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HAM RADIO TODAY

VOLUME 12 NO.3 MAR 1994

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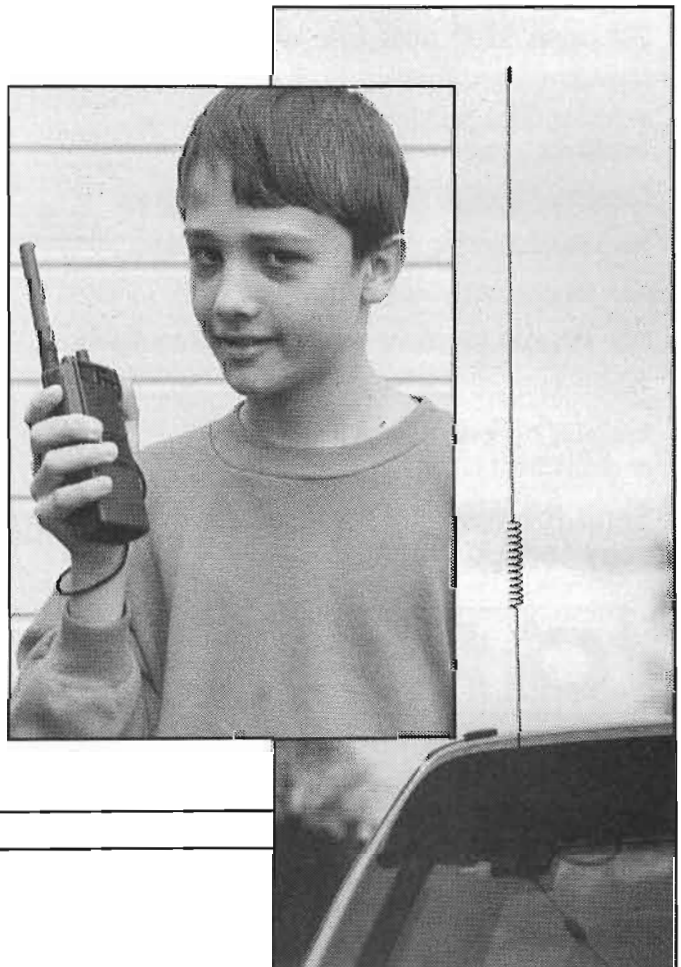
NEWS AND VIEWS



Left; Steven Lorek with the new Alinco DJ-480, an ideal novice portable rig. Right; Pro-Am 2m/70cm glassmount aerial

CQ de G8IYA Editorial

What's in a name?

Many licensed radio amateurs appear, quite understandably, to prefer to speak in 'international' English on the air. This certainly has its merits, especially when speaking with foreign amateurs who may only know enough English to manage an on-air contact with you. But try telling a British motorist that he must always drive his car along the pavement to avoid getting in trouble with the police, and you'll probably be classed as rather an 'oddball' (as well as someone to avoid when you're driving a car). Moms don't push their diaper-clad juniors in colored strollers thru bums on sidewalks in the UK. Hoods, trunks or shift sticks don't come fitted on UK cars. But I sometimes get asked "Why do you use the word "aerial" instead of "antenna" in the magazine?" You've probably guessed by now, although both words now appear to be used in Britain. Like 'thru' instead of 'through'.

In France, a country whose people are noted for their cultural pride, commonly used 'Franglais' is prohibited in all official documents, 'real' French must be used. I believe the US broadcasters TNT (the Cartoon Network) on the Astra satellite had to cease their French language soundtrack on this a while ago due to alleged injection of non-French culture. An interesting 'snippet' from the BBC World Service shows that they're 'cleaning up' their use of the English language, no more will you hear the word 'diaper' for 'nappy' on there.

Aerials or Antennas?

So what's this got to do with the thing we stick in the air on the end of a bit of coax leading to our rig? A number of years ago, BREMA, the British Radio and Electronics Manufacturers' Association, found they had to decide one way or the other which to use, 'aerial' or 'antenna'. The latter was being increasingly referred to amongst the British public (maybe they'd been influenced by foreign-made TV programmes). After many deliberations, they came to the conclusion that an 'aerial' was a thing of the air, and that an 'antenna' was a sensory object (like you'd find on an insect). People in the UK who make and install the things in the air on the other end of your coax leading from your radio or TV are often a member of the CAI, the Confederation of Aerial Industries. The nice people who put the thing in the air on the other end of the coax from your radio or TV may alternatively be members of the Federation of Aerial Fitters. A look through my British Telecom 'Yellow Pages' to find people who make and put such things in the air reveals listings under "Aerial mfrs & suppliers", "Radio Aerials", and "TV and Radio Aerial Services". Nothing at all under "Antennas".

So, why do many UK amateurs use the word 'antenna' when they're speaking amongst themselves, or to other members of the public such as their friends and neighbours? These neighbours have an *aerial* on their roof, but the amateur down the road wanted permission to put an *antenna* up. That's one of those things that causes interference to all the TVs in the street, isn't it? No, he's not having one of those things up.

How about sending me a 'Letter to the Editor' for publication discussing why I should use the word 'antenna' instead of 'aerial' in HRT. You might just get a £10 cheque (that's a UK cheque, not a US check) if it's the 'Letter of the Month'.

The Radio Ham

At the presentation of the first UK Novice licences, the RA issued a press statement telling the public how the latest newcomers to our hobby are (quote) "Keeping Alive the Hancock Tradition". Nothing about them experimenting with 70cm, digital transmissions, and the like, which most Novices start off with. Some of us *do* remember seeing Tony Hancock's sketch of 'The Radio Ham', even if on video rather than when it was first transmitted on radio and TV (I've got to say that, haven't I?)

It's an understandable pity that some UK amateurs still feel they should get away from being called 'Hams'. I believe a lot of this may have been due to just one instance of 'bad publicity' in the past for our hobby. Instead, with a bit of 'education' over the years, it could have been turned around for our benefit (remember that the chap in the sinking boat *did* get rescued by another radio *ham* answering his call).

You'll find in the USA, such derision of a 'Ham' is rarely found. Instead, a 'Ham' is someone to be thought of as a clever person, someone who's passed technical exams to show they know what they're doing, and someone who offers a 'service' to the country and it's people. With so many members of the British public being affected (brainwashed?) by US influences, maybe this might not be a bad idea?

But 'Ham' isn't English, or is it?

You're reading 'Ham Radio Today' of course. Not 'Amateur Radio Today'. My Collins English Dictionary (from England and Scotland, London and Glasgow to be precise) tells me a 'Ham' in the radio sense is an informal word for a licensed amateur radio operator. That's *licensed*, keep in mind. The same dictionary tells me an 'amateur' can be someone with a non-professional interest (like an unlicensed radio pirate), or someone who's unskilled or who has only superficial knowledge of a subject or activity (like someone causing EMC problems on your neighbour's TV through a lack of knowledge of what they're doing). Just to show I'm not totally anti-US, my Websters Dictionary (an acknowledged US 'reference', and yes it *is* on CD-ROM) gives the word 'Ham' in the radio sense as a colloquialism, i.e., for informal or conversational use, of a "licensed amateur radio operator". That's licensed, again. Maybe to be absolutely 'correct' in referring to our hobby of chatting over the airwaves I should rename "Ham Radio Today" as "Licensed Amateur Radio Operators Today".

Maybe I'd better not mention anything to do with "amateur" radio on the front page. It could give the wrong impression amongst UK and International English speaking people throughout the world!

(Keep rattling the cage Sheila, it'll get them talking – HRT Tech Ed.)

LETTERS

Letter of the month

Dear HRT,

I am confused! Could you please investigate and clarify the following point. I recently had my car 'fail' the MOT. The reason given was that no attachments other than manufacturer's approved fittings are allowed on the dashboard/facia of a car. The examiner stated that in a crash the standard of facia had been tested and approved to meet safety standards and extra attachments could be struck by the driver or passenger increasing their injuries. In this particular instance the examiner realised the transceiver was removable and asked me to remove it so the vehicle would pass.

This law appears reasonable and I don't question its sense, but surely there is another side to this story. Safety must be improved by any accessories being in the clear eye-line of the driver. This avoids the grovelling below the facia that some drivers seem to insist on performing. I notice in recent issues that rigs have been photographed on top or front of vehicle facias (often the editors car?) and at least one manufacturer has just introduced an air vent fixture for hand helds.

Could you clarify whether this accessory law in fact exists and if so hoe does it affect amateurs? It must also affect PMR users, have you seen the average taxi dashboard!

Martin Lines G1SEO

Editorial comment;
I first contacted my area Ford dealer and MOT test centre, to ask them to answer this point. They said; "Any vehicle we are testing for the MOT would fail if it had anything on the dashboard that was obstructing the windscreen". They could not tell me if it was actually law or not, as they didn't know. I then had lengthy discussions with my local office of the Dept of Transport (the Enforcement Manager at the office I found also reads HRT!) who said "Yes there is a law and it is very complicated, it is all to do with visibility". Within 'Zone A', which is the swept area of the windscreen (i.e., the whole arc of the wipers on the driver's side of the car), you are not allowed to have anything within 290mm of the centre of the steering wheel up to the top of the arc. Any items placed outside the arc must not measure more than 10mm. Zone B, covering the passenger side of the car, has different laws. If you look at the covers of the May 92, July 93 and Oct 93 issues, you'll see the rigs featured don't obstruct the driver's visibility at all (we're very careful about this) although due to the angle of the photograph this isn't apparent on the TS-50S on the cover of the July 93 issue (which incidentally is a BMW dashboard, I wish I could afford to run one of those!). All this, however, doesn't cover the accident aspect, which comes under the 'construction and use' part of motor vehicle law, which again is very complicated. But overall, it looks like we've all learned something from this doesn't it! For details, readers should contact their local office of the Department of Transport, but in the meantime I'll be researching this further with a view to publishing guidelines to this law in HRT.

Dear HRT,

I was greatly saddened to read the letter from G4XPP in the January issue of HRT about his experiences at rallies. I feel that what he has heard is derived from the flip and cynical expressions used by James Bond and Clint Eastwood in their films when disposing of their opponents, and by 'alternative' comedians (of both sexes) who obtain their laughs by over-emphasising their reactions to everyday experiences. Their behaviour has been taken up by ill educated yobs who try to impress their friends with these out-of-place comments while waiting in the queues.

I do hope he will not stop attending rallies, and speaking as one who has queued and watched the disabled enter first, I can assure him that I and the vast majority of others have no objection at all to their precedence. Long may this civilised practice last.

Regarding the letter from G7NDP and your reply, hasn't it seemed odd to you both that the same price is charged for the same equipment from many different dealers? One has only to check through the magazines to compare prices to see that they are identical for many items, even down to the penny! Even if the retailers get their supplies from the same wholesalers/importers how odd that they all should have chosen to apply the same mark-up to their prices. Have they all been reading the same book on how to run a business? Even if their overheads were identical (impossible) then what a staggering coincidence that they arrive at the same figure. On chance alone one would expect a variation over a small range. It makes one think of an unofficial cartel, as was recently stopped by the government in the cement industry.

M. J. Powell, G3IJE

Editorial comment;
Thanks for your letter Mr. Powell, it's good to see that some amateurs do care about the disabled amongst us. Regarding prices, do note that you're giving advertised prices. Often these are 'recommended retail' prices or whatever, in exactly the same way as you see car prices advertised in the press. One or two well-known and long-established retailers have certainly advertised 'slashed' prices in HRT on several makes of equipment which they're 'authorised' UK dealers for. So there doesn't really look like there's a 'cartel' going on at the moment!

HRT,

I read with interest your editorial in the December 1993 issue. I would like to start by saying that I am very active on packet and am currently

£10 for the Letter of the Month

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

"TONE" BURST

By G6MEN

setting up a TCP/IP station.

Having said that I feel you are getting a bit carried away with all the new technologies. Yes it is all wonderful, however it is also still quite expensive and beyond the scope of a lot of amateurs, especially in developing countries. It's a shame also that you used this Editorial to take a sly dig at the Morse test, having already closed correspondence on this matter.

Also while data communications via a keyboard is a useful mode, it is not brilliant for real time communications. The human voice is still much faster. I do not see many of the professional services abandoning speech for keyboards. I can imagine the Police's reaction if you invited them to carry a keyboard around to call for assistance on. The Essex Fire Brigade tried data communications briefly in their vehicles but gave it up as impractical. When I am out in the middle of nowhere on a RAYNET duty, a voice link is far more practical also.

It is interesting also that even though you claim them to be dying modes, aircraft are still using AM (!) on VHF to communicate, both for civilian and military use. Some of our emergency services are also still in AM. Long distance military communications still use SSB and the VHF marine service is still on VHF FM. Do not be so quick to dismiss modes that are still being used professionally to good effect around the world. Remember, "if it ain't broke, don't fix it".

The above examples also show that like other modes data communications has its uses, but there are many organisations that still value speech as a useful communication tool. We amateurs are in fact lagging behind. Why haven't we got digital speech yet? Packet is great for sending mail that is not real time, and for sending computer files, but as a mode for real time communications, it is still very slow. In fact it is the many 'chat nodes' that are popping up on packet for real time conversations that is clogging up the packet frequencies and slowing all the other uses of the band.

Remember also that whilst packet has allowed people with hearing impairments to enjoy the hobby, screen are not much use to people with visual impairments. In fact there can never be a substitute for the human voice in many situations and it is somewhat naive to say that it is. Yes digital communications have their uses, reliable digital speech that is not hungry for bandwidth and is easy to send over long distances will be welcome. However the brave new world that you seem to be outlining where we all sit in a little box and communicate via a keyboard is not yet here and I for one hope it never arrives.

Andrew Mobray BSc (Hons) G0LWS/ G1NPT

Editorial comment;
Maybe you missed the whole point of the Editorial Andrew? Even the very final sentence said that my Technical Editor was going to call me (on voice) using a digital speech communication system. The 64kB/s video conferencing system described was video plus speech, no keyboard tapping anywhere! The higher speed store-and-forward packet communication likewise was video and speech, not text. Regarding police force communication in the UK, many are now using digital speech communication on FM, those that aren't now are going to soon. The whole point was that world's going digital! The 'dig' that no life-dependant communications will use Morse any more was a pure statement of fact in detailing the means of communications used in the 'lead' photograph, no 'dig' about any test intended, in the same way as there was no 'dig' in the Editorial that we amateurs in the UK should have to pass a test including digital speech and data communications to go on HF, like some countries do (i.e., the USA, for the 'Extra class' licence which gives additional HF frequencies).

Dear HRT,

Maybe I'm a little more short-tempered than usual, maybe it was the famous 'straw', but, do we have to have the continued snide comments about the licensing conditions? Page 21, top of the column in December HRT, is but the latest.

Would you welcome somebody eavesdropping on your conversation when the two of you go out, or the tapping of your home phone line? The principle is the same, the transmissions you monitored are not addressed to you and the continual hankering to be able to do so indicates, to my mind, unhealthy, which does our hobby no good.

J.W. Barker

Editorial comment;
When we're on the air, we know anyone can listen in if they have a suitable receiver. Whether we like it or not, people will listen in. They can 'break in' as well, if they have a transmitter. But we have never advocated listening in to private conversations, such as cellphones, marine ship-to- shore phone calls etc., we just feel that the law regarding not listening in to civil aircraft is stupid. This very evening I listened to an amateur in QSO on 80m describing how, at an amateur radio exhibition station, he showed the public the interesting messages they could hear on airband.

Alinco DJ-480 Review

Chris Lorek G4HCL reviews a handheld that looks ideal for Novice use on 70cm

I'm frequently asked by new Novice licensees "Where can I get a good 70cm handheld that doesn't cost the Earth?". There aren't many about. In the August 1993 issue of HRT, I reviewed the 'easy to use' Alinco DJ-180 2m handheld, which in my opinion was ideal for beginners on 2m, and I knew a 70cm version was 'on the cards'. But when? My wish was recently answered, when Jeff Stanton of Waters and Stanton Electronics phoned to tell me the good news that the DJ-480s 70cm handhelds were now available.

Easy To Use

The DJ-480 currently sells for £259 including nicad and desktop charger, and gives you coverage of 70cm with a transmitter power of around 2W using the supplied 7.2V nicad pack, or around 5W with a 12V supply from either an external power supply or the optional 12V nicad pack. But that's enough of the 'basics', the major point of the set is that it's very, very *easy to use*. To put it another way, after using the set on-air, on simplex, via repeaters, and on packet, as I begin to write this I've only just unsealed the plastic bag containing instruction manual to look at the circuit diagram and check on a few specifications for this review!

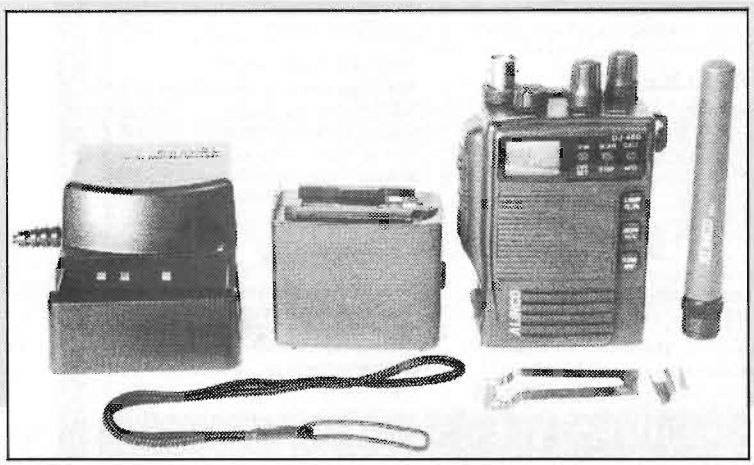
The August 93 issue review gives details on the 2m set's features, which are virtually identical to the 70cm version. If you missed this, then briefly, the set has a click-step rotary tuning knob for frequency change, and 10 memory channels to store your most commonly used channels in, together with any programmed repeater shift and even the CTCSS tone if you've fitted the optional CTCSS unit. 'Memory extender boards', also available as an option, can be internally fitted to give you either 50 or 200 channels if you'd like more than 10 memories, no limitations here.

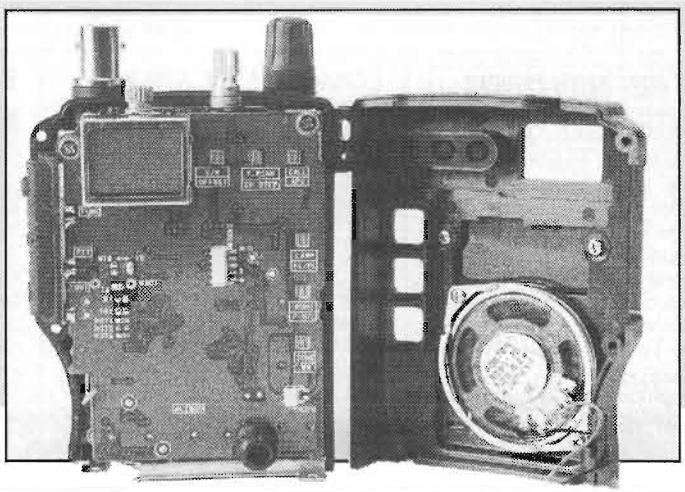
The other controls? Well the accompanying photo shows the easy-to-use push-button controls used on the set. On the top panel alongside the BNC aerial connector and extension mic and speaker sockets, are a rotary on/off/volume control and a 'reduced height' squelch control which is designed for 'preset' use so you don't accidentally knock it in use. In addition to 'normal' 70cm use across 430-440MHz, the set may be extended to cover 410-465MHz by pressing a couple of buttons whilst switching on.

As well as a 7.2V nicad pack, the DJ-480 comes supplied with a belt clip, wrist strap, instruction manual complete with circuit diagram, and a 'pod' type desktop mains charger which you pop the set into for overnight 'top-ups' of the nicad pack.

On The Air

As I expected, the set was very easy to use on the air, and I had many trouble-free contacts with the rig. The PTT bar has a lower button which, when pressed, transmits a 1750Hz repeater access tone along with your carrier. This was a lot easier to use, especially at night or when on the move, than a separate 'call' button or whatever as needed on some handhelds. The set gave me good audio on both transmit





and receive, with plenty of audio even in high background noise conditions.

Out and about, I found I could operate the set easily with one hand, my thumb being used to operate the buttons along the right hand side of the set, the quick-access 'call' memory channel button was especially easy to use this way. The supplied helical seemed very efficient, both on transmit and receive, the slightly 'longer than normal' length of this (when compared to some tiny 70cm helicals) no doubt giving it higher overall gain than I have been used to. At night, the backlight illuminated the set's display very well, and the various buttons were quite easy to use by 'feel' alone once I'd got used to their positions and functions. I did miss the absence of an S-meter indication, the set just indicating 'busy' when it received a signal. However, an S-meter would start to introduce more things to worry about when operating!

As well as on voice, I also used the set extensively on packet over the review period. Leaving the squelch 'open' (to defeat the built-in economizer which couldn't be switched out) and with my TNC in 'software DCD' mode, the set operated without fault for periods of several hours at a time (lots of file uploads/downloads!) with just the nicad pack connected. This continual 'open squelch/periodic transmit' test nicely showed that the set should be easily capable of 'all day' operation at outdoor events and the like.

Lab Measurements

Overall the measured results gave a reasonable level of performance. The receiver worked well, although the image rejection seemed a little on the high side, and the transmitter was very accurately aligned in terms of peak deviation and operating frequency. Throughout the tests, even on high power, the case didn't get anywhere near as hot as some tiny 70cm 5W handhelds I've used, indicating a combination of good heatsinking and good transmitter efficiency.

Conclusions

An easy-to-use rig, which should be attractive to newcomers to 70cm who don't want to start off with a rig that needs a degree in programming to operate. Likewise for the 'old hands' amongst us, as a 'sling it in the pocket' set for use on local 70cm repeaters or chat channels to keep in touch when out and about either on foot or in the car. *My thanks go to Waters and Stanton Electronics, who are the UK Alinco distributors, for the loan of the review transceiver.*

LABORATORY RESULTS:

All measurements taken on 145MHz with 13.2V DC supply, using supplied DC cable, high power TX, otherwise stated.

RECEIVER;

Sensitivity;

Input level required to give 12dB SINAD;

144MHz;	0.17µV pd
145MHz;	0.17µV pd
146MHz;	0.17µV pd

Squelch Sensitivity;

Threshold;	<0.06µV pd (<2dB SINAD)
Maximum;	0.22µV pd (20dB SINAD)

Image Rejection;

Increase in level of signal at first IF image frequency (-61.7MHz), over level of on-channel signal, to give identical 12dB SINAD signal;

34.1dB

Current Consumption

Standby, econ. on	12mA average
Receive, mid volume	86mA
Receive, max volume	167mA

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;

+12.5kHz;	26.1dB
-12.5kHz;	45.9dB
+25kHz;	51.8dB
-25kHz;	54.6dB

Intermodulation Rejection;

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

25/50kHz spacing;	62.1dB
50/100kHz spacing;	59.2dB

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;

+100kHz;	66.5dB
+1MHz;	80.4dB
+10MHz;	81.3dB

Maximum Audio Output;

Measured at 1kHz on the onset of clipping (10% distortion), 8 ohm load;

345mW RMS

TRANSMITTER

TX Power and Current Consumption;

Freq.	*Power*	*7.2V Supply*	*13.2V Supply*
435MHz	High	2.49W/1.27A	5.05W/1.40A
	Low	280mW/450mA	300mW/470mA

Peak Deviation;

4.97kHz

Harmonics;

2nd Harmonic;	-72dBc
3rd Harmonic;	-75dBc
4th Harmonic;	<-85dBc

Toneburst Deviation;

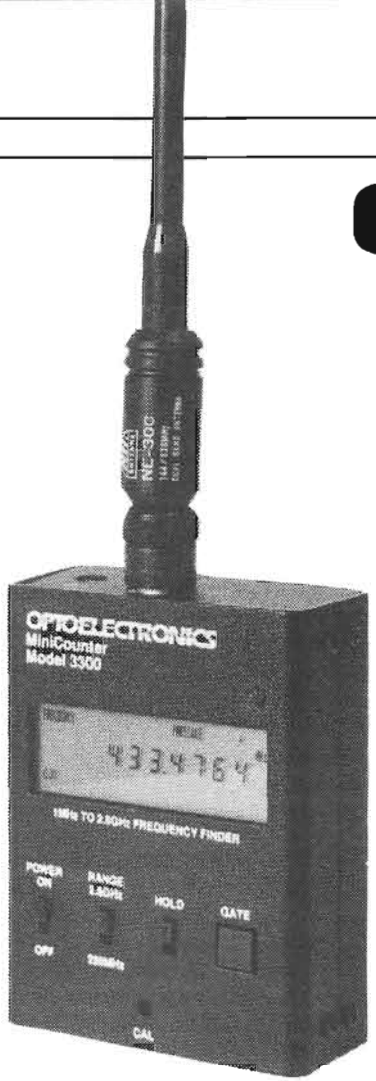
3.14kHz

Frequency Accuracy;

+98Hz

Optoelectronics 3300 Counter Review

Chris Lorek examines a tiny low cost 2.8GHz counter



A year or two ago I wouldn't have thought it possible. But here, in my hand, sits a nicad-powered 2.8GHz frequency counter, with a superb sensitivity capable of showing the frequency of a low power 70cm handheld being used down the road. It's currently priced at just £169, making it quite affordable especially when compared to other counters with this frequency range. And before you think 'another Japanese tiny wonder', it's from the USA.

Features

Measuring 65mm (W) x 30mm (D) x 85mm (H) it really is pocket sized. Two ranges are provided, both with a minimum frequency of 1MHz. The first has a maximum frequency of 250MHz with gate times of 0.01 sec, 0.1 sec, 1 sec and 10 secs, and selecting the 2.8GHz range switches in a divide-by-64 prescaler with overall gates times of either 0.64 sec or 6.4 secs. A large 'gate' push button cycles though these in turn, a red LED flashing briefly each gate period.

A 10 digit LCD readout shows you the frequency, to a maximum resolution of either 0.1Hz (250MHz range) or 10Hz (2.8GHz range) corresponding to the longest gate times. The counter has an excellent temperature stability of +/-1ppm (part per million, i.e., +/-145Hz at 145MHz) over 20-40 deg. C, with an aging of 1ppm per year. It uses an 'industry standard' 10MHz internal reference, which you can adjust against a known off-air reference standard (such as a 10MHz standard frequency transmission on your HF receiver) if you want even better accuracy.

As well as giving a 'continuous' display of frequency, or a random count if there's no signal, a small 'hold' switch lets you 'lock in' the frequency indicated at any time, useful for example if you want to make a note of what was read off-air. The counter is powered from its own internal nicads, which are a pack of four 600mAh AA size cells fitted with a flying lead which plugs onto the counter PCB. You should get around six hours' use before a recharge is needed, a plug-in AC wall charger being supplied with the counter. A BNC plug is fitted for you to connect your own aerial to, although a 2m/70cm telescopic whip for test purposes was provided with the review sample pictured here.

On-Air Sensitivity

As you may be able to tell from the accompanying table, the unit should indeed be very capable of receiving local off-air signals and telling you what frequency these are on. Coupling the unit up to my signal generators confirmed these figures, although to many readers they may not mean too much. So let me give you a couple of examples. I asked Sheila G8IYA to transmit on her 70cm handheld with the set-top helical, while I walked down the road with the counter. I had to go around 50m away before the counter stopped indicating the handheld's transmit frequency! As another example, my local packet BBS is around quarter of a mile away. Switching to the '250MHz' range, the counter consistently indicated 144.6500MHz every few seconds when I used it, with just the short counter-top aerial connected, in an upstairs room of my house. I found the VHF sensitivity far better with the unit switched to '250MHz', indeed the instruction manual states this range should be used for VHF frequency measurements, the 2.8GHz range being used for frequencies above 250MHz.

Possibilities

As well as being a handy test tool for the shack (I used it to good effect for the HRT MX294 synthesized ex-PMR rig conversion), this portable counter has a number of interesting possibilities. Like finding the frequency used by the taxi station down the road that's wiping out your rig, so that you can 'knock up' a quick notch filter. Or taking along to a rally or whatever, and instantly seeing what frequency other handheld users are chatting on. I understand that, in the USA, such counters are virtually an essential 'carry-around tool' for active scanner listeners in finding the channels used by local services!

Overall, I found the counter a very handy piece of equipment, light and small to carry around yet 'fully featured' with an incredible upper frequency range.

Win This Counter!

The Optoelectronics 3300 counter is available from the UK Distributors, Waters and Stanton Electronics, at a current price of £169 including the plug-in AC wall charger, to whom my thanks go for the loan of the review counter. Not only that, but Waters and Stanton have very kindly offered the review model as a prize for a HRT reader's competition. Want to win one? You'll see the entry form in next month's HRT!

Sensitivity *(Typical figures)*

Freq	Sensitivity
10MHz	<15mV
27MHz	<300µV
150MHz	<300µV
450MHz	<350µV
800MHz	<3mV
1GHz	<3mV
2GHz	<25mV
2.4GHz	<40mV

Pro-Am 2m/70cm Glass Mount Aerial Review

Chris Lorek has a sticky time with a windscreen

You've no doubt seen the large number of glass mounted cellular aerials on cars nowadays, and maybe come across one or two amateur versions for either 2m or 70cm, these often based on commercial PMR types for VHF or UHF. But you don't see many dual band versions.

How It Works

Glass mounted aerials use a flat metal plate at the bottom of the whip, securely bonded to the windscreen. This forms one 'plate' of a capacitor which uses your windscreen glass as a dielectric. The other 'plate' is on the inside of the glass, and is usually connected via a small matching network to the coax leading to your rig, and one or two radials are commonly used inside the glass to form the 'ground plane' required for a quarter wave vertical. These inner radials are often short helical types on VHF, just like you'd find on a 2m handheld, although this reduces efficiency somewhat. The reason for the associated matching network is to 'tune out' the effect of the windscreen glass dielectric, and this arrangement normally limits operation to within a given frequency range. Dual band and wide band aerials then have a bit of a problem!

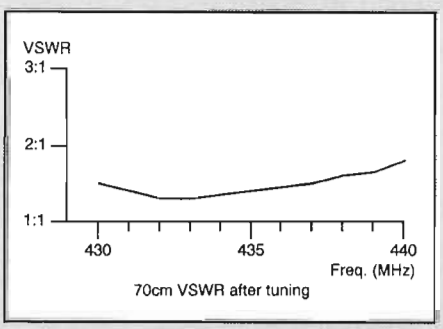
The Pro-Am manufacturers Valor Enterprises, who also make the Pro-Am wideband receive and 2m single band glassmounts for amateur use, have got over this on their 2m/70cm aerial by utilising what appears to be a half wave approach, i.e., a high impedance feedpoint. As such, radials aren't needed for resonance, and the effective capacitive reactance from the inner/outer plates and glass dielectric becomes small in comparison to the feedpoint impedance.

Physical Features

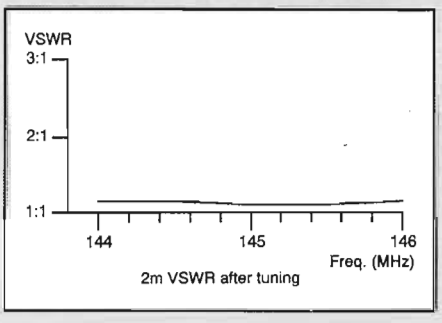
The Pro-Am GM270 is the first dual band glassmount half wave I've come across, and I was very pleased to be able to give it a try. It's a 66cm long copper plated whip, finished in matt black, and comes with a fitting kit and 4.25m of RG-58 coax to connect to the internal matching box. The aerial can handle 50W, giving a quoted 2m gain of 2.6dB and 70cm gain of 6.3dB (presumably over a quarter wave although no reference is given) with an SWR of less than 2:1 across the bands. These, incidentally, are the US bands of 144-148 and 440-440MHz, but a small tuning adjustment is provided, and even a non-metallic adjusting tool, for you to resonate the aerial after fitting. I found it tuned to 144-146 and 430-440MHz perfectly. The aerial is supplied with a small inner quarter wave 'counterpoise' for 70cm, which clips onto the TNC connector on the inner matching socket, but apart from that no large 'radials' are present.

On The Air

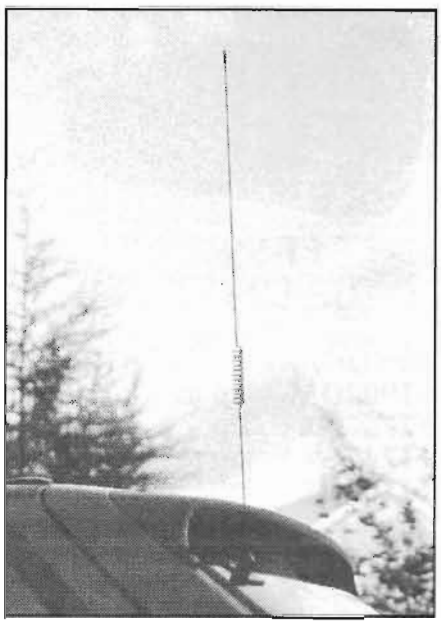
It took me just a few minutes to fit the aerial, after ensuring the glass was perfectly clean inside and out using the small alcohol-impregnated cloth provided. The units stick to the glass **very** tightly, and you only get **one** chance! Fortunately, the distributors can supply re-mounting kits should you need to move the aerial to another car, or of course if you don't follow the instructions and get it wrong! After fitting, I found the aerial gave a low SWR (less than 2:1) without any adjustment at all,



70cm VSWR after tuning



2m VSWR after tuning



although a quick 'tune' using my 2m/70cm rig and an SWR meter put it 'spot on'.

Compared to a 2m ¼ wave/70cm ¾ wave on the car roof, the glassmounted aerial noticeably gave few dB better performance on both bands, consistently giving me good signals in use where I'd expect good signals to be - no 'compromises' with this aerial. Some time ago, I noticed a problems with a (different) half-wave glassmount 70cm aerial, which grew rather 'lossy' when it rained, probably due to the high impedance path presented by water on the car windscreen to the adjacent metal car bodywork. I was quite surprised to find no such problems with this aerial, despite (e.g., today as I write this) torrential rain conditions! It just kept on working, and working well. Grumbles? Well if I listen carefully I can hear a bit of wind noise through the aerial's open-wound coil when driving at speed, and the supplied length coax was just short of reaching my rig at the front of the car (I added an extension length), but apart from that, nothing.

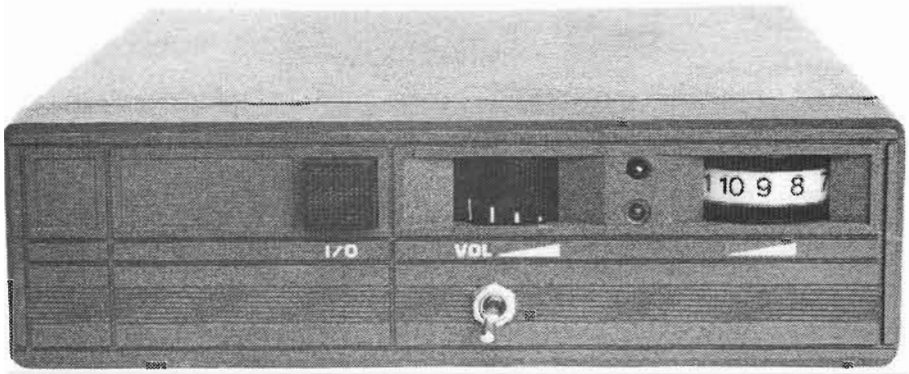
Conclusions

The Pro-Am GM270 glassmount aerial worked very well indeed, it exceeded my expectations. It was easy to install and set up, and gave a very inconspicuous appearance in use. For car washes and the like, the outer whip can be easily unscrewed, making it quite versatile. I can wholeheartedly recommend it. *My thanks go to Waters and Stanton Electronics for the supply of the review sample.*

Pye/Philips MX294 Conversion to 2m and 4m

G4HCL goes fully synthesized with complete details on getting a low cost ex-PMR rig on 2m or 4m

The MX294



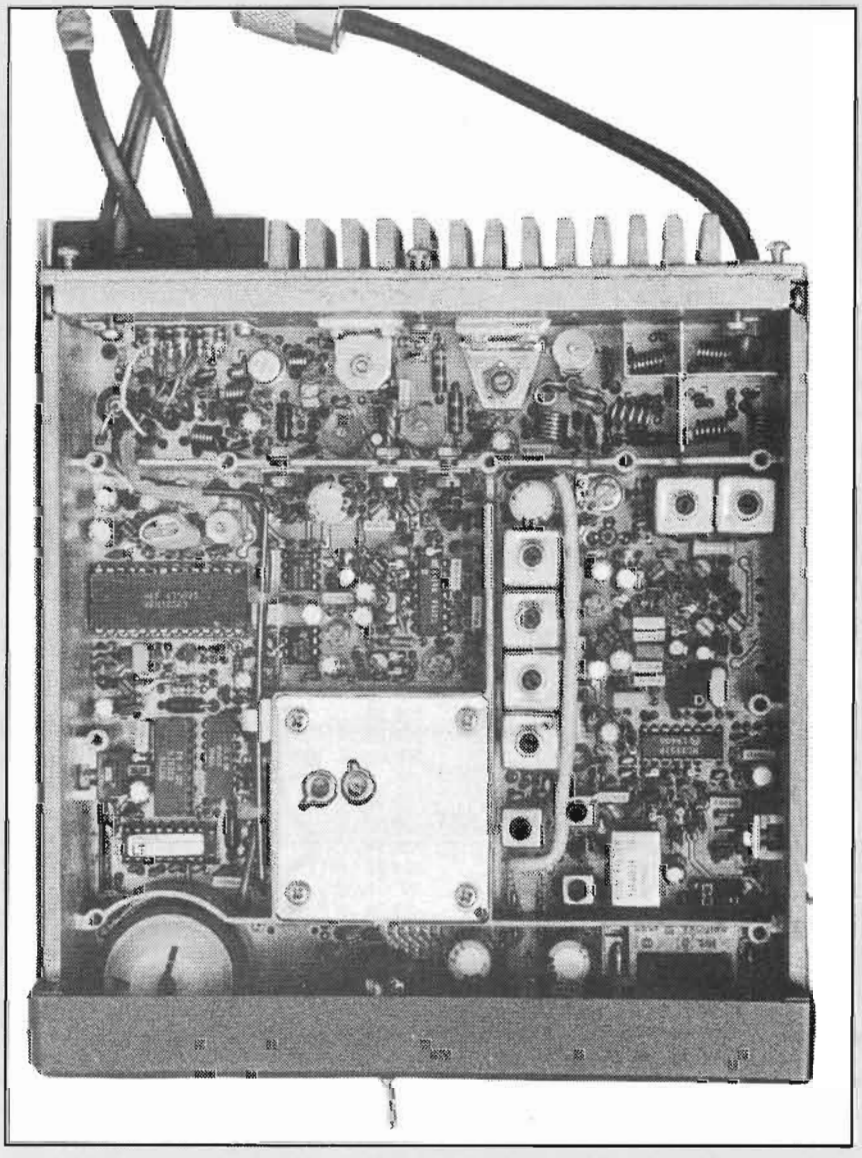
The MX294 is a car radio sized synthesized FM transceiver, designed for 25W out on transmit (it'll give you around 40W plus). The 'basic' set is a 16 channel version with manual channel change, although some 'trunked' types are seen with automated channel control (i.e., no 16 way switch on the front panel). I'll show you how to turn this into a superb low cost amateur set on all the FM channels, with ready-programmed EPROMs for 2m available if you don't want the bother of programming your own (see later).

Identify Your Radio

If you've been following the M290 series conversions in HRT, you'll have read that the MX294 can look almost identical to its crystalled cousin. It's pictured here with a different front panel (the 'modern' type), but the most common way to spot the difference is the 16 way rotary channel change switch on whatever front panel is fitted. You may find several types of front panel, some with loads of push buttons, indicators, and so on. These are for signalling and selective calling applications, and if you remove the two screws at the front sides of the set you can pull this panel off, complete with any such signalling electronics, to leave the radio itself.

You can identify the set by the model number 'MX294' engraved on the rear panel serial number plate. If it hasn't this plate, then leave well alone! If you see 'MX296' instead then it's a UHF model, OK for 70cm (conversion for this in a forthcoming issue of HRT), if it has 'MX295' instead, probably with a completely electronic front panel, then it's a Band III set which is a completely different kettle of fish (I'm working on a conversion to 2m for that set at the moment). A marked band code 'A' means 148-174MHz, code 'B' 132-156MHz, both OK for 2m use, code 'E' means 68-88MHz, OK for 4m. Other letters you may see are 'S' (12.5kHz channel spacing, i.e., narrow receiver

This is what's inside the box



filters) and 'V' (25kHz spacing). The MX293 is a VHF AM set which is not covered here, don't waste your money on an MX293 if you want an FM set.

There are two main types of MX294 circuit, with slight differences in the receiver. The early model, marked AT28790 on the PCB, is fitted with a bipolar BFQ51 receiver front end transistor (small, round, black, three radial legs). The later model, marked AT28873, is fitted with a BF981 receiver front end transistor (also small, round, black, but with four radial legs) which gives better sensitivity. All tuning details remain the same between sets, but note these front end transistors are not interchangeable.

Preliminaries

Remove the top and bottom lids from your set, then remove the front panel (complete with any attached board), we won't need any electronics you may find on this panel. You'll probably be faced with a large metal screen on the main set, remove the screws from this and lift the screen off to reveal the radio board.

You can test the set if you wish by applying 13.8V DC and switching on, make sure the bottom of the radio PCB isn't shorting on any metal on your bench first. If you have a channel switch fitted, then with the controls towards you, check there's a red 'lock' LED glowing at the left of the set, this may occur on only a few channels as you rotate the channel knob. This shows the synthesizer is working OK. If it doesn't, then check if the 16 pin plug-in PROM is missing (this will normally have a white label stuck on it). Don't worry too much if it's not there, as we won't need it for the conversion, but it's presence does let you check whether the set transmits and receives OK before you start 'butchering' it.

You'll see a further screen above the VCO (Voltage Controlled Oscillator), leave this in place, or at least replace it after you've hand a look underneath!. Make sure the four screws are tight on this screen, to save any 'noise' problems under mobile vibration conditions. There will be the adjusters of two multi-turn piston capacitor trimmers visible here, the 2m set will have these approximately flush with the screen, the 4m set will have them protruding around 5mm above the screen - another way of identifying whether your set's a 4m version or not.

At the front right of the set you'll see a set of links. For 'normal' operation (i.e., without any front panel selective calling limitations of TX and/or RX capability) you need to link F to S and K1 to L as shown, remove any other links. If your front panel does have some signalling electronics present, just remove the electronics of this, particularly the plug which mates with the radio itself next to these links, before refitting it after conversion.

Synthesizer Programming

The tune-up of the set is extremely simple, I've seen this done in two minutes flat. The hard part is getting the required fusible link PROM. The type used on the 16 channel MX294 is an 82S129, it is **not** an *EPROM*, it's a *TTL PROM*. Most amateurs don't have programming facilities for these, but if you have then all the information's here for you to put the right numbers into it. Many amateurs *do* however have EPROM programming facilities, low cost PC types which plug into a COM port are available for example. I've included all the programming and connection information here for the 2716, 2732, 2764, 27128 and 27256 EPROMs commonly available. These should give you the capability of as many channels as you'll ever need on 2m by suitably connecting the address inputs as shown.

Channel Switch

The channel switch is a 'pull down to 0V' type, with a 4k7 resistor array fitted to 'pull up' the address lines to the fitted PROM to the 5V line, derived from the 7805 regulator next to the PROM. You may see a small link, LK1, immediately adjacent to the regulator, it's the 5V line link and should be left in. On some boards, you'll see a further link next to the PROM. This is LK2, used to pull the 'binary 16' address line (PROM pin 15) down to 0V. Each 82S129 has the capacity to store 32 channels, and apart from possibly an 'alignment channel' programmed in this 'upper region' of the PROM, accessed by removing the link, the other addresses will be blank, allowing you to use the existing PROM to program 15 or 16 2m channels into if you wish. You may also see other address lines wire-linked to 0V on the bottom of the PCB (including pin 15 where LK2 isn't present).

If you see an 18 pin socket rather than a 16 pin socket fitted for the PROM, note that pin 1 of the PROM always fits to pin 1 of the socket, i.e., pins 9 and 10 of the 18 pin socket are not used with a 16 pin 82S129. This is for use with an 82S185 PROM (with 256 channel capacity), used for electronic channel control front panels.

By using LK2 with a PROM (or 'piggy-back EPROM wired to the same pins) you can get access to 32 channels, i.e., all 2m FM 'S' and 'R' channels plus reverse repeater channels. To do this, use the 16 channel switch and add a toggle switch to the front panel, wired to the two pins on LK2 or to short PROM pin 15 to 0V if LK2 isn't present.

EPROM Substitution for 82S129 PROM

EPROM Funct.	EPROM Pinouts					PROM socket (16 pin) conn.
	2716	*2732*	*2764*	*27128*	*27256*	
A0	8	8	10	10	10	Pin 5
A1	7	7	9	9	9	Pin 6
A2	6	6	8	8	8	Pin 7
A3	5	5	7	7	7	Pin 4
A4	4	4	6	6	6	Pin 3
A5	3	3	5	5	5	Pin 2
A6	2	2	4	4	4	Pin 1
A7	1	1	3	3	3	Pin 15
A8	23	23	25	25	25	0V
A9	22	22	24	24	24	0V
A10	19	19	21	21	21	0V
A11	—	21	23	23	23	0V
A12	—	—	2	2	2	0V
A13	—	—	—	26	26	0V
A14	—	—	—	—	27	OV
O0	9	9	11	11	11	Pin 12
O1	10	10	12	12	12	Pin 11
02	11	11	13	13	13	Pin 10
03	13	13	15	15	15	Pin 9
04	14	14	16	16	16	o/c
05	15	15	17	17	17	o/c
06	16	16	18	18	18	o/c
07	17	17	19	19	19	o/c
Gnd	12	12	14	14	14	0V
Vpp	21	20	1	1	1	0V
OE	20	20	22	22	22	0V
CE	18	18	20	20	20	0V
Vcc	24	24	28	28	28	Pin 16
PGM	—	—	27	27	—	0V

Suggested 2m Channels

Chan	2m ch (sw down)	2m ch (sw up)
16	R0	Rev R0
1	R1	Rev R1
2	R2	Rev R2
3	R3	Rev R3
4	R4	Rev R4
5	R5	Rev R5
6	R6	Rev R6
7	R7	Rev R7
8	S8	S16
9	S9	S17
10	S10	S18
11	S11	S19
12	S12	S20
13	S13	S21
14	S14	S22
15	S15	S23

EPROM Substitution

If you use a more commonly available EPROM, you can simply mount this on a piece of copper strip board such as Veroboard, with wires taken to the appropriate pins of the empty PROM socket on the board, possibly using a blank IC 'header' for ease of connection. With this simple 'wire to wire' wiring, with no additional components, a purpose-made PCB probably isn't justified - we're trying to keep costs down here!

Throughout this article, all pin numbers referring to PROM connections are those of an 82S129 16 pin IC fitted in the IC PROM socket on the MX294 (pin 1 to pin 1), and not the pin connections of any 18 pin IC socket that may be fitted.

Programming Codes

If you need to work out your own frequency codes, here's how to do it. The NJ8813 synthesizer IC requires 4 sequential binary 'words' of 4 bits each for each TX or RX frequency. On the 82S129 PROM, it addresses the A0 (pin 5) and A1 (pin 6) lines to obtain these, the A2 line (pin 7) is used to switch between RX (binary 0) and TX (binary 1). The next four address lines, A3 (pin 1), A4 (pin 2), A5 (pin 3) and A6 (pin 4) are the 16 channel binary address from the channel switch, and A7 is the 'LK2' address for 'moving up' 16 channels. It would be worthwhile testing and noting down which address lines correspond to which positions of channel switch for your particular rig, as two types of channel switch have been used in sets.

The first four 'words' programmed in your PROM/EPROM thus contain Chan 1 RX information, the next four contain Chan 1 TX, the next four Chan 2 RX, the next four Chan 2 TX and so on. All these frequencies are the VCO frequency. For transmit, this is simply the transmit frequency, but on receive it is the local oscillator injection frequency, which for both 2m and 4m is 10.7MHz above the required receiver frequency. If your set is a (rare) 'AW' band unit (148-174MHz wide band), identified by a 21.4MHz crystal filter (marked 21xxxx on the top), then use an injection frequency of 21.4MHz *below* the receive frequency.

Take a look at the colour of the thin PCB between the large HEF4750 IC and its socket. If it's blue or red, the synthesizer reference frequency (i.e., the minimum channel step) is 6.25kHz, as found on virtually all sets in the UK. If it's green (rare in the UK), it's 5kHz. This is important when you work out the codes, a 5kHz reference means you won't be able to program 12.5kHz channel steps, only multiples of 5kHz. The reference frequency is present as a square wave on pin 25 of the HEF4750 if you're in doubt. *Note that all codes given in the tables in this article are for the commonly found 10.7MHz receiver IF and reference frequency of 6.25kHz.*

The method of calculating the codes required is;

1) divide your TX or RX injection frequency in MHz by 0.00625 (6.25kHz, the reference frequency - substitute 0.005 if your's is a 5kHz reference set).

2) Subtract 3840 from this number.

3) Convert this to a four digit hexadecimal word, DCBA, with D as the MSD (most significant bit) and A as the LSB (least significant bit). To do this, first divide the number by 4096, the remaining integer (i.e., the 'whole' number, not the fraction) is 'D', the MSB. Write this down, then subtract this number from your result to leave you with the 'fraction' only. Multiply this by 16. The integer is then 'C'. Write this down, then subtract this number to leave the fraction, then multiply this by 16. The integer is 'B', write this down and subtract it again to leave the fraction, then multiply by 16. The remaining number is 'A' (you may find this is not an exact number, but something like 7.9996 - in which case the answer is 8, the nearest whole number).

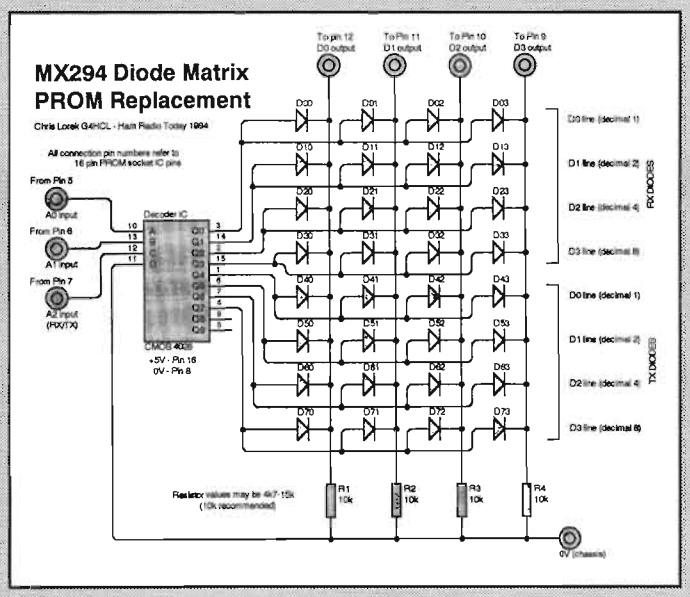
4) Now rearrange this combination from DCBA to BCAD. This is the order in which the synthesizer reads the information, B first, then C, then A, then D, and this is the order you need to pro-

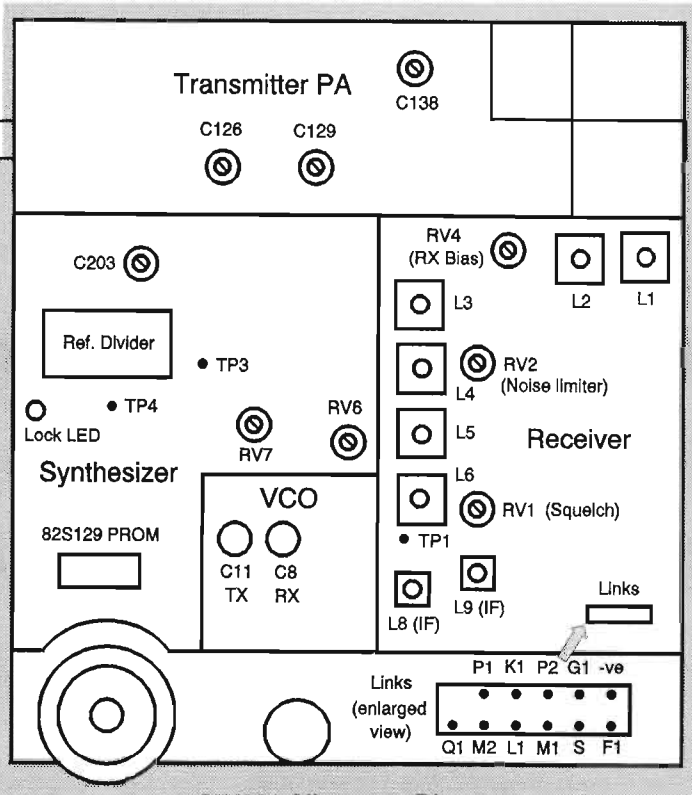
4m PROM Codes

Freq.	RX BCAD	TX BCAD
70.2500	EC81	9382
70.2625	ECA1	93A2
70.2750	ECC1	93C2
70.2875	ECE1	93E2
70.3000	FC01	A302
70.3125	FC21	A322
70.3250	FC41	A342
70.3375	FC61	A362
70.3500	FC81	A382
70.3625	FCA1	A3A2
70.3750	FCC1	A3C2
70.3875	FCE1	A3E2
70.4000	0D01	B302
70.4125	0D21	B322
70.4250	0D41	B342
70.4375	0D61	B362
70.4500	0D81	B382
70.4625	0DA1	B3A2
70.4750	0DC1	B3C2
70.4875	0DE1	B3E2
70.5000	1D01	C302

2m PROM Codes

Freq.	RX BCAD	TX BCAD
144.500	32C5	8BC4
144.525	4205	9B04
144.550	4245	9B44
144.575	4285	9B84
144.600	42C5	9BC4
144.625	5205	AB04
144.650	5245	AB44
144.675	5285	AB84
144.700	52C5	ABC4
144.725	6205	BB04
144.750	6245	BB44
144.775	6285	BB84
144.800	62C5	BBC4
144.825	7205	CB04
144.850	7245	CB44
144.875	7285	CB84
144.900	72C5	CBC4
144.925	8205	DB04
144.950	8245	DB44
144.975	8285	DB84
145.000	82C5	DBC4
145.025	9205	EB04
145.050	9245	EB44
145.075	9285	EB84
145.100	92C5	EBC4
145.125	A205	FB04
145.150	A245	FB44
145.175	A285	FB84
145.200	A2C5	FBC4
145.225	B205	0C04
145.250	B245	0C44
145.275	B285	0C84
145.300	B2C5	0CC4
156.325	C205	1C04
145.350	C245	1C44
145.375	C285	1C84
145.400	C2C5	1CC4
145.425	D205	2C04
145.450	D245	2C44
145.475	D285	2C84
145.500	D2C5	2CC4
145.525	E205	3C04
145.550	E245	3C44
145.575	E285	3C84
145.600	E2C5	3CC4
145.625	F205	4C04
145.650	F245	4C44
145.675	F285	4C84
145.700	F2C5	4CC4
145.725	0305	5C04
145.750	0345	5C44
145.775	0385	5C84
145.800	03C5	5CC4
145.825	1305	6C04
145.850	1345	6C44
145.875	1385	6C84
145.900	13C5	6CC4
145.925	2305	7C04
145.950	2345	7C44
145.975	2385	7C84
146.000	23C5	7CC4





MX294 Alignment Diagram

gram each frequency into your EPROM in.

5) Try a couple of examples, like 145.500 and 145.750, you can and check these against the sample listings.

Diode Matrix

If you just want the set for a single channel, e.g., for packet, then you can use a low cost CMOS IC plus a few diodes and resistors rather than a PROM or EPROM. I developed the circuit shown here for my 4m MX294 to be used on the Isle of Wight packet node on 70.3125MHz. Simply fit the diodes needed to give you the correct binary 'words' for each address, in the same BCAD order. A diode present gives a '1', no diode gives a '0'. Again, due to the simplicity of the circuit, a PCB may not be necessary, I built mine on a small piece of Veroboard.

Binary/Hex Translation (for diode board)

HEX	Binary			
	MSB			*LSB*
	D3x	*D2x*	*D1x*	*D0x*
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Alignment

Assuming you have a programmed PROM plugged into the set, or a correctly programmed EPROM on a 'piggy-back' board suitably wired to the original PROM socket, you can start. I warn you, this won't take long! Ensure you use a *non-metallic* trimming tool for adjustments, never, *ever,* a metal 'jeweller's screwdriver' or similar, for the receiver ferrite coils and the transmitter PA trimmers. Connect a 3-8 ohm speaker to the rear blue/brown speaker lead, and a microphone to the 5 pin 270 deg. mic connector (pin 1 - mic live, pin 2 - mic ground, pin 5 - 10V output, pin 3 - 10V input for TX, i.e., short pins 3 and 5 for TX PTT, pin 4 is low level RX o/p).

First, adjust the multiturn RX VCO trimmer until the red 'lock' LED lights - then tune for a voltage of around 6.5V on TP3 on your 'centre channel'. Rotate RV1, the RX squelch control, until you hear noise from the speaker. Now, simply adjust all six front end coils L1-L6 for best 'quieting' of a received signal, reducing the level of the signal as needed. Reset the squelch, and that's it for the receiver.

With a 50 ohm dummy load connected to the aerial connector via a power meter, key the transmitter and adjust the TX VCO trimmer until the 'lock' LED lights, then for 6.5V on TP3 on your 'centre' channel. Initially set RV4 fully clockwise (maximum power) and simply adjust the three TX PA trimmers C126, C129, and C138 for maximum transmit power. You'll probably find you get around 40W or so. Readjust RV4 to the power output you wish, either maximum or reduced to around 25W if you intend having 'long overs'.

RV6 sets the transmitter deviation, however you'll also need to adjust RV7, which is the modulation balance control. With either an oscilloscope (if you have one), or a high impedance AC millivoltmeter, connected to TP7, adjust RV7 for minimum reading (i.e., to 'null' the 'stepped' AC waveform to zero at this test point), at the same time as you're modulating the rig with audio from the microphone.

You shouldn't need to make any other adjustments, although C203 sets the frequency of both TX and RX in case you find this is off frequency for some reason.

That's it. You now have a working 2m or 4m synthesized rig, have fun!

EPROM Service/Circuit Diagrams

I have made arrangements to have a limited quantity of 2764 EPROMs programmed for the 2m frequencies shown in the suggested channel table, on a 'no profit' basis, to be made available for the benefit of readers (it'll cost you a donation of £5 towards equipment for my local school amateur radio club station, plus p/p for the IC). If you'd like one, call me on 0703 262105 between 6.30-8.30pm weekday evenings for ordering and availability information. Alternatively send an SAE marked 'MX294' to Chris Lorek, c/o HRT Editor (address at the rear of the magazine) for an information sheet. Please do likewise if you'd like to receive a complete circuit diagram for the MX294, we'll be pleased to provide this free of charge to readers.

PMR Conversions in HRT

Where to find those missed PMR Conversions

Many readers contact us each week to ask for details of PMR conversions, and in many cases these have been published in HRT. There's plenty 'in the pipeline' here just waiting to be published, including more Storno, Kenwood, Pye, and Motorola rigs, but here's an index of those we've published in past issues;

PMR Radio Featured	Appeared in issue dated
Pye A200 Amplifier for 2m, 4m, and 6m	Sep 1986
A200 'M' band conversion to 2m	Apr 1987
Burndept Ex-Police UHF portable to 70cm	Dec 1990
Burndept BE448 to 2m	Jul 1990
Pye Europa MF5/MF25 to 2m and 70cm	Mar 1989
E band Europa to 4m	Sep 1987
P band Europa to 4m	Jan 1991
M band Europa to 2m	Aug 1991
Pye M294 A, B, and E band to 2m and 4m	Jan 1993
Pye M294 M band to 2m	Jul 1993
Pye M296 to 70cm	May 1993
VHF Pye Olympics, M202 range including M band, for 2m and 4m	Apr 1991
UHF Pye Olympics, M212 range to 70cm	May 1991
Pye PMR2 high power remote mount to 2m FM	Feb 1992
PF2/PF5 Pocketfones to 70cm	Feb 1986
PF2/PF3 Pocketfones to 4m	Sep 1987
Pye PF1 Pocketfones to 70cm	Jun 1986
Pye PF85 UHF portable to 70cm	Jan 1992
MF6AM Reporter to 4m AM	Sep 1987
SR1 Pager to 2m monitor receiver	Jun 1987
Pye SSB 130 100W HF rig	Jan 1989
Storno CQM 5114S (Synthesized VHF rig)	Nov 93
Storno CQM 644 (Synthesised mid-band version) to 2m	Aug 1992
Storno CQM 713E conversion to 2m	Mar 1987
Storno 900 to 2m packet	May 1992
Pye Westminster to 2m and 4m FM	Mar 1986
Pye W15AM and W30AM Westminsters to 4m AM	Sep 1987
E band Westminster conversion to 6m	May 1989
P band Westminster to 4m and 6m	Nov 1990
M band Westminster to 2m	Mar 1991
W15U Westminster to 70cm	Apr 1986

Add-on projects to use with your converted PMR rig

10-Channel Scanner	Apr 1992
Crystal controlled tone burst	Aug 1992
Plug-in Toneburst for the Pye Olympic	Mar 1993
VFO for 4m and 6m ex-PMR rigs	Nov 1986

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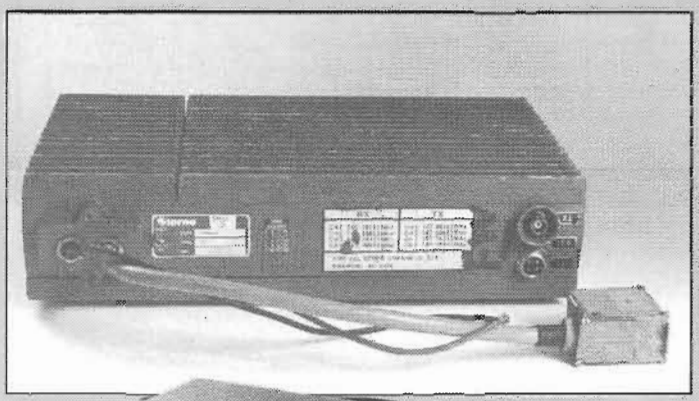

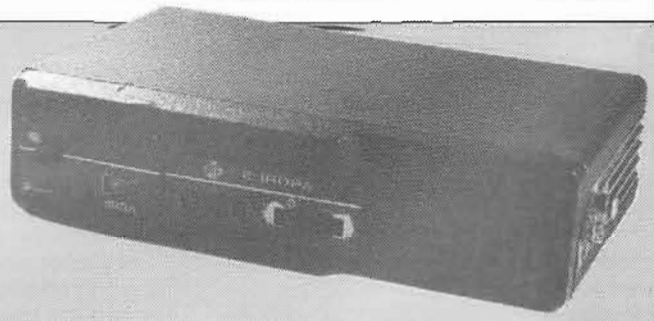

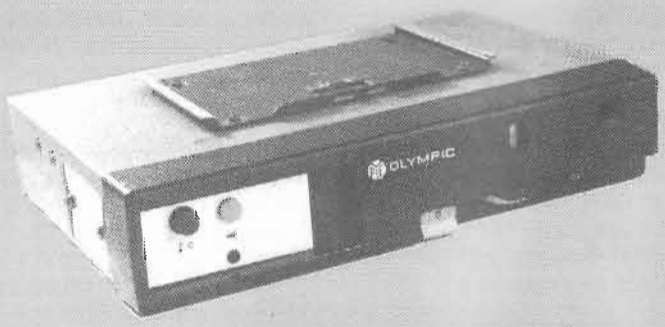

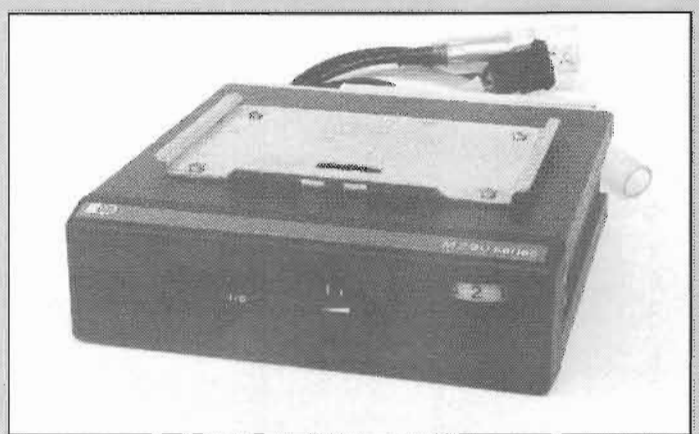

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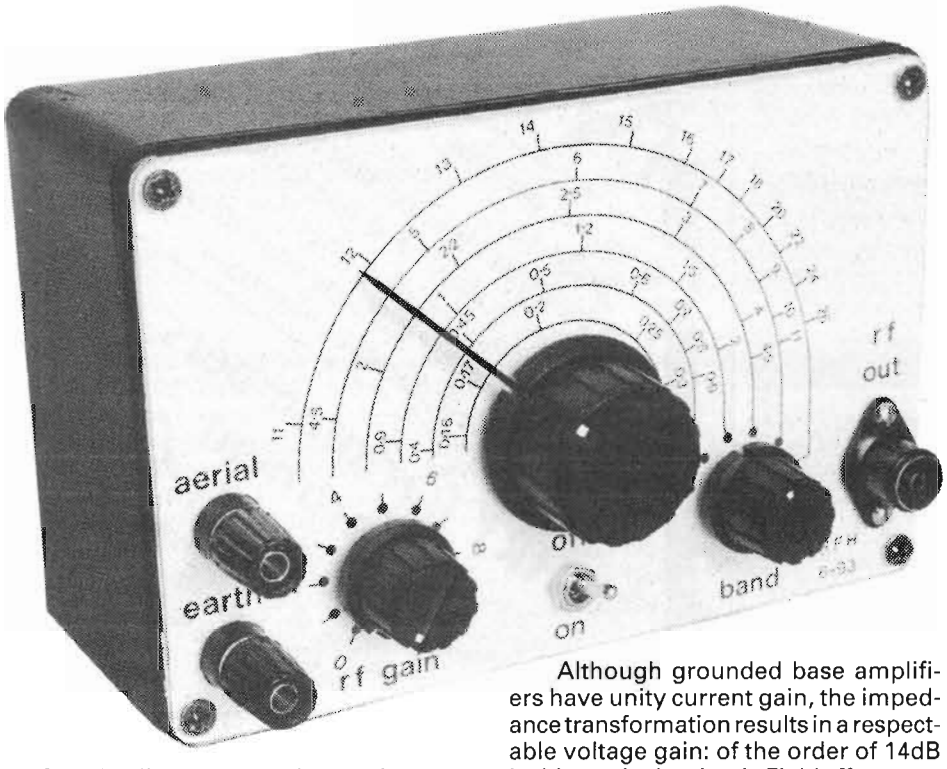
Project - HF Receiver Preselector

Raymond Haigh describes an add-on preselector for your HF receiver



Simple direct conversion and regenerative receivers often suffer from a lack of sensitivity and breakthrough from strong signals on adjacent channels. With basic superhets, the problem is more often image responses (the reception of the same station at more than one setting on the tuning dial, usually spaced by twice the receiver's intermediate frequency).

The additional front-end selectivity provided by this inexpensive, easily constructed unit reduces vulnerability to adjacent channel interference and image signals, and the extra gain gives a worthwhile boost to sensitivity. Frequency coverage is comprehensive, and guidance is given on connecting the preselector to domestic transistor portables where it can effect a dramatic improvement in performance.

The circuit

The circuit is shown in Fig. 1, where the aerial is coupled via capacitor, C1, and gain-control potentiometer, R1, to the emitter of the grounded base RF amplifier, TR1. The output impedance of transistors arranged in the grounded-base mode is high (typically of the order of 1 M ohm) and damping on the tuning inductors, L1-L6, which form the collector load of TR1, is, therefore, light.

Although grounded base amplifiers have unity current gain, the impedance transformation results in a respectable voltage gain: of the order of 14dB in this particular circuit. Field effect transistor, TR2, is connected as a source follower. The input impedance of this stage is extremely high, again imposing negligible damping on the inductors, and its low output impedance minimises coaxial cable losses and ensures a reasonable match with most receiver inputs. This light damping enables the single tuned circuit, formed by the switched inductors and the variable capacitor, C3, to provide a significant increase in front-end selectivity. Moreover, using transistors as impedance matching devices in this way eliminates the need for coils with multiple windings, and range switching is considerably simplified.

R2 and R3 bias TR1, and C2, C6 and C7 are decoupling capacitors. Output is developed across R6, the source load resistor for TR2, and C4 and C5 act as DC blocking capacitors. Adoption of the grounded base mode maximises the working frequency of individual transistors and there is a tendency for TR1 to be affected by parasitic oscillations when C3 is set close to minimum capacitance. This was overcome by selecting a transistor with the comparatively modest fT of 50 MHz and the use of stopper resistor, R4.

Components

Toko coils and a miniature film-dielectric tuning capacitor were chosen for the prototype unit as they enable full coverage and a compact layout to be achieved at modest cost. The coils are available from Cirkit and the tuning capacitor is retailed by Maplin. The capacitor is a 140 + 60 pF type and is supplied complete with a small, bolt-on spindle extender. In this application both sections are connected in parallel to give 200 pF. Most small signal NPN

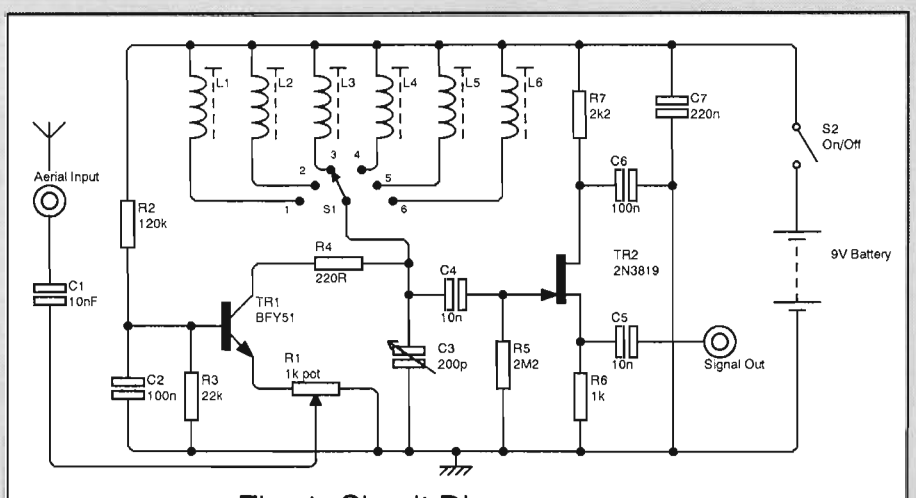


Fig. 1 Circuit Diagram

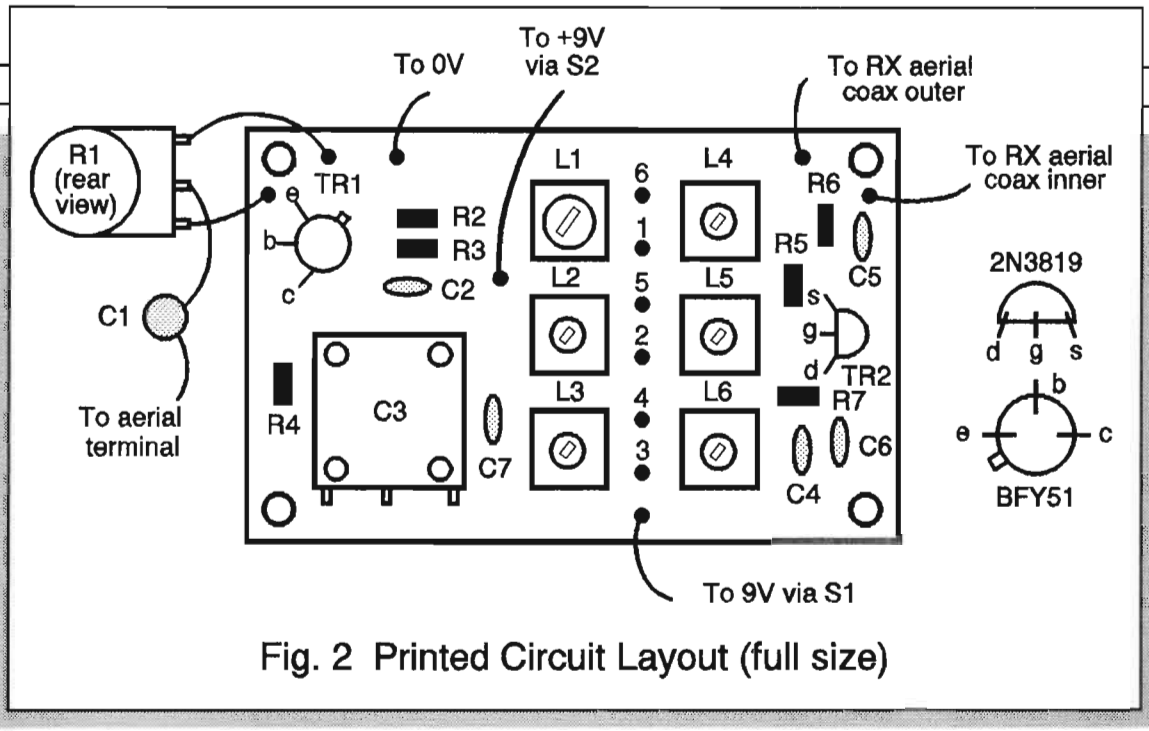
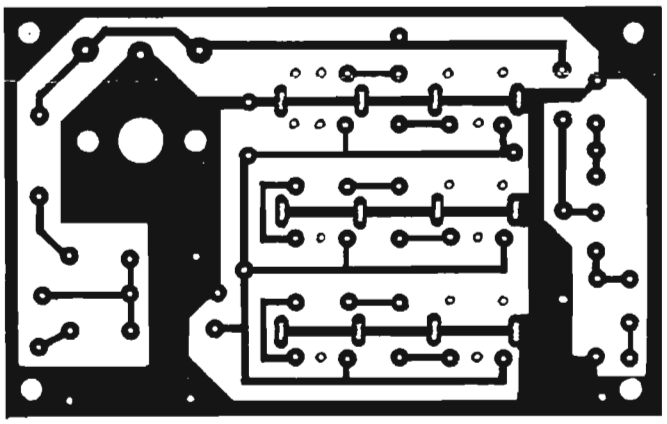


Fig. 2 Printed Circuit Layout (full size)



transistors will work well in the TR1 position but the specified device avoids the risk of parasitic oscillation.

Construction

With the exception of C1, R1, S1 and S2, all of the components are mounted on the PCB illustrated in Fig. 2. Separate windings on L1 and L2 are connected in series in order to increase inductance and achieve the desired low-frequency coverage despite the limited swing of C3. L3 has six pins and a multimeter set to the ohms range should be used as a continuity tester to locate the required tuned winding and ensure correct orientation of the component on the board. (There are three separate windings on this coil but only one is brought out to pins on either side of a screening can solder tag).

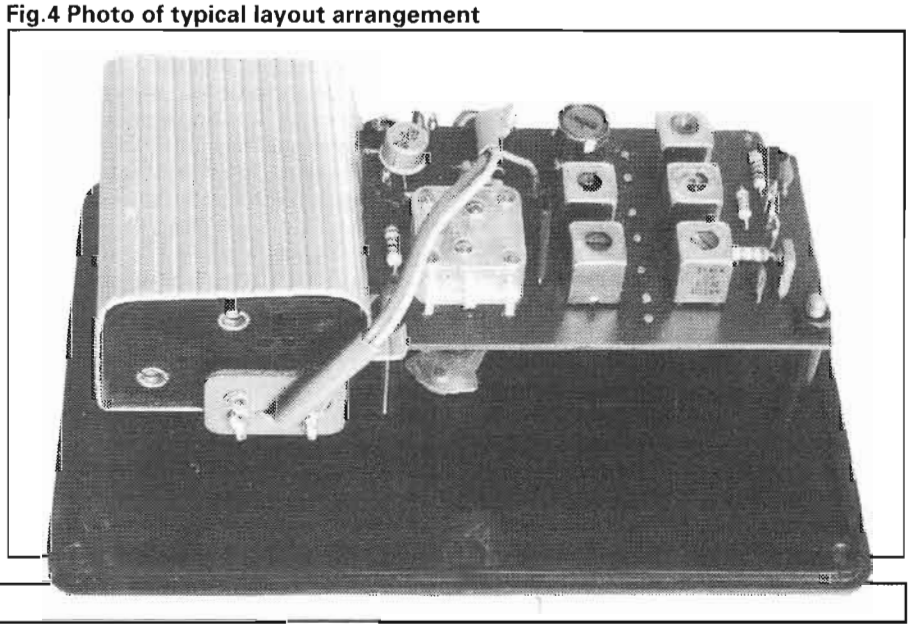
Vero pins inserted at the lead-out points ease off-board wiring, and the use of pins for the transistor leads makes it easier to experiment with alternative devices or carry out substitution checks. Note that the pins for the lead-outs to the range switch, S1, project on the copper track side of the board. The pin numbers relate to the range switch tag sequence, viewed from its spindle end. If the switch is wired up in this way the control knob pointer will align sensibly with the bands on the tuning dial, as shown in Fig. 3. Check that the fixing bolts for C3 will not project through the case of the component and foul the vanes.

The prototype unit was assembled inside a 150 X 100 X 60mm ABS plastic box, all of the components being fitted to the lid which forms the front panel. The PCB was mounted over the range switch on 25mm stand-offs and a coupler, extension shaft and bush were required to bring the spindle of C3 out to the front panel. (A long enough length of spindle will probably have to be cut from R1 or S1 and a bush can be salvaged from an old potentiometer). Fig. 4. makes the arrangement clear.

Wire up the range switch to the pins on the board using short lengths (no more than 25mm) of insulated wire and test the unit, as described below, before fixing it behind the front panel. A pack of six AA cells in a plastic holder was used to power the preselector. The battery pack was retained in a box formed from thin aluminium and secured to the stand-offs which support the PCB.

The front panel layout is shown in Fig. 3. Dial and panel markings were drawn onto thick cartridge paper and rub-down lettering was used to indicate control functions and dial calibration. The paper was protected by 1.5mm

Fig.4 Photo of typical layout arrangement



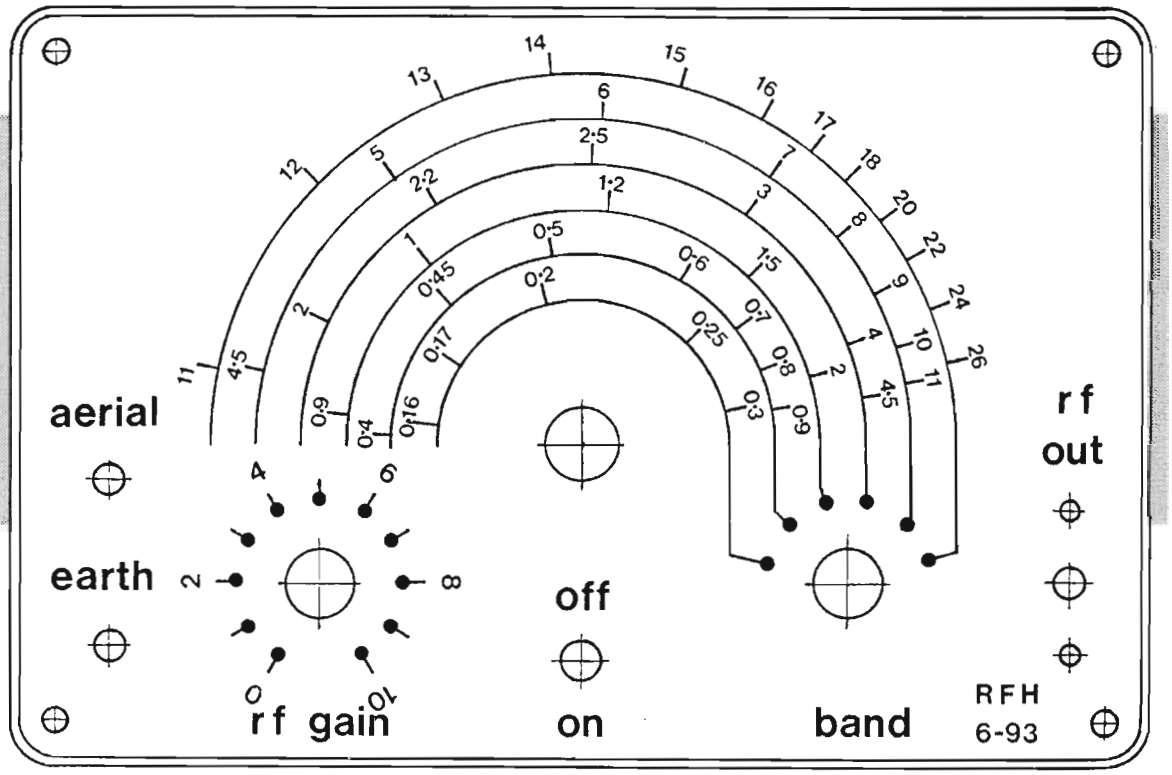


Fig.3 Panel Layout (full size)

Perspex sheet, but the self-adhesive film sold by stationers would be a cheaper alternative.

Setting up and calibration

Check for poor soldered joints or any bridging of the copper tracks on the PCB, and check the orientation of the transistors. If all is in order, temporarily wire up R1 and connect a fresh 9V battery. Current drain should be of the order of 2.5mA. Connect the preselector to a receiver via a short length of coaxial cable and connect an aerial and earth. With the receiver switched to appropriate bands, check that signals can be peaked by C3 with S1 set to each of the six ranges, and that R1 controls the gain of the unit. If all is in order, mount the components on the lid of the plastic box and permanently connect R1, S2, the aerial and earth terminals and the coaxial socket to the PCB. Note that C1 is connected between the slider of R1 and the aerial terminal.

The specified Toko coils give coverage from 160KHz to 30MHz with only a small break between 400 and 300KHz, caused by the limited swing of C3. It is unlikely that constructors will find this gap a drawback. If they do, it can be eliminated by adjusting the cores of L1 and L2, but coverage on long waves will then be limited to about 170KHz.

Set the internal trimmers of C3 to minimum before adjusting the coil cores to fix range coverage. It is best to calibrate the dial of the preselector against the receiver with which it is to be used. Simply tune the receiver over the bands, setting it's dial pointer to round-figure markers, adjust C3 on the preselector for maximum signal or noise, and mark the dial on the unit accordingly.

Using the preselector

Connecting the unit to receivers with aerial and earth terminals is a simple matter. Portables with ferrite and telescopic rods are less straightforward, and the case of these radios has to be opened up to enable minor modifications to be carried out. Constructors who have no experience of mains powered equipment should disconnect the set from the supply and fit batteries before exposing the wiring.

For medium and long waves, wind two or three turns of insulated wire around the centre of the ferrite rod and connect one end of this winding to the core and the other to the outer braid of the coaxial cable. Try connecting the braid end to the 'earth' side of the receiver wiring, also this can improve results.

The telescopic rod on transistor portables is usually connected to the 'hot' end of the RF stage short wave tuning coils via a low value capacitor. If an attempt is made to connect the preselector to the telescopic rod, results will almost certainly be disappointing because of the severe impedance mismatch. Although these RF coils do not have a separate aerial winding, they do have a low impedance tapping or winding which feeds the base of the mixer/oscillator transistor. Try connecting the unit via this.

The preselector was used in this way with three transistor portables and, with four metres of wire as an aerial, faint signals could be lifted out of the noise enabling the portable to reproduce them clearly, free from spurious responses and at good volume.

Simple regenerative receivers must, of course, also have a low impedance aerial winding or connecting the preselector will damp the tuning coil and inhibit regeneration. The unit gives a very worthwhile boost to the sensitivity and selectivity of this type of receiver and, by isolating the detector from the aerial, tends to make the regeneration control easier to adjust.

Superhets with a standard 450-470 KHz IF and a single RF tuned circuit suffer badly from image responses on the short wave bands. The additional front-end selectivity afforded by the unit considerably eases this problem. Keep the preselector tuning in step with the tuning control on the main equipment and avoid setting the gain control too high, even with quite short aerials it is possible to heavily overload the receiver.

Components list;

Resistors; all 0.25W, 5% tolerance.

R1 1k linear potentiometer.
R2 120k
R3 22k
R4 220R
R5 2M2
R6 1k
R7 2k2

Capacitors;

C1, C4, C5	10nF (.01µF) ceramic.
C2, C6	100nF (0.1µF) ceramic.
C3	200pF (140 + 60pF) miniature tuning capacitor.
C7	220nF (0.22µF) ceramic.

Inductors; all Toko.

L1 CAN1A350EK (red)
L2 RWO6A7752EK (green)
L3 YMRS16726Z (red)
L4 154FN8A6438EK (violet)
L5 154FN8A6439EK (yellow)
L6 KXNK3767EK (pink)

Transistors;
TR1 BFY51
TR2 2N3819

Sundries;
S1, one pole, six way switch; S2, miniature toggle switch; spindle coupler, (shaft and bush, see text); aerial and earth terminals, coaxial socket, control knobs, PCB materials, Vero pins, connecting wire, battery holder and connector; ABS plastic box for case, 150 x 100 x 60mm minimum.

SCANNERS

Pro-Am Mobile Glassmount Scanner Aerial Review

Chris Lorek goes glassmount mobile with Pro-Am's 30-1200MHz wideband aerial

When using your handheld scanner in a car, a suitable aerial fitted to the outside of the vehicle can make a tremendous difference. 'Putting up' with the scanner's set-top aerial is OK as a temporary measure, but you won't get the best from your scanner. Purpose-designed mobile scanners will, of course, always need some form of external aerial.

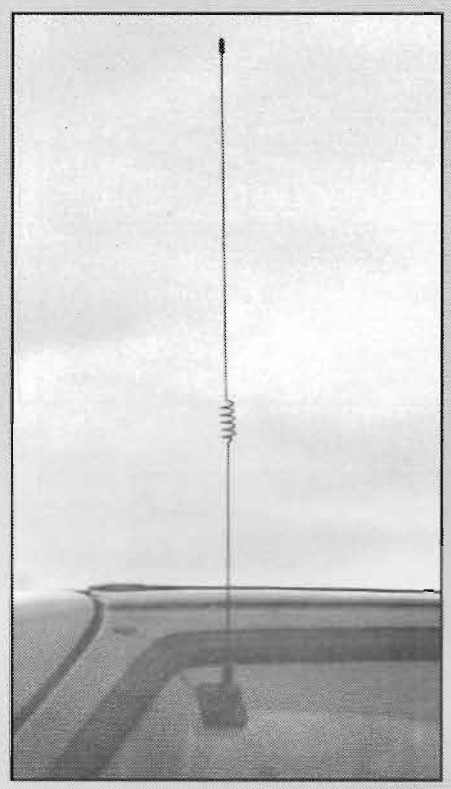
If you'd prefer not to drill holes or clip aerial mounting brackets to your car gutter or boot lip, then a glass-mounted wideband aerial could be useful. A 'glassmount' aerial sticks onto one of the windows of your car, usually the rear windscreen, using the glass as a 'dielectric' between the inner and outer fittings. Waters and Stanton Electronics have recently started to distribute what could be an ideal aerial, which is designed for wideband scanner receive-only use over 30-1200MHz.

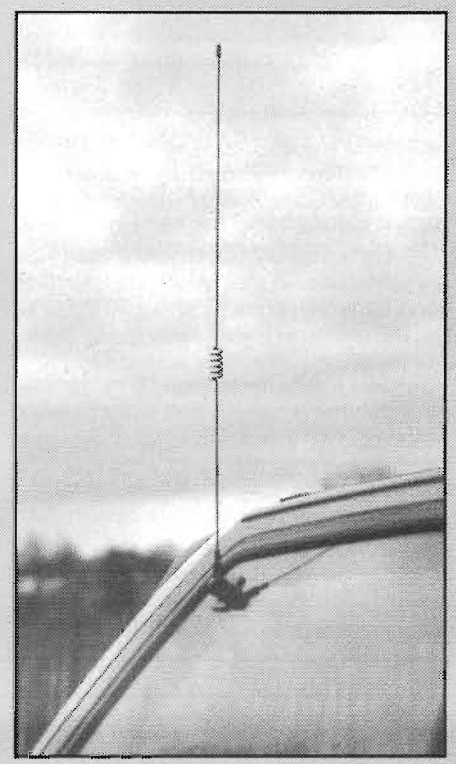
This is the Pro-Am TGSBNC, and it comes with everything you need for installation and use, right down to the BNC plug at the end of the length of coax, and after fitment the aerial element itself can be unscrewed from its base for carwashes or security against other damage when not in use. The *Scanners* team were fortunate in being able to test one 'first hand'.

Listening on the Move

It only took me a few minutes to fit the aerial, this having a very smart appearance as you can see from the accompanying photo. If you're fitting one of these, make sure you get the position 'right first time' (check the travel of windscreen wipers) as it's very difficult, if not impossible, to change once it's stuck! A remounting kit is, however, available should you change cars.

As I expected, the improvement in performance when 'listening on the move' was tremendous. I found the greatest improvement was on the VHF and UHF airband ranges, as I usually find reception of these (often weak) AM signals amongst the car's electronic ignition and other instrumentation interference can become quite a task, the squelch usually opening non-stop when scanning around! With the Pro-Am wideband scanner aerial positioned at the rear of the car, I had no problems at all in this respect.





Wideband Performance

The aerial also gave good performance on the other UHF ranges commonly used in the UK, although (probably not surprisingly) it wasn't as good as a purpose-designed dual band glassmount, also available from Pro-Am, on the 2m amateur band. I found lesser performance on the VHF 'low bands' (i.e., 30-88MHz) including the 47-50MHz range. However to be fair, the aerial is rather less than a quarter wavelength at these bands – the available capacitance through the glass no doubt having an effect here also. What *was* certain though, was that it was always a *lot* better across any of the 30-1200MHz range than my AM/FM car radio aerial 'plugged into' my scanner via an adaptor.

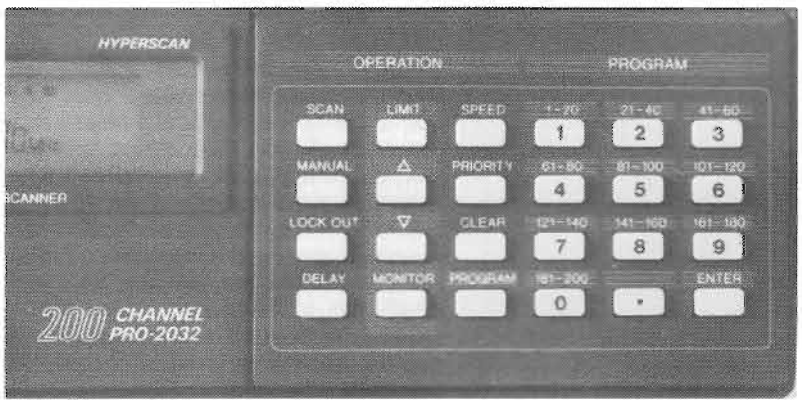
A test with my signal generator noise bridge showed the aerial gave a very good match to 50 ohms at around 120MHz and 340MHz, and at UHF and above, although it dropped off rapidly below 100MHz confirming the on-air results. However, this 'drop off' would be far, far worse, with a telescopic or helical aerial on your scanner, so I shouldn't complain too much!

Conclusions

The Pro-Am wideband glassmount is an easily-fitted and very unobtrusive aerial for mobile use, I liked it very much. It gave good performance, especially on the VHF and UHF airbands, and it certainly 'brought the scanner to life' in my car.

The Pro-Am TGSBNC is currently priced at £32.95, and my thanks go to Waters and Stanton Electronics for the provision of the review aerial.

Netset PRO-2032 Base Scanner Review



The 'Netset' range is getting quite well known as a 'high street scanner' name. Their latest addition is the Netset PRO2032 base/mobile scanner, designed primarily for table top use with its built-in Ac mains power supply, although using an optional 12V DC lead you can also use it in your car.

Offerings

The scanner offers coverage of 68-88MHz in 5kHz steps, 108-136.975MHz in 25kHz steps, 137-174MHz in 5kHz steps, 380-512MHz in 12.5kHz steps, and 806-960MHz (missing out the US cellular segments) in 12.5kHz steps. The scanner allows FM reception only apart from the 108-137MHz aircraft band range where AM is automatically selected for you. 200 memory channels are arranged into 10 banks of 20 channels each, and ten further 'monitor' memory channels are provided for quick manual storage of active frequencies you find in 'search' mode.

The PRO2032 has the very latest fast scan and search modes (which the manufacturers name 'Hyperscan'), giving 50 frequencies per second in search mode and 25 channels per second in memory scan mode.

The set measures 75mm (H) x 220mm (W) x 210mm (D) and weighs 1.65kg. It comes with a fitted AC mains cable with moulded-on UK three pin plug fitted with a 3A fuse (it's nice to see this 'proper' plug fitted), and a telescopic aerial which fits onto the top of the scanner for local listening. A BNC aerial connector on the rear panel lets you plug in an external aerial for more 'distant' listening. An external speaker socket is also fitted on the rear panel, plus a headphone socket on the front panel for 'quiet' listening.

In Use

For base use, a couple of lift-up feet are provided at the bottom of the set's plastic cabinet, making the keypad and volume/squelch controls easier to use on a desktop. The set was quite easy to use, the accompanying instruction manual giving worked examples which were very easy to follow. I found the 'monitor' memories could be used as handy 'temporary stores' of active frequencies the scanner had come across in 'search' mode – just pressing the 'Monitor' button automatically stored the frequency the scanner was listening to in the current monitor memory. Transferring these to within the set's 200 memory channel bank was also quite easy, a couple of button pushes doing the job.

Connected to my rooftop aerial system, I found the scanner gave 'so-so' performance, reasonable on airband but prone to receiving unwanted signals on other bands (such as distorted airband signals on the 2m amateur band). It seemed rather less sensitive on UHF than I'd have hoped, distant repeaters on 433MHz that were fully readable on a 70cm amateur handheld sometimes didn't even lift the squelch on the PRO2032.

As I always find with 'designed for the US rather than Europe' scanners, the 5kHz steps on VHF didn't always provide 'spot on' reception of 12.5kHz spaced signals, as used in the UK. However, the relatively wide bandwidth of the set's filters didn't produce any distortion from these slightly off-frequency signals.

Laboratory Tests

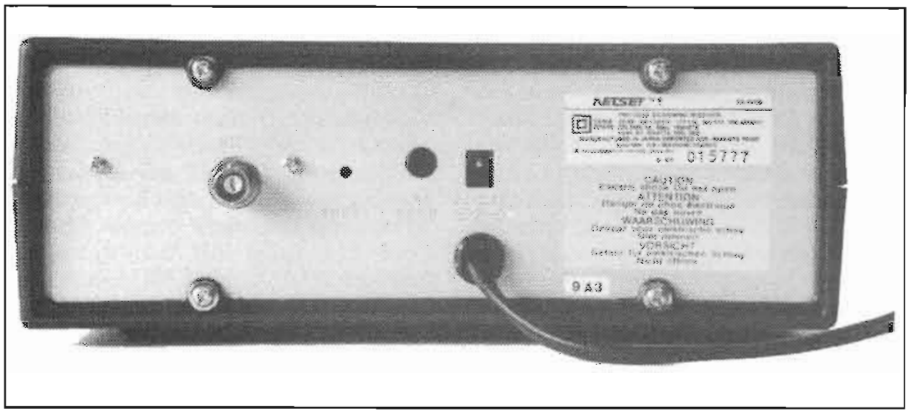
These showed the set to give a reasonable, although not superb, performance in terms of sensitivity (the ability to receive weak signals), especially on UHF. The extremely poor, in fact 'negative', rejection of image signals on UHF suggest the reason for this. Unwanted 'image' signals were actually received better than the signal the set was supposed to receive, i.e., that shown on its LCD. This however is often a limitation with low cost scanners, and the price you pay must be borne in mind here. There was very little rejection of 12.5kHz spaced channels. However, providing no other adjacent channel signals were present, this would allow reception of 12.5kHz spaced signals on the nearest 5kHz channel step without distortion. An 'added' advantage would probably also be lesser distorted reception of weather satellite signals on 137MHz, plus the deliberately offset AM aircraft band signals. The rejection of 25kHz spaced signals, and those further away (apart from the 'image') was in fact quite good, and the set gave a good performance in this respect.

Conclusions

The PRO-2032 is an easy-to-use scanner,

allowing reasonable reception of 25kHz spaced signals on FM (even when offset by 12.5kHz) as well as giving coverage of the AM civil aircraft band. The set's wide availability and economic price should make it a popular 'buy', although its technical performance understandably isn't up the class of its 'bigger brothers' such as the very popular PRO-2006 marketed by the same distributors.

My thanks go to Link Electronics in Peterborough for the loan of the review set.



LABORATORY RESULTS:

Sensitivity;

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

Freq.	*Sensitivity*
68MHz	0.22
78MHz	0.25
88MHz	0.25
118MHz	0.47 (AM)
130MHz	0.49 (AM)
145MHz	0.28
160MHz	0.29
174MHz	0.33
400MHz	0.54
435MHz	0.69
450MHz	0.73
500MHz	0.44
512MHz	0.37
806MHz	0.59
850MHz	0.78
900MHz	0.59
935MHz	0.61
950MHz	0.62
960MHz	0.67

Squelch Sensitivity;

Level of signal required to raise receiver squelch

Threshold; 0.28µV pd (12dB SINAD)
Maximum; 1.06µV pd (30dB SINAD)

Blocking;

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

+100kHz;	74.7dB
+1MHz;	85.2dB
+10MHz;	86.4dB

Intermodulation Rejection;

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

25/50kHz spacing;	51.2dB
50/100kHz spacing;	52.8dB

Maximum Audio Output

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

1.65W RMS

Image Rejection

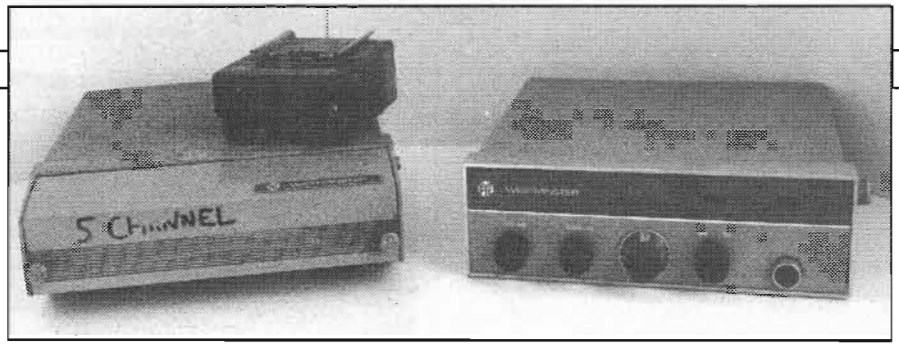
Difference in level between unwanted and wanted 1st image signal levels (-21.4MHz), each giving 12dB SINAD signals;

145MHz;	25.4dB
435MHz;	-3.6dB
935MHz;	4.2dB

Adjacent Channel Selectivity;

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

+12.5kHz;	4.0dB
-12.5kHz;	2.4dB
+25kHz;	58.7dB
-25kHz;	59.4dB



The Lothians Club Net

Mel Evans GM6JAG tells how his club got a net going 'cheaply' by using ex-PMR radios

Could you put 28 people on the air on 70cm for around £350? Well we did, and perhaps after reading this short article, so could your club! Perhaps I should start by explaining who we are and take it from there.

We are the 'Lothians Radio Society' and we are based up here in the capital of Scotland, the city of Edinburgh. We meet every two weeks, the second and fourth Wednesdays of each month, and we have about 40 members. Amongst our membership we have four or five 'professional' amateurs, myself included. By that I mean people who are involved in radio to make a living, mostly in the repair of PMR-type gear for various public utilities.

At the Beginning

It all started when it became possible that some UHF Westminsters might be withdrawn from active service, and could be perhaps gifted to the club. After the initial shock wore off, we tried to think of a possible good use to which these rigs might be put, and eventually we decided on the idea of a club net. Most of our members live within the city boundary, and as Edinburgh is really quite a small city 70cms should cover most of the area without too much difficulty. The nominal 5W or so out of the Westminsters would be more than adequate with some reasonably efficient aerials in use. We decided then to 'go for it' and perhaps these notes may encourage you to do the same in your area!

Where to find them?

First of all, where do you get 40 plus Westminsters in the first place? We were lucky in that we were offered these sets by an amateur outside of the club, as a result of the sets being withdrawn from service. Many of the 'public utilities' in the UK have clauses in their constitutions forbidding the sale of surplus equipment, this may even extend to any part exchange value offered by the supplier of the new rigs. Much of the old stuff ends up in skips suitably disabled, or is taken away by the supplier of the new kit and then junked as part of the deal. Your job is locate any good potential sources in your area and let them know you exist as a radio club and could offer a caring home for any surplus gear that they may have. Why should they give you the old kit? Well, where a condition exists forbidding the sale of surplus gear, usually a rider to that provides that gear can be donated for educational or social reasons. What could be nearer the spirit of self-training than converting some old gear and using it as we did as a project! You could try your local Gas, Water, and Electricity Boards, plus the Council, drainage and social works departments, and of course roads, housing and public transport where they exist and use two-way radio.

Your best approach is to find out first if any of your members work for any of these bodies and can put you in touch with the person in charge of the radio system. If you have to go from scratch, then phone the user concerned and ask for 'Telecommunications' or whoever is in charge of their radio system. Once you have his or her name, then you can make contact by phone or letter and simply ask what they do with their old kit, going on to explain who and what you are and what you could do with any old gear they might donate. Be reasonable, give as much information as you can and don't expect a reply there and then, your contact may have to present a case to their superiors to clear kit in your direction. Whatever happens, follow up any phone call with a letter anyway, you could enclose a copy of this magazine to back up your case.

A lot of commercial radio users are in the process of moving frequency and updating systems just now, and you could just strike lucky as we did. If you do, be ready. The user will almost certainly want the gear uplifted in one batch in the week after they have installed the new kit, they will not be impressed by 22 calls from assorted radio club members at their premises. Be ready to uplift the kit when they specify and use as little transport and manpower as possible. Bear in mind that 40 Westminsters complete with control gear and cables will most certainly flatten a minivan completely. You need a couple of big estates or a transit type van to do the job properly. Once you've got them, remember also you have got to store them, and again, they do take up a fair old bit of space. Loft owners should think about the weight also!

PMR to Amateur

The technical bit is relatively easy thanks to 'Uncle Chris' and his Surplus 2-Way Radio Conversion Handbook. We found the best plan was first of all to check the sets out on their original frequency, making sure they are reasonably near specification before we started. There is no point at all trying to convert a non-working set! If you have a signal generator, output meter and dummy load plus a frequency counter, check the receiver and the transmitter for sensitivity and output, putting any failures to one side for spares or repairs later. We used some of our non-workers to provide extra silver plated wire required to retune the Westminster helicals, we also offered our members the BFY90 transistor to improve the front end on receive. We were again lucky, because when checking the sets on their original frequency, I found bells were ringing when I saw the receive crystal frequency. A quick 30 seconds with the pocket calculator showed it would go on 434.725MHz without change, this being the image of the original, i.e., the original frequency multiplied up, with injection at 'plus 10.7MHz' instead of 'minus 10.7MHz'. For the receive crystal we were then able to use the original commercial one, and we simply priced transmit

Problem Page

This month's problem answered is "How do I get going on packet without any packet software?"

Question; Derek Thomsom from Lanarkshire asks; *"How can I get into packet radio. I do own a CPC (Amstrad 464 plus), I do not have any software for packet, but I do have a great deal of interest in it. Is there a program for the 464 plus, or do I need to invest in another setup?"*

Answer; This is a very commonly asked question Derek, and we're sending you a HRT T-shirt as a small 'thank you' for your question. The other good news is that, as long as your computer has a serial port fitted (e.g. an RS-232 port), to 'talk' to the outside world, you don't need *any* specialized software for packet on your computer. All you need to use is a 'dumb terminal emulator' to communicate with the packet TNC (Terminal Node Controller) that fits between any computer or terminal and your rig - it's the packet TNC that does all the 'hard work'. You *can* buy dedicated packet programs for some computers for use with various TNCs, these programs being full of automatic 'bells and whistles', but these programs only add 'icing on the cake'.

The serial interface for the Amstrad 464 plus, which **is** an add-on unit, has an EPROM fitted with a built-in enhanced terminal emulator called 'Comstar', complete with file uploads/downloads to tape or disk etc. These interfaces, or 'clones' of them, are still available from some computer dealers if your CPC hasn't one fitted. We're told the built-in terminal emulator is extremely good, and that many amateurs use this very successfully packet.

It's a common misconception that amateurs need a computer for packet. All you need is a 'dumb terminal' to provide a 'human interface' in terms of a keyboard and display, to communicate with your packet TNC. Several bargain terminals can be found at rallies from about £5 upwards. You *will* however need a TNC, which the majority of amateurs around the World use for packet. We featured a low cost 'build-it-yourself' TNC in the March 93 issue of HRT, as well as several reviews of commercial types. Alternatives to a TNC are the 'Baycom' and 'Digicom' packet systems, where a packet modem (rather than a TNC) is used together with the computer handling the protocols. This however only works with Commodore computers (Digicom) and IBM PCs (Baycom) and this 'way into' the mode isn't applicable with the Amstrad 464 plus.

Please send your questions on any Amateur Radio related subject to:
Problem Page,
Ham Radio Today Magazine, ASP,
Argus House, Boundary Way, Hemel Hempstead,
Herts HP2 7ST

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crystals with three or four suppliers until we got the best price. Remember you are ordering 40 crystals to a standard commercial specification, and many suppliers will offer you around 25% off their list price for this size order of crystals all on one frequency. We did the same with the front end BFY90 transistors and then put the whole thing together to our members as a complete package deal. The Wessie plus speaker, cable and control gear, crystals, 'GT' kit of the front end transistor, plus enough wire to remake the helical resonators came to about £12.50 each, not bad for a 70cms set with 5W out?

A word to the wise. Make haste slowly if you intend to do this type of conversion. It is best to first make sure you have a working set on the original frequency, and then go through the suggested tune-up procedure. When you are sure you have a set working on the new frequency, albeit poorly, then, and only then should you think about the more permanent mods such as adding wire to the helicals and changing any transistors. With hindsight also, if we do this again, we will almost certainly order up sufficient of the correct trim tools and build this into the price. Despite our verbal warnings and 'Uncle Chris's' written ones, some people still persisted in using all sorts of objects including the dreaded jeweller's screwdrivers. Please note that this dreadful implement is almost certain death to coil cores, and should not be used even as a last resort.

For the actual conversion we first checked that all members had access to a suitable meter, we then showed them how and when to use it to do the tune-up by actually doing one 'live' on a club night. All our members then went away and did it themselves. We then gave another club night over for checking the converted sets over, and trouble shooting where necessary. The experienced PMR people were all up and running by this time and provided an on-air service where needed, in some cases using professional test sets to squeeze the very best out of each set.

Our Net

We now have over 25 people on air on a dedicated 70cm frequency, and less than a month later we were finding more and more local amateurs joining in on what is already known as the 'Lothians Club Net'. We have also equipped our SWLs with a set each but with no transmit crystals. Hopefully this will help them towards their tickets, as they all know we've got their transmit crystals sitting waiting for them when they pass!

So far, the talk has been of UHF Westminsters. If you get offered something on AM, or with strange split TX and RX frequencies, what can be done? Well, there is an all-mode section in the band plans and you could use AM there if you had enough sets to go around. If all else fails on these or on 'split band' sets, the PA section of what you are given might be useful together with the various changeover relays. If you get too many sets, think about packet or your local Raynet, a stand-alone dedicated set might be useful there. If you can get hold of some multi-channel sets you could always add in your local repeater crystals, not forgetting you should be able to listen on the input transmit to satisfy the license conditions.

Finally, what to do if your potential supplier tells you they are accepting a part exchange deal from the supplier? Easy, ask them to ask their supplier to give them the part exchange but let you have the sets. Almost certainly the old sets will be skipped anyway, and you can save the supplier the problem of uplifting and scrapping them!

Call us on 434.725MHz if you are ever in the area, you'll be made welcome.

Packet Radio —Roundup—

Chris Lorek G4HCL gets involved with TCP/IP EPROMs

From 1st February, i.e., just as this magazine becomes available, the UK 2m recommended bandplan has been changed to give additional spectrum for digital communications, which now allocates frequencies between 144.5125 and 144.6875MHz. This change *was* to have occurred in December, but it looks like additional time was needed for local users of these frequencies to adjust.

The recommended plan from the RSGB's Dat Communications Committee is seven 25kHz spaced channels;
144.525 MHz (high speed data, 24,48,9600 Bd)
144.550 MHz (secondary BBS access)
144.575 MHz (general packet operation, real time QSOs etc.)
144.600 MHz (FSK RTTY)
144.625 MHz (TCP/IP)
144.650 MHz (primary BBS access)
144.675 MHz (DX Cluster access)

Kent TCP/IP Group Formed

The acronym "TCP/IP" has recently become familiar to everyone interested in data communications. It stands for Transport Control Protocol/ Internetworking Protocol. It is a protocol used in all types of networks, from ones within a single office, up to the World-wide Internet.

Less well known is the fact that the use of TCP/IP is rapidly increasing on packet radio in the UK. Users in Kent have recently set up a group to help develop the network and encourage its use.

The greatest benefit of TCP/IP is its availability on almost all types of computer, which allows the transfer of files as well as mail and news bulletins. The software used is a multi-tasking system, which allows a user to carry out several activities at the same time.

Another benefit, particularly welcome to many users of packet radio, is the feeling that all users are part of the community. "We are very keen to encourage all users to work together to improve the network" said Chris Wallwork G6AHK, the Chairman of the new group. "We have already set up the basic links in the area by voluntary contributions, and hope to improve their speed and quality in the future."

The group mention that TCP/IP also has the benefit of greater reliability than some systems, which stems from its original development as a means of linking military and academic computers in the USA, but is of value for mail and file transfers on packet radio.

The TCP/IP network in Kent has links with radio amateurs in other parts of the Internet, in the UK and internationally, and the group is working to improve these links for users in the Kent and fringe areas.

You can get further information from Stuart Dixon G4IYK, who is the group's Secretary, either via packet or by post with an SAE to 33 Medhurst Crescent, Gravesend, Kent, DA12 1HJ.

KISS EPROMs

Patrick GW1SXN @ GB7OSP sent me greetings from Wales, and asks if I'll be covering TCP/IP and comparing the various versions of NOS TCP/IP programs? He's been told that some of these programs are slow, although he understands the faster version, which he has, is NET by KA9Q and PE1CHL. I'm hoping to continue this month's brief introduction in subsequent issues Patrick, as many packet users (including myself to start with) currently 'shy away' from it purely because it's seen as quite a 'mystic art'!

Patrick has a Tiny 2 TNC fitted with a JKISS EPROM, but says he was told by the Tiny 2 distributors that it was the wrong chip and that he should use the KISS EPROM. In contacting Phil Bridges of Siskin, he'd already sent Patrick EPROMs with two versions of JKISS, plus KISS, free of charge, so hopefully by now all should be OK!

What I'd always advise is that potential users go along with what's recommended by the originator of the driver software, as I have personally found that KISS mode, despite what TNC distributors may claim, is not the same between makes! I spent many infuriating hours trying to fathom out why my BPQ node would not communicate via RS-232 with my tiny Japanese-made portable TNC running KISS. Even the local SysOp experts at a monthly SUNPAC network coordination meeting couldn't work out what was wrong. 'Hands on' help then came from John G8BPQ himself (thanks John) who also couldn't see that I was doing anything wrong, but he told me he'd never used it with *that* type of TNC's KISS. Changing to a Kantronics KPC-3 running KISS solved everything. End of problem!

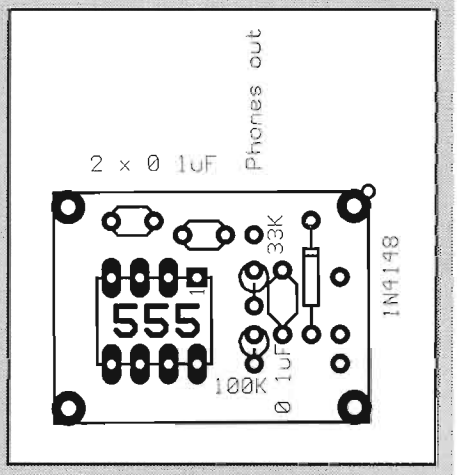
New BARTG Guide to Packet Radio

Several years ago, the British Amateur Radio Teledata Group (BARTG) published its Beginners Guide to Packet. Time has marched on, and they've now produced a completely new book aimed at the beginner to packet. Written by Ian G3NRW (of NOSintro fame), it gives a short and quite readable guide to the 'technicalities' of on-air packet systems. You'll need your TNC handbook to enable you to 'get started' with the various connections needed and setting your terminal's baud rates etc. - which I'm told is the biggest problem encountered by newcomers - but this book goes 'one further' by helping you in possibly understanding a little more of what's 'going on' after you've got everything connected up and working. As well as being a guide, it gives a useful reference section on where to get more information, even a nice 'plug' for this column (thank's Ian). The guide is available at £1.00 including p/p, from the BARTG publication manager Mark Ashby G6WRB, 47 Ryton Close, Luton LU1 5SR.

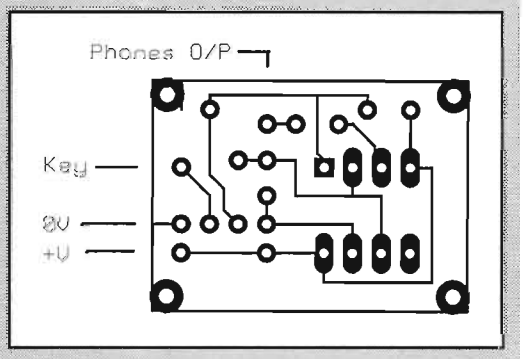
CTRL-Z, End of Message

The latest copy of ***Digicom***, the newsletter of the very active Midlands packet group ***Maxpak***, comes with details of node changes including node maps, and several pages of Brian G8ASO's excellent 'How Packet Works' mini-series. You can get membership information on Maxpak from Richard Nichol G1NZZ, 37 Thicknall Drive, Stourbridge, West Midlands DY9 0YH or via packet. Next month I hope to feature the East Lancs Packet Group.

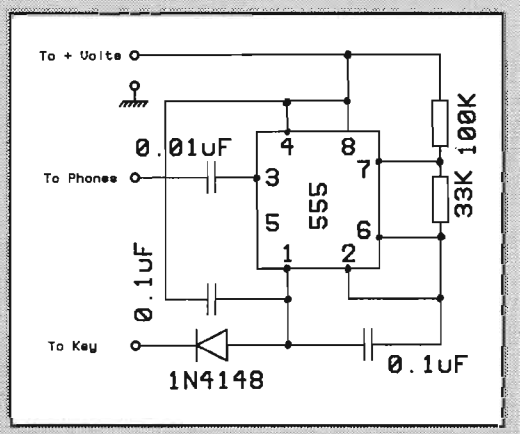
You can contact me with your news either on packet via GB7XJZ. #48.GBR.EU or the DX Cluster system, or by post via the HRT address. 73 from G4HCL @ GB7XJZ.



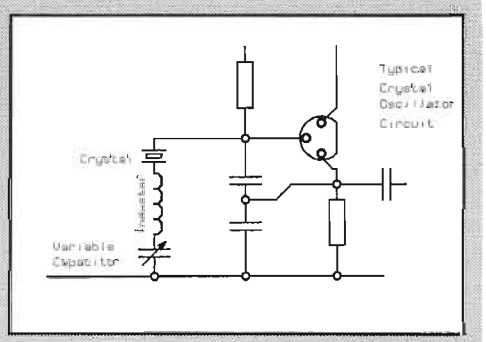
QRP Sidetone parts layout



PCB layout full size



Sidetone circuit diagram



QRP Corner

Dick Pascoe G0BPS introduces some QRP awards for you to strive towards

As I sit and write the column this month, the temperature outside my shack/office is in the region of -2 degrees. Inside it is close to 12 degrees, not beneficial to getting on the air, but very conducive to getting the soldering iron warmed up. Every extra bit of heat helps. The chicken's water was completely frozen today and the rotovated ground is still solid too!

I had built a Oner transmitter from a kit. Members of the G-QRP club will be very familiar with this little beast, it has also been mentioned several times in the past here in HRT. A huge favourite, it is a transmitter on a one square in PCB. One thing I hate is trying to read my own CW from key clicks, I have never mastered the technique and often get tied up in knots when transmitting. A simple side tone was required. Many circuits have been published over the years, but this will provide a simple unit that could be coupled to any transmitter. Using the 'standard' 555 counter IC that is used in many circuits, only six other components are required. The circuit says it all, and the small PCB shown can be used for this too. Back to the Oner transmitter, most amateurs will be aware of the usual trick of adding a variable capacitor in series with the crystal to 'pull' it a few kHz. This is great when you always want to go low of the crystal frequency, but not usable when you wish to go higher. By adding a small inductor as well as the capacitor, the crystal is 'pulled' high by the inductor and then tuned low by the capacitor. Covering a very small part on the spot frequency of the crystal.

By using a ceramic resonator instead, because of the very low 'Q' of these a much greater bandwidth may be covered by this method. One builder using a 3.580 MHz resonator managed to get a coverage of 3.530 to 3.600MHz with a 365pF capacitor.

Packet on the phone!

I have recently connected up to Internet, a system where messages can be sent all over the world from computer to computer via the phone line. Very much like packet, but for long haul message handling very much quicker. I can send a message to a N8ET (a friend over in Ohio) in the morning and have an answer in the afternoon. I mention this because I was amazed to find how many amateurs are subscribing to this form of electronic mail (E-Mail for short.) Adverts appear, and requests for help. The beauty is that you can cry help for a project and have an answer back the same day, even within hours if you are lucky enough.

Standard Fax modems working at 2400 baud can, and will work, but downloading information can be slow. High speed modems working at 14,400 baud are the norm. I mention this because of, not only the 'Joe Average' amateur but there is a healthy group of builders there. Names I noted included Zak Lau, a very highly skilled UHF man who works in the ARRL labs. He is noted for his excellent constructional articles of UHF projects in the ARRL magazine for the experimenter called QEX. Another very useful magazine for those interested in experimentation.

News of another QRP group that has sprung into life. The Northern California QRP club put out a very good magazine called *QRPp*. Full of news and a few very good circuit ideas, several of which had already appeared in SPRAT. For anyone interested, details are available from Jim Cates WA6GER, 3241, Eastwood Road, Sacramento CA 95821. US Membership costs $5, but I would expect that DX would be a touch more. One circuit that did appear in this magazine is for what is called the *Pixie*, a very simple transceiver that is small enough to fit inside a film canister. It should deliver about 200mW of RF and

Jones Hand Key Review

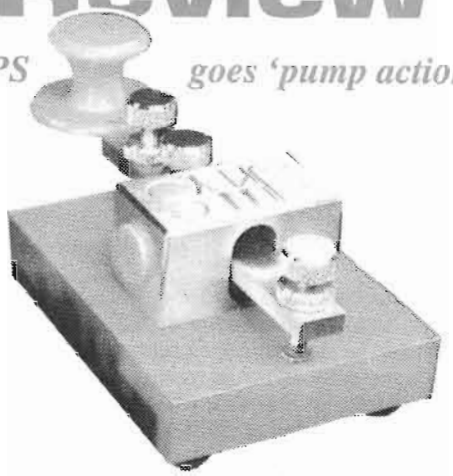
Dick Pascoe G0BPS goes 'pump action' on the bands

Many readers will be aware of the name of Peter Jones when the subject of Morse Keys is raised. His twin paddle key was designed by him for members of the FOC (First Class Operators Club) who regularly use Morse code at high speeds. A review of this key appeared in HRT last year.

The latest offering from Peter is a hand pump key and it is of the same quality. It is quite difficult to make something that differs to the standard idea of a hand key, because the size and shape must remain basically the same.

In this case the key's appearance is fairly standard. The weight is obvious too, at a massive 1.6kg the huge slab of steel that provides the base of the unit is painted the same bright red as the twin paddle. This is another key that will not move around the bench except when used by the most heavy handed user.

One of the best ways of testing any new offering is to give it to a gang of Morse enthusiasts, such as those gathered at Rochdale for the annual G-QRP Club's Convention. Operators from all



over Europe and the USA tried the key over a period of four days, including some FOC members and others who just love Morse code.

The consensus was that this was a great piece of equipment, it looked good and would grace any shack. It would also look good just sat on the shelf in the shack or even the lounge.

The key is supplied in a polystyrene cube without any fancy packing or boxes, it comes as a kit of parts and it can be assembled in under the half hour. The setting up is minimal, the instructions are a little sparse but the placement of parts is so easy that it is difficult to get it wrong.

The solid brass arm is held in a further brass housing, in bearings that feel like silk. You cannot feel any restriction to movement. The contacts are gold plated and feel equally good. The hand grip is set high but should ensure that a good keying action is made. If anything this will help to ensure good Morse after some practice.

I liked the idea of hiding the tension spring inside a sleeve so that only solid brass and red steel can be seen. I would have liked this spring to be a little stronger as almost all the users had trouble getting the settings right. I am assured though that this is being done.

The key is available in three forms, a solid brass top with red steel base costs £60.10, the solid brass base version is £78.43 and also available is a gold plated version, ideal for a present at £166.26.

My thanks to Peter Jones Engineering for the loan of the review model pictured.

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if it works I promise to let you know all about it. Watch this space

All over America, small groups are getting together, as I hear of them I will keep you informed. As this is the start of a new year perhaps this is the time to take a look at the clubs awards that are available to members.

The Worked G-QRP Club award.

Members contacting other members may claim an award for contacts with 20 other members, endorsements are available for each 20 worked QRP countries (Bob G4JFN has 300+), worked DXCC countries, claiming station must be QRP, other any power. Basic qualification is for 25, with endorsements for further 10 countries.

Two way QRP, as above but both stations QRP. Basic 10 countries, endorsements for each 10 more.

QRP Master. Awarded to any member who has contacts with any 60 members, 75 DXCC countries and 20 counties with QRP power.

The G2NJ trophy is given on an annual basis for (a) the best technical article (non aerial) submitted for SPRAT, and (b) for the greatest contribution made to international QRP by a member. Nominations are made by the committee only.The Partridge Trophy is awarded annually to the member submitting the best aerial article appearing in SPRAT, again nominated by the committee only.

The G4DQP Trophy goes to the member submitting the best log of QRP contacts made during the 'Winter Sports'. The application must reach the Awards manager by February 7th.

The Chelmsley Trophy is awarded for the best log of QRP activity in the current year, so start now. Any authorized band may be used with power levels of not more than 5 watts out on CW and 10 watts PEP SSB. Aerial should not be more than 10m high or more than 40m long. Not more than one vertical, and one horizontal may be used at any one time. Beam type aerials are **not** permitted. Applications for this award must reach the award manager by the 15th of February of the year following.

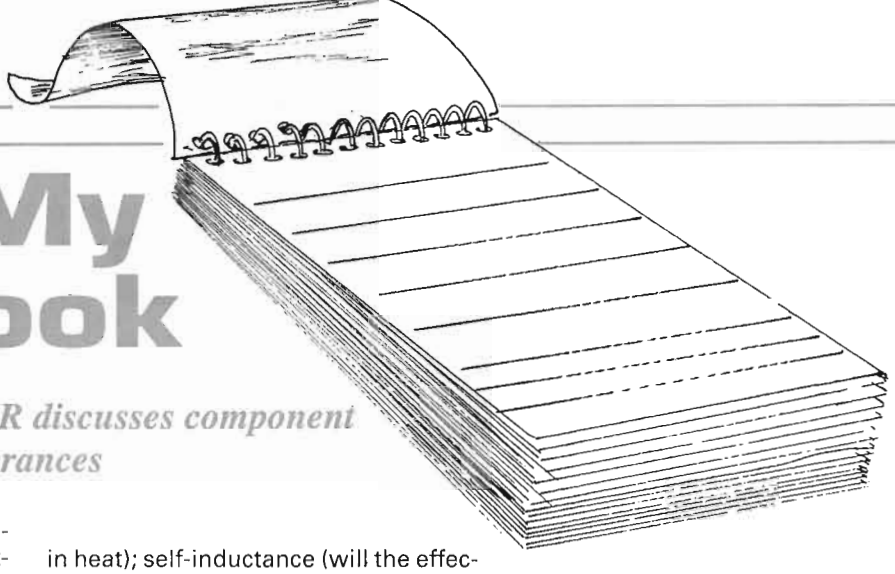
17th June each year is the annual international QRP day, power and bands are as above for the Chelmsley Trophy but only on one day. The operating must be for a maximum of six hours in not more than two periods. Contacts are valid for any region, one country only. Normal QSOs are the game with no serial numbers. The operator submitting the best log wins the Suffolk Trophy. For the newcomer to the HF bands, the *CW Novice* award is given to any amateur who works more than 50 different stations on CW within the first year of gaining his licence.

For the purpose of these awards, QRP is defined as not more that 5 watts RF out when CW is used, for SSB contacts not more than 10 watts PEP is permitted. QRPp is defined as a power level of less than 1 watt.

Full details of these awards and trophies and how they may be gained can be obtained from the G-QRP Club Awards Manager, Mr. G. Taylor G8PG, 37 Pickerell Road, Greasby Mersyside. L49 3ND. Please enclose an SAE for the reply.

Well that's all from me this month, I hope to catch a few of you on the air during 1994 as I get a little more time to operate. News and views to me either via HRT Editorial, GB7RMS or to Seaview House, Crete Road East Folkestone CT18 7EG.

From My Notebook



Geoff Arnold G3GSR discusses component tolerances

When we look at any electronic or electrical component, there are certain ratings which spring immediately to mind - value and wattage for a resistor, value and voltage rating for a capacitor, gain and safe power/voltage ratings for a valve or transistor, and so on.

For any component, there are also ratings or parameters which could almost be called hidden. Certainly they are to be found in manufacturers data sheets and in the more helpful component catalogues, but they are all too easily forgotten until they sneak up on you to cause a circuit failure of some sort. When they do, they may take several other components with them at the same time.

Resistors

When we think of a resistor, the first and most obvious factor to spring to mind is value. Then, depending upon the particular circuit the resistor is to be used in, we need to consider some or all of the following: wattage (how much power can be safely dissipated by the resistor); tolerance (how close the actual value is to that marked on the resistor); temperature coefficient (how much the value will drift with changes in heat); self-inductance (will the effective value change with changes in the frequency of an applied AC voltage); noise (will the natural noise level generated by the type of resistor selected be so great as to affect the signal-to-noise ratio of the circuit); and finally, what is the safe working voltage the resistor will withstand?

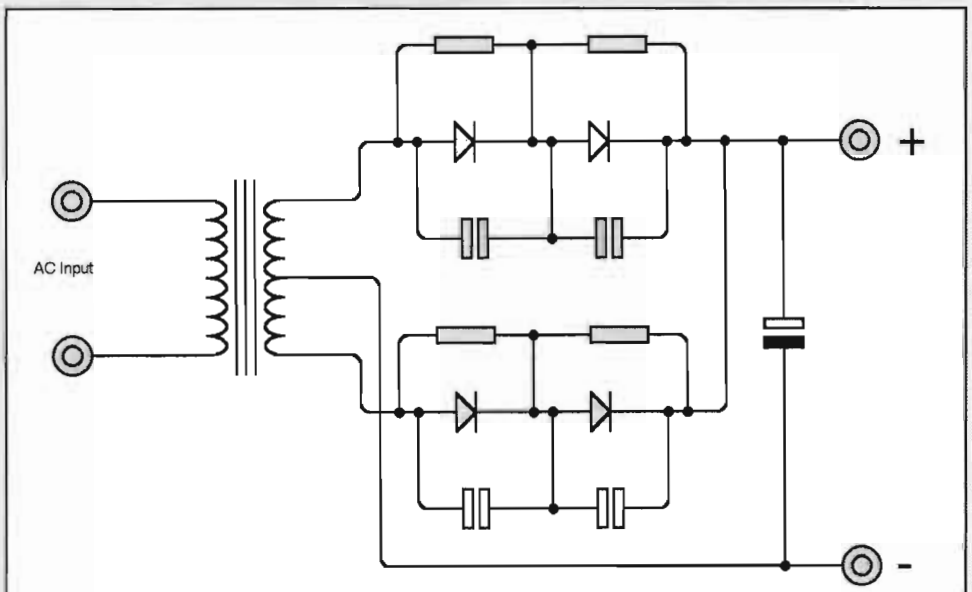
That last item is one which is often overlooked. People do a calculation of the power likely to be dissipated in the resistor, by using one of the formulas $W = I \times V$, $W = I^2 \times R$ or $W = V^2/R$ as most convenient, and think that s all that s necessary. There may be more to it, however, particularly where high values of resistance are concerned.

Small carbon film or metal film resistors of up to half-watt rating are likely to be unhappy with more than 200 to 300 volts across them - precise ratings vary with type. What does this mean in practice? Let s take as an example a 0.6W metal film resistor, with a quoted maximum working voltage of 250. Transposing the last of the above formulas into the form $R = V^2/W$, we find that the largest value resistor which you could safely work at its maximum wattage would be $250^2/0.6$ or approximately 104 kilohms. A 10 megohm resistor from this range could never safely be called upon to dissipate more than about 6 milliwatts - just one-hundredth of its power rating -without exceeding its voltage rating.

Capacitors

Virtually every component has some unwanted property -none of them is pure - and the capacitor is no exception. In the same way that every resistor has a certain self-inductance, so too does every capacitor. The effect of this self-inductance is to limit the frequency range over which any capacitor is effective, for as frequency increases the inductive reactance eventually exceeds the natural capacitive reactance. That means, of course, that at some frequency the capacitor will become self-resonant. Yes, that capacitor which you re expecting to exhibit a reactance becoming smaller and smaller as the frequency of the applied signal is increased, will actually become a tuned circuit all on its own.

As a rule of thumb, capacitors that are physically smaller exhibit less self-inductance, and are therefore more suitable for use at VHF and above. In fact, at those frequencies, the length of the capacitor s connecting leads can have a significant effect on the self-inductance. Examples of actual self-resonant frequencies for particular capacitor types can be found in books such as the RSGB Radio Data Reference Book and the ARRL Handbook for Radio Amateurs . Another hidden aspect of capacitors, this time of the sort of electrolytics used as reservoir capacitors in mains power supplies, is their ripple rating. The reservoir capacitor reduces the natural ripple from the pulsating DC voltage output of the rectifiers by trying to maintain the DC steady between supply voltage peaks, effectively filling in the dips. To do this, it is charging up and then partly discharging fifty or a hundred times a second (depending on whether half-wave or full-wave rectification is used). That



A simple full-wave rectified DC supply, showing parallel Rs & Cs added to diodes

rapid charging and discharging is an alternating current, the so-called ripple current, and it naturally produces a significant amount of heat within the capacitor.

The ripple current which can be safely handled by an electrolytic capacitor without the risk of it overheating and possibly exploding depends on the value and grade of the capacitor. It varies from a few milliamps for a small component used for coupling or decoupling, to several tens of amps for large computer-grade capacitors.

As to the ripple current rating required for a reservoir capacitor, a figure of 1.3 times the DC output current is often quoted as a suitable rule of thumb for bridge or full-wave rectified supplies.

Semiconductor Diodes

The two main ratings of a semiconductor diode are its current-handling capacity and the reverse voltage which it can safely withstand. The first of these depends on the amount of heat generated by the voltage drop (0.6 to 0.7 of a volt for a silicon diode at turn-on, rising to 1 to 2 volts or more at maximum rated current) which naturally occurs across the semiconductor junction when it is conducting (forward biased). This heat must be safely got rid of, either directly to the air (and to some extent by conduction through the component leads) for small diodes, or via a heatsink for larger diodes. If the junction overheats, there is a risk of failure.

The reverse voltage rating, once universally known as PIV (peak inverse voltage), but now often renamed VRRM (repetitive peak reverse voltage ! and no, I don t know how they got that abbreviation either!) must be sufficient to withstand the highest potential likely to appear across the diode when it is cut off (reverse biased).

For a standard transformer-driven, rectifier-plus-reservoir-capacitor DC power supply, this is equal to the sum of the peak AC voltage coming from the supply and the standing DC voltage existing on the reservoir capacitor. Depending upon the circuit configuration, this can be up to 2.8 times the RMS voltage rating of the transformer secondary.

Two hidden parameters for semiconductor diodes are the values of forward (conduction) resistance and reverse (isolation) resistance. That basic 0.6 to 0.7 volt forward drop I mentioned earlier is equivalent to a resistance, of course, and there is also a small ohmic resistance in the junction which is responsible for the increased voltage drop at higher currents. The effect that this drop will have is relative to the working voltage of the circuit the diode is used in. As a rectifier in a power supply producing two or three hundred volts HT for a piece of valved equipment, it s quite insignificant. As an isolating diode (for reverse-voltage protection) between a nominal 12-volt power supply and a 12-volt rig, it can result in quite a drop in power output from the transmitter.

Fair Shares for All

One place where the actual value of the forward resistance is important is where two diodes have been connected in parallel, so as to handle a larger current. Say we need to pass a current of 10 amps, and have two 5-amp diodes (not good practice to run right up to the rating like that, but it s just an example of what can happen in the extreme). One of our diodes might have a forward drop of 900mV (0.9V) at 5 amps and the other one a forward drop of 1100mV (1.1V). It s not a straightforward task to calculate how the current might be divided between them, because the voltage/current characteristic is not linear, but one diode will certainly be called upon to carry the lion s share of the current.

To overcome this, it s good engineering practice to insert a resistor in series with each of the paralleled diodes, to swamp any differences in diode forward resistance, and share the current more equally between the diodes. The added resistors can have a very low value ! something that will give a drop of around 1 volt at the expected maximum current is usually reckoned about right (0.2 ohms in our example).

Variations in reverse (insulation) resistance can be even more marked - typically upwards of 20 per cent - and it is especially important to allow for this where several diodes are connected in series in order to cope with a higher voltage. A series-connected string of three diodes each with a PIV rating of 400V should in theory safely cope with a rectification job where the anticipated peak reverse voltage is 1kV - each diode seeing around 333 volts. But what happens if one of the diodes has a reverse resistance which is double that of the other two? That diode will have 500V across it, and its brothers 250V each. Not a healthy situation!

We need to add something to the circuit to ensure that the reverse voltage is shared more equitably across all the diodes in the chain. In the case of parallel diodes, we added low-value resistors in series with each to share the current. Now, we need to add a high-value resistor in parallel with each of the series diodes, to equalise the reverse voltages. The opinions of the experts on how to calculate a suitable value seem to vary somewhat, but a figure in the range 250 kilohms to 1 megohm is fairly typical.

Switching

Beside their use as rectifiers, diodes are also commonly used in switching circuits in place of traditional mechanical switches. The mechanical switch is almost perfect in terms of on-resistance - a small fraction of an ohm - and off-resistance - many tens or hundreds of megohms, but as already mentioned, the diode is very imperfect as a switch.

In designing a circuit incorporating diode switches, perhaps to control waveband or channel selection in a receiver front-end, it is essential that these diode imperfections are taken account of when circuit impedances are chosen. If not, considerable losses will be incurred, due to voltage drop across the diode when in the on condition, or due to leakage through the diode when in the off condition. Looked at another way, the diode will function as part of a potential divider, rather than as a switch.

Another switching attribute of a diode, and one which equally affects its use as a rectifier, is the speed with which it will turn off , from its conducting state to its non-conducting state. You may think that as soon as forward bias is removed from a diode, it will instantaneously cease conducting: Unfortunately that isn't so, due to an effect called charge storage .

This is another factor which has to be taken account of where series strings of diodes are used as rectifiers. In simple terms, the diode or diodes which switch off fastest will be subjected to excess reverse voltage until their fellows have switched off and assumed their fair share. As well as the resistors in parallel with each diode, it is therefore good practice to add a parallel capacitor, usually of 10nF, to equalise the switching speeds by slightly slowing down the faster diodes.

With all these sharing components, it is obviously essential that their values are reasonably well matched, otherwise they will not do their job properly. You don't need to go overboard, though, and a tolerance of 10 per cent is adequate.

More Sharing and Caring

Once again, I've just about filled my alloted space, so I shall have to return next month to the subject of hidden parameters, and how to allow for their effects. See you then!

BRAZIL

PT7NK

DXCC
5B DXCC
WAS
WAZ

CQ ZONE 11
ITU ZONE 13
Grid Locator HI 06 SF

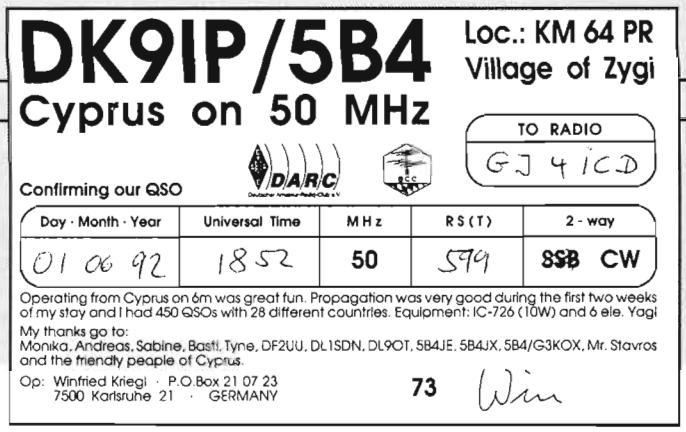
ETEVALDO BARCELOS FONTENELE
Rua José Fraga Neto, 71
60815 - Fortaleza - Ceará - Brazil

AMATEUR RADIO			MO	DAY	YEAR
GJ4 ICD			Nov.	04	91
UTC	MHZ	RST	2 WAY		QSL
11.55	50	55	SSB		Pse.

CECW

FORTALEZA DX GROUP FOR DX

73's GOOD DX



DK9IP/5B4

Cyprus on 50 MHz

Loc.: KM 64 PR
Village of Zygi

TO RADIO
GJ 4 ICD

Confirming our QSO

DARC

Day · Month · Year	Universal Time	MHz	RS(T)	2 - way
01 06 92	1852	50	599	~~SSB~~ CW

Operating from Cyprus on 6m was great fun. Propagation was very good during the first two weeks of my stay and I had 450 QSOs with 28 different countries. Equipment: IC-726 (10W) and 6 ele. Yagi

My thanks go to:
Monika, Andreas, Sabine, Basti, Tyne, DF2UU, DL1SDN, DL9OT, 5B4JE, 5B4JX, 5B4/G3KOX, Mr. Stavros and the friendly people of Cyprus.

Op: Winfried Kriegl · P.O.Box 21 07 23
7500 Karlsruhe 21 · GERMANY

73 Win

VHF/UHF Message

Geoff Brown GJ4ICD says "The bands open up!"

It had to happen. Just as I left the Island for the Leicester show, there was a fantastic opening on the VHF/UHF bands! Reports came flooding in at the show, everybody just loved to wind me up about the DX, so here's a general view of what was worked around the end of October.

Geoff G3NAQ worked OE on 432MHz, Reg GW8VHI worked SM/LA, John G3XDY also had openings to LA/SM but apparently on 23cm. On the 31st, 144MHz was open to OK/OM, Lyn GW8JLY reported good conditions into central Europe and SM on 144MHz on 29th. Lyn also reported conditions were better on the 30th to HB9, DL, OZ, SM, LX.

Rumours were heard of Reg GW8VHI working RB5 on 432MHz. Reg also comments that most stations had to be reasonably high to get into the ducting (around 250-300 metres). Other hot spots on 144MHz noted were from John GM4FRX in IO86 working DG9BBT, SM7SPG (JO66) working G4TVR, F1CYB (JN17) to GM4JJJ as he was working DK5PK (JN49)!, I2FHW to ON4GG, GI4KSO to F1CYB (JN17), plus EI to DL, G6RAF to I2FAK (nice haul lads), and G4WKN to HB9SNR.

Seventy also had its fair share of DX. G6RAF (IO92) reported the OZ7IGY beacon on 432.930 at 2023z on the 30th but no stations were active from Denmark (beacon listening again!). GM4JJJ reported HB9MIN/P, ON4GG reported I2FHW also on the band at 419. The lists go on and on, so I know lots of new squares were worked.

Ela G6HKM sent in a report for the period of DX but reckons most of the DX was going over her head. She reports from the 28th with the Lerwick beacon at S6 and a few GM's worked in Aberdeen, SM6MPA (JO67) was also worked plus a few German stations. On November 1st, things improved with German stations being worked in JO48/30/41/50 and 51, plus OK1UBR in JN69. Things seemed very selective for Ela on 432MHz, Ela's CQ was answered by OE5MKN (JN78), she also had contacts with DL, LX, F, ON, and EI in squares JN38/39/48/49/59/30/31/40/42 and EI4AEB in IO63. Ela also added new squares on 23cm in the form of DL6NAQ/P (JO40), DL4EAU/P (JO51), DF6NA (JN49). Her total now for 23cm is 61 squares, however another one got away due to ducting. Ela could hear a DL working EI4AEB (IO63) but nothing was heard in Essex. A pity really as Ela has not worked EI on 23cm (neither have I - Geoff).

Still DX on Six

October still brought a few openings via 'ES1. Countries reported during the month were; I, 9A3, 5T5JC, 9H, CT, EH, and S53.

I received a fax from John EI8HZ in County Donegal, who reports an ES opening on the 6th November in which he worked IK2GSO and IK1EGC in JN45 and 35 respectively. Both stations were S9, and John was very surprised at this opening and signal strength so late in the year.

Early November (7th) saw the OZ contest take place, but little action was reported from the UK. I did manage to work OZ3ZW, SM7AED, OZ3AEV and GU8NIS, the latter being via tropo but the others via MS.

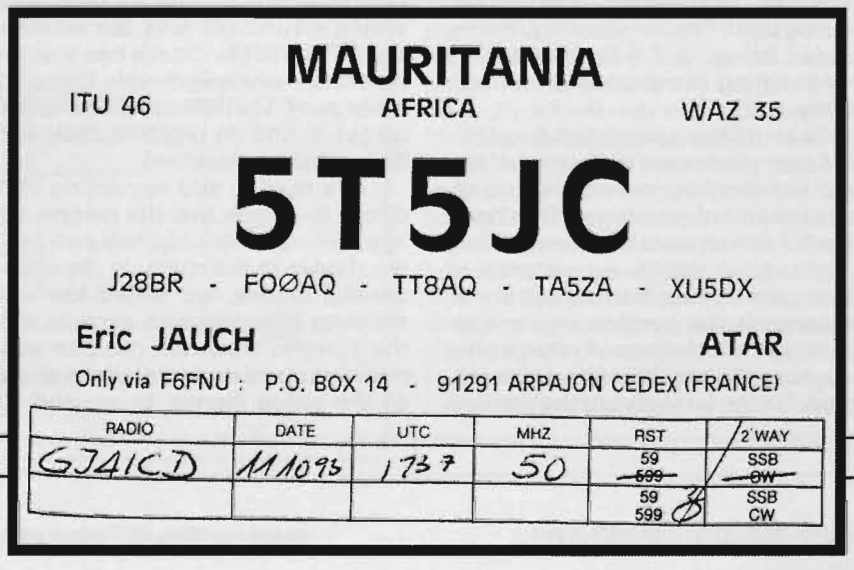
On the 17th, tropo conditions in GJ were very good indeed with the Buxton beacon at S9+. Later in the morning, Russian Military could be heard between 32 and 42MHz, then at 1030z F2 TV was logged from the far East on 49MHz. A quick check on 28MHz revealed UA6/UA9 stations at S9+. The opening lasted about 45 minutes, with many CQ's on 50.110 but with no results.

News from Pierre, ON4PS, is that he has sent many letters to the PTT in his country regarding the expiry of 50MHz permits at the end of last year. So far, (December 1993) he has not received a reply and is rather worried that 50MHz may be lost in Belgium. Peter also reports that Alex RA6YY in LN03 should be active any time now on Six. Also active is Z23BU (Macedonia), but so far only has a dipole for the band.

In a letter from Z23JO in Zimbabwe, Mal say's "I have received the 50MHz beacon at last and will now apply for a licence". Mal was puzzled how it came to be posted from Harare in Zimbabwe and wonders who went to Harare from the UK ??!!

Other 50MHz news is that OD5RAK is now active on the band. So far he has had propagation into 5B4, 9H, F, and

A very special QSL card this month; double hop sporadic 'E' in October with Mauritania! 5T5JC



MAURITANIA

ITU 46 AFRICA WAZ 35

5T5JC

J28BR - FOØAQ - TT8AQ - TA5ZA - XU5DX

Eric JAUCH ATAR

Only via F6FNU : P.O. BOX 14 - 91291 ARPAJON CEDEX (FRANCE)

RADIO	DATE	UTC	MHZ	RST	2 WAY
GJ4ICD	111093	1737	50	59 ~~599~~	~~SSB~~ ~~CW~~
				59 599	SSB CW

SV1, so keep a look out for this new one as OD5SK is back at university.

The 17th brought more short 'ES' openings from the northern UK to Italy, with another 'ES' opening from the UK to 9A3 on the 24th.

More Tropo Events!

On November 16th, as the high pressure began to move, and another nice opening occurred. HB9F on 432 was reported at S9+, FX1UHY (Paris) on 1296.850MHz was also S9+. In Jersey GB3PS (IO92XA) on 1297.075MHz was end stopping, as was GB3CLE (YM48H 14km north east of Ludlow, Shropshire) on 1296.910MHz. On the 17th, GB3MLY on 432 and GB3MLE on 1296 were both S9 into GJ, but no activity was spotted down here, only reports of stations in the North of England working into Germany on 1296.

As pressure fell again on the 27/28th, all bands from 50MHz to 23cm were open. GB3BUX on 50.000MHz was very strong on the south coast (and GJ) as was GB3NHQ at Potters Bar. But where was the activity?

GW6ZUQ was heard calling and calling DX on 432MHz at S9+, HB9F was S9++ on 432.985, FX1UHY (1296.850, JN18) was S9, and GB3DUN (ZL03) on 1296.890 was also very strong. I personally called CQ for 45 minutes on 50, 70 and 23 and did not get a single contact. So has VHF/UHF died, or what?

Other Snippets

No reports of the results of the VE3ONT experiment were received, I heard nothing at my end on 23cm after listening for a couple of hours.

The Leicester show was again great fun with a record number of visitors attending. It was nice to see you all again, but I did miss our old friend Peter Rouse from Guernsey. The popularity of VHF scanners seemed to be big business, so much so that my son Andrew caught a visitor trying to pocket an MS1000 mobile scanner from Nevada's stand. However when the visitor realised he had been spotted, he returned the unit from under his coat and vanished from sight!

New VHF/UHF Aerials

Vargarda Radio AB (Sweden) have recently introduced their range of VHF/UHF aerials into the UK. It is noted that no coaxial connectors are used and that a special poly-propylene plastic waterproof connecting box is used with a drain hole. These aerials look and feel very sturdy, the gain quoted for a 19 element 432MHz aerial is 14.5dbd, on 50MHz a 3 element is quoted at 7dbd with a front to back ratio of 18db at 1.7m long, and on 144MHz a 9 element yagi is quoted at 13dbd on a 4.5 metre boom. If you are interested in any of these antennas then call Jaytee Electronic Services on 0227 375254 in Herne Bay, Kent.

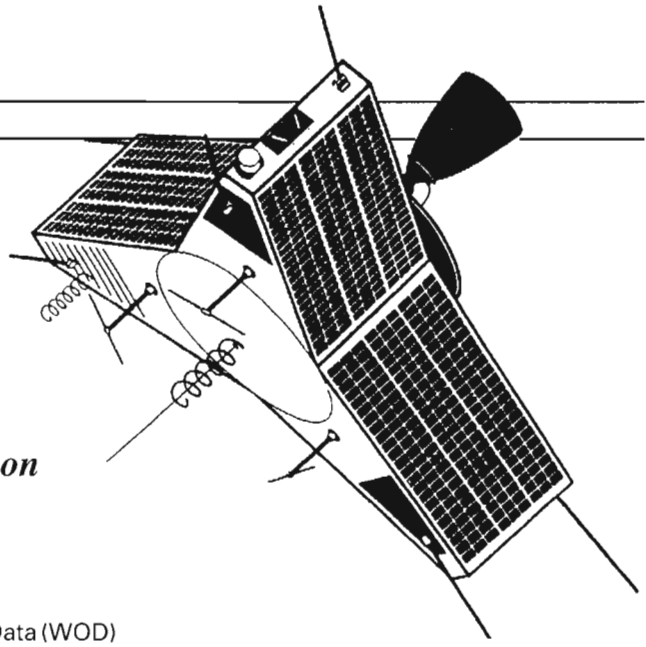
Late News

During the latter part of 1993, negotiations took place with the Royal Jordanian ARS for 50MHz operation in June 1994. A fax has been received to say 'yes' we can operate 50MHz. Six UKSMG members, GJ4ICD, G0JHC, G4CCZ, G3WOS, G3KOX and others will be going to Jordan in June. More on this next month.

Final Final

That's it for another month, please let's have some new faces in the news for 1994, plus photos of the shack etc. Please send any info to: Geoff Brown, TV Shop, Belmont Rd., St. Helier, Jersey. JE2 4SA or Fax/Phone 0534 77067 anytime.

Satellite Rendezvous



Richard Limebear G3RWL with AMSAT-UK news on IO-26

First of all, IW3QOK apologises to all those who sent their status and telemetry data on IO-26 to him without having had any response. He's been rather busy but notes that he has found them to be quite invaluable and they contribute greatly to making IO-26 an even more interesting and useful satellite from the user's point of view.

IO-26 In Good Health

Telemetry received so far shows that all systems are working properly and that IO-26 is in good health. The Bulletin Board System (BBS) has been opened and the number of users is growing rapidly day by day.

They are running the spacecraft in a low power configuration at present. This is *not* a problem, but has been implemented because of battery considerations and also because its signal is very good and readable. Recently the command station increased the output power of the transmitter to its maximum value (approx. 4W) as a test for a few minutes and everything worked fine. The Battery Charge Regulator (BCR) is working well and the solar panels are charging the batteries (provided by Amsat-UK) regularly.

There have been some questions about why the array voltage was so low (around 11V) with respect to the other MICROSATs. The answer is simple: IO-26 uses highly efficient solar array panels that have a lower voltage than those used on the other MICROSATs so don't worry. Another question is about the very high value presented by the Error Detection And Correction (EDAC) telemetry counter. Their theory is that there must be a bug in the telemetry software and ITAMSAT's main working group is working to solve this problem.

From all the telemetry data received it has been possible to understand the IO-26 spacecraft attitude and to see that its motion is quite predictable. The results will be presented soon in a readable form. All IO-26 users are invited to down-load the Whole Orbit Data (WOD) and analyze it.

As for the higher speed operations, they emphasise that the 9600 baud mode is experimental and they still have to verify whether the V40 CPU can keep with this baud rate. They plan to make some further tests with hardware and software at the first software reload and promise to keep all the users posted on future plans but, as a taster, here are some of their ideas:

– Add automatic broadcast of NASA 2line elements.
– Automatically adjust the TX power depending on user activity.
– WOD file to be available like any other file.
– Switch to AFSK mode (FM) on Wednesday.

Oscar 10

This satellite is still operational in Mode-B. 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. Downlink signals are quite strong from AO-10 but there are complaints that no users are taking advantage of it.

Russian Satellites

AO-21 is still on the old schedule, minutes 0 to 7 are for fm transponder (uplink 435.016 MHz, downlink 145.987 MHz), minute 8 carries an announcement in English and minute 9 carries an AX25 packet transmission containing schedule and telemetry. It is still saying that the schedule is about to change and they will install new transmitter modes.

MicroSats

DOVE is currently up and running on 2m, sending normal ASCII telemetry and short text bulletins on 145.825 MHz. A very quick look at telemetry indicates the spacecraft is basically healthy. The DOVE Recovery Team are using new software that allows automated loading in half-duplex mode which replaces the 'ear-ack on S-Band' method used in the past that was so difficult.

At the time of writing, the Recovery Team say they would like to receive telemetry reports. Please send them to vk7zbx@KO-23, @AO-16 or on INTERNET to vk7zbx@amsat.org or to wd0e@amsat.org, or to the CompuServe address of 71477,546. The most recent version of TLMDCII (3-8-92) will decode and record DOVE telemetry very nicely. After the Recovery Team is sure the satellite is stable in this configuration and the RF transmitter power targets are established, the next step will be to load up and test the voice module. Depending on the condition of the spacecraft and other issues, this could take several weeks from the time this is being written, and may indeed have already happened.

I have a breakdown of information in the STATUS line presently being transmitted by DOVE, available on request. Note this applies to DOVE and to this version of the software only.

Short Bursts

The Lambda Amateur Radio Club (an international group) are planning a *satellite DXpedition* to VP2E in March 1994. They will also have HF and Packet. For more information mail VP2EHF, or VP2EE, @ VP2EA.ANG.CAR.NA, KK3K @ K3PGB

Forthcoming Shuttle flights that will be visible in this country are:
STS-60: Discovery at 218 miles altitude and 57 degrees inclination (8 days) and *STS-62:* Columbia at 184 miles altitude and 39 degrees inclination (14 days).

AMSAT-UK News

The latest issue of the Amsat-UK *Oscar News* includes a 32 page catalogue of services to members along

with an order form, TrakBox parts kits are in.

Now a date for your diary: The 1994 AMSAT Colloquium will be held on the 28th to the 31st of July, 1994. Further details are available from Ron Broadbent, G3AAJ, telephone number 081 989 6741.

For further information about Amsat-UK contact: AMSAT-UK, c/o Ron Broadbent, G3AAJ, 94 Herongate Rd, London, E12 5EQ. Big SAE gets membership info. SWL's are welcome. All new joiners get the USAT-P tracking program on 5¼in disk.

KEPLERS

NB: In this set, the elements from the Spot launch are 'as received', but I0-26 acquisitions match predictions for POSAT-1, and KO-25 matches object-H.

SAT:	OSCAR 10	UoSat 2	AO-13	PACSAT	DO-17	WO-18	LO-19
EPOC:	93328.37358304	93329.58852952	93324.87971886	93329.65139180	93329.69541395	93329.66728536	93325.67080327
INCL:	27.1967	97.7948	57.8676	98.6116	98.6133	98.6131	98.6146
RAAN:	354.6814	348.7516	283.0185	53.1033	53.4054	53.39315	49.6483
ECCN:	0.6020029	0.0011121	0.7211074	0.0012281	0.0012278	0.0012865	0.0013250
ARGP:	132.8205	196.5663	328.8644	69.9146	69.3547	69.5507	80.8874
MA:	296.5509	163.5164	3.5221	290.3351	290.8917	290.7020	279.3806
MM:	2.05877703	14.69089775	2.09724867	14.29862845	14.30000149	14.29977633	14.30069500
DECY:	6E-08	2.48E	-2.21E-06	7.8E-07	8.1E-07	6.6E-07	9.9E-07
REVN:	5058	52041	1014	20051	20053	20053	19997

SAT:	FO-20	INFORMTR-1	UO-22	KITSAT-A	KO-25	POSAT-1	HEATHSET
EPOC:	93325.97912877	93327.46610100	93329.66348198	93325.56659606	93325.63865674	93325.63461159	93325.63062485
INCL:	99.0202	82.9432	98.4552	66.0893	98.6761	98.6764	98.6738
RAAN:	152.1718	294.9482	43.0587	354.6876	38.3168	38.3197	38.3070
ECCN:	0.0541163	0.0034102	0.0007468	0.0005267	0.0009527	0.0010035	0.0010219
ARGP:	89.0188	299.3528	171.3856	339.3077	93.6148	94.7836	83.4992
MA:	277.2925	60.4149	188.7451	20.7715	266.6130	265.4492	276.7343
MM:	12.83222068	13.74528481	14.36867889	12.86281948	14.27591127	14.27693538	14.27794329
DECY:	-5E-08	8.4E-07	1.11E-06	1E-08	7.7E-07	7.8E-07	1.31E-06
REVN:	17755	14131	12385	6008	807	807	807

SAT:	ITAMSAT	EYESAT-1	1993 061H	RS-10/11	Cosmos 2123	Mir
EPOC:	93326.611709649	93299.20720744	93329.75587440	93325.49625370	93327.59616256	93329.00833400
INCL:	98.6738	98.6741	98.5755	82.9207	82.9217	51.6175
RAAN:	39.2798	12.0806	41.8168	122.3575	163.9135	131.5118
ECCN:	0.0010455	0.0010509	0.0012580	0.0010357	0.0028927	0.0004921
ARGP:	80.2690	157.5898	55.8337	239.9809	323.6427	24.8845
MA:	279.9381	202.5757	304.4036	120.0325	36.2770	335.1502
MM:	14.27794111	14.27978486	14.28018454	13.72326180	13.74030145	15.58670399
DECY:	6.1E-07	2.25E-06	7.8E-07	1.6E-07	3.1E-07	5.257E-05
REVN:	821	430	866	32142	14041	44419