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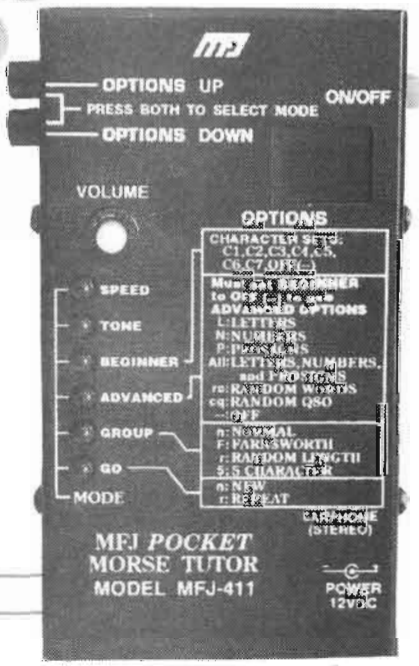


Left; Drake SW8 HF Receiver reviewed

Right; MFJ Personal Morse Tutor reviewed

CQ de G8IYA Editorial

A good chance for publicity for our hobby

There I was, in a local newsagent buying a copy of the TV Times, when on the counter I saw the happy, smiling face of Tony Cudlip from Locks Heath in Hampshire, sitting in front of an HF rig and Yaesu ATU with his Shure 444 desk mic, staring at me in full colour. This was on the front cover of the Fareham daily paper 'The News'. Now, it's not often that you see amateur radio on the front cover of a newspaper, is it? That is, unless something's gone wrong, or there's a new war or conflict started up somewhere (when the HRT Editorial phone often rings nonstop with national news reporters wanting to know what the radio amateurs have been "broadcasting").

However, *this* front cover story was detailing how the Submariners Amateur Radio Club, based at HMS Dolphin, would be setting up an outdoor station for Gosport's D-Day 50th anniversary commemorations in June. The front cover headlines said "Radio team to put town on map," next to an adverse story also on the front page of how the grandson of "D-Day supremo" General Dwight Eisenhower wouldn't be coming along to meet over 1,000 D-Day veterans as hoped. Never mind, at least the veterans can use Gosport Club's special event amateur radio station, GB50DD, to pass greetings messages to other veterans around the world. Nice one lads, and more power to your elbows, I hope your station this month is a great success.

Opportunity

An event like this, especially combined with the facility for members of the public to pass a greetings message over the air, has the chance to give our hobby a superb 'boost' in the eyes of non-hams. Maybe *your* club will also be doing something like this in the future? If not for the D-Day event, then for a local carnival, fund raising effort, or whatever. From the post I've received for this month's 'Radio Today' and 'Club News', it seems like several clubs will be.

It was at such a special event station that I met my husband, the Leyland St. Ambrose Scout Jamboree-On-The-Air station, GB3SA, to be precise. He was living 350 miles away at the time, but came along 'to help' after seeing his very first 'live station' at that very same place and event a few years earlier. I met him again at the Leyland Festival special event station, GB2FES, where the public were given a superb opportunity to see ham radio 'in the flesh' in the special radio marquee. This of course is a personal (if rather extreme!) example of how visiting a special event station or two eventually turns someone into becoming a licensed amateur. But from the number of people I see visiting a typical special event station at a public event, and with them taking an often baffled interest at what goes on, I feel there's certainly an opportunity going. I understand the people manning the amateur radio stand at last year's 'Live 93' exhibition couldn't cope with all the people asking about our hobby. This year at 'Live '94', taking place at Earl's Court from the 20th to 25th September, they're getting help from the amateur radio trade in terms of extra 'bodies' capable and willing to give details to the information-hungry visitors. Many of these visitors could very well be prospective new hams.

Up To Date

At such events, which are visited by many teenagers, the excitement of our hobby can be stressed. It *isn't* just a load of old codgers talking about their bunions. It's a unique chance to communicate, on an equal footing, with like-minded people interested in what *you're* doing, in *your* hobbies, *your* town, your country's culture, as well as offering the chance to find out more about the hobbies, interests, and daily lives of *others*, all around the world. Communicating around the globe, and in fact beyond, now doesn't only need to be on HF coupled with high power, interference, massive aerials and high towers. Amateur satellites can now be worked with your dual-band handheld linked to an aerial resting on the ground. Packet radio 'wormholes' link continents together. These are the things that start opening youngsters' eyes wide. My local school's amateur radio club station uses packet radio to link up to other schools all around the world, their TNC will also decode VHF weather satellite information that adds to the 'hobby interest'. On at least one occasion the school's pupils have been literally queuing up to have a go 'on air' on 2m. Add the occasional burst of activity from the Shuttle amateur radio experiment, or the Mir space station, and you have a line of exited youngsters, eager to find out more about how to become an amateur themselves.

Your Event?

So, as well as your club putting on an HF station, blurting out possibly indecipherable SSB (to many visitor's ears, at least) on a table, why not have a video on amateur radio running on an adjacent table? Most clubs either have, or have access to, the RSGB video, there's no shortage of material. To this you could maybe add a 'scrolling presentation' running on a PC, about your local club and its activities. Virtually *every* club has at least one computer 'whiz-kid' who'd be pleased to knock up an eyecatching display on his or her VGA monitor!

Finally, *do* take a leaf out of the Gosport Club's book. Get in touch with your local press, as well as the amateur press such as HRT, to 'spread the word'. The Gosport Club's Chairman, John Gilbert G0OFD, made sure *his* local paper received a correct and interesting story. It worked.

HRT Counter Competition Winner

The winner of the competition in the April 94 issue of HRT, for the Optoelectronics 2.8GHz counter, was won by Richard Westlake G8MVC from London, our congratulations to you Richard. Thanks go to the many readers who entered but weren't successful this time, we've a few more competitions 'lined up', don't worry!

LETTERS

Letter of the month

Dear HRT,

Could you explain to me why it is that my 14 year old son, who has passed his exams and Morse Test to become a full class A amateur has to pay £15 for his licence, when a Novice under the age of 21 gets his or her licence free of charge?

I think this system of doing things is very unfair indeed. Its not just my son, but countless other youngsters who have worked very hard indeed to obtain their full A or B licence. My son, like others I've mentioned, is not old enough to support himself. I think that the free licence should be extended to *all* youngsters under the age of 21, not just the very privileged Novices.

Please don't think I'm anti Novice or anything like that, in fact I think that it's a great idea and should be encouraged. Moving up the ranks to become a full class A or B should also be encouraged and this is one way of doing it.

D.P. Kirby, GW0PLP

Editorial comment;
The Novice licence was introduced as a 'beginner's licence', and the RA have tried to make this entry into amateur radio easier for youngsters by charging no licence fee for those under 21. However, when the novice licensee 'progresses' to a 'full' licence, by studying and 'coughing up' the required exam fees for the RAE, then it's possibly reasonable to assume that things would be as they have been in the past, i.e., 'coughing up' a licence fee as well. Mind you, some countries charge nothing at all for one's amateur licence, all classes of the US licence for example are totally free of charge, are valid for ten years, and are renewable for the price of a stamp.

Dear HRT,

I have been following the problems of Ernie G4LUE, through the letters page and your Editorial in the April edition, with interest. His problems are not isolated. I have heard various complaints being voiced, but thought you might be interested in my renewal experience.

I waited a month or so before I phoned SSL about my validation documents, as I knew there was a backlog. I had already checked with my bank, that they had received my money. The gentleman that I spoke to confirmed this and informed me that my licence was valid and that I could operate legally. He also said that I would get my validation as soon as SSL had received the licensing terms and conditions booklet BR68 from the RA. The validation document cannot be sent out on its own as it is an integral part of the licence. That therefore is the cause of the delay.

On Wednesday I got my validation (hooray!) complete with ..... CB Radio Licence Terms, Provisions and Limitations Booklet. What now??

Ken Walker, G1LJA

Dear HRT,

I was pleased to read the April issue of HRT and to see my letter regarding Subscription Services LTD warranted being Letter of the Month. I had already contacted the Radio Communication Agency regarding this matter, as a result I finally received my validation certificate and over a period of five weeks, three more! So I now possess four; one with CB documentation. As regards the remarks made in the letter, I now rest my case.

I thoroughly enjoy reading your magazine, especially when you take up issues on our behalf.

C. Cooper GIWUQ

Dear HRT,

With reference to your Editorial and letters (April Issue), I too have undergone a saga of inepritudes on the part of the SSL.

In 1992 when Post Office counters ceased being agents for the issue of Amateur Radio Licences, I duly applied for my new Validation document on August 6th after waiting a period expecting a reminder from the new SSL (my renewal date being July 19th). However, in the absence of a notification from the SSL, I sent them the requisite fee expecting the Validation Document by return post (well almost!).

However, it was not to be. After engaging in a lot of letter writing from my end, without even receiving a letter of explanation in return, my Validation Document arrived on September 30th. About ten weeks off the air, in effect a licence valid for 10 months. To make things easier, I decided and informed them that in future I would like to pay by Direct Debit. Again no reply.

In July 1993 I expected by this time the SSL would be running more smoothly! Again, no licence renewal reminder, so I waited a little longer and then sent my renewal cheque. But again, no Validation Document arrived, so again I was engaged in frequent letter writing without receiving a single reply. My Validation Document finally arrived on Sept. 6th 1993, a waiting period (off the air) of about seven weeks (a 12 month licence valid again for about 10.5 months). I again decided to opt for Direct Debit, but the SSL didn't reply.

I wrote to the RSGB in a similar vein to this letter, but apart from an acknowledgement, it ended there. I am now wondering what will happen when my licence is due for renewal on July 19th 1994? If I have to go through with the same frustration I think I will call it a day as far as Amateur Radio is concerned.

L. Hawkings

Dear HRT,

Reference the letters regarding SSL. I have a story to add. When my friend sat and passed the Novice course, he sent for his Validation Document and awaited his Novice callsign.

When it eventually arrived, lo and behold they sent him a G7 callsign. Two years after my callsign was issued, I am appearing in the callbook

£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.

as "Nottingham post code area". This I did not request, as I wanted my full particulars to be printed. I've nothing to hide and am proud of my achievement in passing the RAE. This was taken up with SSL and I'm still awaiting a reply since 1992.

Finally, I have today received a renewal notice for a CB licence which I also hold for mobile use only, which expires on the 31st March, which is less than the 6 weeks promised.
G. E. Seaton, G7MMR

Dear HRT,

The controversy of SSL is never ending with nothing going for it and everything against it. These problems never arose with Post Office Counters, Chesterfield, you received your renewal notice in good time and myself 14 days later my licence came back! Now SSL want 4-6 weeks, why?

I passed my CW on 13th Dec 1993, three days later I sent off my postal order and pass certificate with the view of reserving a particular callsign, as the callsigns were in the UH's. I asked for, and after much letter writing and phone calls, eventually got the callsign I requested, G0UIU, it's so easy on the key. Now for the funny bit, I made reference to SSL that my son had not received his renewal validation document which had been posted 4 weeks before his time was up. Somewhere in their computers someone had made a mistake, for four weeks after I received my validation document, we received for four weeks on the trot a validation document. So now I have four, and my son has four. Why?

To the young man who's letter I answered via your magazine who couldn't learn CW, I made it, two years and four tests, it was worth it.
J. H. Clifton, G0UIU

Dear HRT,

Following the comments made on the letters page in the April issue concerning SSL, I felt that I should inform you of my own problems with them.

As someone who holds both amateur 'B' and CB licences I took the precaution of amateur renewal via direct debit from my bank account, and CB renewal by cheque. My amateur licence was due for renewal in late November and following the information in the radio press and the four notifications from SSL concerning the changes to the renewal system last October, I was surprised when on receiving my monthly bank statement in November (which showed transactions up until the end of the first week of November) that my direct debit with SSL was not taken out of my account. However, at that stage I was not unduly concerned as there was still time before the renewal.

The day before the renewal was due, I had cause to contact my bank with regard to another matter and, more or less as an afterthought, asked them to check if my direct debit with SSL had been paid. After some checking my bank advised me that the debit had not been applied for by SSL. I immediately rang SSL and asked them what was going on. To begin with I was told that my licence did not expire until the end of January and I had made a mistake. My reply was that I thought that they had become confused with my CB renewal and asked them to check again. This time they came back full of apologies and admitted that they had made a mistake and had forgotten to apply for the debit from my bank, adding that the earliest that they could now do this was mid December. I then asked about my legal operating position and was informed that as the mistake was their fault I could still operate.

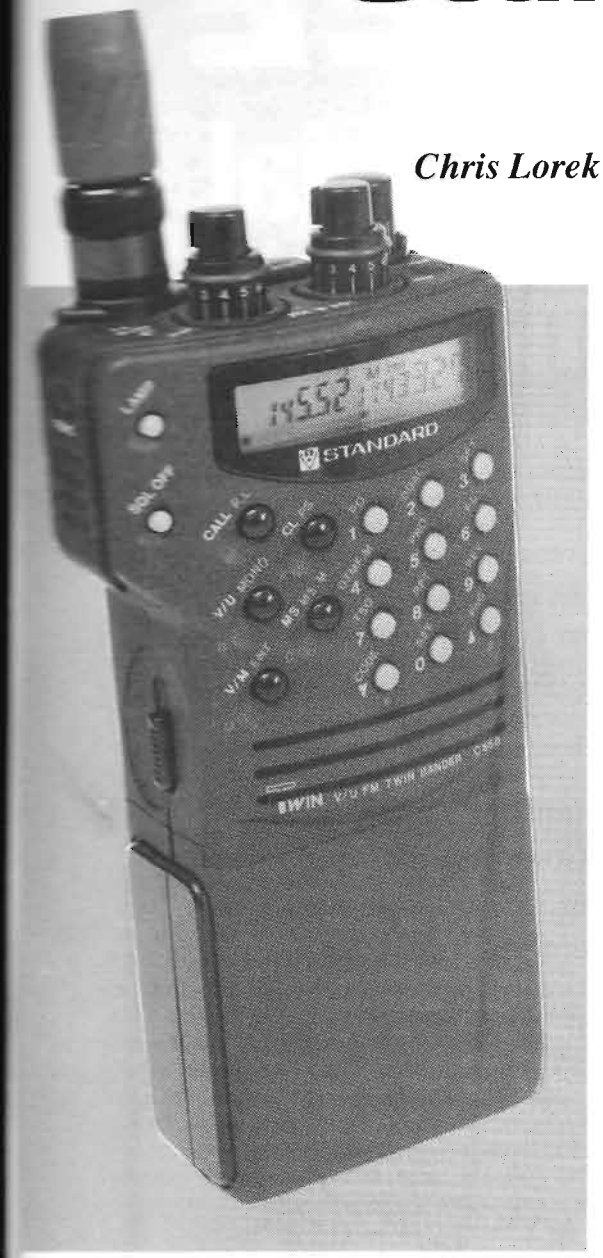
As you may be aware, amateur and CB mobile operators in N. Ireland are asked very frequently for radio licences by security force patrols, it is essential to have these up to date or equipment can be seized and fines imposed. I pointed this out to SSL, to be told that if I encountered any problems I should ask the security force patrol to contact SSL by telephone, who would confirm that I was legal. This was fine but it could be very time consuming at a road check! I also contacted the RA and after a brief description of the problem, they also confirmed that I was legal. I must admit that I took the easy option by ceasing mobile operation until I had the new validation document, which I did eventually receive three days before Christmas.

My CB renewal in January was paid by cheque at the end of the second week, the validation document was not received by me until the 24th February. I do not think much of their system and firmly believe the old licence application and renewal procedures were far better. In the light of my experience, I would suggest that all those who renew their licences by direct debit should keep a careful watch on their bank accounts, to make sure the debit is applied for. Although in an automated system this should not be needed, as paying by direct debit is supposed to be easier as it is not essential to remember renewals, however, my experience has proved this theory very wrong.
R. A. Connolly, GI7IVX

Readers may like to read the 'SSL Reply' regarding licensing in last month's issue of HRT – Ed.

Standard C558 Review

Chris Lorek G4HCL tests a feature packed dual bander



One of the many popular 'black box' buys amongst amateurs nowadays is undoubtedly that of a dual band 2m/70cm FM handheld, having the facility of operation 'out and about' in portable use together with possibly also mobile operation with a speaker-mic plugged in, as well as in the shack and around the house. With this in mind, the C558 dual band handheld from Standard offers complete coverage of 2m and 70cm, and a lot more besides with its 'opened up' wideband receiver which came as standard on the review set, with simultaneous receive on both bands and selection of either 2m or 70cm for transmit. In fact, the transmit side also seemed to be 'opened up' on the review set tested, quite useful for trips to Dayton, Florida, or whatever where the relevant amateur bands cover the wider ranges of 144-148MHz and 420-450MHz.

Bells and Whistles

Indeed, if you were thinking of having a listen around on, say, VHF airband while you were over there, this set's receiver tunes down there quite nicely, it even has a selectable AM receive capability! Reading through the set's instruction manual shows that it's full of a lot more 'bells and whistles', such as the capability of being used as a self- contained cross-band repeater, complete with off-air DTMF remote control of the memory channel (i.e., frequency) of operation and even with a remotely-controlled fixed transmit time which you can set in steps between 10 seconds and 200 seconds.

There are plenty more DTMF functions fitted, such as paging and selective calling facilities using the now-common three digit DTMF 'codes', the C558 indicating the caller's ID for you on its LCD when you've been 'paged' by another user. A selectable 'page delay' of either 450mS or 750mS even lets the set cope with repeater squelch delays and the like. You can transmit individual DTMF tones using the set's keypad, for remote control purposes for example, alternatively there are ten DTMF memories available which can each store up to 15 DTMF digits for transmission. You can even select how fast these go out, either 10 digits or 20 digits per second.

An optional CTCSS (sub-tone) unit adds CTCSS encode and decode facilities to the C558. A 'CTCSS scan' mode is also available with this unit fitted, which you can set to scan a received signal and display the frequency of the CTCSS tone used on it. Quite handy for 'repeater input' checking if you're not sure which tone is in use in the area you're in.

Memories

The C558 comes fitted with a plug-in memory module giving 20 channels on VHF and 20 channels on UHF for storage. By replacing this with the optional CMU161 module (which is also used on the Standard C168 rig) you get 100 channels on VHF and another 100 on UHF, which should be plenty for most people, even *with* the set's extended receive capability. Each memory channel can store the frequency, repeater status and offset, CTCSS tone and status (i.e., encode or encode/decode), paging or code squelch mode and code and paging 'send' code address. A selectable 'protect' mode on each memory channel guards against you accidentally overwriting the memory contents. Separate quick-access 'call' channels are also fitted, one for VHF and one for UHF, from which you quickly tune away after selection if you wish.

Your programmed memory channels can be scanned either in total, or in 'blocks' of ten channels, for example two blocks of ten channels on either band (chans 0-9 or 10-19) in the case of the standard set or ten blocks of ten channels on either band if you've fitted the optional CMU161 module. Alternatively, *any* number of memory channels which you've preselected can be scanned, giving quite a range of options, along with selectable scan 'busy', 'pause', or 'stop' mode on each active channel found. A dual watch' lets the set automatically check your selected memory channel briefly (for 0.25 sec) every three seconds for activity, pausing on this channel when the squelch raises. This can be changed to a quick alternate VFO/memory check (0.6 sec on each) if you wish.

In Use

The review transceiver came supplied with a slide-on DC adaptor to allow operation from an external 6-16V DC supply, plus an empty cell case into which you can place 6 AA size alkaline

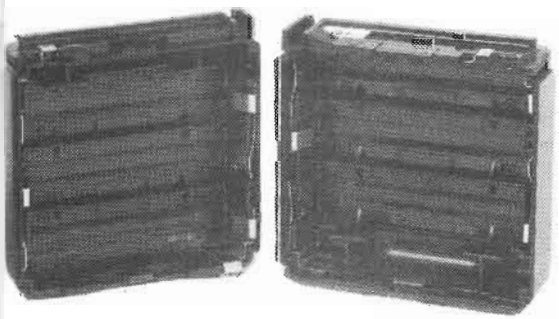
batteries (not nicads as there's no short circuit protection, indeed the supplied manual says nicads aren't suitable, although I feel most users would fit them anyway!). However a modest £20 extra gets you a nicad pack and charger. So, I fitted my half dozen batteries and then proceeded to have a great time learning all the wonderful operating modes the set was capable of!

The first thing I found was that the set had an incredibly wide receive range on both VHF and UHF. For example on VHF it went right down to the VHF weather satellite and VHF AM airband frequencies, and up to (and well above) the VHF marine band. All this could have interesting possibilities where allowed under licensing regulations, and I felt that maybe the optional 200 channel memory module could prove rather useful for 'globetrotting C588 users'.

I started off by configuring the rig with the correct UK 70cm repeater shift of 1.6MHz, as it was set to 5MHz which the set's manual seemed to think was the only one used anywhere in the world on 70cm – fortunately it could easily be altered, then changing the tuning steps from 5kHz to 25kHz. I also had a problem in direct frequency entry using the keypad, where as supplied the set defaults to 10kHz frequency entry steps. So after trying to enter 145.525MHz, I got 145.520MHz, and stepping channels up and down from there meant everything was 5kHz off-channel. However, towards the *end* of the user manual the '1kHz entry mode' was detailed, which I promptly switched in!

Performance

After that, I had great fun with the set out and about. Its receiver really did seem to 'pull in' distant 2m repeaters even with the small dual band set-top aerial as supplied fitted, I was very impressed. For 'home use' though, coupled to a rooftop aerial, I find many such handhelds almost 'collapse' through other strong signals on the band. Marks must go to Standard though, as an internal 15dB receive



attenuator can be selected for such times. Although this naturally reduced the strength of weaker signals, sometimes to inaudibility, local repeaters and packet stations came through 'clean' and I could tune and automatically scan around without the set continuously 'locking up' on internal mixing products. Well done Standard! I found that using the set on low power, with the receive attenuator 'in', was absolutely ideal for accessing my local packet BBS with the set with a much higher 'throughput' of data both sent and received.

The C558 had a number of battery-saving features, such as a variable rate battery saver (between 0.25 and 10 secs 'off time') and an auto-power-off, which kept me operational that bit longer when out and about. Overall, the set worked reasonably well on air, with good receive audio and quite reasonable, although reportedly very slightly 'muffly', transmit audio.

Two Bands

With dual-band operation, it can often be a little embarrassing to have the 'sub-band' receiver open up while you're chatting away on the main band. Yes, this has happened to me several times in the past! The C558 has a switchable 'auto-mute on TX' mode which guards against this, which I found extremely handy, no longer did I have to remember to keep turning down the 2m volume before replying to a station on 70cm. There were plenty more 'user functions', even a squelch 'pop' noise reduction setting, although sometimes you can get rather 'into' a programmed memory channel scan, selective call function, or whatever, which could be rather difficult to 'get out of'. For example, when you're driving along and you see your amateur friend's car in front of you, and you know he's monitoring S20 on 2m, trying to find that channel and defeating whatever CTCSS mode you've got the set in can often not be very conducive to safe driving. The C558 comes to the rescue however, with a two-button push ('power- on' and 'call') which gives a 'temporary reset' back to plain VFO mode. Switch the power off and back on again, and you're back to the whiz-bang super selective calling mode you were in before. Very handy for those awkward times when you'd rather be doing something else, like watching the road ahead.

Laboratory Tests

Overall these showed the set had a reasonable performance on both receive and transmit, with a notably good receiver sensitivity. The strong signal handling was again reasonable for such a set, bearing in mind it's intended primary use as a handheld, the receive attenuator could often be necessary if you attach an external aerial in an 'RF congested' area such as the one I live in. On transmit the power output was well regulated, especially giving plenty of output with an external 13.2V supply connected, although on the set tested was rather more 'off frequency' than I would have hoped for under normal manufacturing tolerances.

Conclusions

I think Standard have got another 'winner' here. The C558 works well, has plenty of operating functions built in, the capability of being 'expanded' if you wish, and sells at what appears to be quite a realistic price. It's currently priced at £429 for the 'basic' set with cell case, or £449 complete with nicad pack and charger. A common limitation with 'do- everything' handhelds is that amateurs *do* use them as such, with receiver overload problems common to many such current sets, the C558 being no exception. In an effort to overcome this, the incorporation of a switchable 15dB receive attenuator is very welcome move, which I applaud Standard for.

My thanks go to Norman of Lee Electronics in London for the loan of the review set.

LABORATORY RESULTS:

All measurements taken using supplied battery case filled with six fully charged 700mAh AA nicads (under lab conditions to simulate use with nicad pack), high power TX, unless stated.

RECEIVER;

Sensitivity;

Input level required to give 12dB SINAD;

144MHz;	0.13µV pd
145MHz;	0.13µV pd
146MHz;	0.13µV pd
430MHz;	0.16µV pd
435MHz;	0.15µV pd
440MHz;	0.15µV pd

Squelch Sensitivity;

	145MHz	*435MHz*
Threshold;	<0.05µV pd (<2dB SINAD)	0.09µV pd (4.5dB SINAD)
Maximum;	0.19µV pd (21dB SINAD)	0.22µV pd (23dB SINAD)

S-Meter Linearity

	145MHz Sig Level	Rel. level	*435MHz* Sig level	Rel. Level
S1	squelch open		squelch open	
S2	0.15µV pd	-31.5dB	0.17µV pd	-29.8dB
S3	0.21µV pd	-28.5dB	0.23µV pd	-27.0dB
S4	0.35µV pd	-24.1dB	0.33µV pd	-24.0dB
S5	0.42µV pd	-22.4dB	0.47µV pd	-20.7dB
S6	0.81µV pd	-16.8dB	0.85µV pd	-15.8dB
S7	1.80µV pd	-9.9dB	1.78µV pd	-9.4dB
S8	3.39µV pd	-4.4dB	3.21µV pd	-4.3dB
S9	5.63µV pd	0dB ref	5.25µV pd	0dB ref
S9+	8.94µV pd	+4.0dB	8.49µV pd	+4.1dB
S9++	18.8µV pd	+10.5dB	20.0µV pd	+12.0dB

Image Rejection;

Increase in level of signal at first IF image frequency (- 43.6MHz on 2m, - 46.1MHz on 70cm), over level of on-channel signal, to give identical 12dB SINAD signal;

145MHz	*435MHz*
79.5dB	55.0dB

Blocking;

Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

	145MHz	*435MHz*
+100kHz;	77.6dB	74.6dB
+1MHz;	94.2dB	87.6dB
+10MHz;	97.2dB	88.9dB

Maximum Audio Output;

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

145MHz	*435MHz*
153mW RMS	159mW RMS

Current Consumption

Standby, squelch closed;	72.0mA
Receive, mid volume;	108.2mA
Receive, max volume;	172.1mA

Adjacent Channel Selectivity;

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

	145MHz	*435MHz*
+12.5kHz;	30.8dB	30.5dB
-12.5kHz;	29.3dB	24.2dB
+25kHz;	63.5dB	61.0dB
-25kHz;	64.2dB	60.5dB

Intermodulation Rejection;

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

	145MHz	*435MHz*
25/50kHz spacing;	67.2dB	62.4dB
50/100kHz spacing;	66.3dB	61.7dB

TRANSMITTER

TX Power and Current Consumption;

Freq.	*Power*	*7.20V Supply*	*13.2V Supply*
145MHz	High	2.44W/1.05A	5.15W/1.27A
	Mid	2.44W/1.04A	2.49W/904mA
	Low	450mW/490mA	450mW/504mA
435MHz	High	1.53W/874mA	4.69W/1.32A
	Mid	1.53W/874mA	2.14W/924mA
	Low	300mW/450mA	300mW/476mA

Harmonics;

	145MHz	*435MHz*
2nd Harmonic;	-78dBc	<-80dBc
3rd Harmonic;	<-80dBc	<-80dBc
4th Harmonic;	<-80dBc	-80dBc
5th Harmonic;	<-80dBc	–
6th Harmonic;	<-80dBc	–
7th Harmonic;	<-80dBc	–

Frequency Accuracy;

145MHz	*435MHz*
-541Hz	-1.40kHz

Toneburst Deviation;

145MHz	*435MHz*
3.40kHz	3.57kHz

Peak Deviation;

145MHz	*435MHz*
5.02kHz	5.23kHz

MFJ Personal Morse Tutor Review

Chris Lorek, alias N0ZTU/AE, finds that his morning 'jog' would never be the same again

For many would-be Class A amateurs, getting through the Morse test is seen as a great hurdle. There are plenty of 'learning aids' available, in an effort to overcome this hurdle, or at least make it a bit easier. It's fair to say that, today, it's a lot easier to learn than it was, say, ten or twenty years ago before the advent of microprocessors! Learning the basic Morse characters is usually relatively straightforward, as is sending them on a key, the hard part is getting your *receive* speed up to the required standard!

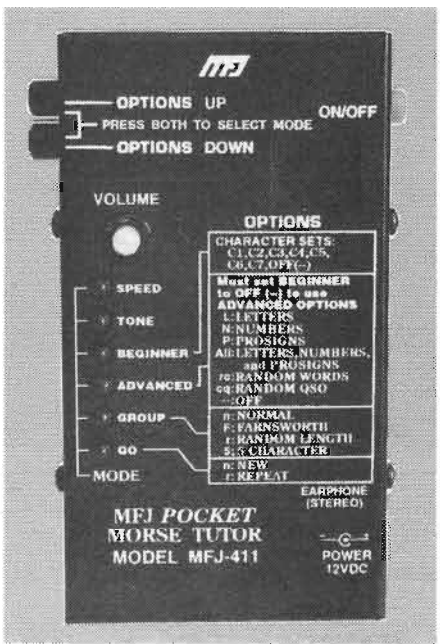
I did this many years ago with invaluable off-air practice on 2m from my friend George G3ZQS, a true 'helper' to other amateurs and listeners. I believe that to this day George continues to help beginners and newly licensed amateurs in their 'first steps', along with many other 'helpers' who generously also donate that valuable commodity, *their* time, in helping others get their licence.

But not everyone learning Morse is fortunate enough, either through location or work restrictions, to be in a position to listen at the required times or to obtain one-to- one help. In these cases, the advent of micros has almost revolutionized CW learning, as it recently did for me when I wanted to 'brush up' my CW skills to take the US 20wpm test. Computers with software such as 'Supermorse' are superb for this, and with this I managed to comfortably read above the required speed a lot sooner than I thought I would have done. But a desktop PC isn't exactly the thing you'd use to practice while waiting at the train station, or on the bus to work! The MFJ Personal Morse Code Tutor certainly *is* though.

Portability

It's a self-contained unit measuring 75mm x 30mm x 140mm, powered from an internal 9V battery, with a built-in speaker and volume control together with a headphone socket for 'personal stereo' type use – your morning jog will never be the same again! As well as offering a 'Beginner' mode, where characters are sent in an ordered sets given in the accompanying manual, its most useful purpose in my opinion is that of increasing your receive speed, and your receive proficiency (more of this later), after you've learned the basic letters, numbers, and punctuation symbols. It'll send to you at any speed you select between 5 and 60 words per minute, with either normal spacing according to the speed selected, or 'Farnsworth' spacing with individual characters sent at a default speed of 18wpm. You can even set the sidetone to whatever you prefer between 300Hz and 3.3kHz.

After you've got the 'hang' of the characters themselves, possibly using the MFJ unit together with the manual, you can go on to the 'Advanced' mode on the unit. Here, you can instruct the unit to send either standard groups of the letters A-Z, the numerals 0-9, a large range of punctuation and procedural symbols, or a combination of the lot. It can also send real words relevant to amateur radio, such as *rig, tuner, ground, contest* and so on. However, the really useful bit is that the unit can also send *random simulated QSOs*, with callsigns, signal reports and the like, to prepare you that much more for the sort of 'real QSO' passages you'll be examined on in your Morse test.



Getting Professional

OK, you've used the tutor to get through the Morse test successfully, first time. Congratulations. You may even have upgraded from Novice to the 'full' A licence with it. What do you do with it now? No need to sell it, because it'll also help you increase your 'on air' CW proficiency. As well as helping you increase your speed above the required 5 or 12wpm for those fast contest and DX contacts, you can use the 'word recognition mode' where it sends entire amateur radio-type words to very good effect, to eventually recognise entire words, and not individual letters.

After a while listening 'on air' you'll have started to recognise things such as CQ, DE and so on. With this little gadget, you'll be taking this even further, and maybe even soon be able to read CW 'in your head' rather than writing it all down, just like the long-standing CW 'buffs'.

Conclusions

I consider the MFJ CW Tutor to be a very handy device, its portability allows you to improve your CW speed and proficiency during those 'odd moments' you find you have, here and there. Its use in actually *learning* the code symbols I feel is a little more limited, however this unit, combined with, say, an introductory book on Morse such as that available from the RSGB (which can't of course send CW at you!) should help you considerably. The trick to getting your speed up to the required standard, as many 'old hands' will tell you, is to practice, practice, *practice*. This'll let you do just that, even when you maybe otherwise couldn't spare the time each day. I wish I'd had the use of it when I was getting ready for the US 'Extra' test a short while ago!

The MFJ Personal Morse Code Tutor currently retails in the UK at £89.95, and my thanks go to Waters and Stanton Electronics in Hockley, Essex, for the loan of the review model.

Drake SW8 HF Receiver Review

Chris Lorek G4HCL tests the latest receiver from the land of Uncle Sam

Just over a couple of years ago, the much respected US radio manufacturing firm of Drake reappeared on the amateur radio scene with the launch of their new high-performance R8E HF receiver. Since then it appears their design department haven't been resting on their laurels, with the recent appearance of the R8E's 'little brother', the SW8. This one's clearly aimed at the serious broadcast listener as well as the HF radio enthusiast, and it's current price of £599 in the UK gives it a foothold in the 'hobbyist', rather than just the 'top-end', market.

As well as desk-top operation, the receiver being powered from the supplied AC mains adapter, the SW8 has also been designed with portability in mind. You can fit a set of six D size cells inside the set's case, and with the carrying handle, which also doubles as a tilt-up desk stand, you can take it out and about with you – the receiver less batteries weighs only around 4kg. As well as a collection of rear panel aerial sockets for low and high impedance HF aerials, there's also a built-in telescopic aerial which you can use for on-air listening. The SW8 measures 292mm x 133mm x 330mm including all projections.

Coverage

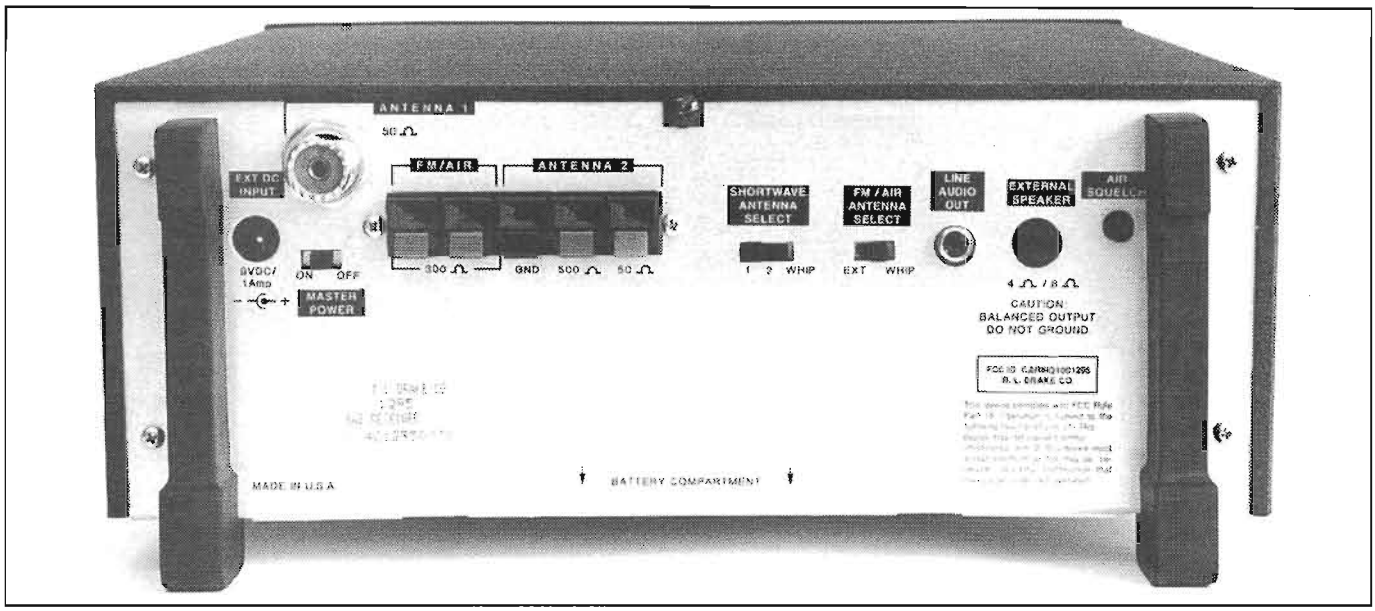
The set covers the HF range of 500kHz to 30MHz, together with the VHF FM broadcast band of 87-108MHz and the VHF civil airband range of 118-137MHz 'thrown in' for good measure. For HF listening under those conditions of fading and distortion we've all grown to know and love, together with 'plain AM' the SW8 has synchronous AM reception capability in an effort to combat this. Lower and Upper Sideband modes for amateur and utility station listening are of course also fitted, there's more than one HF broadcast band station using SSB nowadays in an effort to give its listeners a better signal. Three IF bandwidths are available, 2.3kHz, 4.0kHz and 6.0kHz, to suit a variety of HF listening conditions. These can be automatically selected for you according to the mode, which you can then change as you wish, alternatively the 'automatic selection' can be defeated if you choose. The AGC (Automatic Gain Control) can be set to either fast or slow for any HF mode, and a switchable 20dB attenuator can be used to guard against mega-strong signals or just to give your ears the occasional rest on a noisy band.

You can tap in the frequency you want to listen to directly on the set set's keypad, or use the large up/down buttons in combination with the tuning knob for just listening around. 70 memory channels arranged into 7 groups of 10 channels each are fitted, these storing all the preset receiver functions such as mode, bandwidth, AGC setting etc. in addition to the frequency.

On The Air

After unpacking the set, I quickly popped it on my shack table for an initial 'listen around', the receiver coupled to my various LF and HF amateur band aerials. I must admit, I was impressed. On the amateur bands, it just sounded 'right', good signals unhampered by adjacent channel interference on a crowded band, with extremely 'clean' audio from the set's forward-facing internal speaker. Likewise on the broadcast bands, stations came and went cleanly, with good audio quality, no compromises here. "Better sit down and read the instruction book" I thought!

I found the set allowed a number of handy 'short cuts' in getting from one part of the spectrum to another. As well as direct frequency entry, each of the HF broadcast bands could be selected by entering just the appropriate 'waveband', i.e., "41" for the 41m band, "49" for the 49m band, and so on. Whenever the receiver was within what it believed to be a HF broadcast band, either following selection or just after tuning to it by other means, it displayed the appropriate band



designator on the LCD as a 'reminder'. Also, after recalling any of the memory channels I could tune away from these simply by giving the main knob a twist, the receiver retrieving the bandwidth, mode and so on programmed in the memory channel. This I often used as a 'bandchange', for both the amateur bands and for my favourite sections of the broadcast bands.

On the amateur bands, I missed having the facility of an RF gain control. Although the AGC did work remarkably well, listening to SSB under 'static interference' conditions meant I had to use fast AGC, which tired my ears quite a bit. I found the set tuned in 50Hz steps on HF, which although were OK for speech modes could sometimes present a problem for receiving some narrow-shift data modes. However, the frequency stability was excellent, once set to a given fixed station the receiver didn't seem to 'budge' even over a period of several hours, so at least any 'offset' was stable. I found there was a synthesizer tuning 'glitch' every 100kHz, although I quickly became used to this.

On Medium Wave, the up/down buttons on the SW8 could be set to step through in either 10kHz increments (as used in the US and Canada) or 9kHz increments (as used in Europe). As on HF, I found Medium Wave DX reception very good, with the 4.0kHz bandwidth proving useful at night in extracting those weak stations.

A 'line out' phono socket on the rear panel allows for connection of a tape recorder or data terminal, although neither terminal of the external speaker connector may be grounded as the receiver's audio amplifier has a balanced output. The manual warns that the receiver could be damaged if you do this – important advice! The aerial selectors allowed for either high or low impedance HF aerials, either via. 'block connectors' coupled with a ground connector or an SO-239 socket. An adjacent switch allowed use of the internal whip either on VHF only or on HF as well.

An internal clock, once set, gave the time in two time zones, for example local and GMT. A two-event timer also allowed the set to be used as an alarm clock or 'sleep timer', the programmed times also selecting the programmed frequency or memory channel. Unfortunately there's no tape recorder DC switching output from this, so it'll be difficult to use this for unattended recording, the set doesn't come with a circuit diagram either so 'do-it-yourself modifiers' could have a hard time!

I found the Synchronous AM facility very easy to use. On tuning, the 'Synch' circuit automatically disabled itself so that I could tune stations in normally without all the associated squeals and whistles. A second or so after halting, the 'Synch' re-engaged itself to give synchronous AM reception again – a nice touch. A 'memory scan' lets you scan through a block of memory channels, this halting on each channel for 5 seconds before continuing. I must confess I didn't find this very useful, although it could be handy for initial searching through a number of HF frequencies all programmed to, say, a given station operating on different frequencies in order to find one giving satisfactory reception.

A quick listen on VHF FM showed this to operate well too. When I'd tuned into a stereo FM broadcast station, plugging in a pair of stereo headphones into the side-mounted 3.5mm jack socket even brought up the 'stereo' icon on the LCD, and gave true stereo reception through the 'phones. The external aerial input for VHF FM was unfortunately a balanced 300 ohm line only, likewise for the VHF AM airband. That's right, there's no facility for plugging in your coax-fed discone or whatever without going out and buying an external VHF balun to fit on the back of the receiver. Ah well! The set did however operate quite well on VHF using the internal whip, and there was a finger-adjustable preset control on the rear panel for AM carrier squelch on VHF airband.

Technicalities

The SW8 is a dual conversion superhet on HF and VHF AM, with a 1st IF of 55.845MHz for roofing selectivity and a 2nd IF of 455kHz for narrow band selectivity, where three multi- pole ceramic filters are used. For VHF FM, a single conversion approach with an IF of 10.7MHz is used. The receiver's memory channel details are stored into 'non-volatile' memory, meaning you don't lose them when the power is disconnected. The clock settings are lost however after around half an hour without external power if a set of internal batteries aren't fitted.

The set can be run off any external supply of 7-10V DC (not 12V) capable of delivering 1A. To give you an idea of battery life you'd expect before a battery recharge or replacement is needed, with an average 0.25W audio output on AM the set draws around 600mA from either the DC supply or the internal batteries.

The lab results show the set to be a reasonable performer. The selectivity 'shape factor' of the set's ceramic 455kHz filters was quite good, and the IF ad image rejection exceptionally good, no doubt due to the high 1st IF. The bargraph LCD S-meter was particularly accurate, especially at the S-9 level and above.

Conclusions

Drake's SW8 will I'm sure find a 'home' in many listener's abodes for HF broadcast or SSB listening. It should be equally useful either in the lounge or the hobbyist's 'shack', and it's relatively easy portability could also find it being taken along in a mobile camper or whatever, powered either from an external 9V DC supply of internal batteries.

It gave reasonable performance on HF, the synchronous AM was extremely beneficial on the broadcast bands, and the inclusion of VHF FM and Airband AM coverage was a useful 'extra'. Various connectors for either low or high impedance HF aerials, as well as the set's internal whip, are fitted, you'll need to provide an external balun to connect an external coax-fed aerial on VHF though.

My thanks go to Nevada Communications in Portsmouth for the loan of the review set.

SW8 Band Designators

120m	2300-2500kHz
90m	3200-3400kHz
75m	3900-4000kHz
60m	4750-5060kHz
49m	5800-6200kHz
41m	7100-7500kHz
31m	9500-9900kHz
25m	11650-12050kHz
19m	15100-15600kHz
16m	17550-17900kHz
13m	21450-21850kHz
11m	25600-26100kHz

LABORATORY RESULTS:

Sensitivity;

Input level in µV pd required to give 12dB SINAD, measured with SSB 2.4kHz bandwidth, AM 6kHz bandwidth;

Freq. MHz	*SSB*	*AM*
0.5	0.54	1.69
1.0	0.56	1.52
1.5	0.41	1.38
2.0	0.47	1.49
3.0	0.43	1.34
4.0	0.42	1.38
5.0	0.42	1.35
6.0	0.38	1.38
8.0	0.38	1.13
10.0	0.39	1.21
12.0	0.39	1.25
14.0	0.40	1.27
16.0	0.43	1.26
18.0	0.42	1.31
20.0	0.44	1.37
22.0	0.48	1.49
24.0	0.47	1.50
26.0	0.43	1.36
28.0	0.39	1.24
30.0	0.42	1.33

Selectivity;

Single Signal selectivity, measured at 10.7MHz

	2.4kHz	**4.0kHz**	**6.0kHz**
-3dB	2.47kHz	4.85kHz	7.17kHz
-6dB	2.69kHz	5.65kHz	8.34kHz
-10dB	2.96kHz	6.16kHz	9.19kHz
-20dB	3.27kHz	6.68kHz	9.95kHz
-40dB	3.62kHz	7.53kHz	10.81kHz
-60dB	4.93kHz	8.33kHz	11.74kHz

Attenuator Level

Measured on 10.7MHz
19.5dB

3rd Order Intermodulation Rejection;

Measured on 10.7MHz with SSB 2.3kHz bandwidth as increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;

10/20kHz spacing;	81.0dB
20/40kHz spacing;	81.4dB
50/100kHz spacing;	81.5dB

Blocking;

Measured with SSB 2.3kHz bandwidth as increase over 12dB SINAD level of interfering signal at 10.70MHz, unmodulated carrier, causing 6dB degradation in 12dB SINAD on-channel signal;

+100kHz;	94.3dB
+200kHz;	90.7dB
+1MHz;	97.0dB

IF and Image Rejection;

Increase in level of signals at the first IF image frequency (+111.690MHz), and the IF itself (55.845MHz), over level of on-channel signal to give identical 12dB SINAD signals;

Freq. MHz	*Image Rej.*	*IF Rej.*
0.5	93.7dB	98.1dB
1.0	97.3dB	98.3dB
1.5	97.2dB	97.3dB
2.0	>100dB	>100dB
3.0	>100dB	>100dB
4.0	>100dB	96.7dB
5.0	>110dB	96.2dB
6.0	>110dB	94.3dB
8.0	>110dB	90.5dB
10.0	>110dB	89.7dB
12.0	>110dB	89.4dB
14.0	>110dB	88.5dB
16.0	90.3dB	86.9dB
18.0	90.6dB	86.0dB
20.0	90.2dB	86.3dB
22.0	90.0dB	86.0dB
24.0	89.4dB	85.9dB
26.0	88.9dB	86.1dB
28.0	94.6dB	86.8dB
30.0	89.3dB	86.5dB

S-Meter Linearity;

Measured at 14.25MHz, SSB, 2.3kHz bandwidth

Indication	*Sig. Level*	*Rel. Level*
S1	-	-
S2	1.06µV pd	-33.2dB
S3	1.53µV pd	-30.0dB
S4	2.76µV pd	-24.9dB
S5	4.61µV pd	-20.4dB
S6	8.32µV pd	-15.3dB
S7	18.2µV pd	-8.5dB
S8	33.1µV pd	-3.3dB
S9	48.7µV pd	0dB ref.
S9+10dB	155µV pd	+10.1dB
S9+20dB	519µV pd	+20.6dB
S9+30dB	1.55mV pd	+30.1dB
S9+40dB	4.61mV pd	+39.6dB
S9+50dB	15.5mV pd	+50.1dB
S9+60dB	47.8mV pd	+59.9dB

Review – JPS DSP Filters

HRT's Consultant Technical Editor gets even more technical by digitally processing his receive signals

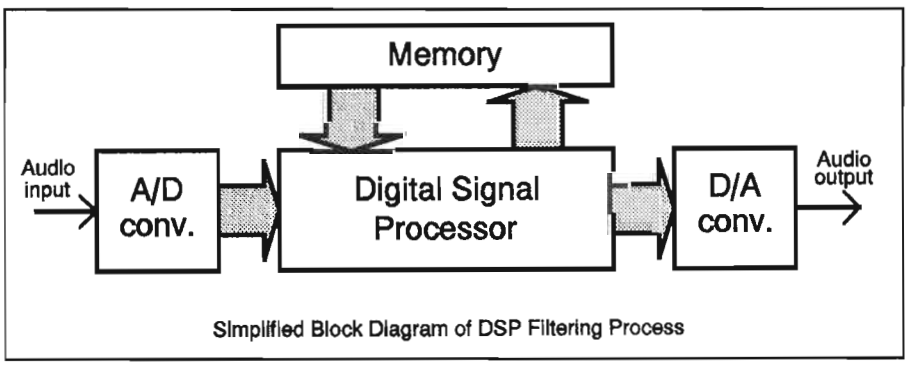
It's a sure sign that we're living in the 'digital world' when things we've taken for granted as being analogue, like speech and noise (as on amateur radio) and even music (as virtually everywhere, e.g., compact discs, digital audio tapes, and soon digital broadcasting on 220MHz VHF) suddenly become digitally processed. The benefits of being 'digital', as many people know, are freedom from noise and as near to perfect reproduction as possible. Wouldn't it be nice if the signals we fight to hear on 20m could be like that? Well, maybe that could take the fun out of 'digging through' the QRM to search out the weak DX! Whichever way you look at it, Digital Signal Processing, or DSP for short, is with us *now*, and I've heard more than one amateur using DSP receiver filtering on the HF bands in an effort to cut out the noise and interference. Following this year's London Show I was very pleased to take away a couple of the latest DSP offerings from JPS for review in HRT.

What is DSP?

The accompanying block diagram is a (very) simplified idea of what goes on inside a DSP filter such as the JPS units featured here. Basically, the input signal (from your receiver's audio) is converted to a digital 'data stream', of 14 bits in the case of the JPS units. From here it enters the 'brain', where the powers of microprocessors take over! The signal is examined, closely, and digitally processed to 'clean it up' as required. For example, if there's a steady, strong tone there (like a carrier from someone tuning up on your frequency), the DSP filter can instantly reject it. If there's a tone going on and off like the clappers, then it's likely to be a CW signal, which depending upon whether you're operating on SSB or CW you may want to receive or not. So, you can instruct the DSP to either reject it and pass everything else like the SSB audio you want to listen to, or (if you're actually operating CW and *not* SSB) to pass *that* CW signal and reject everything else. Good, eh? I wish my ears could do that! What about data signals, like RTTY, or even stuff like SSTV? Multiple interfering tones are no problem to DSP filters, the JPS units here can even reject up to *four* simultaneous interfering tones!

The NTR-1

The NTR-1 is described as a wide band noise and tone remover. A spectral notch filter function is provided to remove multiple tones from receive



Simplified Block Diagram of DSP Filtering Process

audio. A dynamic peaking noise reduction function removes noise from the received audio, and provides dynamic peaking around all coherent signals, voice or otherwise. This in effect dynamically reduces the effective audio bandwidth to the minimum required to pass the information.

A front panel wide/narrow switch provides audio bandwidth switching. The narrow bandwidth is optimised for narrowband SSB, CW, and data signals, and an internal three-position jumper can be set for optimum noise reduction in the 'wide' band position to give best intelligibility for either wideband SSB, AM voice broadcasts, or AM broadcasts including music.

The NIR-10

The NIR-10, described as a noise and interference reduction unit, could be classed as a 'go-faster' NTR-10 with the addition of a noise reduction mode. Operating at twice the clock speed, together with multiple tone rejection and dynamic peaking noise reduction facilities it also has an 'NIR' noise reduction mode which is designed to automatically enhance voice signals. It does this by recognising speech characteristics and dynamically reducing the amplitude of all signals which are not part of the speech information. The amount of noise reduction is continuously variable, from zero to maximum, by the NIR Level control on the filter's front panel.

A variable bandpass mode is also present, in effect a 'brick wall' filter action intended for CW and RTTY reception, with a variable centre frequency and three bandwidth positions.

Each DSP filter connects in line with your receiver's speaker lead, with phono in/out sockets used on the DSP filters. Each requires an external 12V DC 1A supply for power, and suitable connectors for DC power and audio in/out are supplied with each unit.

On The Air

One of my special interests is greyline DXing on 80m, indeed I've been interested in this for over 20 years (and I still often use the same receiver model I did then!). However, as soon as dawn approaches during some parts of the year, the noise creeps up, and there's only so much one can do with an aerial system in a modern housing estate garden to try and reduce this. After hearing of other amateur's 'success stories' with DSP filters, I was very interested to see how the JPS filters would cope. Likewise in trying to receive HF broadcast stations with 'entertainment quality' on a Sunday afternoon, when besotted by neighbouring TV line timebase and video game RF noise!

As the NTR-1 seemed to be the 'simplest' one to get the hang of in terms of controls, I started with that, coupled to a variety of rigs from the very latest HF black boxes to a 1970's amateur band receiver. On general listening around to SSB signals on the amateur bands, I found the notch filter to be absolutely superb – switching this in and out even completely got rid of (probably commercial) data signals beneath amateurs. I found that leaving the notch filter in all the time did give normal speech a slightly 'metallic' sound, which I didn't find too pleasant to listen to all the time, so I tended to use the notch only as and when nee[illegible]. With the bandwidth switched t[illegible], virtually everything sou[illegible] cleaner' on my older receiver, I left this in all the time to good effect.

I had mixed feelings about the noise reduction facility on weak SSB and CW signals. Where the signal was reasonably strong in relation to general band noise, it usually made the readability rather better, although sometimes at the expense of a slight 'warble' at the beginning of each syllable or CW digit. Where the signal was buried in the noise, it just tended to 'warble' the signal completely, sometimes even making readability worse! To be fair, the manual *does* acknowledge that the unit can't cope with signal to noise levels worse than 0dB, and I suppose this is where the human brain processing must come into play!

Listening on the HF and MF broadcast bands however, the noise reduction was, to be honest, very good indeed. AM signals severely masked by repetitive noise, such as computer 'hash', were cleaned up tremendously, even my family said they didn't mind listening to such broadcast stations with the DSP unit in line!

After 'playing' with the NTR-1 for a while, I felt it was time to progress to the NIR-10. Now I usually have little difficulty in reading and understanding instruction manuals, but the NIR-10's almost drove me mad with it's 'you can use this mode but not with this mode', and 'when you use this other mode you must remember that the other mode isn't operative', and so on. In all, I was *very* confused until I used the three-page pull-out table showing the various switch positions required for nine different operating modes! This I found to be absolutely essential, at least whist I was beginning to use the filter. JPS obviously thought likewise, maybe someone read their manual, hence its inclusion!

On air, as I expected the NIR-10 seemed to do everything the NTR-1 achieved. Again the notch filter was excellent, at the expense of a slight 'metallic' ring. The bandpass mode I found was very good on weak CW signals. With the rotary knob used as an audio tuning control I could nicely separate even closely-spaced CW signals, giving a noticeable improvement even when I also had my receiver's 500Hz IF crystal filter in line. Data signals were also cleaned up nicely with the filter in the 'medium' selectivity position, my all-mode terminal unit certainly noticed the difference, with plenty more coming up on my monitor screen from weak signals. For SSB, in 'wide' mode the knob acted as a useful audio selectivity 'shift' control, getting rid of adjacent channel 'chatter' noises nicely.

Switching from 'Bandpass' to 'NIR' mode on SSB showed just what the unit was capable of. Here, the rotary knob acted as an NIR level control. I found I could set this to give a useful degree of noise reduction without the onset of signal degradation (which did occur with the level 'screwed up'!), depending on the conditions at the time. Again it *wouldn't* 'pull signals out of the noise', but with careful adjustment it made a sterling effort in letting me receive the weak ZL stations on 80m in the mornings, a little better than I otherwise would have been able to.

On the broadcast bands, the NIR mode was absolutely *superb*. I could set the level control to almost completely get rid of most noise, without hardly any apparent degradation to the signal, only a few 'holes' where the interference would have been, it really was superb. I found it an invaluable addition when tuning around the weaker stations.

Conclusions

The units aren't cheap. At £199 for the NTR-1 and £399 for the NIR-10, you could probably gain quite an improvement by spending the same amount on improving your aerial system, or receiver IF filtering, or the receiver itself. However, if you've already done this to a reasonable extent, and you're striving for the 'ultimate' in readability, the JPS DSP filters are worthy of consideration. As well as for speech and CW, data enthusiasts (including Fax, SSTV and the like) will find a good improvement. Broadcast band listeners striving for 'entertainment' quality of noise and heterodyne corrupted stations, rather than very weak-signal 'DX chasers', will find the NTR-1 quite useful. The NIR-10 really scores in this respect, its dramatic improvement of 'hash' corrupted AM signal has to be heard to be believed.

My thanks go to Lowe Electronics in Matlock for the loan of the review filters.

Storno 4000 Series Ex-PMR Conversion

Simon Lewis GM4PLM converts the synthesised 2W UHF CQP4662, CQP4663 and CQP4664 handheld to 70cm

The Storno 4000 series and drop-in quick charger

The Storno 4000 series handheld is a synthesised 2 watt handheld originally designed for short range commercial communications use. Recently many of these have started to appear on the amateur market, turning up at rallies throughout the country. With a new PROM and a quick re-tune you will end up with an excellent 70cm portable with plenty of scope for user add-on's.

The set consists of the transceiver unit, aerial and battery pack. Don't worry if you didn't get an aerial with your radio, I'll tell you how to get round that, but **do** make sure you get the correct battery pack to go with your radio, it doesn't matter if it works or not! I'll show you how to repair it. A drop-in charger is also available as part of the 4000 range, these are also appearing on the market but again don't panic if you can't get one. I would advise you if you do get offered one to buy it. It does make for convenience, as it's a fast charger and you can charge two batteries or sets simultaneously.

The radio is fairly small and light with all the controls being contained on a membrane keypad on the front. Channel display is via an LCD which also carries a transmit indicator. The radios were made to cover numerous frequency ranges, just like Pye gear. The models covered here start with the model number CQP 466*. There are three available, although I have only come across the 25kHz spaced model on the amateur market so far.

A small label in the bottom of the radio carries the model number and specifications;

CQP 4662; 25kHz channel spacing
CQP 4663; 20kHz channel spacing
CQP 4664; 12.5kHz channel spacing

Any of the above will be suitable for conversion, although with the 12.5kHz model you may find some audio distortion on receive. After the model number you will find some letters and numbers, these give the model details. These break down as follows:

Radio Type; **S**; Standard,
U; Universal
Transmitter Output; **1**; 1 Watt **2**; 2 Watt
Frequency Capacity; **A**; 2 Channel, **B**; 10 Channel, **C**; Automatic

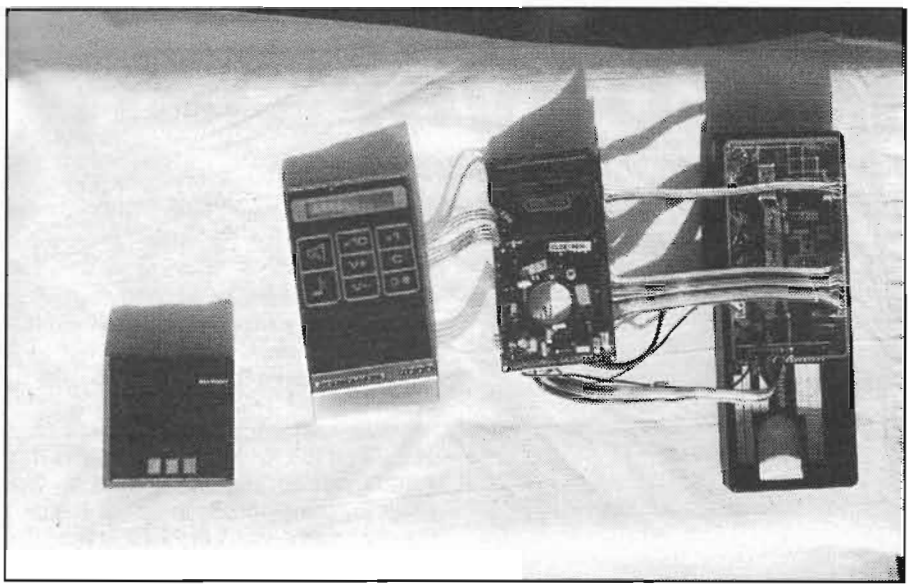
So the model *SO2B* decodes to a standard, 2 watt, 10 channel set. Beware of sets marked C as these are for use on trunked radio systems and are *not* suitable for conversion, choose another radio as you will need to replace the Processor board in this model. The frequency range of the CQP 466* range is 400-470 MHz with a maximum 2.5MHz segment in any one section of the coverage.

The receiver specification is quoted as 1µV for 20dB SINAD, however I have found most sets to exceed that. The story is pretty much the same with the transmitter, the output is quoted as 2 watts but I have found most to exceed that.

Channel information is held on a 256 x 4 bit PROM (that's a non-erasable *PROM*, **not** an *EPROM* - Tech Ed). The programming information is beyond the scope of a small article like this, the programming manual comes separately and is massive! To overcome this problem, the HRT Editor can supply readers with a suitable program to produce the necessary code for the PROM. The program, written for the PC, is very simple to use and was written for the amateur population by G7HEX and is basically a cut down version of the original Storno programming software. The code generated by the program can then be loaded onto a new PROM, but make sure you get it right, you only get one chance! Incidentally RS Components sell the PROMs, type 82S129AN, you can buy them over the counter at one of their branches. Once you have your programmed PROM you can then start the conversion.

Alignment of the radio is very simple but there is one hurdle to get over before you can commence. The radio is built on a 'sandwich' type construction with the boards mounted atop of each other. To align the radio you need to be able to operate the radio with it in bits so you can get to the RF deck alignment points. The only way around this is to make a set of extender leads so the boards can be separated but still connected together. I made a set from the Minicon connectors available from Maplin. Together with some ribbon cable you can make a set of robust leads that will help you align the radio without trouble. The set I made up has so far aligned over 30 radios so they are quite reliable when made correctly. Connect the leads 'pin for pin', as if the boards were close together. Once the leads have been made up you can start the alignment.

Start by dismantling the radio. Take this *slowly*, the front panel assembly is delicate and easily damaged and almost impossible to repair, be warned! Unscrew the two screws on the case rear, remove the aerial and pull the transceiver unit from the case. Undo



'Ready for Conversion'

the four screws at the radio back then *gently* prise the front panel off the unit. The keyboard/loudspeaker/mic is connected to the radio by three ribbon cables, be very gentle with these. Pull the ends of the cables from their appropriate connectors on the processor board and remove the front panel. Next remove the processor board from the RF deck by *gently* prising the board upwards from the radio. Again take care, the pins connecting the radio together are delicate and are easily damaged if you are not careful. You will now be able to see the RF covered by its metal screening. You should be able to prise this free as it is only solder tagged in a few places. You should now have a naked 4000!

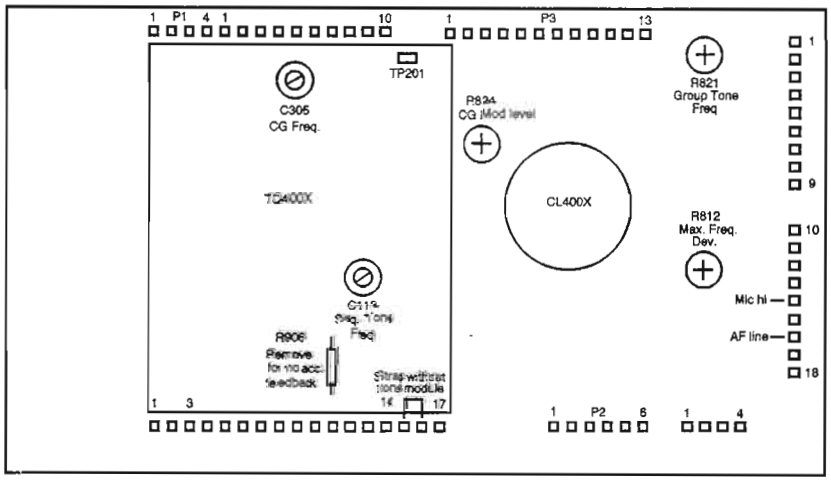
The conversion

Remove the PROM from the processor board and replace it with the one ready programmed with your channels, checking that you have inserted it correctly. Connect up your test cables making sure you have all pins connected pin to pin with no shorts.

Place the RF unit back into the plastic case and connect the battery. Switch the radio on and check the display shows *C1*. Press *C* on the keypad - make sure you can change channels correctly. Select the channel with the centre-most frequency of the ones you have chosen. Measure the voltage at TP4, and adjust C514 until the reading is around 3V. Check all channels remain around the same voltage. Attach a diode probe and volt meter onto TP2 and adjust L508 for a reading of 0.13V +/-0.02V.

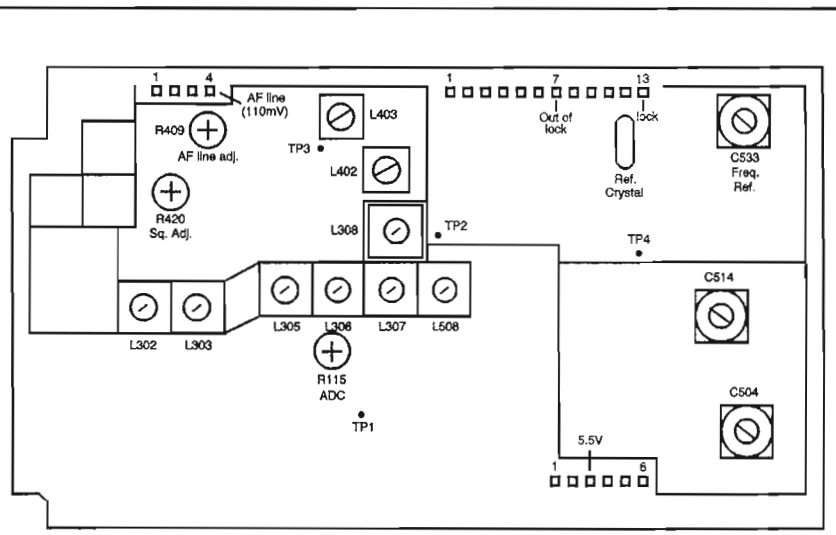
Remove the probe from TP2 and inject a signal into the aerial socket of the radio. You should hear the signal straight away but if not try using the squelch defeat switch on the front panel until you hear the signal strongly enough. Adjust L306, 307, 305, 303, 302, 508 in that order for maximum quietening. Keep reducing the signal input and re-adjusting the front end coils until you can get no improvement. That takes care of the receiver.

The transmitter is very simple. Connect the aerial or a dummy load to the radio. Put the radio into transmit and measure the voltage at TP4, adjust C504 until it measures around 3V for all channels. You should be able to hear the transmitter on a monitor receiver. You may find hum, burbles or some instability in the transmission, don't worry. It's because of the test leads that this is happening, it should disappear once the radio is re-assembled. Check the TX indicator is showing on the LCD when you go to transmit, this shows the VCO



Adjustments, TX400X and CL400X

Test points and adjustments



Test Points and Adjustments, RF4660

is locking on transmit. Finally check VR115 is adjusted fully clockwise to give maximum power out, or adjust it to the power output level you require. That completes the transmitter alignment.

You may now re-assemble the radio in reverse order taking care when you replace the tinplate screen that it does not short any of the pins to the case. Once you have re-assembled the radio, switch on and carry out a complete check including transmitting on all channels. You may find that you will need to re-adjust the TX VCO capacitor C504, but this is rare. One final point on the transmitter is to check the deviation is correct, if not readjust the variable resistor R812. You should now have a converted 70cm Storno 4000.

Other Information

Battery packs are quite hard to come by, make sure you get one with the radio when you buy it. Don't worry if it doesn't work, you can prise the pack open and replace the cells with new ones. Reseal the pack with polystyrene cement, this is the type found in plastic model kits. Don't use epoxy, you will never be able to get back into the pack again!

If you didn't get an aerial with the radio don't panic. The screw thread for the aerial socket is removable and can be easily prised out, open out the hole until a standard BNC socket fits it. Remake the connection to the RF deck and this will allow you to use a standard commercial 70cms rubber duck or even an external aerial.

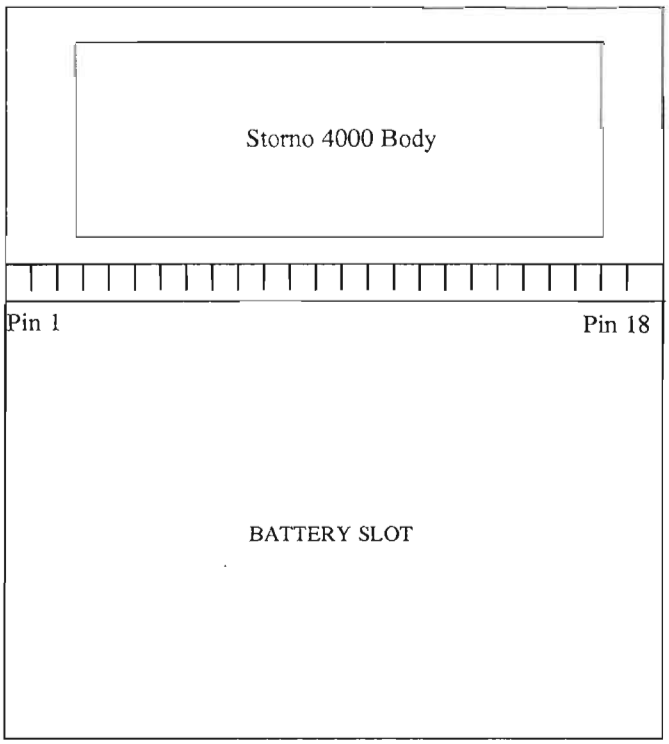
It's quite possible should you wish to add other items on such as external speaker, power supply or packet TNC connections. This is limited only by your own ingenuity!

The finished radio will give you hours of fun. It's robust (which I can vouch for!) and built to last as well as being rainproof. To top it all, it's cheap and easy to convert and shouldn't tax the brain too much.

I am happy to advise anyone who needs information on the Storno 4000s and even align radios for individuals if required. Please contact me at the address shown. If anyone is stuck for programming a PROM then please contact me and I will be able to supply one custom programmed to your channel selection. Write to; Simon Lewis GM4PLM, 9 Malcolm Place, Helensburgh, Strathclyde G84 9HW, please enclose an SAE for reply.

Readers just wishing to obtain a copy of the PC program for the PROM may send a *blank, formatted, 3.5in disk* together with suitable **stamped** return mailer, to 'Storno 4000 disk', HRT Editor, Argus Specialist Publications, Argus House, Boundary Way, Hemel Hempstead, Herts, HP2 7ST. Unformatted or non-blank disks may be returned uncopied, and no return stamped mailer means no return.

DETAILS OF STORNO 4000 EDGE CONNECTOR



Intel Hex file suitable for sending to a PROM programmer, for ten 70cm channels as shown.

```
:0800000000020200020000001F5
:0800080000010F0102000000EE
:0800100004020200020000001E5
:0800180004010F0102000000DE
:0800200008020200020000001D5
:0800280008010F0102000000CE
:080030000C020200020000001C5
:080038000C010F0102000000BE
:0800400000030200020000001B4
:0800480000020F0102000000AC
:0800500004030200020000001A4
:0800580004020F010200000009D
:080060000803020002000001 94
:0800680008020F0102000000 8D
:080070000C030200020000 184
:080078000C020F0102000000 7D
:0800800008000300020000 177
:0800880008030D0102000000 6C
:0800900004000300020000 167
:0800980004030D0102000000 5C
:0800A000000000000000000058
:0800A800000000000000000050
:0800B000000000000000000048
:0800B800000000000000000040
:0800C000000000000000000038
:0800C800000000000000000030
:0800D000000000000000000028
:0800D800000000000000000020
:0800E000000000000000000018
:0800E800000000000000000010
:0800F000000000000000000008
:0800F800000000000000000000
:0800F000000000000000000206
:0800F800000000000000000000
:00000001FF
```

Ch 1; RB0, Ch 2; RB2
Ch 3; RB4, Ch 4; RB6,
Ch 5; RB8, Ch 6; RB10,
Ch 7; RB12, Ch 8; RB14,
Ch 9; SU20, Ch 10; SU21.

Pin connections

1; Ground
2; Ground
11; PTT
14; Mic
15; Loudspeaker
17; Battery positive
18; Battery positive

Where To Find That Ex-PMR Gear!

Our 'conversion boffin' G4HCL shows where to find that gear, and more importantly how to make sure you buy what you think you're buying!

Hardly a day goes by without my getting at least one phone call or packet message something like "I've bought an M290, can you tell me how to convert it to 2m?". My reply often surprises the enquirer; "Yes, certainly if it's suitable, but there's no such thing as an M290, it's a *series*. Which particular set have you got? You'll find this on the serial number plate". This is often the first time the amateur realizes that, what they have sitting in front of them, sometimes *isn't* a 'high-band' (148-174MHz) VHF FM rig at all but instead something like a UHF FM rig, or possibly a 'mid- band' (105MHz RX) AM rig. Read on, and hopefully you'll find out how to become a wiser buyer common question is "Where can I buy the gear from?". This one's easily answered!

The Best Bargains

You'll invariably find that the best bargains are those you find either at rallies, or, if you're fortunate enough to be able to go along, by a personal visit to an ex-PMR equipment supplier. The reason for this is that, with the gear being so cheap to start with, additional time spent by the supplier in sorting his gear out, documenting it, stacking it on ordered shelves, pricing it and advertising it, then dealing with the mail orders and posting it, all costs money. So a set which could cost, say £10 to start with ends up costing at least two or three times that price. it can sometimes be much better for them to just place the pile of sets on a table and let amateurs sort out what they want. Armed with a bit of knowledge, such as the published HRT conversions by a variety of authors, or indeed the 'Surplus 2- Way Radio Conversion Handbook (now out of print but available from dealers such as Poole Logic and Anchor Surplus), you'll know what to look for. You'll also be armed with the knowledge that, after having chosen your set, you'll have the information in front of you on how to convert it to the band of your choice.

'Haggling' at a rally stand is often another way of getting the best deal, and next month's HRT will feature a 'Rally Special' including a guide by Dick Pascoe G0BPS on this very subject! And don't try to tell me a published conversion puts the price up. After HRT's Pye SR1 2m receiver conversion, the 'going price' (at that year's Elvaston Castle Rally, on the weekend after the conversion was published), instantly dropped from £10 each to £1 each to 'clear the lot'!

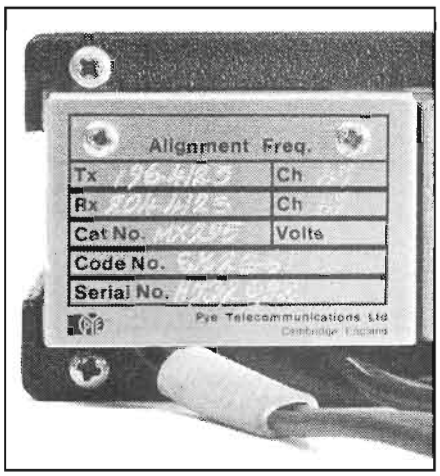
Rally hunting can bring plenty of bargains

Searching

Not everyone can travel long distances to buy a set personally of course, indeed the journey costs involved plus the often-increasing entrance fees of *some* 'rally' events, could sometimes be more than the money you could save. Here, mail order can be very useful, and you can often find out what's available for the cost of a phone call. A further option, which I urge readers not to overlook as ex-PMR gear is often quite heavy (and thus incur high postage costs), is see if the dealer will be present at a rally that you know someone in your area is going to, and if so arrange for them to bring it back to you. The price of a 'pint' for your friend's services can often be beneficial to all parties! In the case of large base station equipment for amateur repeater use (I've purchased several in the past), this could be a most useful option, provided of course you or your friend don't have too far to carry the gear to the car!

Part of a series?

Never, *ever*, assume that the set you see described *only* with a 'generic' name for that manufacturer's *series* of sets, such as a Pye M290, Pye MX290, Storno CQP4000, Storno CQM5000,



Check the actual model number to identify your set

Motorola M700, and the like, is suitable for the band or use that you want. Check it has the correct model *number* (e.g. MX294, M296, CQP4662 and so on) for the band and mode you want. Many sets in a series look identical from the outside, but can be very different inside! If you're in doubt, and indeed if you'd like to double-check, then if the set is in front of you ask the dealer if either he, or you, can 'take the lids off' to look inside. Compare this to the photos or diagrams given in your conversion details, and if you see the radio board itself is obviously greatly different then beware! It's a sad fact that a

small number of sets I've seen at rallies have had their model numbers either missing or deliberately removed, and sometimes displayed with a label attached indicating a different set in that range.

But the front looks completely different

I have a number of MX296 ex-PMR rigs sat in front of me (synthesized 70cm car-radio sized transceivers for 70cm FM, to be featured in HRT soon). One has just a few buttons and no channel knob, the other has half the number of buttons but has a 16-way channel selector, another has different buttons plus a multi-digit LCD, the other has a compete numeric keypad and multi-digit LED display. They're all the *same radio.* The difference is the slide-on front panel which comes with associated electronics (if any) for selective calling or automatic 'trunking' use. Take the front panel off, and the radio bit (which we're interested in) is virtually exactly the same. A look at the radio's model number on the serial number plate confirms this. So, if in doubt, *look* at the model number on the back panel, not what it says on the front, and if possible inside at the radio unit itself.

A look inside

A quick internal examination is always useful, because the most common cause of a set being incapable of successful conversion, after the set being the wrong type in the first place, is 'butchered innards'. The most common 'butchering' I've found is that of cracked ferrite cores in the tuning coils, which make some of the set's tuned circuits incapable of being adjusted to 4m, 2m, or whatever. The *Problems Page* on page 23 of the December 1993 issue of HRT deals with several commonly asked questions on ex-PMR rigs, such as how to (try to) replace broken cores, how to loosen stiff cores, and whether it's feasible to convert an AM rig to FM, add a frequency synthesizer, etc.

No conversion details?

What happens if you find a set but there hasn't been a conversion published? Well for HRT we've a nice stack of conversions planned, like the MX295 Band III mobile to 2m, the MX296 mobile to 70cm, the PFX UHF handheld to 70cm, the M500 and M700 series VHF and UHF handhelds to 2m and 70cm, the Stornophone 800 series VHF portable to 2m, and so on. Also planned for HRT are more add-ons for ex-PMR rigs, such as digital readout and channel scanning accessories for the MX290 series and the like. You'll see a list of conversions already featured in HRT on an occasional basis, but if the rig you're interested in isn't there, and there are a large number available, then why not let the HRT Editor know? You never know your luck. Please note, however, that I can't commit to perform a miraculous conversion on a 'one-off basis', much as I'd like to do! If you're a 'dab hand' at radio, and you have the set's technical manual available, then you'll probably already have the answer.

But if you're still stuck, then you can try getting in touch with Bob Gant G0LXP, who runs the Ex-PMR Club in the UK. A set of twelve SAEs and £5.00 to cover photocopying costs gives you a year's worth of subscription. This is a 'two-way' affair, based on sharing information between hams, and Bob invites readers and members to let him know what information, circuits etc. they can offer and what costs are involved. You can contact Bob (please write clearly, and enclose a stamped SAE if you want a reply) at 25 Worcester Ave, Garstang, Preston, Lancs, PR3 1FJ.

With that, I wish you happy converting, and happy hunting, see you on the bands!

Some Ex-PMR Sources

AJH Electronics, Unit 12, Hunters Lane, Rugby, Warks, CV21 1EA, Tel. 0788 576473

Anchor Surplus, Cattle Market, Nottingham, NG2 3GY, Tel. 0602 864902

GWM Radio, 40/42 Portland Road, Worthing, Sussex, BN11 1QN, Tel. 0903 234897

Hams 4 Hams, 54 Hampton Drive, Newport, Shropshire, TF10 7RE, Tel. 0952 825679

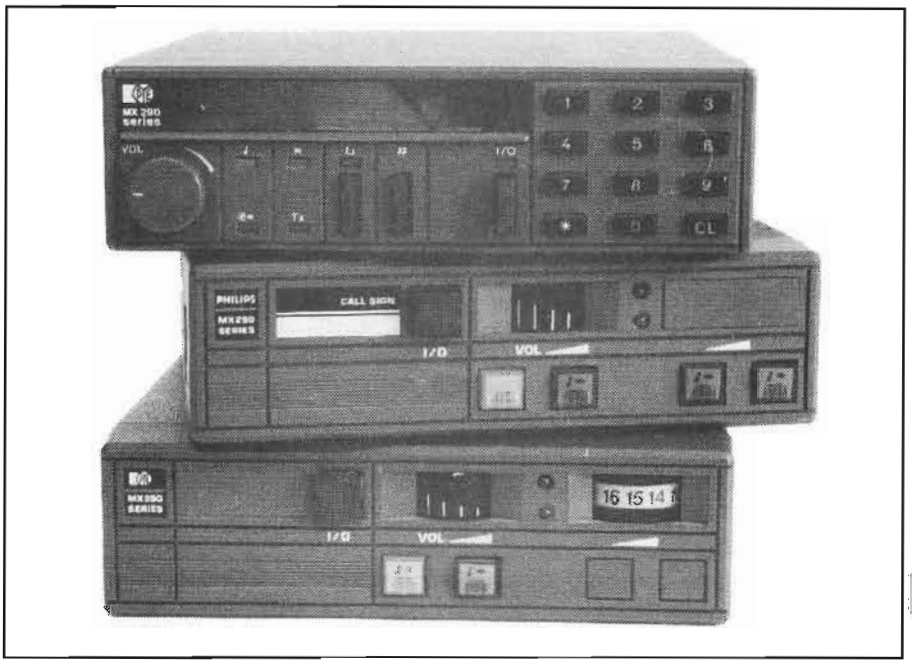
Mail Electronics, Chesham Ind. Est., Oram Street, Bury, Lancs, Tel. 061 761 4520

MDX Communications, 3rd Floor, Goyt Mill, Marple, Stockport, SK6 7HX, Tel. 061 427 8090

RJH Communications, 16 Helmsley Way, Spalding, Lincs, PE12 6BG, Tel. 0775 766533

Southern Aerial Services, (in Newhaven, East Sussex,) Tel. 0273 516033

Trade Centre PMR, 286 Northfield Ave, Ealing, London, W5 4UB Tel. 081 566 5666



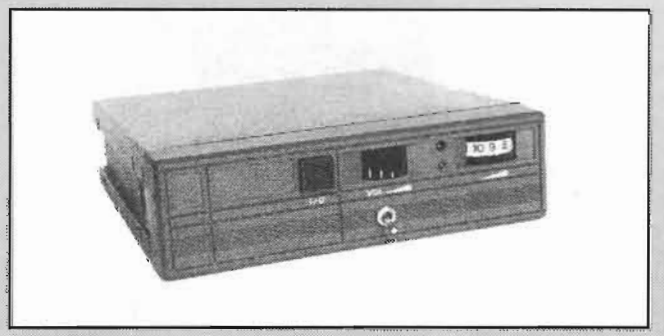
Three sets, all with the same MX296 70cm FM radio unit inside

PMR Conversions in HRT

Where to find those missed PMR Conversions

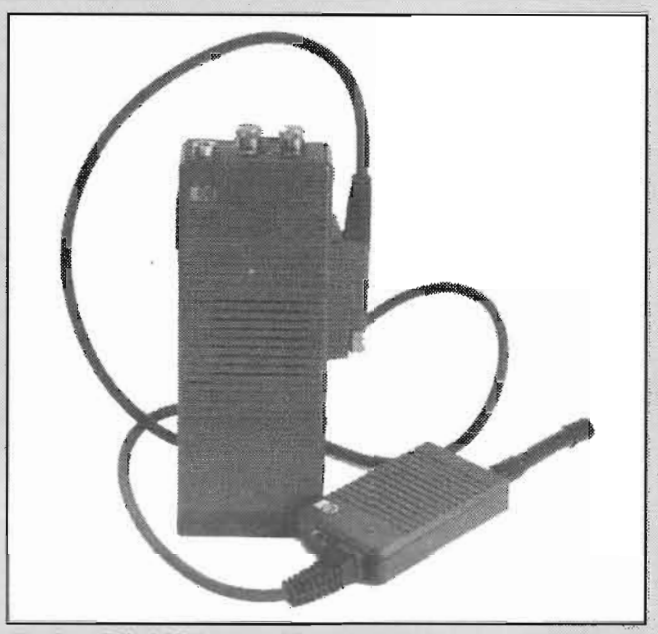
Many readers contact us each week to ask for details of PMR conversions, and in many cases these have been published in HRT. There's plenty 'in the pipeline' here just waiting to be published, including more Storno, Kenwood, Pye/Philips, and Motorola rigs, but here's an index of those we've published 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 (models BE439 to BE470)	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/Philips MX294 (synthesised) to 2m and 4m	Mar 1994
MX294 update (page 28)	Apr 1994



The Pye/Philips MX294

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 receive	Jun 1987
Pye SSB130 100W HF rig	Jan 1989
Storno CQP 4662/3/4 portable to 70cm	Jul 1994
Storno CQM 5114S (Synthesised) to 2m	Nov 1993
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
Trio TK801S mobile UHF transceiver to 70cm	May 1994
Pye Westminster to 2m and 4m FM	Mar 1986
Pye W15AM and W30AM Westminsters to 4m AM	Sep 1987



The Pye PF85 UHF portable

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
CTCSS sub-tone unit	Sep 1990
Plug-in Toneburst for the Pye Olympic	Mar 1993
VFO for 4m and 6m ex-PMR rigs	Nov 1986

You may obtain back issues for the last 12 months from Ham Radio Today Back Issues, Argus Subscription Services, Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, Tel. 0737 768611. Please telephone first to ensure the availability and price of the issue you require, as copies of some magazines, and of earlier issues jn particular, have run out due to popularity.

For photocopies of articles older than 12 months, and indeed of the ones sold out, fill in the photocopies coupon which periodically appears within the pages of HRT, if no coupon this time, send your requirements to; ASP Photocopies Dept, Argus Specialist Publications, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST (we are sorry but we are unable to accept telephone orders for photocopies), a charge of £2.00 for each article applies (cheques payable to ASP). When ordering, state HRT magazine, article title and issue it appeared in. Please allow around 28 days for delivery.

From My Notebook

Geoff Arnold G3GSR dispels the mysteries of CR circuits with Alternating Current

Last month, I began to talk about DC circuits containing resistance and capacitance, and what happens when you vary the voltage applied to the circuit. If you remember nothing else about a capacitor, hold on to the fact that the voltage across it cannot change instantaneously. Charge must flow into or out of the capacitor before the voltage can change. If you try to hurry the process too much – to pass too heavy a current – then in a high-power circuit such as a power supply, the capacitor is likely to react violently.

Many years ago, I was checking voltages inside a Ferguson 400RG valved radiogram I then owned when, letting the positive meter-prod slip, I accidentally shorted out the 330V HT line. The current which flowed through the short-circuit came not from the mains transformer and rectifier valve, which would have had a relatively high impedance, but straight out of the 32µF reservoir capacitor.

One can only guess at the value of that current – maybe a few tens of amps – but the heat that was generated inside the capacitor can caused it to blow its sealing plate straight out of the end, closely pursued by its 'innards'. These luckily missed my right eye by about a centimetre, and finished up in the far corner of the room. All that was left of the capacitor was the can, plus the tags with a few fragments of insulation hanging off the ends of the connecting wires. After that lucky escape, I was always very, very wary of shorting out power supply rails, and you should be too!

CR Circuits and Alternating Current

When you couple a signal of a given frequency – be it at AF or RF – through a capacitor, what you see on the output side of the capacitor will depend on the value of the capacitor, and therefore its time-constant when combined with the resistance of the circuit it is feeding (Fig. 1). Note that the resistance is the parallel combination of 'R'and 'R_L', the input resistance of the load.

I've always found that this is one of those circuits where it helps to get an appreciation of what's going on if you look at it first in the simplest terms. The CR circuit is one which you can approach in several different ways, without even touching on the idea of reactance as it is normally taught.

Looking at Fig. 2, you will see that C1 will have charged up to a voltage equal to the difference between the standing collector potential of TR1 (probably around a half of $+V_{cc}$ in a simple AF amplifier stage like the one shown) and whatever potential exists across the load, due to the base bias on the next stage transistor for example. For simplicity, let's assume that the load has been disconnected, so the only connection to the bottom plate of C1 is via R3 to the 0V rail. Remember that in the absence of any signal, C1 is charged to a steady voltage, therefore no current flows through R3 and the potential at the junction of C1 and R3 is 0V.

When an alternating signal is applied to the base of Tr1, the potential at Tr1 collector starts to vary around its quiescent (standing) value. The voltage across the series combination of C1 plus R3 will also vary, and C1 will try to charge or discharge so as to absorb the changes. At the simplest level, we can say that if the value of C1 (and therefore the CR time-constant) is very large compared with the rate at which the signal alternates, it will have no time to charge or discharge significantly during each cycle. The voltage **across** C1 will therefore remain nearly constant, and so the voltage at the lower plate will follow almost exactly the voltage at the top plate.

If, on the other hand, C1 is small in value compared with the signal frequency, it will have time to charge and discharge in step with the signal, the voltage at the lower plate will remain at 0V.

That can't be really true, of course, because for the charge on the capacitor to change, current must flow through R3. Therefore there must be a voltage drop across R3 while the capacitor is changing its charge, and at least some small version of the signal from Tr1 collector will be applied to the load.

Similarly, in the case where the capacitor value is large compared with the signal frequency, if the voltage across R3 is changing (which it must do if the voltage at the lower plate of C3 is varying in step with the signal), a current must be flowing through it. That current is trying to change the charge on C3, but won't get far in doing so before the signal begins to reverse its direction of change. Looked at from this point of view, the large capacitor is constantly trying to draw or drive large currents through R3, therefore producing a large and varying voltage drop across that resistor.

Onwards to Reactance

So, that's two ways of looking at CR coupling circuits, either of which may help you to appreciate what the effect is. There is a third way, which is to consider them as potential dividers. Imagine for a moment that C1 and R3 in Fig. 2 are two resistors instead of a capacitor and a resistor. If the resistance of the upper arm of a potential divider is large in value compared with that of the lower one, only a very small sample of the voltage at the top of the divider will appear at the tapping. At the extreme case, if the upper arm is an open circuit (infinite resistance) there will be no voltage at the tapping.

If, on the other hand, the upper arm is small in value compared with the lower one, the voltage at the tapping will be a significant proportion of the input signal, the extreme case being where the upper arm is a short circuit (zero resistance) when the voltage at the tapping will equal that at the input.

In Fig. 2, C1 and R3 form a potential divider in which the value of the upper arm can effectively be changed by remote control. How so? Simply by changing the frequency of the alternating signal supplied from TR1. If the frequency is raised, the value of the upper arm will be reduced, therefore more of the input voltage will appear at the tapping. If, instead, the frequency is reduced, the value of the upper arm will be increased, and a smaller sample of the input will appear at the tapping.

Notice that I've carefully avoided using the term 'resistance' to describe the value of the upper arm of our 'po-

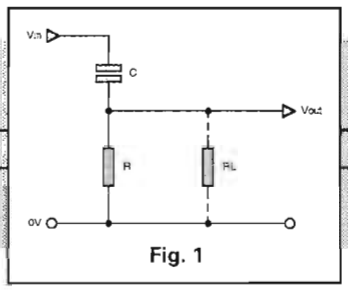


Fig. 1

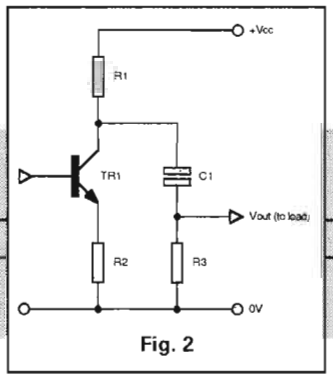


Fig. 2

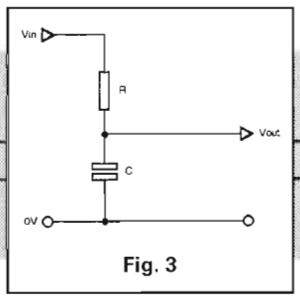


Fig. 3

tential divider'. For a capacitor, the property is of course called reactance. At a basic level, you can think of it as being similar to resistance, but it has properties which differ from those of a resistor, due to the fact that the current through a capacitor and the voltage across it are not in phase. As my graph in Fig. 5 last month indicated, current must flow into the capacitor before there will be a voltage across it; in other words the voltage lags on the current.

The reactance of a capacitor is termed capacitive reactance, and given the symbol X_c. For a given value of capacitor, the reactance becomes lower in value as the frequency applied to the capacitor is increased, and vice versa – in other words it varies inversely with frequency. Alternatively, we can say that for a given signal frequency, the reactance gets smaller as the capacitance value is increased, and vice versa.

The textbooks normally look at capacitors in AC circuits only from the point of view of their reactance, but I think that the alternative approaches which I've outlined can be useful in understanding the reasons why a capacitor behaves the way it does.

Speech and Music

If the signal coming from TR1 collector is not just a single tone, but a whole range of different tones, as in speech or music for example, then C1 will have more time to charge and discharge in time with the cycles of the higher frequencies, than with those of the lower frequencies. Therefore, depending on the value of capacitor chosen, higher frequencies may appear almost unattenuated at the output, but lower ones may be very much reduced by comparison. Music or speech would therefore sound 'thin' and lacking in bass and perhaps mid-range notes.

On Its Head

The coupling circuit which I've described is a very simple form of high-pass filter; it passes the high frequencies and attenuates the lower ones. By turning the circuit upside down, as in Fig. 3, and taking the output from across the capacitor instead of across the resistor, we turn it into a simple low-pass filter. In effect, capacitor C acts as a shunt across the output for higher frequencies. This is the circuit of the basic 'top-cut' tone control which was once fitted almost universally in radio receivers or audio amplifiers – less so nowadays, with solid-state implementations of bass and treble controls or even graphic equalisers being achieved comparatively cheaply.

Whichever way up the two elements are arranged, in a series RC (or CR) circuit (Fig. 4a) the voltage across the capacitor V_C will always lag that across the resistor V_R by 90 degrees. How so? Because: (1) the voltage across a resistor and the current through it are always in phase, and (2) the voltage across a capacitor always lags the current through it by 90 degrees. Since the same current I must flow through the two series elements, then V_C must lag V_R by 90 degrees.

Now life begins to get a little more complicated! Because the voltages across each element of the circuit are not in phase, the voltage across the circuit as a whole (V_T in Fig. 4a) must be a vector sum of the individual voltages V_C and V_R. I've chosen values of capacitor and resistor which make the reactance of the capacitor exactly equal to the resistance of the resistor at the frequency of the applied signal. This means that V_R leads the applied voltage by 45 degrees, while V_C lags the applied voltage by 45 degrees.

In Fig. 4b I've shown I and V_R as lying at the zero-point of the vector diagram. If you insist on the applied voltage V_T being the phase reference, which appears logical, it somehow seems harder to cope with the concept that I and V_R are leading V_T, the voltage which caused them, although this is exactly what is happening. I've shown the situation this way in Fig. 4c; if it foxes you, remember that the drawing is a 'snapshot' of just one moment in the life of a continuously rotating set of vectors.

Inductors

All the descriptions of CR circuits can be applied, with suitable modifications, to LR circuits – those incorporating inductance and capacitance in series.

First, the current through an inductor lags the voltage across it by 90 degrees. Consider a DC circuit, Fig. 5, in which $+V_{in}$ has just been applied. The resulting voltage step will attempt to push a sudden rise in current through the inductor. The rapidly-building magnetic flux produced by this current will link with the inductor's own turns, inducing a voltage in them. This induced voltage will oppose the applied voltage which caused it, and therefore limit the current, slowing its rate of rise. The induced voltage is known, rather descriptively, as a back-EMF.

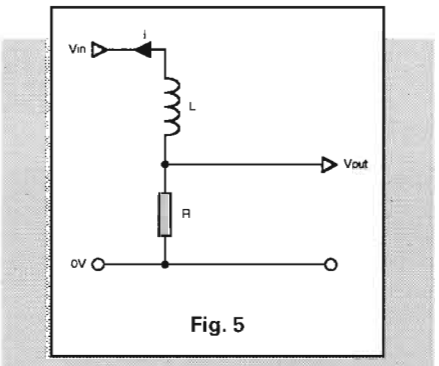


Fig. 5

As the current rises more slowly, the magnetic flux will build more slowly too, inducing a smaller back-EMF, and so on, allowing the current to continue to rise until a maximum is reached, limited by the series resistance in the circuit. The current can be looked upon as charging the magnetic field surrounding the inductor.

So, whereas in the CR circuit the current starts off at a maximum, with the voltage across the capacitor building rapidly at first, then more and more slowly, in the LR circuit it is the voltage across the inductor which is a maximum at first, with the current at a minimum at switch-on, then building ever more quickly to a maximum. In other words the currents lags 90 degrees behind the voltage in an inductor, exactly the opposite of the capacitor.

In AC circuits, the effect of the inductor is also exactly opposite to that of the capacitor. Its reactance, termed inductive reactance and given the symbol X_L, increases with increasing frequency of the applied signal, so its reactance is directly proportional to frequency. It is also directly proportional to the inductance value.

An LR circuit arranged as in Fig. 5 will therefore act as a simple low-pass filter; again the exact opposite of the CR circuit with a similar layout of reactive and resistive elements (Fig. 2).

What happens when you have inductors and capacitors in the same circuit? Some very interesting things, which I shall be exploring next month. See you then!

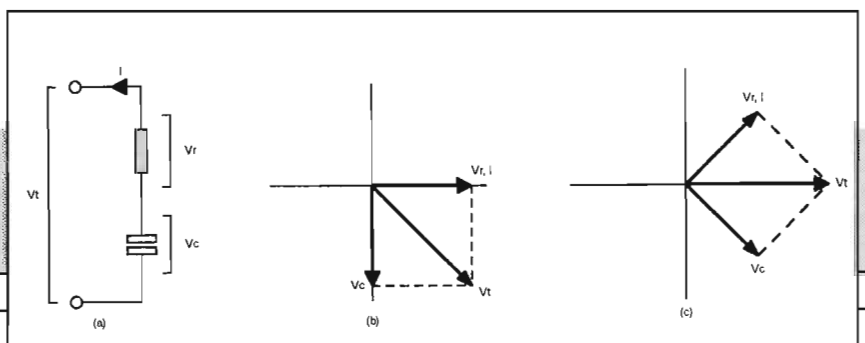
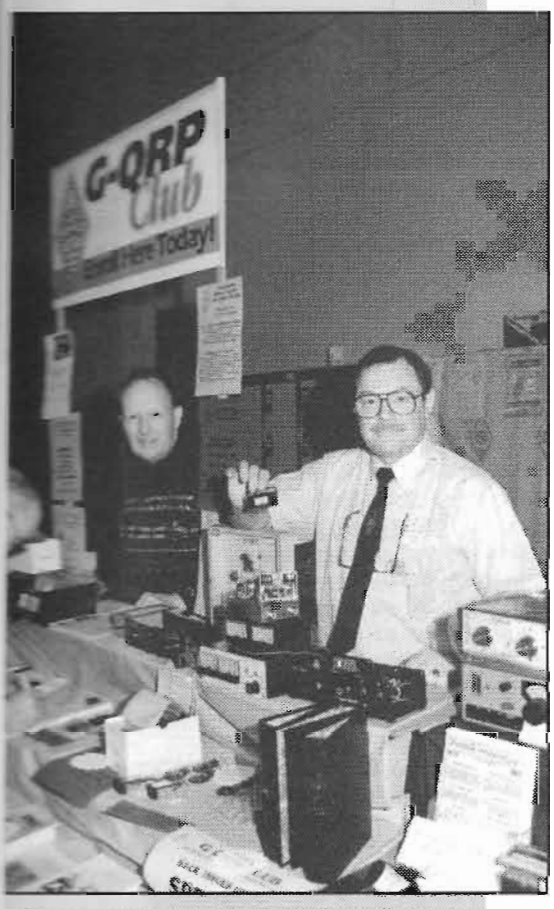


Fig. 4

QRP Corner

Dick Pascoe G0BPS finds out about the historic "QRP Society"



Your scribe with the 'oner' QRP rig at this year's London Show

The rally at the Lee Valley Leisure Centre in Pickett's Lock has now become a 'standard' in the rally scene. As I attend a rally most weekends throughout the year, I may consider myself somewhat of an expert. It was delightful to walk round with plenty of space to pass others. Some rallies only allow a mere 2m (or even less) between stands, but here a generous 4-5m permitted even the wheelchairs to pass relatively unhindered.

The G-QRP club always takes a stand at this show and of course a lot of members 'sign in' and stop for a chat. A few club items are always on sale, but the main objective is to provide a point of reference for members to gather. George G3RJV and Ian G3ROO manned the stand, with a couple of others assisting during the Saturday. On Sunday Bob G4JFN and Gerald G3MCK provided the required support.

Many members stopped to chat, especially Rene, ON4KAR a club member from the south of Belgium. He was accompanied by a few others from his own club, Jean ON5KZ, Paul ON5LG, Rene ON4WP, Jean ON4TC, Alex ON4AY and Guy ON1KNI.

After the show we returned to our hotel, operated by Tom Street G0LFI who provided a complete HF station for our use comprising an FT77S (the 10 watt version). It was put on the air of course during the evening. During the early Saturday evening we'd mentioned to Rene that it was usual for the QRP members staying over to go to a local 'Curry House' for a typical Indian curry, the Ponders End restaurant has become a favourite over the years. It turned out that the whole Belgian contingent wanted to come too. Unfortunately the restaurant was 20 minutes away and they didn't have any transport.

Picture it; nine Belgians, two Brits all in a Midi van. How far is it now... "Cinque minute" ... a little later "Cinque minute encore.."

On arrival we found that only Rene spoke English, with a few others having a smattering. Paul G1PJJ is fairly fluent in French, with my own passable but limited. Could *you* translate an Indian menu into French? The evening was a huge success though and a terrific boost for inter-club relations.

As an aside, also at the restaurant were Bill and Martin from Dee Comm. They joined in and tried to help with hilarious results.

QRP Society

It just goes to show that nothing is new in the world. At the London Show I was presented with a folder full of information about this QRP Society by Victor Brand G3JNB, who had been given it by the widow of the late John Whitehead.

One of the amazing things was also a pack of QSL cards dating from the 1950's from several members of the *QRP Research Group*. It would appear from the comments made on the cards that they had mostly been handed in to the very first mobile rally dedicated to QRP enthusiasts. Cards from all over Europe are there too.

The list of traders and groups attending this are fascinating. We find the British Amateur Television Club were giving a demonstration of amateur TV, the Radio Amateurs Emergency Network, and Proops, a very well known firm who have only recently closed their shop. Other interests catered for include Data Publications, Radio Controlled Model Society and of course a table for the QRP Society

Others, who may bring a smile these days, were a group selling "Modern Components" and Radio History. And all this took place in a small church hall in Walton on Thames. The date? Saturday October 30th 1954. The entrance fee was just 1 shilling (5p) and children could get in for just sixpence (2.5p)

An advert in the RSGB Bulletin in September 1954 tells that the show was opened by the then President of the RSGB, Mr. Arthur Milne G2MI, and featured demonstrations of Amateur and Commercial equipment, Vision Equipment, Walkie Talkies with one stand dedicated to the sale of surplus equipment (sounds familiar!)

It would appear that the highlight of the show for the younger visitors was a radio controlled version of a Churchill tank "A piece of almost unbelievable wizardry in its perfection of control". A demonstration station using the callsign G3JNB/A was used, with the operator being a young Mr. Victor Brand (see above) who lived in Surbiton Hill Park at that time. It appears that the show was a huge success, as over £35, a rather large sum in those days, was raised and handed over to the church hall fund. It will be obvious that this was not just a simple gathering, but a well organised event by a successful group of low power enthusiasts.

I also have a sample of the Membership Data of the society which was founded in 1949 to "widen the interest in the low power field of amateur radio". The aims of the society were to promote a "bond of friendship and mutual interest among QRP enthusiasts wherever they may live", it seems that we are continuing that intent.

There were several groups within the broad heading of the society, which includes the *General Transmitting Group*. This covered the working of all stations in any 'G' area below 30Mc/s, "maximum power for any QSO shall be five watts to the final!". The *General Receiving Group* covered all SWL stations as above. The *VHF Group* (yes, they had QRP VHF interest then too) looked after the interests of members who used the frequencies above 30Mc/s with a maximum power level of 10 watts. The *TRF Group* looked after all those who "found that the straight receiver, by its simplicity, cheapness

and silent background provides.... greater satisfaction" There was also a Model Control group, a DF Group, Student Division and an Affiliated Clubs division. The Overseas Division covered Australia, Denmark, Holland, Ontario, Rhodesia N & S, Sweden and the USA. Several contests were organised throughout the year including both Top Band and 144Mc

Membership to the Society was a modest 10/- (50p, my pocket money as a 10 year old in 1954 was less than 1/-) and to assist the less well off this could be paid in two separate instalments of 5/-. Students could enrol for the modest sum of 3/-. The president at the time of that newsletter was Mr. E. Banks GC2CNC, the Chairman Mr. E. Fergus G2ZC, with the Press and Publicity Officer being (a young) Mr. Victor Brand. Incidentally, there is no prize for guessing what country the suffix 'GC' stood for.

The information, QSLs and paperwork given to me by Victor G3JNB will be held in trust for all members of the G-QRP club and they may be seen at any reasonable time by appointment, see address below

VK QRP Day 1994

The QRP day in Australia is 11/12th June 1994, so look out for VK contacts during this weekend. Times 0000 UTC Saturday to 0800 UTC Sunday. They have suggested the following rules for this contest;

Use the bands as follows... On the hour - all bands, hour + 15 minutes - 40m, hour plus 30 mins - 20m, hour plus 45 mins for 10 & 15m. Stations should only call on the usual (VK) frequencies and then QSY to their working frequency. Frequencies in Australia are basically the same as ours but with one notable exception: 3.530, 7.030, 14.060, 21.060, 28.060MHz.

Scoring is easy, for UK stations score 10 points for every high power station and 20 points for every QRP station, but only contacts with VK, ZL & P29 areas count. As usual the power limit for QRP stations is 5 watts carrier to the aerial. Logs or reports should be sent to: Ron Everingham VK4EV, 30 Hunter Street, Everton Park, Queensland 4053 Australia by July 14th 1994.

Ten Tec Scout 555

I've heard via the Internet grapevine that it is likely that the QRP version of the Scout will be released at Dayton. This is not surprising, as the original 50W version was introduced at the last show. Their promise to provide the low power version "for the fall" was obviously ambitious.

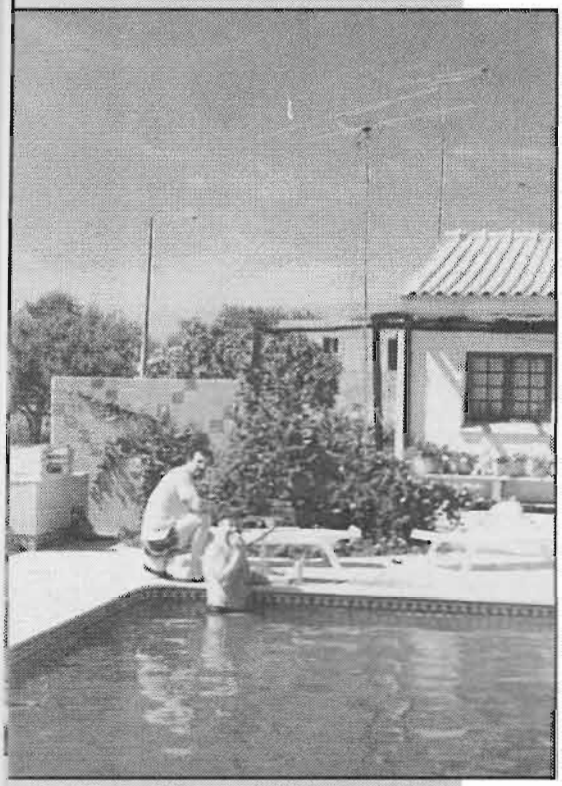
However, some interesting things have come to light. It would appear that the QRP version will just be the existing Scout minus the power amplifier stage. One amateur decided to check this out and opened up his Scout and removed the feed from the driver stage to the PA. He connected up a dummy load and a power meter and made some checks. As he also has all of the band modules it was quite easy. On all bands except 40m the output power was measured at 9-10 watts! On 40m this was down to the three watt level. DC voltage to the rig was kept at 12.5V for the test, so we could expect that this power to slightly increase at 13.8 volts.

The RF control pot inside the rig had been set to full power output as supplied. I would expect that the QRP version will have the power backed off to the five watt, or even three watt level, but how about 40m? If this is the case, then the QRP version will still be a versatile piece of equipment for mobile or base use.

Well, once again that's it for the month. News and views to me via HRT Editorial, via GB7RMS or direct to Seaview House, Crete Road East. Folkestone CT18 7EG. 72/73 de Dick G0BPS

VHF/UHF Message

Geoff Brown GJ4ICD looks at some rather promising rigs for VHF and UHF use



Is this maritime mobile? Dave G3SDL and CT1LN in Portugal.

Sporadic 'E' should be really good at the time you're reading this column, and so (with thanks to the UKSMG and G3USF) I have enclosed a VHF TV listing to help you determine what direction the openings are occurring, good luck on all VHF bands this summer.

Ela G6HKM wrote in on her activities but the post seemed to take it's time, seven days from Essex to Jersey! She took part in the UKSMG contest and at last found some activity on the band, in early February she also took part in the RSGB 432MHz contest and did manage to work GI8AYZ (IO64) and GI8FLQ (IO74). Ela at last received QSL confirmations from RU1A in KO48 and KP40 during last summer on 50MHz.

The March 144/432MHz contest was nothing to shout about, a small ridge of high pressure existed but no DX over 1000km was reported on either band.

Neil G0JHC reported Aurora on 50MHz in early March along with Auroral 'E' on the 6th, stations in Norway (JP field) were worked but nothing else new. Tropo conditions improved a little on 144MHz, and stations in the south of France and Spain were worked from the UK on the 8th/9th. On the 17th there was a brief opening to PY on 50MHz at 2000z, TEP with top end Sporadic 'E' seemed to be the mode.

Mal Z23JO wrote to me with the bad news that Z21SIX was off the air. I very quickly sent down the circuits to Mal, however, on close inspection Mal found lots of ants in the aerial coax! The coax was replaced and the beacon put back into service with its first report coming from 9H5EE at 569 at the beginning of March, Mal also had propagation to SV and 5B4.

Other TEP reports came from Alan G0IAS who is the QSL manager for the 7Q7 gang. Alan reports TEP between the 7Q7 boys and SV5 (Rhodes Island) in March. Over to Japan now, and these lads seem to have some form of propagation all the time with openings to VK, V85 etc, just like stations in Malta! The 26th/27th brought a little better tropo, but even this was short lived, 144 and 432 were reported open to Spain and southern France from the UK.

A phone call came from Dave G3SDL/OZ3SDL while he was in Cyprus on business during March, stating that when he returns to Cyprus in June to operate on 50MHz Dave has received permission to operate on 70.200MHz +/ -6.25kHz. It has been quite a number of years since Cyprus was activated on 70MHz, and, when last active I believe that David G4ASR claimed the 70MHz distance record from the UK. Could it be beat this year? I fear so!

Kenwood's New TS60S

It's a real 'cracker' as comedian Frank Carson would say! You just cannot believe that this radio has all the frills and 100W out in such a small package. After reading up on the circuit, it became quite logical that the radio will do extended coverage (instead of the 50-54MHz). The VCOs shift 20MHz, so 40-60MHz is certainly possible, which is needed to monitor 48.250MHz and the other offsets heard during Sporadic 'E' events (see the VHF TV Listing). Maybe this radio could cover 70MHz as well! More on this later.

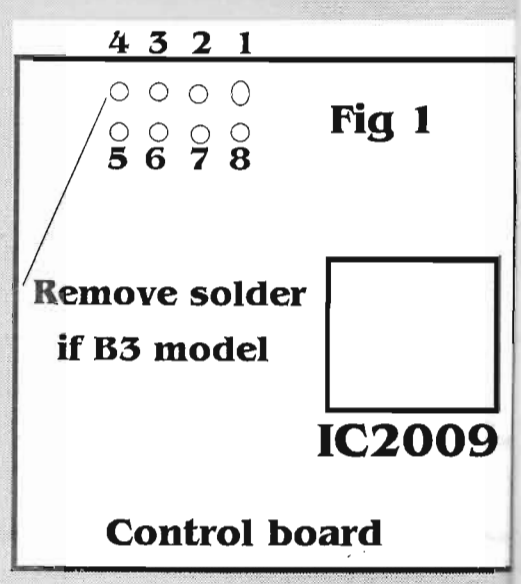
The radio has the usual friendly Kenwood menu system, which is becoming very popular amongst amateurs because there's no need to pick up the instruction book every five minutes.

FT11R, Even More!

April's HRT featured a review of the FT11R. As well as the details given then (detailing its performance and features 'as supplied' for 2m amateur use – Ed) there is another outstanding feature on this tiny powerhouse. Most radios can have extended receive coverage these days, although the USA are getting tough with imports. The FT11R is no exception, and by holding the up/ down arrows while switching the radio on, extended receive coverage is achieved. The radio is opened up from 110 to 180MHz, with may I add, an auto AM receiver when it falls below 135MHz.

Better still, if you're an amateur and mariner needing a backup hand portable, this little baby also transmits from 140 to 180MHz with a slight hardware mod (a blob of solder and very small fingers!), this following procedure is not for the faint hearted amongst you. *Important note; using a set such as this on VHF marine frequencies is illegal in the UK, although it's quite OK to modify if, say, you are visiting the USA with the appropriate US licence (not G reciprocal, which*

Fig. 1 FT-11R Links



VHF TV Listing

FREQ'y	COUNTRY	LOC'R	ERP (Kw)
48.239.6	DL	JN39	100
48.239.6	SM	JO79	60
48.242.2	CT	IN51	40
48.246.1	LA	JP20	30
48.247.4	DL	JO40	100
48.249.7	LA	KP59	30
48.250	HB9	JN36	50
48.250	EA	IN80	250
48.250	EA	IN52	40
48.250	OE	JN78	60
48.250	SM	JP93	60
48.252.6	LA	JO38	60
48.256.1	LA	JP53	100
48.260.4	DL	JN57	100
48.260.4	LA	JP77	60
49.224	F	JN25	100
49.739.6	HG	JN97	150
49.739.6	EM-EO	KN29	150
49.739.6	OK	JO70	150
49.739.6	EM-EO	KN74	50
49.739.6	RA-RZ	KO89	35
49.739.6	EM-EO	KO62	35
49.740.9	RA-RZ	KP78	10
49.744.8	HG	JN86	50
49.747.6	RA-RZ	KO85	240
49.750	RA6	KN95	50
49.750	EM-EO	KN67	35
49.750	RA1	KP75	10
49.750	RA3	KO59	240
49.750	EU-EW	KO33	150
49.750	RA6	KN93	35
49.751.3	SP	JO93	100
49.757.8	RA3	KO56	90
49.757.8	RA1	KP63	10
49.760.4	UQ2	KO06	50
49.760.4	EU	KO41	50
49.760.4	EM-EO	KN79	35
49.760.4	RA3	KO91	35
53.739.6	I5	JN53	34
53.760.4	IT9	JM67	35
53.760.4	I7	JN81	34
53.760.4	I3	JN65	1.6
53.757.8	EI	IO52	100

doesn't allow 146-148MHz) and wish to use their 2m band which extends above 146MHz – Tech Ed.

Most versions of this radio so far found in Europe have been the 'B3' model, this model requires only one tiny blob of solder for modification. Firstly, lay the radio on its face on a soft cloth, remove the four back screws on the sides of the case, remove the battery pack and the two small silver screws underneath where it was. Now very carefully split the radio in two. You'll see that there are two boards piggy backed (with board mounted plugs and sockets), this is the tricky bit. Remove the two screws in the centre of the top board, then lift off the top board, this now gives you excess to the control/display board.

Place the board in such a position that the 100 pin IC (Q2009) is on the right hand side. Now you can see in the top left hand corner that there are eight small solder points. In order to extend your radio, blobs 1, 4 and 8, must be open circuited and blob 5 should be short circuited.

Out of the dozen or so that I have modified so far, all that had to be done was to remove the solder on blob 4. Please use a very small soldering iron and magnifying glass, reassemble in reverse order being careful that; *a)* you don't lose the battery slide knob, and *b)* that you put back the small pin which holds the carrying strap to the case *that fell out* when you started this job!

When assembled, hold the up and down arrows on 'switch-on' to activate the extended TX/RX function (136-180MHz). Do the same to remove it, and please remember what you are licensed for! The same procedure is carried out on the FT41R, but this time make sure that jumpers 5 and 8 are shorted and that 1 and 4 are open, this will give receive coverage from 300-500MHz and transmit coverage of 420-470MHz approx.

No responsibility can be given to anything else happening to the radio, and also note your warranty conditions, but I know it does work.

Jordan

As this column is being written in April, by the time you read this June will be upon us meaning that, providing things have settled down in the Middle East, we should be talking to you on HF/50MHz/144MHz. Look out for the beacon which has the club call JY6ZZ (and not JY6SIX as I previously reported) on 50.075MHz. Don't forget to check 14.345MHz (the VHF net) and 28.885MHz (the 50MHz talk-back frequency)

Next Month

Featured next month will be the VHF'ers delight, *Fastlog* (new version) which indicates all your squares worked graphically on the VHF/UHF bands

Thanks once again for your input, but I do need a few photos, shacks, aerials, in fact anything relating to the VHF/UHF spectrum just to break up the script, can you help please? Send any info to: Geoff Brown, TV Shop, Belmont Rd., St Helier, Jersey, C.I. or phone/fax anytime on 0534 77067 (the dialling code may soon change so I am told).

Packet Radio Roundup

Chris Lorek G4HCL finds a growing number of new books on packet, and looks at easy ways to upgrade to 9600 baud

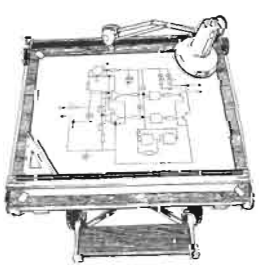
A measure of the growing popularity of a mode can often be gauged by the amount of new books coming out covering the subject. This certainly seems true with packet radio.

Higher Speeds

Our packet radio network is a superb means for searching for, and indeed offering, help in ham radio matters. A typical listing of the day's messages on my local BBS usually brings up at least one or two 'help needed' requests for circuit diagrams and so on, together with of course a number of information bulletins on current matters such as rally and activity news. One of the perennial requests for information is "How can I modify my Kencomsu xxx rig for 9600 baud packet?" More often than not, someone out there has done it, and at least one reply follows, sometimes a whole stack of replies from the many 'thanks for help' bulletins seen!

In Germany, 9600 baud operation in addition to the more 'usual' 1200 baud is quite common, and I understand there's been a 'mod collection' book there for a short while, written in German of course. In the UK, Mike Mansfield G6AWD, who is the author of the 'Practical Guide to Packet Operation in the UK' has done likewise with 'High Speed Packet Radio Transceiver Connections'. This 85 page A4 sized book puts together a collection of information from a number of sources, on connection points and any modifications needed for successful 9600 baud use. Over 80 different transceivers are covered, including those from Alinco, Kenwood, Icom, Yaesu, Pye, Maxon, Navico and Standard. Together with these, operational notes, hints, and techniques for 9600 baud and even 56kb operation are included. In all, an extremely useful guide for anyone involved with, or contemplating, higher speed packet operation on the amateur bands. The book is priced at £4.95 plus £1.00 p/p, and is available from Siskin Electronics in Hythe to whom my thanks go for the loan of the review copy.

High Speed Packet Radio Transceiver Connections



By
Mike Mansfield
G6AWD

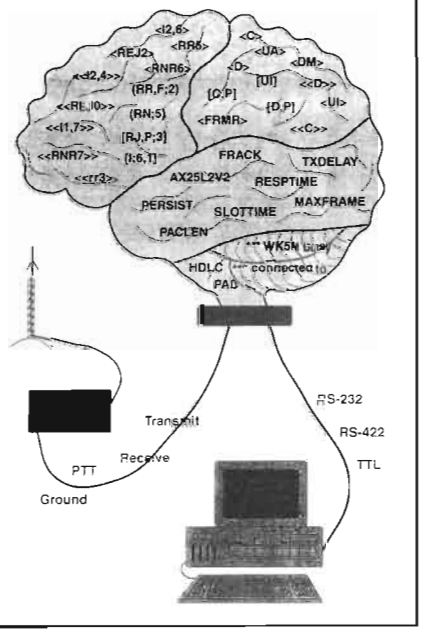
PACKET BBS SURVIVAL FOR THE BEGINNER

By
Roger Cooke
G3LDI

For Beginners

What if you're not yet up to the 'higher highs' of 9600 baud packet? Maybe you're just about to get on packet, and want to know more about the enormous range of facilities your local BBS has? Like the various 'servers', gateways, file areas, white pages, and so on. You can of course download the many 'help' pages, once you've overcome the 'first hurdle' of finding out how to do this of course, and then continue to do things by trial and error. On the other hand, Roger G3LDI's recently published book 'Packet BBS Survival for the Beginner' could be quite a useful 'reference' to have in the shack! Its 73 A4 pages cover virtually every aspect of the F6FBB software, as used by many BBSs in Europe, I found it an extremely useful guide. From the selling price at £4.50 plus p/p (my thanks again to Siskin Electronics, who stock the book, for the loan of a review copy), Roger passes £1.00 of the proceeds of each to the Amsat Phase 3-D fund, to help our future amateur satellite efforts – nice one, Roger.

What is your TNC doing?



Intermediate

The final book offering this month is 'What is your TNC doing?' by Gloria Medcalf KA5ZTX. This explains what your TNC gets up to inside its little box, such as the meaning of <RR3>, <RE16>, <DM> etc. in the frame header information, and the interfaces between computer and TNC. After a brief explanation of a computer and keyboard, the book explains how the typed information gets from the computer to the TNC,

and which parameter settings affect this journey. The TNC parameter and radio settings that affect throughput are then discussed, together with details of AX25 frame structures, and finally a troubleshooting section to help you with the most common problems. It's published by Zm Xpressions, 1544 N 1000 Rd., Lawrence, KS 66046-9610, USA, and should be available in the UK at £10.95 plus £1.00 p/p from stockists such as Siskin Electronics.

New 1200/9600 baud TNC with Gateway

Most if not all users 'start off' using 1200 baud packet, but the capability of a 9600 baud 'upgrade' would be quite useful. Having both available, at the same time, would be ideal! At around the time you see this in print, Kantronics' brand new KPC-9612 should just be coming available. This is a true dual-speed dual-port TNC, with two modems and two radio ports. it's capable of operating on 1200 baud and 9600 baud at the same time, and it offers the 'KA-Node' with up to 26 simultaneous connections, including cross-speed switching. A connect at either 9600 baud or 1200 baud *can* be forwarded through to the other port and converted to the other speed. A full-feature personal mailbox includes forwarding and reverse forwarding, and you can have up to 512k RAM fitted for plenty of storage. The Kantronics 'New User' mode is fitted to get you started without tears, and the TNC even offers WEFAX reception so you can see what the weather's going to be doing. Even with all this, the KPC-9612 can be run on a single 9V battery, and measures a very compact 21mm x 158mm x 155mm. You'll be seeing a review here as soon as I can get my hands on one!

A 'Sprint' up to 9600 baud

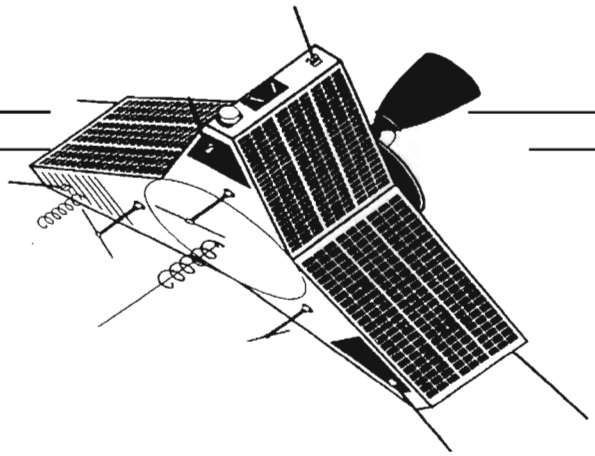
The *SPRINT-2* is described by manufacturers PacComm as a totally new packet controller, designed for the 'second decade' of packet for 9600 baud and faster packet station use, including BBS ports, nodes, and satellite operations. TAPR style commands are used with a 512k EPROM, plus a special command set to support DX Cluster users and even GPS (Global Positioning System) receivers - the mind boggles! Radio baud rates up to 38.4kb are accommodated, and I'm told a G3RUH design modem is used for good weak signal performance. For node use it has bank switching for TheNet, including TheNet X1, and for 'normal' use it has special commands built-in to support TheNet-style deviation meter and signal strength accessory boards. The SPRINT-2 is due to be available around the time this magazine appears.

Lurpac 9600 baud Node/ Gateway

Still on 9600 baud, the Lancaster University Research into Radio Packet Data Networks (*Lurpac*) Group have been in touch to say they now run a 9600 baud user access node on 433.650MHz, callsign G0UJE, with a gateway to JANET and Internet. They add that "your link to centl is now operational", so if you're in the Lancaster area, why not give 9600 baud a try?

CTRL-Z, End of message

I hope to be receiving a 'G-TOR' upgrade for my KAM any day now (see last month's *Packet Radio Roundup*), and I hope to let readers know next month how I get on with this new mode. Please do also let me know what you or *your* packet group is getting up to. I'll be pleased to publicise activities through these pages. I can be contacted by post via the HRT address, or packet to G4HCL @ GB7XJZ.#48.GBR.EU. 73 until next month.



Satellite Rendezvous

Richard Limebear G3RWL with this month's AMSAT-UK news

With its new operating schedule, AO-13 is now seeing increased activity during its Mode BS and S periods from users of the 2.4GHz transponder (even the HRT Tech Ed's having a go - Ed). With four hours available per orbit, listeners to the S band transmitter are enjoying strong signals and noise free reception. Aerials are mainly small dishes from 0.6m to 1m diameter although some stations are successfully using loop Yagis. With a 1m dish on receive and a single 19 element yagi on 435, good results can be achieved with 10 to 20 watts.

Oscar 10

It's still operational in Mode-B. Despite good signals from the transponder, there are very few stations using it. Its currently available when in view but *please do not* attempt to use it if you hear the beacon or the transponder signals FMing. The downlink signals are quite strong from AO-10 but there are complaints that no users are taking advantage of it.

Russian Satellites

Newcomers to amateur satellites may like to try working through one of the low-orbit Russian analogue transponder satellites. For example, RS10 and RS12.

RS10 (normally in Mode A); 145.860-145.900MHz uplink, 29.360-29.400MHz downlink, "Robot" on 145.820MHz uplink; 29.403MHz downlink. Also it is possible to use the special channel (but I don't know what's so special about it); 145.850MHz uplink and 29.350MHz downlink.

RS12 (normally in Mode K); 21.210-21.250MHz uplink, 29.410-29.450MHz downlink, "Robot" on 21.130MHz uplink 29.454MHz downlink.

Please send QSL cards for "Robot" contacts to RK3KPK direct (SAE plus IRC); Andrey Mironow, ul. V-Voloshinoj, d.11, kv.72 station Perlovskaya, 141014, Russia, CIS or via DF4XW.

For those with weather fax decoding capabilities, AO-21 is transmitting pictures, from time to time, in WEFAX format at 240 lpm.

Spot Launch

Recently the PSK modulation on ITAMSAT's primary transmitter became more and more difficult to decode. Residual carrier and lower output power seem to indicate a failure in the PSK balanced modulator, being worse at the current low power setting. Increasing the power level made the demodulation better but was not acceptable due to power budget constraints. Ground controllers decided to switch to the secondary PSK transmitter on 435.822MHz and the spacecraft is now back in normal operation.

AO-27 has turned up in FM talkthrough mode; there is no particular schedule, it's just ON whenever the spacecraft is in sunlight. At present the power setting is 0.5W; aerial's are whips. It has been worked with a hand held on low power 2.5 W into a four element yagi and was fully quieting. Uplink is 145.850MHz (which seems to have AFC, Automatic frequency Control), the downlink is 436.800MHz.

Phase 3D Report

In February, Karl Meinzer DJ4ZC, hosted a working meeting in Marburg to discuss recent progress on the Phase-3D project. Also during the meeting, the team took delivery of P3-D's main propellant tanks; manufactured in Russia under contract from AMSAT-DL. Seven tanks were delivered, although one had been subjected to a destructive pressure test by its Russian manufacturer.

Not only have all the tank specifications been achieved, but they've actually been significantly surpassed. Each tank can accommodate almost 50 litres of propellant. Following a brief inspection, the tanks were immediately shipped to Florida where integration of the satellite is now scheduled to begin this summer. WD4FAB reported on the good progress of the flight model structure's construction, currently under way at Weber State University.

After much discussion, the team decided to again employ a cable wiring harness arrangement for Phase 3-D, similar to that used on AO-10 and AO-13, rather than an AART-based LAN design. However, the team decided to also fly a CAN bus and DB2OS's experimental LAN controller as part of the spacecraft's digital (RUDAK) transponder. In a related decision, the group decided that the AO-10/AO-13 1802-based Internal Housekeeping Unit (IHU) computer design would still be adequate for P3-D with some minor modifications.

The team has now decided to build two RUDAKs for P3-D. The first will be a user-oriented digital communications module; this RUDAK, which has yet to be formally named, will be the one most P3-D satellite users will operate. A second, more experimental RUDAK (called RUDAK-E), will also be built. It will promote experiments with advanced high speed modems, Digital

AO-13 Transponder schedule, 7th April to 11th July 1994

Mode-B	:	MA	0	to	MA 170	
Mode-BS	:	MA	170	to	MA 218	
Mode-S	:	MA	218	to	MA 220	<- S beacon only
Mode-S	:	MA	220	to	MA 230	<- S transponder; B trsp. is OFF
Mode-BS	:	MA	230	to	MA 250	Alon/Alat 230/-5
Mode-B	:	MA	250	to	MA 256	
Omnis	:	MA	250	to	MA 120	Move to attitude 180/0, Jul 11

Note: The mean attitude for the period 1994 Apr 07-Jul 11 will be ALON/ALAT 230/0. This is an Alon 10 degrees 'better' than originally proposed. It is achieved at the expense of a 10 degree 'worse' Sun angle, which will will now reach 40 degrees (77% illumination) May 30-Jul 11. During that period the Mode-B transponder *might* have to be *off* from MA 250-80 to conserve battery power. Continuous up to date information about AO-13 operations is always available on the beacons, 145.812MHz and 2400.646MHz in CW, RTTY and 400 bps PSK.

ADVERTISERS INDEX

Signal Processing (DSP) techniques, and new communications protocols.

Amsat-UK News

This year's Colloquium will be the same price as last year. If you haven't already got it in your diary then please note it will be held on the 28th to the 31st of July. Further details are available from Amsat-UK.

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. SWLs are welcome. All new joiners get the USAT-P tracking program on a 5.25in disk.

AO-21, RUDAK Schedule

(down 145.987MHz, up 435.016MHz)

min/10	Beacon Mode
0..4	FM Repeater
5..7	WEFAX Picture
8..9	AFSK TLM

KEPLERS

SAT:	OSCAR 10	UoSat 2	AO-13	PACSAT
EPOC:	94079.88849305	94080.50956311	94079.56167208	94080.46187457
INCL:	27.1881	97.7914	57.8735	98.5999
RAAN:	336.3846	99.3260	262.2374	167.5628
ECCN:	0.6021341	0.0011137	0.7209738	0.0012341
ARGP:	163.5017	186.0140	337.3974	89.1267
MA:	230.9609	174.0935	2.4979	271.1308
MM:	2.05878514	14.89174575	2.09727288	14.29886627
DECY:	-1.43E-06	3.21E-06	-4.27E-06	5.9E-07
REVN:	5297	53743	1265	21706

SAT:	DO-17	WO-18	LO-19	FO-20
EPOC:	94080.42475274	94081.23816758	94080.24263321	94080.89109631
INCL:	98.5973	98.6015	98.6015	99.0243
RAAN:	167.8190	168.6325	167.8834	249.2547
ECCN:	0.0012406	0.0013015	0.0013223	0.0540894
ARGP:	88.5722	86.3234	87.9281	177.1640
MA:	271.6879	273.9433	272.3415	183.2749
MM:	14.30025717	14.30001255	14.30095566	12.83224747
DECY:	7.6E-07	8.6E-07	7.8E-07	-1.6E-07
REVN:	21707	21719	21706	19293

SAT:	AO-21	UO-22	KO-23	KO-25
EPOC:	94080.39087956	94079.70081566	94080.53661719	94080.22548462
INCL:	82.9379	98.4399	66.0814	98.5601
RAAN:	207.6619	155.9592	103.5014	155.1027
ECCN:	0.0035401	0.0007223	0.0011679	0.0012635
ARGP:	331.2194	188.8493	308.7258	74.3234
MA:	28.7007	171.2552	51.2714	285.9328
MM:	13.74536127	14.36900838	12.86285587	14.28041738
DECY:	9.3E-07	1.11E-06	-3.7E-07	8.9E-07
REVN:	15752	14037	7551	2514

SAT:	IO-26	AO-27	PO-28	RS-10/11
EPOC:	94081.10608673	94081.11877430	94081.13993678	94079.84948217
INCL:	98.6605	98.6600	98.6563	82.9229
RAAN:	157.7921	157.7790	157.8404	34.1304
ECCN:	0.0009917	0.0009554	0.0011057	0.0010237
ARGP:	100.6730	101.5696	89.9512	273.8387
MA:	259.5579	258.6548	270.2938	86.1598
MM:	14.27717009	14.27613987	14.28013136	13.72333391
DECY:	4.2E-07	2.5E-07	9.8E-07	3.2E-07
REVN:	2526	2526	2527	33779

SAT:	RS-12/13	Mir
EPOC:	94079.90823919	94082.55565485
INCL:	82.9180	51.6467
RAAN:	76.9195	255.5171
ECCN:	0.0029938	0.0015224
ARGP:	357.6064	66.2816
MA:	2.4956	293.9772
MM:	13.74037183	15.58312653
DECY:	3.2E-07	8.598E-05
REVN:	15652	46269