Order*
ALC Onset	-29dB/ -29dB	-44dB/ -44dB	-53dB/ -50dB	-44dB/ -42dB	-47dB/ -53dB
Mid ALC	-28dB/ -29dB	-46dB/ -42dB	-53dB/ -43dB	-44dB/ -46dB	-47dB/ -44dB
Proc On 10dB comp.	-24dB/ -19dB	-29dB/ -34dB	-42dB/ -43dB	-43dB/ -44dB	-46dB/ -46dB

SCANNERS

Bill Robertson finds things become interesting in the new year on the scanner front

Although I'm writing this in November, I know it'll be the beginning of the new year when you'll most likely be reading this. So, I feel it appropriate to wish all readers a Happy New Year, and to thank you for the many letters and emails you've sent me throughout 1995.

Most of these have been questions and requests for help, which I hope I've managed to answer through this column. Many of these have asked for frequency information for a particular area, i.e. "Can you tell me what frequencies my local fire brigade operate on?". I could, of course, turn this column into a monthly frequency listing for a particular area each month, but that wouldn't be of much interest to the majority of readers in other areas, would it? Besides, there's plenty of such information readily available in publications such as the 'UK Scanning Guide' which I've featured in these pages in the past. For airband listeners, I can particularly recommend the excellent airband frequency guides produced by Javiation. I also try to include short wave listening interests in this column, as many scanners now include coverage of HF, including single sideband reception.

Regarding the aims of this column, the Editor has asked me to tell a little about myself for the benefit of readers (I'm naturally quite a reserved person!). Although I live in the South East of England, I travel around the country quite often with my work, having had a career in radio and TV communication for a number of years, which puts me into contact with many users. As well as advising government agencies in the use of radio communication, I take a very active involvement in the hobby of 'listening around' in my spare time, primarily to land mobile radio systems but also airband and marine communication, on HF as well as VHF/UHF. I've known the Editors of Ham Radio Today for some time, and I was very pleased when they asked if I'd put together a regular Scanning column. I hope the resulting effort suits a wide range of listening interests, but I'm always ready and eager to listen to what you want to read about, and try to oblige through this column.

From the mailbag and the 'net

Mr. Henley from Aylesbury writes to ask if there's a 'best buy' list available for scanners. Well, a guide to 'Which Receiver' was published in the Oct 93 issue, and the latest scanners reviews list is always available either from the 24hr Ham Radio Today Fax-Back service (01703 263429), or for an SAE to the HRT Editor requesting 'Scanner/Receiver Reviews list'. Both of these are also available on Internet on the Ham Radio Today World Wide Web site; *http://www.tcp.co.uk/~slorek/*

This site also has one-touch 'links' to plenty other sites of interest to scanner users.

A listener in South Yorkshire dropped a line in the post to say that the following publications are publicly available and free from the Home Office, which may be of benefit to those with an interest in professional radio communications;

Radio Communications in the Police and Fire Services of England and Wales. Final report March 1993. Document PL/93 8/1246/2.

Police Service user requirements for radio communications. Document GD-91/1235/4 Smith.

Fire Service user requirements for radio communications, Document GD91/1174/3 Smith.

Ian says these are available from the Home Office, F7 division, Room 538, Hoseferry House, Dean Ryle Street, London SW1P 2AW, Tel. 0171 217 8361.

A message from Andrew Waples asks about modifications for the 'European' version of the Realistic PRO-43 scanner. The internal diode setup connections 'as standard;' are Diode 5 connected, Diode 4 missing, Diode 3 connected, Diode 2 missing, and Diode 1 connected.

Here, the diode matrix basically controls the frequency coverage to distinguish between the US Version and the non US Version, i.e. the 'low VHF' and the US cellular band ranges. Here are the functions of these;

Diode 1; If removed, disables the keylock switch. If in place, enables the keylock switch.

Diode 2; If in place, enables the 30-54MHz range. If removed, disables 30-54MHz.

Diode 3; If in place, enables the 66-88MHz range. If removed, disables 66-88MHz.

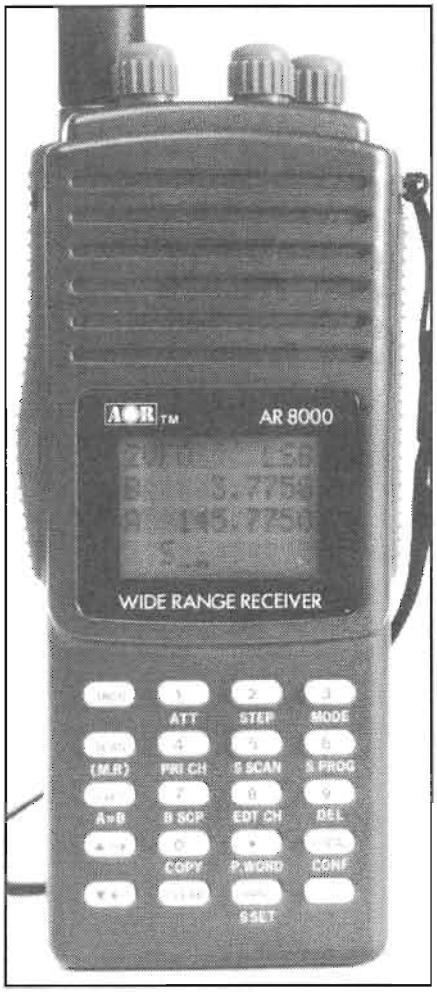
Diode 4; If removed enables the US Cellular band segments (870-890MHz) If in place, locks out the US Cellular bands.

Diode 5; If in place, steps the 870-890MHz range in 12.5kHz steps. If removed, steps in 30kHz steps.

The modification that European users might find useful (although I haven't personally tried this!) is to add a diode in position 2, to add 30-54MHz (54-66MHz is not possible with D2 and D3). The RF circuitry will most likely be set up for 66-88MHz here in Europe, or for 29-54MHz on US versions, so a slight readjustment may be needed.

A message from Iain Taylor says that he's going to Mombassa later this year, and would like to take his scanner with him. Does anyone know whether the use of scanners is allowed or tolerated there. Also does anyone know any frequencies that are of interest? I'll be pleased to pass on any information readers may offer.

John Charles from Lincolnshire asks where can he obtain Kepler elements for the Mir space station, which he receives on 143.625MHz FM using his



The AOR AR-8000 scanner (reviewed in the Oct '94 issue)

scanner. The monthly Keplers from AMSAT-UK (see *Satellite Rendezvous* each month), includes Mir in the 'amateur satellites' list, so all you'll need is either a fax machine or an SAE for the very latest!

Pager frequencies

Following on from the POGSAG paging feature in this column, Alex Wilkins is interested in what frequencies and protocols are used for Mercury MiniCall paging, as he recently bought a Motorola 'Lifestyle Plus'. The news here is that it is indeed POGSAG, using 1200 baud. The frequency used, from one report, is 138.175MHz which is indeed a Mercury frequency, however I'm told the Minicall units operate on 137.975MHz. He's heard that satellites are used to relay the messages, but questions that surely systems on the ground actually transmit the paging signal? Here, each VHF base station site has a satellite receiving system, which receives a dedicated channel from the satellite. The coded paging information is received by the satellite receiver and then passed on to the VHF paging transmitter to then be broadcast. I'm told that Mercury have a satellite uplink that sends all the paging requests up to the satellite, in this way every ground base station can receive each page request. An on-site GPS receiver is used to ensure correct timing or sync (my thanks to Mark Jackson for information on this). GMT says that his organisation uses Mercury pagers at work, these having a label giving an operating frequency of 466.075MHz. This is indeed a national paging channel, but it's on a system run by Hutchison. A message from Mark Jackson gives 153.275MHz as a new Vodapage frequency (who recently bought out AirCall paging), the 'old' frequency being 138.05MHz.

Because VHF pagers use small, internal aerials, the paging transmitters are usually very high-powered affairs in order to give 'blanket' coverage. Unfortunately, because of the proximity of the 138MHz paging section with the 137MHz weather satellite band, scanner users trying to receive weather satellites often have problems (sometimes very severe) with interference from the unwanted pager base transmissions. This is where the Ham Radio Today review technical results on real scanner performance become invaluable, where you can see which sets have better 'blocking' rejection than others before you go out and spend your hard-earned cash!

News

Simon Collins, the author of the software package PC-MANAGER for DOS, says that his Windows version is currently being tested by AOR UK, (Tel. 01733 880788). This controls the AR-8000 and AR-2700, contact Richard Hillier at AOR for more information if you're interested. 1996 should also see a new scanner in the high street shops, this being the 'top of the range' Realistic PRO-2042 base station scanner from Tandy. This reportedly is because the current PRO-2036 doesn't conform to the CE marking directives which become mandatory in 1996.. Also coming is a new handheld, the PRO-60, to replace the PRO-43. Maybe there's going to be some 'bargains' on sale right at the end of the year?

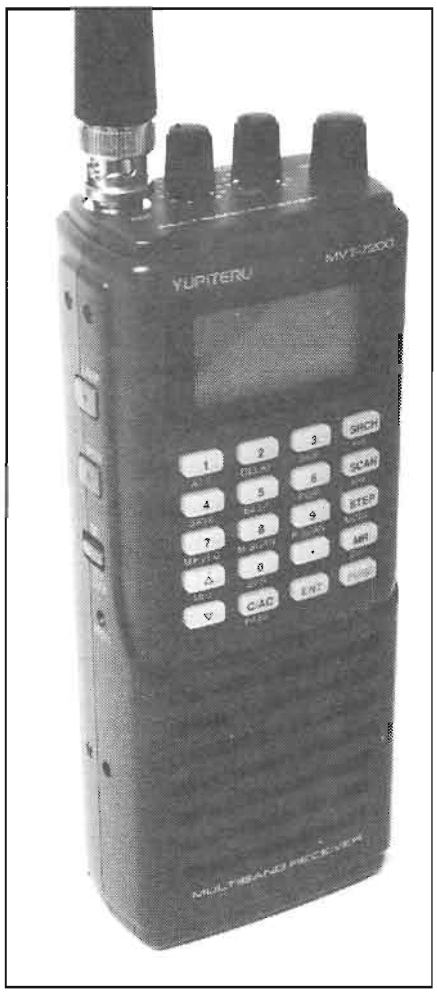
Next month

Mr. Daniels from Humberside tells me he's the proud owner of a brand new MVT-7200 scanner from Yupiteru (I envy you - it's a superb handheld), and asks about the 'numbers' stations on the HF bands which he comes across on tuning around, asking if I could cover these in the column. I've run out of room here, but I plan to feature these strange 'spy' (or whatever!) stations next month's column, together with a rather interesting book. As usual, if readers would like any specific scanning topics covered in this column, or if I can help with a question on hobby radio listening, please do drop me a line. See you next month.

Bill Robertson is pleased to hear from readers and answer queries through this column - address your letters to; Bill Robertson, c/o HRT Editor, Nexus, Nexus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or by fax or email to the Ham Radio Today direct Editorial contact points.

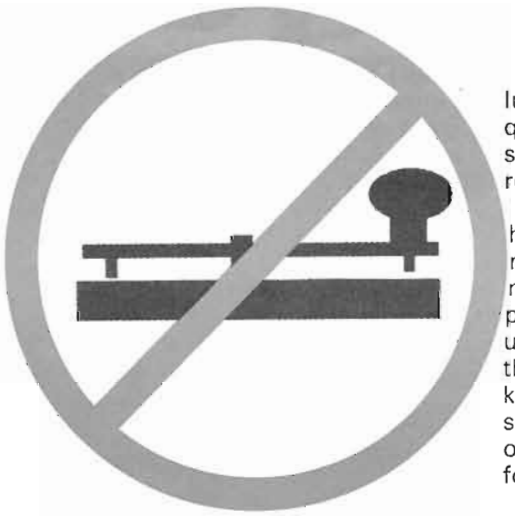
Please remember that reception of some services may not be permitted without appropriate authority. The RA's information sheet on 'Scanners' has full information for the UK.

The Yupiteru MVT-7200 scanner (see last month's issue for full review)



Is This What Samuel Morse Would Really Have Wanted?

Dr. George Brown, BSc. PhD. C.Eng. F.I.E.E. G1VCY pleas for some sanity from the authorities



The year is 1840, and one Samuel F. B. Morse, an artist by profession, patents a telegraph code comprising a series of dots and dashes, by which letters, numbers and punctuation were eventually to be sent thousands of miles, initially by telegraph and then by the new-fangled medium of wireless. Even before wireless came along, methods had been devised for the automatic sending and recording of the signals. By 1844 a telegraph link was used, where the words "What hath God wrought?" were reported to have been sent. The International Morse Code burst upon an unsuspecting world in 1851.

That so many people of subsequent generations should have cause to regret these events is, in itself, just as momentous. The Morse code became a necessity for obtaining an amateur radio licence. As the adverts for mobile telephones are continually reminding us, man has an insatiable desire to *talk*, and to communicate with his fellow beings using a mode of communication which he has been developing for thousands of years - *speech*.

There may have been some glimmer of sense in the *original* decision to incorporate Morse code into the licence requirements, since it was a second mode which could easily be used (more simply than speech) as a means of wireless communication. But then, as do all infant prodigies, wireless grew at a pace which its progenitors could not match. They wanted to see that the old ways were not forgotten, and so they made sure that the Morse code requirement in the licence remained.

Granted, we are all guilty of this behaviour occasionally, but the implications are not so dramatic. I am a great advocate of valve circuits, and I want to see an awareness of their great contribution to radio and electronics persist through future generations of scientists. What I *do not* advocate is that everyone who wishes to pursue a career in science should be able to use the Richardson-Dushmann equation, or recite the Langmuir-Child law as prerequisites for their degree exams. Provided the well-educated scientist has heard of these, and appreciates their place in the history of electronics, I will be satisfied.

Has this stance been adopted by the ruling bodies of our hobby? The Morse code seems to have been blown up out of all proportion, to the extent that it is *the only compulsory (i.e. examined) mode of communication for an A licence!* Do we have an oral exam to see if we can speak the Queen's English before getting a licence? Do we have to be able to send RTTY and Packet by hand and receive them by ear? Yes, these questions *are* ludicrous, but *no more so* than the question "Do we have to be able to send Morse code by hand and receive it by ear?"

If the authorities were to pull their heads out of the sand and see what modes of communication were now available, they would, perhaps, catch up with the rest of us. I am all in favour of extending the RAE in order to examine knowledge of digital modes to the same (or greater) extent that operating procedures are examined for speech.

I would never deny the use of Morse code by those devotees of the mode, but neither should they deny me the use of the HF bands based on this anachronistic criterion. I have a feeling that if Class A licensees could be balloted unwittingly on just how often they used the mode (once a day, once a week, once an month, once a year, ...never), the results would be very revealing. Once they realised what the question was about, they would suddenly become everyday users!

'Political correctness' has become the bane of the 1990s; no sooner than the words like *dyslexia* become commonly recognised, then it becomes incorrect to use such words. It is now agreed that dyslexia is a genuine disorder, and is a type of 'word-blindness'. It is just one small step to the statement that some people suffer from 'Morse-blindness'. The symptoms of dyslexia can be reduced but not removed; hence, we should be aware of the fact that 'Morse blindness' can never be removed. Whereas it is a modern-day cardinal sin to discriminate against a dyslexic, it is all too obvious that

those with 'Morse-blindness' can never become Class A licensees.

Yes, there have been questionnaires on the subject, and views have been solicited. Can these ever be representative? Out come the A licensees in force with their *'Keep the Bs off HF'* banners, while the B licensees don't bother to respond because it's a lost cause. Even the nomenclature (A and B) is designed to keep us in our place!

Is this what Samuel Morse would really have wanted? Would he have wanted to see his system outstaying its welcome, once Bell had obtained his patent for the telephone in 1876, and Edison had invented the carbon microphone in 1878? The death-knell of the Morse code for landline telegraphy was sounded in the same year, 1878, when the first commercial telephone exchange was opened in New Haven, Connecticut. Morse code still serves its purpose in DX contacts on amateur radio but, for most of us, it is too slow and pedestrian a means of communication for the late 20th century. An intentional misquotation of that first Morse message rings ironically true: "What hath Morse wrought?"

I may be misquoting Isaac Newton, too, this time unintentionally: "We are great because we stand on the shoulders of those that have gone before". It is *not* the role of those that have gone before to stand on the toes of those that follow, to prevent the rapid development of amateur radio. I fear that there are many guilty consciences in the 'A' fraternity; a smug statement of "I did it - let them do it too" may salve their consciences temporarily, but the harm it is doing to the hobby is longer-lasting.

The debate on this has died down in these pages. We should not allow this to happen because it goes hand in hand with attracting people into the hobby. It is the most contentious issue of amateur radio. Any leisure interest is always judged by the outsider on his vision of the subject. For amateur radio, the layman's vision is one of an old man sitting hunched over a table clutching a Morse key in his fist. Is this the true vision of amateur radio in the late 20th century? If it is, well may we ask "What hath Morse wrought?"

I know that many Class B licensees do not want to use HF and are therefore apathetic to the code requirement. However, to me it is a matter of principle; should there be a discrimination on the grounds of this 'minority mode?' I fail to see any logic in its retention.

Finally, I was recently reading the list of RSGB members in the 'Silent key' section of RadCom. May I make the request, in all seriousness, that when I am eligible to join this illustrious list (for which there is no examination), I am *not* described as a "silent key", for it is the single piece of equipment that has prevented me from enjoying my hobby to the full.

The HRT Editorial staff wish to remind readers that opinions of contributors may not necessarily be those of the magazine. As always, Ham Radio Today invites readers to express their views on current ham radio topics through the magazine's monthly 'Letters' feature. We invite comments from all, but especially comments on the above from those similarly (or indeed more highly) technically qualified than the author of this article.

'Q' Multiplying Preselector for 80, 40 and 20m

Raymond Haigh concludes with the construction and testing of this simple and inexpensive unit to enhance the front-end selectivity of a receiver and boost signal input

The first part of this project appeared in last month's issue of Ham Radio Today, back copies are available for the next 12 months from our Back Issues Dept., Tel. 01858 435344

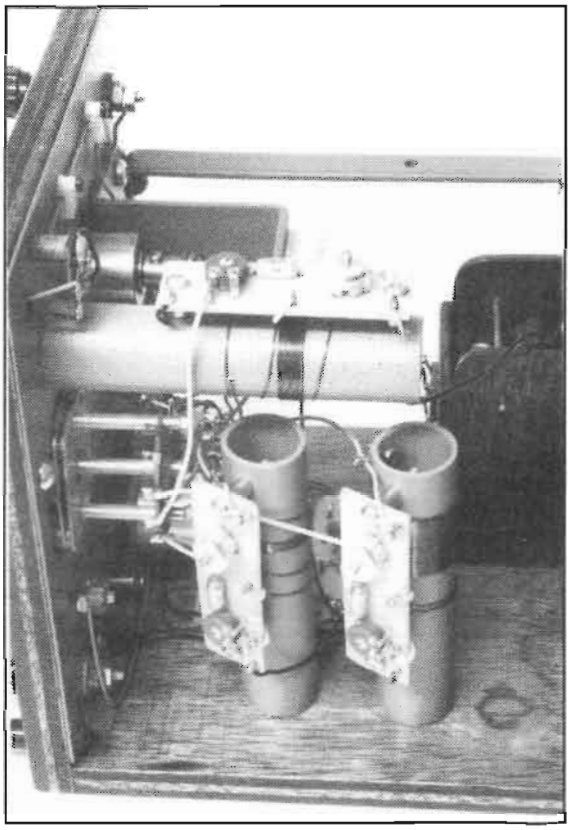
Winding the Coils

Full details of the three tuning inductors are given in Fig. 6 and Table 1. Solder tags, bolted to the plastic formers, are used to anchor the windings and at the tapping point. A pair of tweezers will prove helpful for pushing the fixing bolts through the holes located near the centre of the formers.

Thoroughly clean and tin the enamelled copper wire before attempting to solder it to the tags, good connections are essential or the performance of the unit will be seriously impaired. Tighten up the fixing nuts after the windings have been anchored to the tags. This will prevent the heat of soldering iron from softening the former and absorbing into the tag.

All turns are close wound (i.e. with turns touching), in the same direction, and located centrally between the relevant tags. Use the specified 26 SWG wire: thicker wire cannot be accommodated between tags 1 and 2 on the 80m coil. The number of turns in the larger windings can be checked by drawing a sharpened matchstick along the coil and counting the clicks.

The coil formers in the prototype unit were cut long in order to bring the windings into close proximity with the band change switch, and they were mounted by inserting a wooden plug into the base. The length can be reduced to suit more compact assemblies, but make sure that any plugs and fixing screws do not penetrate the coil windings. Mount the trimmer PCBs on short metal stand-offs.



Initial Testing

When the components have been mounted on the main PCB, and one of the coil assemblies completed (preferably the coil for either the 80 or the 40m band, as these are the most consistently active), the unit can be tested on the bench before being enclosed in a case.

Connect up the potentiometers and C10 (don't bother with swing-reducer, C9, at this stage), bridge the S1B pins to provide power to TR2, connect up the coil assembly and insert the unit between aerial and your receiver. Remember to make the earth connection between the unit and your receiver via the outer braiding of the screened cable. Without this connection the unit is

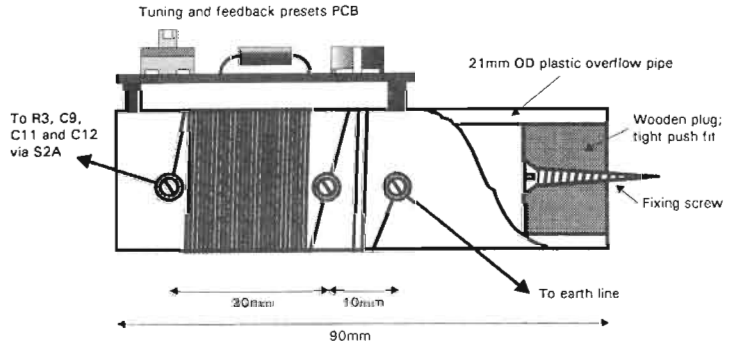


Fig. 6 Coil Construction Details

Table 1: Coil Winding Details

Band	*Total* No. of turns (Tags 1-3)	Tapping point (Tags 2-3)
80m	40 turns	2 turns
40m	14 turns	1.5 turns *
20m	8 turns	1 turn

* - Relocate tag 2 to ensure half-turn tap.

All windings 26SWG

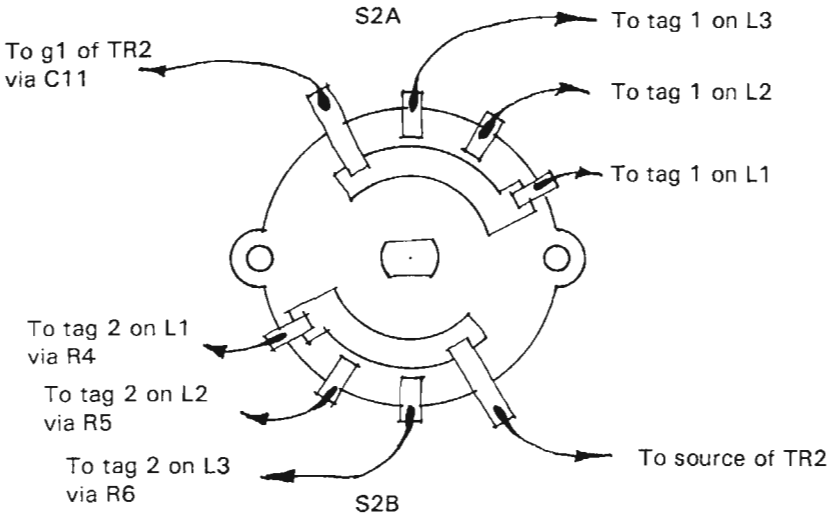


Fig. 8 Wiring details S2A - S2B

unstable.

Check component placement, particularly the orientation of the semiconductors and C13, and, if everything is in order, set all variable controls to mid-travel and connect up a fresh 9V battery. The current consumption should be in the region of 6mA.

Tune your receiver to a transmission near to the centre of the band and rotate C10 until the signal peaks. The tuning should be sharp and the peak dramatic. If the unit fails to tune to the signal, adjust the trimming capacitor until the correct tuning position lies within the swing of C10.

If the unit oscillates when tuning isbrought into alignment with the receiver, turn down the 'Q' multiplier control.

The complete setting-up procedure is given at the end of this article, and it may prove helpful to refer to it whilst carrying out the initial testing.

Enclosing the unit

If all is in order, the assembly can be mounted in a case and the band-change switch and other off-board wiring completed. Use reasonably heavy, single-strand hook-up wire and keep the connections between the coils, band-change switch and tuning capacitor, short and direct. Different insulation colours will ease the task of switch wiring, which is fully detailed in Figs. 7 and 8.

Connect the moving vanes of the tuning capacitor to earth (tag G on the specified component), and the fixed vanes of the oscillator section (tag O) into circuit via swing reducer, C9.

The layout is not critical, but the input terminals and R2 should be kept reasonably clear of the output terminals or coaxial socket.

Hand capacity effects are not troublesome, but it is a good idea to use a metal front panel, or to screen a wooden or plastic panel with a piece of PCB or thin aluminium sheet. Mechanical rigidity is, however, crucial to the proper performance of the unit. Extremely high levels of 'Q' are developed, and the performance will be erratic if any part of the assembly (particularly the tuning components) is able to vibrate or move.

I constructed a front panel and base-board from 12mm plywood and screened the front panel with thin aluminium sheet. It is strong and rigid, and has proved to be electrically and mechanically satisfactory. Some constructors may choose to screen the entire unit by mounting the components in a metal case. If this is done, keep the coils at least a former diameter away from the case sides.

A slow motion tuning drive is almost essential. It need not be frequency calibrated as the unit covers known and narrow segments of the RF spectrum in step with the receiver tuning. A graduated dial is useful, however, and suitable components are available from a number of suppliers. I finished the front panel with a spray can of car paint, applied dial markings with a draughtsman's ruling pen, and indicated control functions with rub-down-transfer letters and numerals.

Setting-up procedure

Turn all presets and controls to the half-way position, connect the unit between aerial and receiver with a short length of screened lead, and

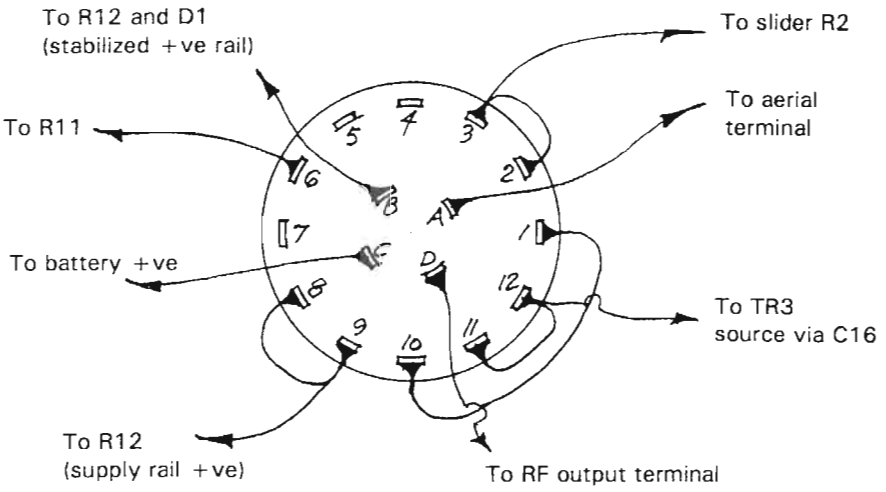
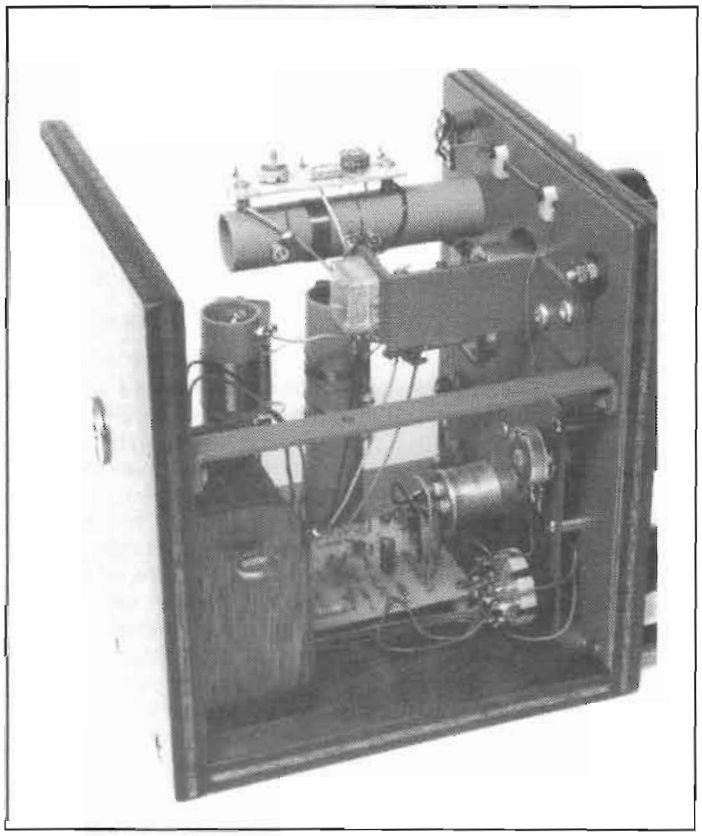


Fig. 7 Wiring details S1A - S1D



make sure that the unit earth is connected to receiver earth via the outer braiding. Switch in the 80m coil and switch the 'Q' multiplier into circuit.

Tune in a transmission around the centre of the band and adjust trimming capacitor, C2, until the signal peaks. If the coils have been constructed as described, and the specified tuning capacitor fitted, the 60pF trimmer should be at about half-mesh.

Potentiometer R4 presets the gain of TR2, and hence the range of the 'Q' multiplier panel control, R8. It should be set so that 'Q' reaches the maximum achievable level at any setting of the tuning capacitor, when R8 is rotated fully clockwise. If preferred, it can be set so that the unit begins to oscillate when R8 nears full rotation, but the action of the control is bound to be a little less gentle.

The preselector must be tuned to precisely the same frequency as the receiver or the 'Q' multiplier will seem to be having no effect. This unit does not function in the same way as a conventional preselector with one or two tuned circuits and a stage of RF amplification. Preselectors of this kind have a relatively flat response and will produce some increase in signal strength even when they are considerably off tune. This 'Q' multiplying preselector is highly selective and its response is sharply peaked (sidebands can be clipped from broadcast transmissions). Tuning must, therefore, coincide precisely with that of the main receiver.

Although quite effective, buffer stages TR1 and TR3 do not completely isolate the 'Q' multiplier from the input control, R2, or the aerial circuit of the receiver. Because of this there is a slight interaction between R2 and R8. Hardly noticeable on 80 and 40m, the effect is more pronounced when searching the 20m band. This does not present any problems in practice, as the RF input control can usually be set to suit a particular aerial and prevailing reception conditions, and then left alone. Even if it has to be adjusted, the effect on the setting of R8 is predictable and slight, but it should be born in mind when adjusting R4, R5 and, more particularly, R6.

Similarly, connecting the unit to different receivers has a slight but perceptible effect on the setting of the 'Q' multiplier control. It is desirable, therefore, for the setting-up procedure to be carried out with the unit wired to the receiver it is to be teamed with.

Check that the swing of the tuning capacitor will cover the entire 80m band, then switch to 40m and set the trimmer capacitor, C4, to centre the tuning, and potentiometer, R5, to optimize the action of the 'Q' multiplier control. Repeat this procedure for the 20m band with C7 and R6. Adjustment of the various presets is fairly critical.

Using the preselector

The debate on the advantages and disadvantages of various front-end circuits continues to rage, but anyone looking for high selectivity and a very significant increase in signal level at the receiver aerial terminals should give this preselector a try.

No claim can be made for an improvement in signal to noise ratio, but the unit dramatically narrows the band of frequencies taken in and amplified by the receiver, and second-channel interference is virtually eliminated from superhets with a low IF. If conventional front-ends are likened to gazing out at the RF spectrum through a wide-open barn door, using this unit is like peeping out through the key hole.

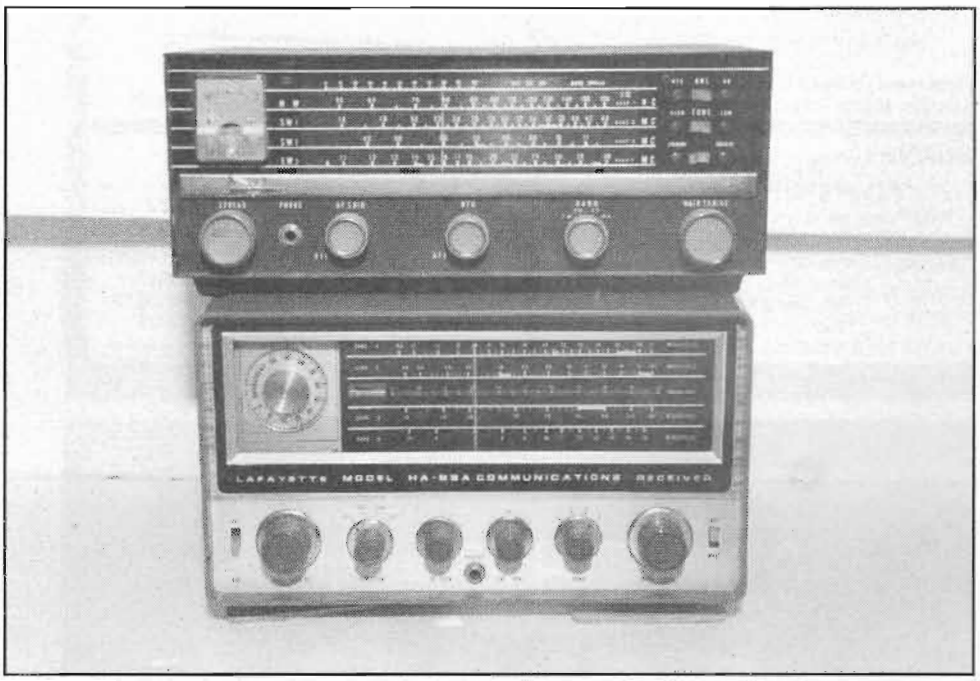
When the TR2 source resistor has been correctly set, the action of the 'Q' multiplier control is extremely smooth and completely free from backlash. If the highest possible levels of selectivity and signal magnification are not required, it can be turned almost fully up and then left alone while the preselector and receiver are tuned across the band. Switching the 'Q' multiplier in and out of circuit will reveal just how dramatic its effect is on the selectivity and magnification of the single tuned circuit.

Problems of cross-modulation and intermodulation, which can arise when subsequent receiver stages are driven into non-linearity, have to be guarded against. There is a also a tendency for regenerative circuits to lock onto a particularly strong transmission and to have their sensitivity to weak signals suppressed by a strong transmission on an adjacent frequency (phenomena known respectively as the Zeehen effect and Wipe-out in the early days of radio when regenerative receivers reigned supreme). However, careful adjustment of R2, the RF input control, and the RF gain control on the receiver, should eliminate difficulties of this kind in all but the most adverse circumstances.

Queries regarding this project should be addressed to the author c/o the Ham Radio Today Editor. Ready-made PCBs may also be available from PCB suppliers advertising in Ham Radio Today for readers who do not wish to produce their own. Any reported updates to this project will be detailed, and available for the next 12 months, on the 24hr Ham Radio Today information and fax-back line, Tel. 01703 263429.

Modernising An Old Receiver

Ben Nock G4BXD shows how to breath new life into a valved receiver with the addition of a few solid state components



Typical sets that could be used to experiment on without great expense. The top set is the Realistic short wave set, 4 valves,with a Lafayette HA-63A below, this is a 7 valve set. Both have bandspread, and S meter and a BFO function.

Many of us have an old favourite receiver that is perhaps a little 'over the hill', so to speak. One action that could be taken would be to modernise the set and use this as both an exercise in construction and as a test bed for improvement. After modernisation the set should consume less power, thus run cooler, hopefully stability could be improved and noise reduced.

Working on an existing piece of kit is usually easier than building from scratch, no case is needed, not many parts are required, no holes to drill, and so on. Using an existing receiver will give both the newcomer to the hobby and, those who have perhaps not bothered with construction too much, an opportunity to 'have a go'.

If we consider an existing valve receiver, always assuming you're not going to try this out on something like an RA17 or similar, it will probably be a 5 to 8 valve set, general coverage and single conversion, the usual functions, AM/CW/SSB, perhaps a noise limiter, perhaps bandspread and maybe even an S meter.

There is nothing stopping you considering modifying a ham bands only set, or even a double/triple conversion set, but if you want to simply gain experience without too much worry about spoiling the set then you will probably pick a cheaper set to experiment on.

Let us consider what we could do to the set. We could replace some or all of the various stages with transistors or integrated circuits. We could also add functions that were not in the original, a BFO for example, an audio filter for SSB or CW, an S meter or even FM reception.

Power Supplies

One thing that can be done at the start, if the set uses a valved

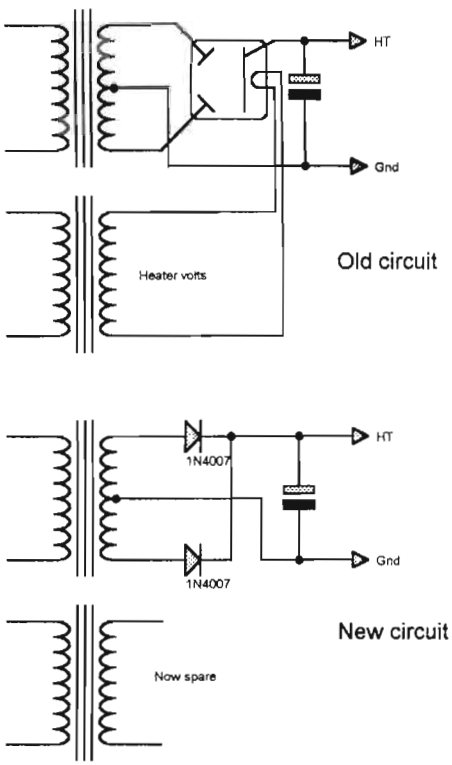


Fig. 1

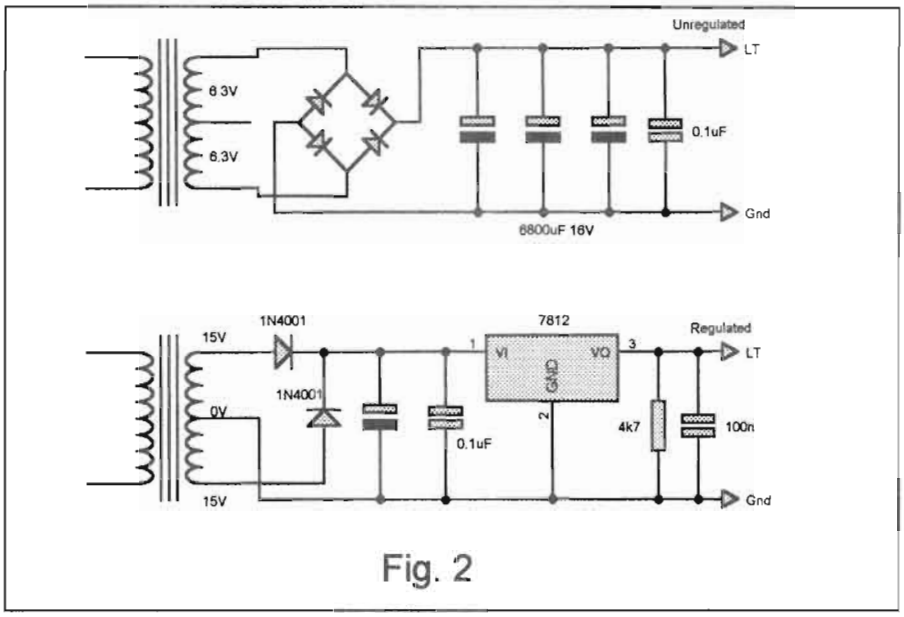


Fig. 2

rectifier in the power supply, an EZ80 or a 5U4G for example, is to replace this with semiconductor diodes thus saving the waste of heater current in the rectifier alone.

If a circuit diagram can be obtained for the set then all the better, if not then valve reference books will need to be scanned for pin numbers etc. Assuming though a simple set then the layout of such sets is usually quite easy to trace given a little patience. A typical valve PSU circuit and its replacement is shown in Fig.1. The new semiconductor diodes are simply wired across the existing valve holder, with the valve now removed of course.

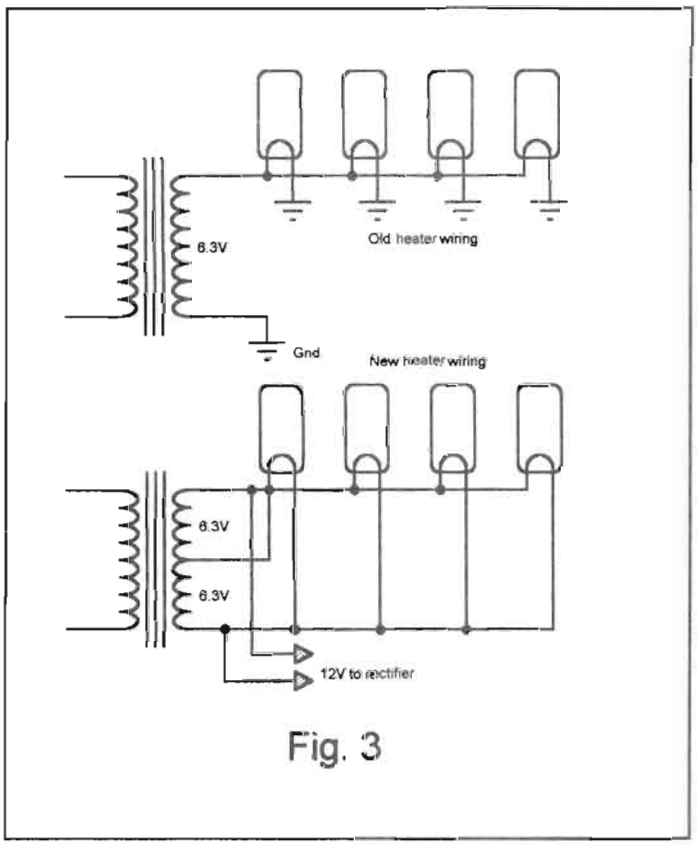


Fig. 3

If you are going to add some transistor or IC circuits to the set, you will need to provide a low voltage stabilised supply. If you are lucky the original mains transformer will have some combination of voltages that you can use. If it has two 6.3V windings then these could be wired in series to give 12.6V which could be rectified and regulated to give the required volts.

If the existing transformer cannot provide a supply then a small low voltage one, 15V-0-15V at 1A for instance, could be fitted. If the low voltage is obtained from a 12.6V winding you may not be able to get a regulated 12V supply as the 7812 regulator chip needs about 3 to 4V more than its designed output to work properly, and as current is drawn the rectified 12.6V supply will reduce in level. You would be able to get a lower one though, say 8V, for supplying such parts as oscillators and RF amps. A fully regulated 12V supply, which is what you could get from a 15-0-15 transformer, could then be used to power the semiconductor audio output stage as well as the other circuits, see Fig.2.

One point, if you are using an existing winding on the transformer that is also used for supplying the heaters you should see if one side of the supply, 6.3 or 12.6V, is attached to ground. If it is you cannot then simply attach the bridge rectifier, it will not work. If one side of the heaters go to ground then the grounded pins need 'lifting' off ground and wired directly to the transformer tap, see Fig.3.

Audio Output

Having obtained a suitable low voltage supply, the next stage to be tackled could be the audio output. Check, but don't touch, around the output valve, possibly something like an EL41, EL81, 6AQ5 or similar, you will find it very hot. This is obviously wasteful. The output valve and quite probably the AF preamp can be replaced with a single chip output stage.

There are many devices around, I prefer the LM386N and the TBA820M as these are small and require very few external components. Fig.4 details the standard circuit for the two devices. The LM386 will give just under 0.5W into 8Ω , which sounds low but can be enough, whereas the TBA820 will give 2W into 8Ω . Around 12V is a good supply voltage for both, but they will work at a lower voltage.

With the output valve removed, the IC input is connected to either the anode of the preamp (via a 0.1µF cap) or direct to the slider of the existing volume control. The actual layout and construction of the two amplifiers is not too critical so long as all leads are short. Veroboard is an ideal base for the circuits or a PCB can be etched. The completed PCB/Veroboard is then mounted possibly on the rear wall of the set, away from the mains transformer and any other valves. Screened leads are used from the volume control to the amplifier but

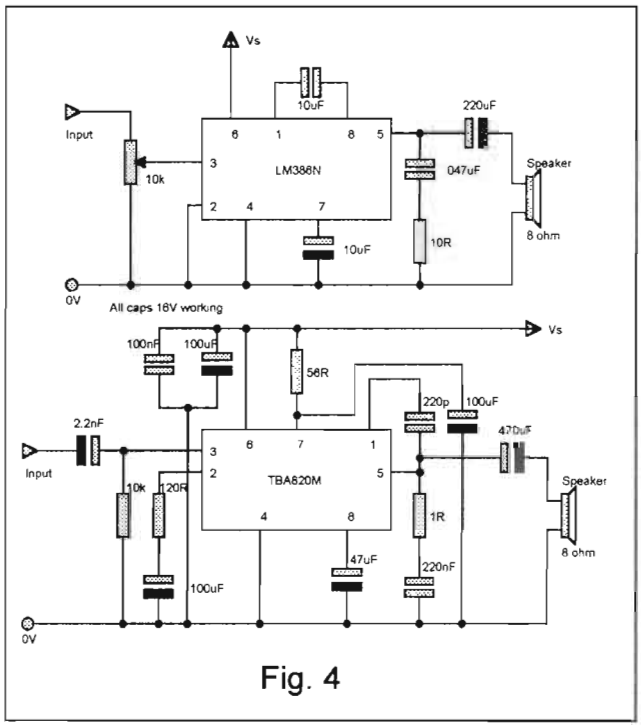


Fig. 4

the speaker and supply leads can use unscreened wire.

If the chip can be driven from the volume control direct, then the AF preamp valve can be removed. It is usual however that this valve is a double diode triode, a 6AT6 for example, the diodes being used for audio detection and AGC generation. The diode sections can be replaced with OA91 diodes for example, the new diodes simply wired across the existing valve base.

FET replacements

Already a reduction in power consumption and generated heat has been achieved. Additional savings can be achieved by replacing the oscillators, typically a 6AQ8 or ECC80 series, the main tuning oscillator and the BFO, with semiconductors. A good device for this task is the FET. This resembles a triode valve and can be used as a substitute, after ensuring you cut the HT supply to the circuit.

Fig.5 shows two typical circuits used for valve oscillators, (a) and (b) and a suggested FET replacement. The capacitors marked with the asterisk in the valve circuits may require alteration, reduced, to allow the same tracking of the tuned circuits. I have not shown any switching of band coils of course. The FET can be mounted on the valve base, and used as an anchor point. The diode across the gate of the FET to ground can be a 1N914 or equivalent.

Ensure that all soldered connections around the oscillator stages are firm and secure. Keep leads short and if possible ensure that items like the capacitors and FET cannot move, even a little epoxy glue to hold them in place is a good idea, it all helps to improve stability and stop microphony.

If the new circuit fails to oscillate then the 39pF and the two 180pF capacitors can be varied slightly, try values slightly higher, then lower, on each in turn. Whilst the main tuned circuits are retained some of the other components can also be used, e.g. RF chokes etc. The LT to the new VFO or BFO circuit is taken from the main LT line and further regulated using a Zener diode.

After installation of the new circuit the set will require retuning and the tracking checked, but it should be possible to hear signals even straight away.

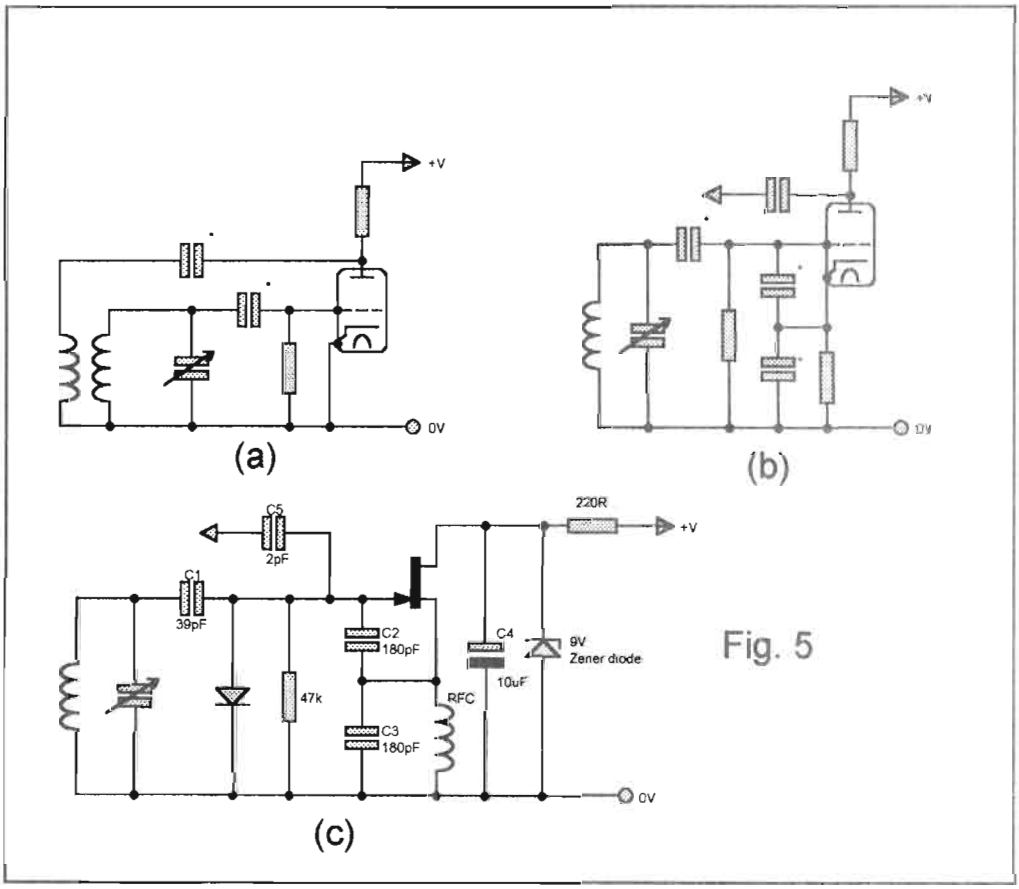


Fig. 5

In operation

With the few modifications already performed your receiver should be producing a little less heat, have a little less power consumption and be slightly lighter, unless an LT transformer has been fitted of course, but once the whole set is modified the original mains transformer can be removed. Components for the modifications could be obtained from suppliers such as Cirkit, Maplin, etc.

Hopefully the oscillator, both VFO and BFO, should be a little more stable and a little less prone to drift. There are further modifications that can be done, the IF amplifier, RF and Mixer stages can be transistorised and if not already fitted, an S meter can be installed. I hope to cover just such modifications in future issues.

LETTERS

Letter of the month

Dear HRT,

In April last year, I had a TS-50S (HF) and FT-480R (VHF) stolen from my car whilst on holiday in Torquay, these were reported in Ham Radio Today June 1995. Unfortunately there has been no trace of the stolen equipment and I therefore submitted a claim on my house contents insurance, where I believed the equipment to be covered. My understanding was that all my amateur equipment was covered under the contents insurance whilst in the home, and that I had cover for up to £2000 (with maximum cover per item of £500) for equipment when outside my house, under the personal possessions section for which I paid additional premiums.

After seven months of deliberation, with evidence of much uncertainty and indecision, the insurance company have now informed me that they will not settle the claim, as their definition of personal possessions is "personal possessions that are normally carried on or about one's person". Because of the history of my particular situation and the fact that I believe the insurance company have treated my claim badly, I plan to take the matter to the Insurance Ombudsman. My broker, who is sympathetic to my case, feels that I have a good chance of success due to the portability of the equipment and that its use is not restricted to the home or mounted in a car.

I would like to hear from any amateurs who have used the FT-480R or TS-50S (or other equipment of similar size and weight) in applications other than at home or in the car. If, as I believe, I can demonstrate that amateurs do use their equipment outside the home or in the car, I will have a good chance of succeeding with my appeal - has anyone biked or back-packed with similar sized equipment?

In the meantime, I can only recommend you inspect your policy wording closely to ensure you do not suffer a similar difficulty to myself.

Ray Oliver G3NDS

Editorial comment;

Insurance companies, in our experience, normally (quite correctly?) only insure what they tell you they do insure on your policy. Thus, when you sign your name on the dotted line and/or pay your premium money, you should make very sure you're getting what you think you're getting. We, and a number of other amateurs we've known, have had no problems at all in obtaining recompense from amateur radio equipment claims in the past, but then we and others have ensured the equipment is indeed covered, by either itemising the covered equipment, and/or insisting on 'non-itemised' equipment up to a certain limit, and ensuring the company agrees to cover this, before they get the premium. If they refuse, it's quite simple, a different insurance company gets the business instead. We'd be pleased to hear from other readers' experiences.

RAE Discouragement

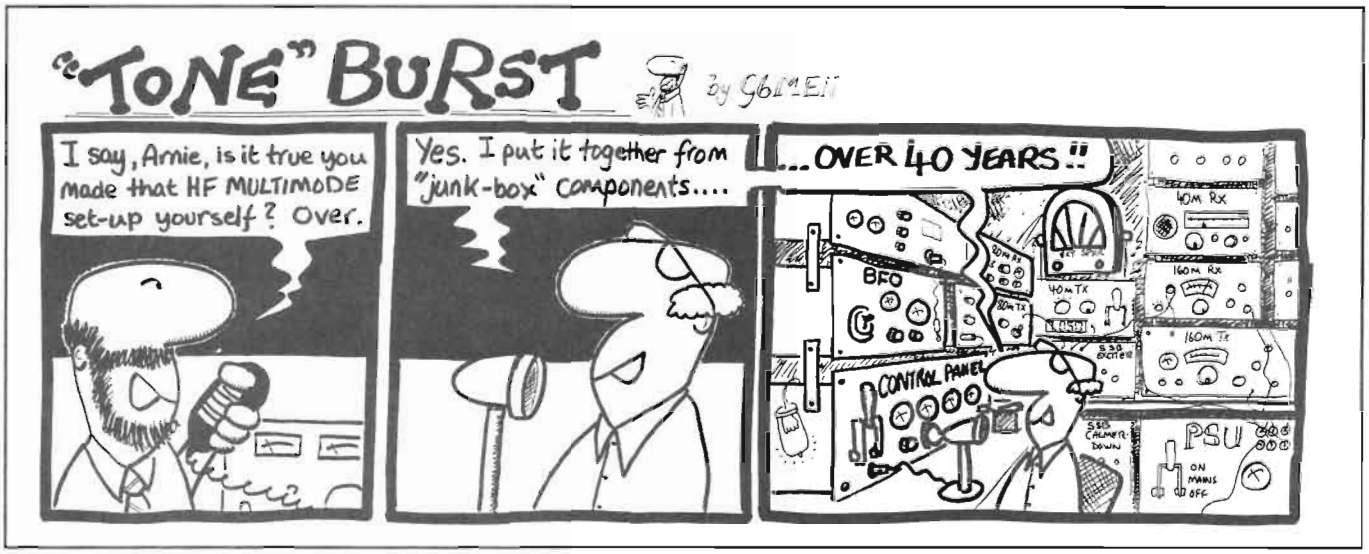
Dear HRT,

Many thanks for printing my letters, now to those who, as Paul Essery GW3KFE who states that candidates are being discouraged from taking the RAE, and Greg Jameson who cannot get the information he requires, pity that. But all who live in the Wednesfield, Willenhall, Bloxwich, Wolverhampton areas wishing to take the RAE, you have a golden opportunity. The Willenhall and District Amateur Radio Society has a franchise with Bilston Community College. The snag is you have to first become a club member, then you get your tuition free and only pay for the exam. A Morse code class is also being started. Our Club Secretary is the tutor for the RAE course, he is a full time college lecturer on Electronics and a Class A amateur. Many CBers in the surrounding areas take advantage of this offer, we teach them how to run a VHF and HF station. At the moment we're desperately trying to get a room to teach DIY projects for our Project Manager.

J.H. Clifton, G0UIU

£10 for 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 (normally paid during the month following publication). So write in with *your* views, to; *Letters Column*, Ham Radio Today, Nexus, Nexus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or fax your letter direct to the Editor's desk on 01703 263429 (fax letters for publication *only*, for general readers queries please see the *'Readers queries'* section in the *'Who's Who and What's What in HRT'* section at the rear of this issue), or email to chris@radshack.demon.co.uk. Please keep your letters short, we reserve the right to shorten them if needed for publication. Letters must be original and not have been sent to any other magazines, and must include names and addresses plus callsign if held. Reader's views published here may not necessarily be those of the magazine



Amateur Converts

Dear HRT,

With reference to the letter 'Amateur Converts' published in the December edition of Ham Radio Today. As the author of this letter, I wish to inform you that my name and callsign were incorrectly published as K. A. Connolly GI7TVX. Please can you publish a correction before I am accused of being a pirate.

Incidentally, I have written to you a couple of times concerning PC cover disks being forced on those who do not own PCs, myself included. Well I have very recently ordered a multimedia PC, so I shall be able to make use of these disks now. Perhaps it could be said that the converted has been converted again!

R.A. Connolly, GI7IVX

Editorial comment;

Thank you for informing us of this. Most of the typed letters received are now scanned onto disk using a 2400 dpi flat-bed scanner, to save considerable work and human errors in re-typing them. Looking at your original typed letter, it appears that your printer misprinted some of the letters, as the top of the 'R' was missing from your name and the bottom of the 'I' was also missing from your callsign. Therefore the scanner probably interpreted them as a 'K' and a 'T', as a 'human' would possibly have done! Regarding the disks, it's only a matter of time (no-one can withhold progress, although some choose to resist it, with historically proven results). We're pleased to continue to offer a low-cost ham radio software offer every month for the benefit of readers who wish to benefit from this. For the benefit of computer users, we're very pleased to accept readers' letters (or any material for publication) on PC disk, by Email, or via our Internet Wold Wide Web page at http://www.tcp.co.uk/~slorek/

Dear HRT,

Your magazine is excellent and I take it regularly. The new look is superb, I always wondered about HRT as well. Encouraged by your magazine, I have written a letter to the Radiocommunications Agency, here's what I wrote;

"I will be sorry to see the Morse Test go, the hobby will be the loser, but I wholeheartedly agree with your decision to support the proposal from New Zealand that it should no longer be a requirement for HF operation. That is progress. The history of radio and amateur radio are important, but there is a need to look to the future rather than the past. In doing so you may wish to consider the following ideas.

Charging a realistic licence fee in line with the current rates for PMR licenses, making the whole operation financially viable and remove a deep seated fear that frequencies may be taken off the amateur service and sold to commercial operators. It may be an administrative nightmare, but on top of the basic licence fee you could consider additional charges for each frequency and mode of operation a station wished to use. Those of commercial interest attracting higher rates, for example VHF and UHF, and also data communications. Band plans should be made part of licence conditions, protecting established minority interests and not left to the whims of the RSGB.

Much operation could be restricted to type-approved equipment and the licence then made available on demand over the Post Office counter. A series of callsigns would need to be retained for the genuine experimenter and researcher who is able to demonstrate technical ability by holding recognised qualifications or passing a searching examination.

The RSGB *do not* speak for *all* radio amateurs, many who are devoted to the hobby and wish to see it continue in a progressive manner. Charging radio amateurs the going rate for their use of spectrum and modes will do more to improve the hobby than most proposals I have seen. One hundred pounds, at the very least a year, for the basic licence plus the premiums for additional privileges, would establish an individual's commitment to the hobby in much the same way as the Morse test has done for HF operation in the past.

My suggestions are well in line with current government strategy and the plan endorsed by the Deputy Prime Minister to franchise out military frequencies which are no longer used. Some of the extra revenue could be spent in investigation and enforcement of some of the long standing problems the hobby attracts.

G. P. Hamblin, G4VBB

Editorial comment;

A view that is bound to promote lively discussion, so what do other readers say?

QRP corner

Dick Pascoe G0BPS shows how to build a simple HF amplifier and offers advice on crystals

I saw a great idea going the rounds on Email recently. Many of us will have odd crystals in the junk box that are not on the frequency that we require. Most amateurs would never think of attempting to change the resonant frequency of any of these crystals. This now may be the time to give it a try. I know that one amateur has been at this for several years with great success.

The difficulty for most is to keep a check on the frequency of the crystal as you grind it away. One way that the crystal may be ground is by taking some coarse grinding paste and put this onto a small sheet of plate glass. The crystal is then ground until it nears the frequency required and then fine paste is used to bring it to the exact spot we want.

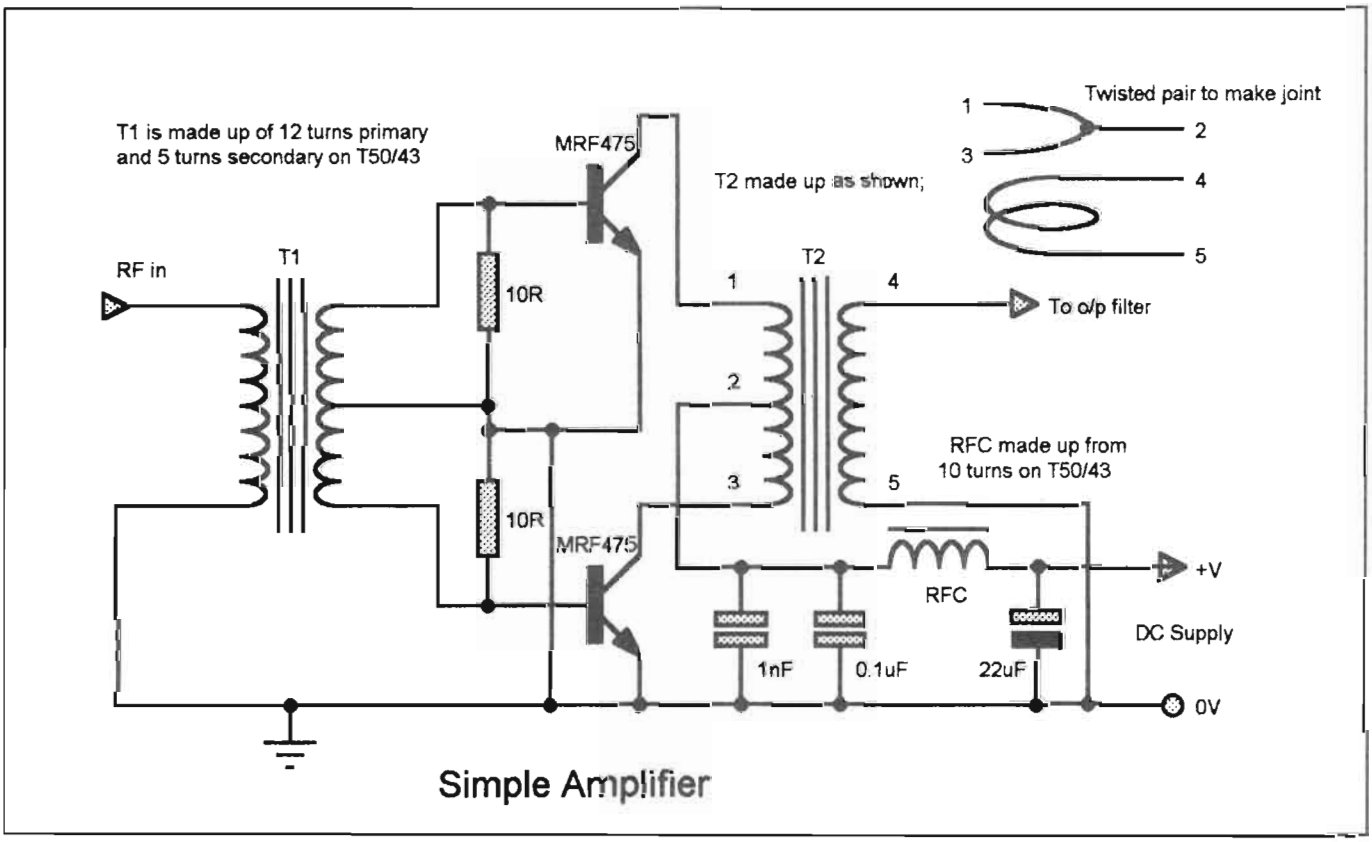
There have been two ideas now floated around the net. The first suggests that a small sheet of aluminium, the same size as the plate glass, is laid out under the glass. A wire is connected to the alloy sheet and then led to the station receiver set to the frequency required.

It is apparently possible to hear the crystal scratches as the crystal is ground near to frequency. Jim N0OCT has used this method and also found that just a short lead from the receiver laid across the glass also works. When grinding crystals such as FT243 types, he got spot on with this method.

Are there any others out there who grind their own? Perhaps a note from you will help others to try this out via this column.

Construction methods

I am often asked about the different ways that we can put together the various circuits that



Simple Amplifier

we see in the magazines. Often a circuit board will be made available, but what if there isn't?

This style takes its name from the vision of a pile of dead insects on the table. Called the 'Ugly bug' style, it enables the builder to try out an idea by soldering the components to each other. When a piece of PCB material is used, this can be used as the earth plane. Where several joints are made and no earth is required, then a very high value resistor can be used to support the 'floating' components. An odd 1Mohm in the circuit will not make too much difference.

When the circuit has been completed and checked, it can be built properly and neatly in a case. Murphy's law will dictate of course that at least one component will have to be changed for it to work in the box.

The next easiest way is to use a 'Blob Board'. These are boards with set pads and tracks laid out without any holes. The components can be soldered onto the board and then joined together by jump leads. The beauty of these boards is that the components can be changed easily.

A simple QRP amplifier

Having built that all-singing, all-dancing transmitter with just a watt out, there is often the need for some help. Or in true amateur terms, "a bit of welly"! The following circuit comes from the USA and Doug DeMaw. It can use virtually any CB type PA transistor, and around 8W out will be obtained. This is higher than the standard QRP level, but by reducing the drive it can be held back to 5W.

The first problem is to match the 50 ohm output of the transmitter to the 10 ohm input of the amp, so T1 is used. The output impedance also needs to be changed, soT2 is employed. The wire is made up as shown in the diagram, and care must be taken to ensure that it is done correctly. Both T1 and T2 use ferrite T50/43 mix toroids, with T2 being made up of three of them glued together after the wire is passed through.

As we are using high power here (OK, highish, well for us it is) a good filter on the output must be used for the band in question. Heatsinks must also be used for the transistors, and alloy sheet of about 75mm x 75mm will be ideal. It must however be insulated from the transistors.

When building and using an output power as high as this, care must be used to ensure that it is stable and filtered properly. Any mistakes will ensure that it may be unstable and thus cause loads of EMC problems for you. The RFC is simple to make, just wind 10 turns of 26 SWG wire on another T50/43 toroid.

For those who have never seen it I also offer the *ONER* transmitter to build, to drive the amplifier to distraction. Designed by George Burt GM3OXX, it will provide 1W out on 80m and is very popular with members of the G-QRP club.

That's it for another month. Let me please have some letters of what you are doing. News and views to me either via the Editor, or direct to Seaview House, Crete Road East, Folkestone CT18 7EG or via GB7RMS or even Email to Dick@kanga.demon.co.uk 73/72....

Update - 'From My Notebook' December 1995

Note that the directions of AC and DC current were inadvertently omitted from Fig 1 accompanying the December 1995 'From My Notebook' column. Here's the modified diagram, our apologies to readers, and to Geoff Arnold G3GSR, for this error.

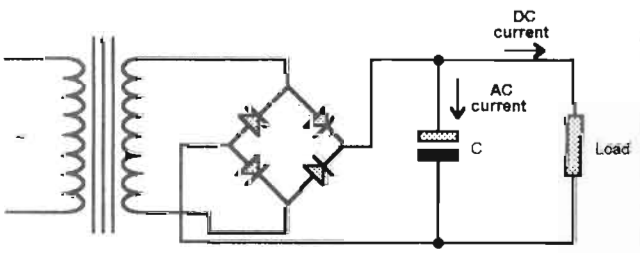


Fig. 1

DATA CONNECTION

Chris Lorek G4HCL looks at software, hardware, and talking data

I recently received a sample of the new PacTOR II unit to test, and I'm currently having great success with this on air. PacTOR II offers up to four times the data throughput of PacTOR (although it's 'backwards compatible' with PacTOR), and the specifications say it'll get through, 100%, in even weaker conditions.

A glance inside the case shows that DSP techniques are very much in evidence, there's even a slot for a plug-in SIMM card memory upgrade as well as facility for plug-in packet modems, e.g. for VHF/UHF use. Unfortunately the unit doesn't come cheap, but I'm sure such a system will rapidly become used by aid agencies and other such HF users, who need to get through in otherwise 'almost impossible' RF conditions using low power and temporary aerials. Remember, PacTOR and PacTOR II was developed by *amateurs*, not professionals, yet PacTOR has already achieved worldwide use by the professionals for reliable data communications. An up-to-date example of amateurs leading the way?

Young hams on packet

A packet bulletin from Nigel G7RTY, who's aged 17, says he's trying to set up a monthly newsletter aimed at young amateurs. Nigel has been interested in radio for 4 years, and gained his licence in February 1994. He's run TCP/IP packet on both the PC and the Amiga, and has had experience on JNOS, WNOS, DEDHOST, AMIGANOS, BPQ, and FBB, and would like to collect information on what the rest of the young ham community is up to and distribute that as a news letter. He's looking for chaps and lasses aged under 20 who are running packet radio. If you're interested in joining in, you can send a message to Nigel G7RTY @ GB7NRY.#19.GBR.EU with details of what software you run and on what computer, TNC details, whether you've experienced any problems, and so on. Nigel says he's also looking for suggestions on a good name to call the newsletter.

Blind amateurs on packet?

With the growing use of sound cards in PCs, and the easy availability of 'talking' PC utility programs, i.e. which speak the content of displayed text, packet radio use for the blind isn't the problem it once was. Blind amateurs reading this (each month's issue of Ham Radio Today is also available on tape from the Talking Newspaper Association) may be interested in a bulletin from VU2SOC in Bombay, who's blind himself. He says he'd like to get in touch with blind packet users throughout the world, and asks blind operators to tell him about yourself, the equipment you're using and the adaptive gadgetry you have to help you in your hobby. You can reply with a packet message to VU2SOC @VU2NA.BOM.IND.AS

SUNPAC news

SUNPAC is a non-profit making organisation, dedicated to the improvement and development of the packet network in Hampshire, Dorset and South Wiltshire. Their secretary, John G8OQN, dropped me a message with news on the latest node updates in the area. He's recently submitted a site clearance application for the GB7HP node, near Portsmouth. It's estimated that this will take around six months to be processed, during which time the group needs to fund and prepare the equipment, ready for installation in spring.

GB7HP will be the second major hilltop site to be set up by the group. The first was GB7SW near Salisbury which provides user access for Salisbury as well as links between GB7NW in Swindon, GB7SD in Weymouth, and the GB7BNM bulletin board.

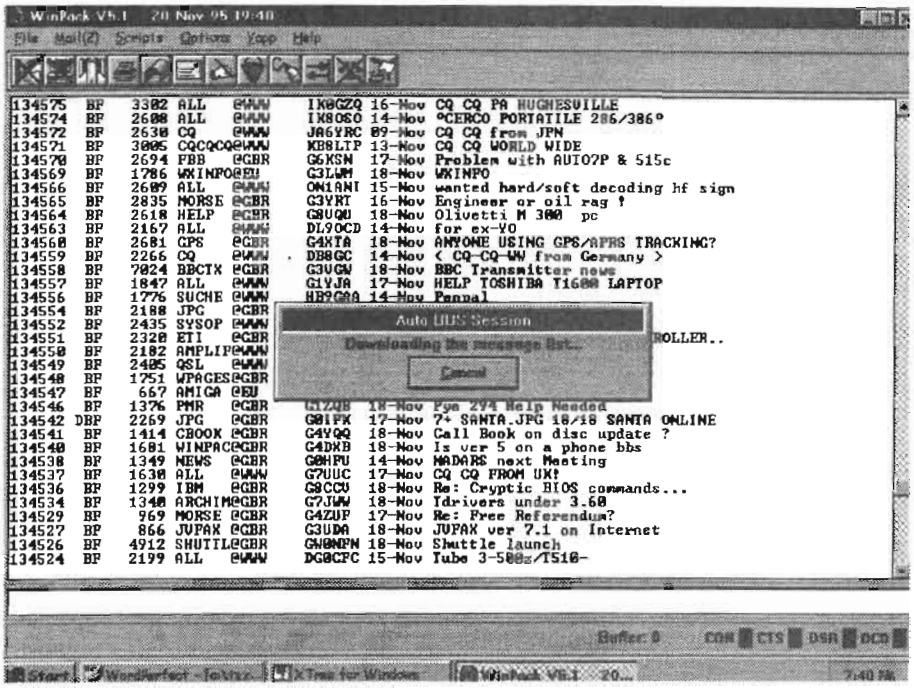
GB7HP has been planned to relieve the currently congested mail forwarding routes (which currently rely upon many individual SysOps' nodes and operate at 1200 baud) by providing a 9600 baud backbone across the SUNPAC area. This will mean the existing routes will be quieter, enabling better user access to BBSs and clusters, but they will still be available as a back-up should there be an outage on one of the main links.

A late news item from John says that SUNPAC also now have site owner's approval to establish a new node near Basingstoke. This should hopefully provide a much-needed north-south 'link' for the area. SUNPAC have also recently teamed up with Isle of Wight Packet Users Group to assist with management and funding of the GB7IW node, located at Chillerton Down on the island.

All users and SysOps in the area are invited to join the SUNPAC group. Membership application forms are available in the file areas of GB7HJP, GB7XJZ, GB7BNM, GB7SIG and GB7IOW BBSs, and via packet from John G8OQN @ GB7XJZ.

WinPack V5.13

Following on from last month's column, news is that version 5 of that superb program, WinPack, from Roger G4IDE is still *freeware*, and not *shareware* as originally planned. Roger tells me that version 5.1 has a 'bug' in it, in that the program sometimes crashes if you try to print to file, and that V5.13 fixes this and a couple of other 'bugs'. Roger also tells me that any users of the 'beta' test version, V5.0 should upgrade to the current version, I'd presume that if you have V5.1 (as I'm running at this very moment, just waiting for V5.13



WinPack V5 has arrived as freeware

to drop through the letterbox - thanks Roger) it would be appropriate to do the same as well.

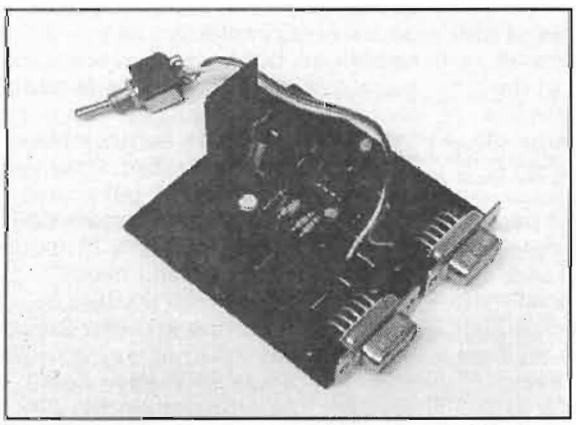
Version 5.13 has all the facilities of version 4, but with the addition of support for FBB unproto message beacons, compressed forwarding, and FBB style compressed downloads. These can be used in any combination, you don't have to use the 'unproto' beacons to be able to use compression. There's also support for five servers, these being REQCFG, REQDIR, REQFIL, BACKUP and ACK. The interface to the servers is fully documented and allows other people to easily write additional servers. If you've just recently requested the WinPack disk from the Ham Radio Today software service, you'll have received V5.13 rather than V4 (the latest version of software is always supplied as soon as it becomes available). Otherwise, if you'd like a copy of V5.13, then it's available from Mike G0OPC as detailed in past columns, alternatively see the 'software offer' page in this month's magazine where I've arranged for it to be available as a service to readers.

UltraPak V4.0

Hot on the Windows packet software front comes the promise of the forthcoming release of *UltraPak 4.0*. This program offers many useful facilities, including multi-stream support, but unlike previous 'demo' versions, these being restricted to 30 minutes operating in each session, V4.0 is promised to be fully unrestricted and to be offered as shareware. The author, Tim G4WFT, says he hopes to have it released by the time this appears in print, so this too should be available through usual sources as well as the software offer page again in this month's magazine.

BayFax from Badger

If you're looking for a low-cost way of getting on both packet and other data modes, and you don't want to invest several hundreds of pounds in a standalone all-mode TNC then the BayFax unit from Badger Boards could give you an ideal 'start'.



The BayFax PCB comes ready assembled

I've been using a unit in my station for a couple of weeks now, and I must say that, for the price, few amateurs now have any excuse not to try out data modes on either HF, VHF, or UHF! The 'secret' is that it uses the power of your PC for the processing, the unit acting simply as an audio interface / packet modem.

It comes ready assembled, as shown in the accompanying photo, as an uncased printed circuit board, similar in style to the Badger HamFax unit. In a similar manner, the BayFax unit links between your PC and receiver or transceiver to operate on packet, SSTV, RTTY, CW, FAX etc. The assembly, which comes complete with PC programs EMBAYCOM (for packet) and HamComm (for other data modes) is priced at £35 plus £1.50 p/p, from Badger Boards in Birmingham (Tel. 0121 384 2473), and certainly has my recommendation!

BayCom from J&P

I've had a number of messages regarding copyright or otherwise of programs such as BayCom V1.5 and V1.6 following my mention of this in the Dec 95 column. However, I'm reminded that J&P Electronics Ltd in Kidderminster, Tel. 01562 753893, (who I'm told have a sub-licence from Siskin) are also authorised distributors of the superb BayCom system, having been authorised to supply BayCom V1.5 and V1.6 on a commercial basis, and are not 'ripping off' the BayCom team! My thanks to J&P and Denis G0KIU for confirming this.

CTRL-Z, end of message

That's it for this month. As always, please do let me know what you're up to in the ham radio data communication side of things, or indeed what your local group are doing. Likewise if you'd like a specific topic covered in this column, or a question you'd like to ask, just get in touch and I'll try and help out. You can contact me either direct via packet, or via post, fax or email c/o the Ham Radio Today Editor. Until next month, 73 from Chris G4HCL @ GB7XJZ.#48.GBR.EU

VHF/UHF Message

Geoff Brown GJ4ICD tells of the 50MHz openings in part two of his review of the VHF/UHF bands during 1995

If 50 pages in HRT were available for this report it would not be enough! There were so many openings in the northern hemisphere in 1995 that we believe it was the best Sporadic 'E' year since the bottom of the last solar cycle. 'Six News' Editor Neil Carr G0JHC reports the following; "I had realised that we had had something rather unusual on July 7th, 1995 - you know what I mean! July 6th saw what I would call typical of most Es openings since 1983. The picture for July 7th was different with many W9 and particularly W0s involved. This all points to an unusually northern path with some reflection points being towards the north pole - suggesting perhaps auroral E? Looking back over my records of these summer openings to North America, it seems quite common to have W1/2/3/4 and occasionally 8, but rarely if ever W5 W9 and W0. With regards to distances worked, most were over 5000km great-circle. This seems to suggest at least three hops. A few, EM48, 49 and EM32 would need four hops (incidentally it has been pointed out by G3NAQ that chordal hops do not give the chance of fewer ionospheric reflections). I made 52 QSOs, 6 were 0's and 6 were 9's, along with N7JJS/5 in EM32. Randy also heard IK5OEL, OZ1ELF and S57A."

(G3IMW) "Here is a resume of my humble activities, I don't know if they are spectacular or run of the mill as I haven't spoken to anyone to compare notes. My first sign of DX was around mid-June when I heard the FY7THF beacon, unfortunately I lost the bit of paper where I'd written down the date and times. July 7th saw N0QJM and W7XU/0 in EN13, South Dakota. Also WB0HHM in EN13 running just 5W! Then at 0045 (July 8th) my best DX was WC5E in EM02 in Texas, closely followed by WB5CHW in EM12, also Texas. I also worked a Japanese station, unfortunately he was in EN62 at the time and signing 7M2PSC/W9!"

(GM1PKN) "The opening of 7/8 July 1995 was the most widespread and long lasting I have ever heard on 6m. The geographical spread of stations that could be heard at the same time was very surprising, and the opening didn't appear to move as has occurred before. Best DX worked was W4WQM in Alabama, EM72."

VHF DX'er Basil G2AMV and XYL visiting Jersey

(G3TCT) "Can you explain why it is that when guys all around me, kindly phone to say FP5EK is on, I either hear absolutely nothing or S9 Ws and VEs but no FP5? I think the answer is simply that propagation on six is very selective and capricious, but never the less some quite precise distances are favoured more than others."

(G3HBR) "It was a surprise how far west could be worked. Only disappointment was to get a card from K0TLM who is in Kansas City, to find his state is actually Missouri and not Kansas, which I need!"
(G3NVO) "Worked 20 DXCC countries in Europe in under 2 hours on July 7th!"

(K4TO) "I was QRV when east coasters had propagation to HB9, EH6, 9H, YO, IS, I and S0 but I never heard any of them. All except Italy would have been new countries for me, however I did work 16 European countries this summer."

(WB4DBB) "I'm now running a kilowatt into an 11 over 11 element M2 6m 2.5 wavelength at 140 and 113 feet. This array seems to work OK!"

(WA1AYS) "The amount of E has been phenomenal. I have noted that some signals during some of the openings to Europe have been marked with very high levels of fading, apparent phase distortion, noise etc. I should also mention that some stations here (notably WA1OUB and K1TOL etc.) seem to live in a "blessed" location and while their equipment is top shelf, location once again is often the key to success. Many times I have sat here listening to noise while Bob and Lefty work a hoard. Not really jealous, just a few tummy pangs at times!"

(WA2BPE) "Worked FP5EK at 2037z on July 6th for the first and only SM-FP 6m QSO"

(SM7FJE) "Would be interested to know if anyone worked K9VV, according to the callbook he is in California, and I don't believe that (he's in EN51, de GJ4ICD). I did hear a few weak W9s on SSB, but they seemed to have their first ever pile-up which they managed very poorly. Even with a 7 element yagi at 25m and full legal power, it was very hard to get through the wall of

QSL Listing

ER5OK - Mike Rudenco, Box 7, Chadyr-Lunga, 278700, Moldova, CIS.
JW0BY - Via LA0BY, Stefan Heck, Floyvegen 25, N-9020 Tromsdalen, Norway.
JY4MB - Mohammad Balbisi, Box 3236 Amman, Jordan.
LZ1BB - Harry Popov, PO Box 87, Sofia 1618, Bulgaria.
LZ1JH - Rumen Marinov, PO Box 57, Tvarditsa 8890, Bulgaria.
LZ1KDP - Radio Club, Box 812, 1000 Sofia, Bulgaria.
LZ1UF- Radelin Gaydardjiev, Box 187, 1000 Sofia, Bulgaria.
LZ1UK - Savi Dimitrov, PO Box 23, S Boninica 3840, Bulgaria.
LZ1ZX - Dimiter Rahnev, Yavorov 37, 8680 Straldja, Bulgaria.
LZ2UU - Jordan Radkov Yankov, Box 196, 7200 Razgrad, Bulgaria.
LZ3SM - Svetozar Gerashev, Box 61, 2670 Bobov dol, Bulgaria.
LZ3UF - Andrzej Gaydardjiev, Box 187, Sofia 1000, Bulgaria.
OH1ZAA - Via OH1NSJ. Pasi Alenko, Jaakont 13 As 7, SF-28500 Pori, Finland.
SM2HTM. Leif Renstrom, Skolg 8 B, S-97100 Malmberget, Sweden.
SM5VCK - Markku Siitonen, Bravallag 9A, S-602 23 Norrkoping, Sweden.
SV2KD - George Gatsis, Box 3, GR-58200 Edessa, Greece
SV4AAQ - Dimitris Hiotis, Box 1232, GR-38110 Volos, Greece.
SV4AFY - Via SV4AAQ.
SV7BAY - Box 59, GR-67100 Xanthi, Greece.
SV7QC - Nick Iosifidis, Vas Sofias 6, GR-67100 Xanthi, Greece.
SV8CS - Spyros Cheimarios, A Loyka 20, GR-29100 Zakinthos, Greece.
SV8QG - Alex Deligianis, N Bologianni 14, GR-81100 Mytilini, Greece.
SV9ANJ - E. Nerantzulis, Box 1272, GR-71110 Iraklion, Greece.
SV9ANK - N. Vardaxis, Box 1272, GR-71110 Iraklion, Greece.
T97F- (ex YU4VO, 4N4VO, T94VO, T95VO). QSL manager T94CC (ex 9A3KK). See below.
T94CC - Drazen Bonjas, Rue Tenbos 5, 1050 Brussels, Belgium.
UX0FF - Nickolay Lavreka, PO Box 3, 272630, Izmail, Ukraine, CIS.
V51KC - Jack Anderson. PO Box 5, Okahandja, Namibia.
YO2IS - Sziggy Suli, Box 100, R-1900 Timisoara 1, Romania.
YO4BZC - Dorin Latan, Box 82, R-6200, Galati, Romania.
YO7VJ - Emil Nistorescu, Box 107, R-1100 Craiova, Romania.
YO7VS - Vasilescu Schmidt, Box 63, R-1100 Craiova, Romania.
YO9IE - Vasile Pestritu, Box 113, R-2000, Ploiesti, Romania.
Z32BU - PO Box 467, 91000 Skopje, Macedonia.
3A2LZ - Daniel Plett, PO Box 349, MC-98007, Monaco.
3V8BB - Via JF2EZA. Kohich Oguri, 4-81-46 Hirono-cho, Tajimi-city, Gifu 507, Japan.
5B4AAI - Nick Kyriakides, Skala Court, Makarios Ave, Larnaca, Cyprus

G and PA stations".

(OZ1LO) "I missed the openings in July, I was on my holiday in Hungary. OZ2LD, my friend, was QRV, he has told me about the opening more than 100 times since I got home!"

(OZ3ZW) "Over here the number of openings were outstanding. Signal strengths were always quite weak, and I can confirm W3EP's previous comments on that. The strongest signal heard was VE3RM at S6 on June 19th. I do not think we had better skip this year than on June 25th 1994, when DL7QY heard or worked N5JHV (greater than 8500km). My record this year was KS0F (7700km), although I thought I heard N5JHV (later confirmed, GJ4ICD) buried by WA1OUB and DL7QY on 50.110 (an excellent example of why those in the mid west should stay well clear of 50.110 - GJ4ICD).

(DL7AV) "Today 10th July I had another opening at 2140z with KJ4E at a distance of 7736km".

(DL7QY) "My impression is that these openings did not produce the very strong signals that we are used to. Often I had to scratch them out of the cone of my speaker".

(PA3BFM) "Funny to work so many stations who have not worked PA before. With the IC736 and the new nine metre long 6 element yagi since June 27th, I had great fun working so many stations from North America. On July 15th I heard 4X1IF at S4 on the back of the beam while listening to VO1ZA just above the noise, imagine what could have happened, only if...?"

(PA2VST) "From the stateside openings only a few weak signals came through. On June 19th at 1548z I made a QSO with WA1OUB."

(YO2IS) "I worked 79 stations in North America last summer, best DX was WD5K in EM12, at a distance of 7513km, all with just 10W and a 5 element beam."

(EH1TA) "Results were very poor compared with Northern Europe. 18th June saw VE7CAP/1 2100-2110z and June 19th saw VE1YX and K1TOL between 1400-1440z at a maximum of S3."

(SV1DH) "The results from D4 in June were very good, most contacts were 3000km, but the opening to the USA in July was one of the best I've ever heard, although further distances were copied in 1985 via 'ES' with W5 and 6's heard then."

OX3LX was worked during that opening, and strangely I was the only 'G' station to work him. So selective!

Conclusions

From data collected, the graphs clearly show that the UK, Belgium and the Netherlands had the best of the openings. This could be totally down to high numbers of well-equipped stations in those countries. Spain and Portugal are well positioned to exploit these openings to their full potential, but low activity gives the impression other areas were often favoured, when perhaps this wasn't the case.

There is no doubt that those stations situated on the east coast of North America produced the best results (as always). However it is interesting to note the 'Big Guns' do seem to have the same problem working further east than the centre of JO/JN fields. Much the same as Europeans tend to hit a brick wall as signals creep into EN/EM fields.

There were many other great openings, but July has to take the "Month of the Year". Many stations worked many new countries on the band in 1995. Let's hope for more in 1996.

My thanks to 'Six News' and all of you that took the time and trouble to write in, all in all a bumper year. With that I would like to wish all contributors and readers a Happy New Year!

News and views can be sent to; Geoff Brown, GJ4ICD, TV Shop, Belmont Rd., St. Helier, Jersey. Channel Islands, or phoned/faxed to 01534 877067 anytime. You can also send Email to *equinox@itl.net* and don't forget to check *http://user.itl.net/~equinox* for the latest radio information on the Internet.

QSL LISTING

OX3LX - Via OZ1DJJ. Bo Christensen, Biens Alle 2 St Mf Th, DK-2300 Koebenhavn S, Denmark.
SM2HTM - Leif Renstrom, Skolg 8 B, S-97100 Malmberget, Sweden.
SM4DHN - Lars-bertil Karlsson, Box 7111, Hagfors 683 00, Sweden.
SV2AOK - A. Achtsis, Antisthenous 13, Thessaloniki 542 50, Greece.
S0RASD - Via EA2JG. Arseli Echeguren Bardeci, Las Vagas 69, 01479 Lyando, Alava, Spain.
S07URE - Via EA4URE. U.R.E. Box 220, 28080 Madrid, Spain
TG9AJR - (CB incorrect). Juan Munoz 4959, PO Box 02-5279, Miami, FL 33102-5279
T93M - Via K2PF. Ralph Fariello, 23 Old Village Road, Hillsborough, NJ 08876, USA.
T94DD - via K2PF. See above.
T97F - Faud Arnautovic, Harmani H 16/4, Bihac, Bosnia.
T97V - PO Box 14, Vitez, Bosnia via Croatia.
US7CQ - Yuri Kazakov, PO Box 334, Cherkasst 257000, Ukraine.
US2YW - Via US0YA.
UT6X - DK9OY (see below).
UT8AL - Via DK9OY. Detlef Reinecke, Katenser Hauptstr 2, D-31311 Uetze, Germany.
UX0FF - PO Box 3, 272630, Izmail, Ukraine. OR Via OE5EIN.
YU1VG - Vujanovic Vasa, ul Mose Pijade 2-76, 15000 Sabac, Yugoslavia.
V31RD - Via G4CVI. R. Diamond, SMC, School Lane Industrial Estate, Chandlers Ford, Hant, UK.
XE1KK - Ramon Santoyo, PO Box 19-564, 03901 Mexico City, Mexico.
YL/RZ3BW - Via YL3AF. Uldis Silins, Box 3, LV-4200 Valmiera, Latvia.
YL2DX - Uldis Silins, Box 3, LV-4200 Valmiera, Latvia.
YO4DCF - Via K1BV. Theodore Melinosky Jr, HCR 10, Box 873A, Spofford, NH 03462, USA.
ZC4ES - Via G0PWR. K. Staley, 11 West Lawn, Findern, Derbyshire DE6 6BB
Z23ZM - Dimovski Mome, Bedinje 109, 91300 Cumanovo, Republic of Macedonia. OR Radio Club Nicola Tesla, Box 179, 91300.
9A6V/9A6WM/9A2WM - Dragan Mojsilovic, Slavonska 17, Split 58000, Croatia.

Satellite Rendevous

Richard Limebear G3RWL of AMSAT-UK

Last month's news included an item saying that, due to financial problems, the Russian command facility may be closed down. This however was *not* true. The following information is from the 'horse's mouth':

RS3A command station problem is solely internal politics which limits their efforts in future development of RS-Satellites including finances for RS-16. To help the RS-16 problem they are asking for hardware assistance from various sources. They thank all the satellite enthusiasts for their efforts and support.

Mir space station activity

On Mir they are having a few teething troubles setting up the new equipment. The old Icom 228 is working, but only in simplex mode; they think it will work split frequency but have no clue how to select or activate it - and of course, there is no documentation on board, neither for the old station nor for the new one (TM733).

A few weeks ago, Thomas installed the new station which is working in the voice mode, but the modems cannot be initialized. One of the new modems has a connector for the second serial port of the computer which doesn't fit (two female connectors!), also there is an aerial switch which is supposed to be on board - they can't find it. Also a 'duplexer-box', which allows them to run the new station on the two bands (145 and 430 MHz) into a single aerial - that can't be located either.

If he finds the bits, or someone takes him new ones on the Shuttle mission, the main 70cm frequencies are: 435.725/437.925MHz (Voice) and 435.775/437.975MHz (Packet).

2m frequencies are: 145.200/145.800MHz (as per IARU) and the usual 145.550MHz. There's no 9600 baud activity yet, although the high speed TNC for this will arrive at MIR at the end of 1995. QSLs will be sent after the mission.

The arrangement was for Thomas to stay 135 days on board Mir, mainly in order to investigate the effect of prolonged micro-gravity on the human organism. Now the flight is being involuntarily extended. Thomas and his Russian colleagues will provisionally return at the end of February, not in mid-January. The building of Soyuz rockets is being delayed by financial problems at the Russian space agency, NPO Energia.

RS-16

Apparently RS-16 will have digital store and forward capabilities but there is no other information available as yet.

Oscar 13

Oscar 13's Engineering Beacon (EB) on 145.985MHz is, at the time of writing, currently *on* from MA 0 to MA 40. This beacon is about 6dB stronger than the general beacon (which is *off*), so facilitating telemetry collection at perigee when the omni-directional aerials are in use. The Engineering Beacon is PSK only, it does not transmit CW or RTTY. The satellite's MA counter has been advanced by 78 seconds to re-synchronize it with NORAD Keplers.

Oscar 10

It's still operational in Mode-B. Again, despite good signals from the transponder, there are very few stations using it. It's currently available when in view but *please do not* attempt to use it if you hear the beacon or the transponder signals FMing.

MicroSats

DOVE is saying that software, hardware and sound testing are in progress. I heard IO-26 on the 435.822MHz frequency yesterday and heard the transmission stop. I'm not sure if they were commanding it or if it has some cyclic schedule.

AO-27 seems to be there but the uplink was blocked when I tried it.

Upcoming Space Shuttle missions

Forthcoming space shuttle missions which will be visible from UK, are;

STS-76; March 21, 1996, duration ten days, Mir docking mission.

STS-79; August, 1996, duration nine days, Mir Docking mission.

Phase 3-D

During October it was announced that all major contractual issues for the launch of the satellite are now complete. The contract calls for a firm launch price of some 1.3 Million Deutsche Marks (DM), or about $1 Million US, and confirms that Phase 3-D's primary launch opportunity will be via the second test of ESA's new Ariane 5 booster, *Ariane 502*. However, if for some reason ESA determines that a launch via Ariane 502 is not possible, the contract also calls on ESA to exercise their 'best efforts' to orbit Phase 3-D on an Ariane 4 booster, no later than mid-1997. Ariane 502 is currently scheduled for launch in September, 1996; although the rumour on a recent AMSAT-UK net (last weekend as I prepare this) that the launch had slipped to 1997 is *not* true.

Fortunately, the Phase 3-D design team anticipated this eventuality and constructed both the Phase 3-D spaceframe and its carrying structure to be easily compatible with both the new Ariane 5 vehicle as well as with the Ariane 4. Launching Phase 3-D via the Ariane 4 requires the addition of an adapter ring (to be supplied by ESA) fitted to the bottom of Phase 3-D's support structure on the Ariane 4's upper stage. Preliminary assessments indicate that, other than requiring an additional firing of P3-D's kick motor, changing launch vehicles to an Ariane 4 should have little (if any) impact on the satellite's ultimate orbit or planned transponder performance.

While the final negotiated price for Phase 3-D's launch is somewhat reduced from earlier estimates, the cost of the launch still represents a sizable sum for an organization such as AMSAT. Fortunately, through the generous contributions of individuals and organizations from around the world, money is now 'in hand' to pay the first instalment of the launch bill, about 1 Million DM ($800,000 US) which was due by November 1, 1995. This payment will confirm AMSAT's intent to launch Phase 3-D with ESA and reserve the launch slot. However, the final instalment of the launch bill must still be paid sometime in1996.

In addition to the final launch instalment, we still need to raise more revenue just to complete the satellite

and prepare it for launch. For example, we anticipate the final assembly, checkout and test of Phase 3-D along with conducting the launch campaign will cost an additional $200,000. These are all expenses that we do not have current funds to cover.

The contract even says that we must provide ESA with a concrete mass mock-up unit if for some reason our spacecraft isn't ready to go when they are.

On a related theme, apparently the industry has been impressed with AMSAT's 'KISS' approach to spacecraft design, and the fact that the paperwork needed to document the spacecraft need not weigh more than the spacecraft itself.

VE3ONT's moonbounce

This operation was full of bad surprises. About two hours before moonrise on the Friday, they lost commercial power. Power was restored mid-afternoon on Saturday, but by then they had completely missed the opportunity on 144MHz. Then, on the next night they found that whenever the 50MHz kilowatt keyed up, the 1296MHz transverter shut off. Therefore 50MHz activity was severely curtailed and only four contacts on that band were made. 1296MHz fared better, with 34 QSOs (much poorer than last year).

Then they had word from the Site Manager of the Radio Observatory that an observation by a University had been scheduled for the night of Friday November 3rd and Saturday November 4th. This meant that VE3ONT would probably not be operational on 432MHz the first night of the EME contest and would not likely have had sufficient time to set up 144MHz either. They'd have more clout if they were capable of paying the $1000 per hour fee!

QSLs go to Dennis Mungham, VE3ASO, RR #3, Mountain, Ontario, Canada, K0E 1S0. Enquiries to Peter Shilton, VE3VD, 215 Windecker Rd. RR #1, Cayuga, Ontario, Canada N0A 1E0 or call Int+1 905 772 8938 (EAT/EST evenings).

UO-11

More and more folks are making a fuss about UO-11 not being there when they go looking for it. So I asked UoS if anything more could be done to give it a regular 'kick'. UoS said that the short answer is "no, probably not". They were amazed that, while your's truly hears from "more and more folks," to date they haven't heard from any. They do their best to keep the watchdog kicked, but UO-11 is getting old and, with the passes falling as they do, it is not easy to immediately catch the fact that the watchdog has timed out. So, folks, if you don't hear UO-11 and you're sure your equipment, tracking, etc. are OK, please contact UoS.

UNAMSAT-B

This is coming along quite well. They hope for a launch either late '95 or early '96. They are looking into three possible launches but so far none has been signed.

Mars observer

Last month I said that the Jet Propulsion Laboratory in Pasadena, California will be launching a replacement for the ill-fated "Mars Observer", called the "Mars Global Surveyor", in the latter part of 1996. Among the many experiments carried on the spacecraft, Mars Global Observer will carry a 1.3 W continuous carrier beacon transmitter on 437.100MHz. Amateur Radio operators will briefly have the ability to receive this beacon using their satellite ground stations while the spacecraft heads off to Mars.

There are programs available for deep space tracking; anyone interested should look for Deep Space Ver 5 which is available on Internet at *freebsd.cdrom.com* in the */pub/simtel/msdos/astrnomy* directory (if readers would like a copy on disk, it's available as a service to our readers at £1.00 inc. disk and UK p/p - see this month's Software Service page - Sheila G8IYA).

Want a satellite job?

I'm told there's a job opportunity at Surrey Satellite Technology Limited for an Attitude and Orbit Determination and Control Systems Engineer. The person filling this senior role will be an expert system integrator to guide the activities of sensor, actuator and software engineers in the company. The ideal candidate will combine up-to-date theoretical knowledge with proven practical capabilities and an ability to innovate. The post also requires man-management and project management abilities.

Experience in some or all of the following areas is required: Satellite control algorithm design and implementation, Satellite sensor design and implementation, Satellite actuator design and implementation, Satellite AODCS system specification, AODCS operations, Low-cost spacecraft engineering.

Send CVs, including previous project reports or published papers (if possible) to: Mr Ed Milton General Manager, Surrey Satellite Technology Limited., Centre for Satellite Engineering Research, University of Surrey, Guildford, Surrey, GU2 5XH.

AMSAT-UK news

An upgrade sheet is now available for the *Guide to Oscar Operating*. Send an SAE to the AMSAT-UK office with a pound coin taped between two QSL cards (or similar). New purchases of the Guide will include this sheet at no extra cost.

The date for next year's Colloquium has been set as 25-28th July 1996. It was decided that the first day (Thursday) will be dedicated to administrative (political) affairs with the other days being used for all other subjects.

Latest Keplers

AMSAT-UK Keplers are put out on packet fortnightly, sent to KEPLER @ GBR. The latest satellite Keplers as supplied by AMSAT-UK are also available by fax from the Ham Radio Today fax-back line, 01703 263429 *(use with a personal DTMF, i.e. 'touch-tone', phone/fax keypad - follow the voice menu)*, request fax document 79 from the satellite menu for this month's. You can also get a copy in the post by sending an SAE together with the corner flash from this page to the HRT Editor, marking your envelope 'Keplers' and stating whether you want *all amateur satellites* (one A4 page) or *all* satellites (10-15 A4 pages).

For further information about AMSAT-UK contact: AMSAT-UK, c/o Ron Broadbent MBE, G3AAJ, 94 Herongate Rd., London, E12 5EQ. Big SAE gets membership info. SWL's are welcome. All new joiners get the USAT-P tracking program on 5¼in disk. G3RWL can now be reached via Internet as g3rwl@amsat.org.