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Drake R8E Receiver Review

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HRT
HAM RADIO TODAY
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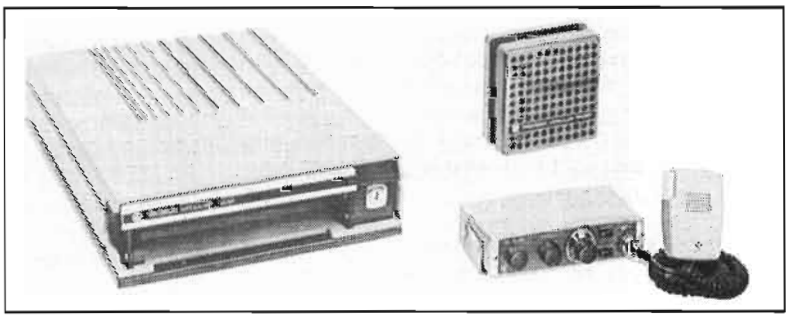

Above: **Conversion Project — PMR2 Remote Mount**
Below: **VHF Contesting**

Tomorrow's Amateurs

CQ de G8IYA

Local clubs snub the Novice!

A 'sensationalist' introduction title? Maybe so, but together with several other amateurs I'm becoming very concerned about the lack of support for our present and prospective Novices. The lack of instructors and the attitude of some amateurs towards the new Novice licensees sometimes causes me to wonder *why?*. I had a letter recently from Jonathan Carr 2E1AAZ, here's what he says; *"I hold a Novice Class B licence and I am treated as inferior by some radio amateurs. I am a member of my local radio club, one member there tried to take my voting rights away from me. I thought this unfair as I had paid my fees and was a full member. Also, another Novice and I are members of RAYNET, when it came to giving the members the new callout sheets our names had not been included. Luckily in both of these cases other radio amateurs stood up for our rights, because after all we are the future of amateur radio!"*

I was very concerned after reading this, what *is* the matter with some amateurs, do they want the newly licensed to lose interest and give up. Maybe they're just part of the group crying out *haul the ladder up, Jack, we're up here now.* Amateur radio as a hobby needs 'new blood' if it is to survive, and I'm glad to hear that some amateurs stood up for our newly licensed Novice, well done! We need to encourage newcomers, inspire them to take part in club activities, show them the benefit of our experience, so that in time they too can become experienced upstanding amateurs.

Go-Ahead Clubs

This is nothing new, readers of the 'CQ de G8IYA' in the February 1991 issue will see how a newly licensed amateur was treated by a couple of clubs. 2E1AAZ's club doesn't feature in this month's 'Club News', not because they've been 'blacked', but because they simply haven't bothered to send in any details of what they're doing, i.e. to get more visitors to the club.

Some of our happy Novice trainees

I know many clubs are doing their best to encourage newcomers by providing courses, not only for the Novice licence but for the RAE and Morse as well, the ones in our Club News section are active and go-ahead clubs, that's why they are in there. *Well done* to all of them and keep it up! The Novice course G4HCL and I currently run is completely full up (held at a local school with several youngsters and a teacher on the course), and I'm sad to have to tell prospective Novices who ring me up that we can't teach them at the moment. We're the only people who have bothered to register as instructors in our large city area, and that's just ridiculous. We're turning future amateurs away!

A New Year's Resolution?

Wouldn't it be great to see every local radio club in the country with a Novice course running, this isn't impossible although it's probably unlikely considering the way *some* clubs treat people. Your members don't need to be experts to teach, all that's required is experience on the bands, e.g. having held a licence for at least a year (although I understand SWLs may also teach), together with a willingness and ability to help others. If *I* can do it, without the backing of a club, so can others!

A radio club shouldn't just be a place where you go just to meet the lads or lasses, but a place where you can go for help and instruction, older members taking the new members under their wings giving help, advice, and encouragement. I personally know several clubs who do just this. Why not make it a New Year's Resolution to stop looking down at other people, and help each other instead. Contact the RSGB for information on becoming an instructor, and consider registering ***now!***

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LETTERS

Letter of the Month

Dear HRT,

After reading J.H. Clifton's letter in the December 1991 issue of HRT I felt it was time I aired my views. I'm 13 years old, I've just passed my NRAE and taking the RAE in December. The reason I got interested in amateur radio was packet, yes, packet. Personally I think that the Morse test for a class A licence should be scrapped and a new Advanced Radio Amateurs's Exam introduced. No one should be forced into a mode because a bunch of key-bashers say so! Don't get me wrong, I think CW is a wonderful mode, but why on earth do the new intake of class A licensees have to learn an antiquated, slow and awkward method of message transmission? To be honest, a better knowledge of propagation, radio theory, and operating practices is more use than knowing the complete alphabet in dits and dahs, and being able to send and receive at 12 WPM. Amateurs are supposed to further their hobby, how can you when you're sat learning Morse to get an A class licence!

For Mr Clifton's benefit I do listen to pop music, I have tried listening to Morse cassettes, but they are so boring I go and read *War and Peace* instead. Ok, that's my tuppenny's worth, last of all, thanks to all at the Hesketh ARC for an excellent Novice course.

Your sincerely,
Antony Howat.

Editorial comment;

An amateur of the future speaks out, confirming the trend seen in the uptake of Novice Class B licences compared with Class A. On the Novice course we're running at a local school, the numbers of students following the introductory meeting went up from 2 to 11 when an answer to the question 'Do I *have* to use Morse?' was given.

Dear HRT,

I am currently studying for the RAE and have been reading with great interest the different opinions of other readers, on the subject of the Morse test for a class A licence. It may have been said before and will probably be said again, but my thoughts are that modes of operation are whatever an amateur feels like using, whenever he or she wishes, at any time they want. Why is CW (a mode of operation) the only criteria required for the class A licence. In my view the current Morse test is greatly outdated, particularly with the intervention of computers doing the work of the key, ear, and brain. Maybe a very simple idea would be to award licence classes on the merit of the exam grade achieved by the candidate. Those who just pass the exam get a class B, then a further re-sit to obtain a 'credit' or 'distinction' pass in the exam for a class A, everyone can then learn Morse at their leisure if they wish to do so.

Why not have a vote from the readers of HRT and pass the information on to the powers that be?

Yours sincerely,
Ken Williams.

Editorial comment;

From the results of our reader's survey, the majority of those readers coming into the hobby feel this should be done. And yes, we're communicating these results, or 'votes' if you like, to the RA.

Dear HRT,

I would like to congratulate HRT on starting volume ten in 1992, I hope you take the staff out to celebrate! I've had HRT since it started and continue to enjoy reading the articles in it. Special congratulations have to go to Chris and you Sheila for motivating the typical radio amateur. Encouraging them to help the Novices, encouraging the novices themselves, sponsoring the 'Amateur of the Year' award, these all encourage amateurs to take an active part in their chosen hobby. Great stuff and more power to your elbow. The recent BARTG rally showed what just a few people can do — if we could motivate a few more to join in .....

Anyway, very best wishes from myself, on behalf of the BARTG committee, to you on your tenth anniversary year, and very best wishes for the continued success of HRT.

Yours sincerely,
Ian Brothwell, G4EAN/G4ATG

Editorial comment;

We're flattered! Thanks for your kind letter Ian, from reading the BARTG journal 'Datacom' you edit we know you do the same if not more on the data side. Keep it up — there's not many like you about!

Dear HRT,

I was very impressed with the letter in your Nov 91 issue, sent in by Barrie Kissack G3MTD, the Assessor for City and Guilds.

Really of what the 7261 consists of it would certainly suit me better, as I only ever want to operate on the VHF 2m and UHF 70cm bands, I am not interested in HF. Under the present method in use, one has to go through this like it or not, and to receive results promptly is by far much better, and on the retake if one should fail.

There are bound to be problems, like those who prefer to take postal courses for the RAE, there is no way they could show how equipment works, the other problem would be getting hold of tutors in each town or city. The present evening class sessions would and need to be vastly reduced, to fit them all in during the winter months, when tutors are available for teaching the RAE, because

£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 HRT, A.S.P., Argus House, Boundary Way, Hemel Hempstead, HP2 7ST.

getting to an evening class can entail a major transport problem.

I think G3MTD has the right idea, but it would need some modifications here and there, which should not be beyond those capable. Now it remains, do we want more radio amateurs or don't we, the more there are, the more transceivers they will purchase, which is bound to boost the market and preserve our present amateur frequencies.

Yours sincerely,
M. Marsden

Editorial comment;

What say our learned readers?

Dear HRT,

Your comments in the December 91 'CQ de G8IYA' were read with great interest. The long saga of the necessity of the Morse test has long been a 'soap box' of mine and the subject seems to be spoken about on most of the repeaters I listen to around the UK.

First, should there be any form of test to distinguish between 'A' and 'B' licence holders? Second, is the two tier license system currently used now outdated and should it be replaced by a more structured system similar to that in the USA? Third, is the current method of testing for 'A' licenses, i.e. the Morse test, an adequate system?

The answer to the first question must indubitably still remain as a yes. However, serious attention should be paid to questions two and three. Question two is a matter of opinion, I personally would like see at least a three tier system, which offers an intermediate level between the current two licences. The biggest question must be number three. If as many people are against the Morse test as is to be believed then maybe the time has come to have a new look at the system. If the Morse test was to be replaced, what could it be replaced with, and how could it be implemented?

Let's work on the assumption that a three tier system is used. The standard 'B' licence could remain exactly as it is at the moment, with the new intermediate level enabling operators onto the HF bands but with more restrictions than at present. These new rules could govern output power to say 100W into the aerial, limited band usage i.e. no operating on the WARC bands, no CW transmission and other possible restraints. The Morse test could then be used as a method of testing for upgrading into an advanced class. All existing 'A' class operators could be given the 'advanced' status, and maybe this may not be obtained unless you have held any amateur licence for a given period, maybe 12 months.

The important thing this system could bring is a practical test in operating procedures and that a governing body would be responsible for setting the 'pass standard'. Another bonus is that operators would not be able to get straight onto the amateur HF bands and left to deal with 'pile ups' and the like which are becoming only to common on our bands.

As I said before these are only my opinions and ideas, I am not against people using CW as a mode of transmission and although I do not currently find it enjoyable to use, I am studying it because I want to get that 'A' ticket. However, I would like to think that in the future a system which is up to date with the hobby could be in effect.

Keep up the good work at HRT, at least the material is interesting and spirited.

73 Steve Jelly, G6URJ.

Editorial comment;

We already have a multi-tier system with the Novice and Full licences of course, together with the suggestion from the RA of an 'advanced' licence in the future giving greater privileges. Maybe extra 'tiers' could just complicate things, alternatively they could act as a continuing 'goal' for amateurs — what say our readers?

Dear HRT,

I have been reading your excellent editorial in the December 91 issue, before I continued to read the magazine I wanted to comment on what you have said.

I have had a class B licence for some three years. In order to obtain this I spent a fair amount of time studying the conditions and theory required. To a great extent much of the knowledge gained has been used on numerous occasions.

To obtain a class A licence I must study an arcane code, I have recently decided to 'bite the bullet' and I am now studying Morse at evening class. I hope, with luck, to be able to pass next spring. I must take the point, however, that I strongly resent the time that I am spending on studying something that I have absolutely no intention of ever using once I have passed the test.

Amateurs sometimes refer to Morse as a 'wally' filter to keep the less competent or committed off the air, but surely the RAE does this. How on earth can learning Morse code at 12WPM show that someone is suddenly qualified to use the HF bands? Of course the majority of the 'old guard' of amateur radio take the view 'I had to pass the test so should everyone else'. Common sense must ultimately prevail. We need a technical test to obtain our class A licence.

There is of course nothing to stop those diehards from taking a Morse test and using it if they really wish to.

Yours sincerely,
J.J.W. Maxwell, G7DXC

Editorial comment;

This does rather echo the results of our reader's survey where the majority of Class A licensees wished the Morse test to remain. Maybe they're older and wiser ..... ?

Dear HRT,

I note the correspondence regarding the dreaded Morse test. I am an RAE instructor and have also taught Morse over the air.

Your many 'anti-Morse test' writers have a point when they quote modern technology as a reason for changing the regulations, however not everyone has high-tech equipment and a mandatory Morse test is enforced so that, with the simplest equipment, an amateur station could be closed down by an authorised station sending a close down instruction in Morse code. Having said that, we now have HF band operators (Novices) who only require a five words per minute test. *Anyone* can learn Morse to 5WPM in about a month. You can use a helpful friend, a Morse trainer, a simple computer program or over the air practice lessons. If 5WPM is good enough for the Novice class then it should be sufficient for the class A licensees.

Whilst on the subject of the Novice licence, what a shame the opportunity was not taken to re-shape the way into amateur radio when the thing was conceived. Why should the Novice licensee have to go along the same road to a class A or B licence as someone with no experience at all?

Why not, from some date next year, scrap the present RAE. Re- introduce the Novice class as a 'stage one' licence, with or without a 5WPM Morse test, still retaining the HF/VHF split. Then after a minimum of six months on-the-air experience, allow the Novice to sit the remainder of the entrance examination and so become a class A licensee if the Morse test is not taken. Why not then legalise all those high power linears by having an advanced class examination to qualify for a licence with top power limit of 30dBW. (If you don't know what that is you're not ready for the Advanced Class test!)

At the same time let's have a good shake up at City and Guilds. Make them publish examination papers, stop putting in the 'catch' questions they are so fond of. They mark the papers with computers, lets see the results broadcast in the RSGB news in two weeks at the most, then publish a correct answer sheet so that students can see where their weaknesses lie.

The RA is keen on recruiting youth into electronics through amateur radio. Let them see that they make the way in a fair and logical one.

Yours sincerely,
Bob Price, GW3ECH

Editorial comment;
One problem in the 'wait six months' is that this may not represent actual experience, however the 'advanced' licence is certainly being investigated.

Dear HRT,

I like many other amateurs, am fed up with hearing or reading comments from some operators regarding the apparent unfairness of using a Morse test pass as the only gateway to the full A licence.

I fail to see what is elitist about wanting to maintain standards on the very crowded HF bands and, although I do not operate CW, I would not have wanted my recent entry to HF to have transpired any other way. The truth of the matter is that we will never find a universally acceptable method of testing applicants, as peoples' ideal criteria and interests in ham radio vary tremendously. Whilst one person's ideal may be a 12WPM Morse test, someone else's may be a written exam on the principles of radioteletype or an oral exam on elocution and correct phone operation. Which do we go for and which is more relevant as a practical assessment criteria for HF entry?

Although this is a difficult area, I feel that some form of extra commitment should certainly be asked of a class B operator before they are given access to HF. Short wave amateurs are not elitist snobs, they just want to ensure that the standard of professionalism on these bands is kept high and that newcomers will maintain these standards whilst effectively representing Britain during QSOs. It seems obvious to me that someone who has taken the decision to learn a new subject such as Morse in order to reach a desired goal is not likely to grace the HF bands with the embarrassing operating practices often heard on VHF bands.

Come one people, take your test and then throw away your key if you want to. Do it now and prepare yourself for a warm welcome from all the hams on HF!!

Yours faithfully,
J.G. Jones, G0OFB

Editorial comment;
Seems daft to us in learning something and then not using it.

Dear HRT,

With regard to the debate on the need for Morse tests. I wonder what would happen if the test were made mandatory every 5 years for class A licensees. If I were to be a private pilot and wanted to retain my licence, I would have to complete a certain number of flying hours per year to qualify. I wonder what percentage of As would still pass each 5 year test. So many claim that they gave up using Morse after the test. If it is a *must* to get an 'A', why is it not a *must* that they carry on using it, at least to the 12WPM standard?

In case some think I am a failed Morse trainee, let me say that I have no intention of going HF or learning Morse. I was licensed in August 1981 and will be happy to still be G6DAY in another ten years.

Yours sincerely,
M. J. Pemberton, G6DAY

Editorial comment;
We don't seem to remember taking a driving test every few years, but the point made does seem correct!

Dear HRT,

In reply to the 'CQ de G8IYA' in the December issue of HRT. I venture to suggest that there *is* sufficient scope within amateur radio to satisfy most of the people most of the time and a minority all of the time.

To ensure that the younger members in the hobby get their fair share of the cake, we first have to clean our house as it were, of those idiots for whom the airways appear to be a playground wherein they practice their obnoxious activities and prevent *everyone* from enjoying amateur radio to the full.

There is also the *old guard* of elitists who regard any and all effort made by others to change and upgrade the system into a more modern and a more flexible society, as blatant sacrilege which has to be stamped out and/or shouted down at every opportunity. They will either have to *go* or *change* for our hobby to carry on forwards. Our national society would also have a lot more members, and therefore have more money to promote the hobby, but they have to change their attitudes.

Progressively, over the next few years, I would like to see our hobby change slowly, from what it is now, to one in which participants progress onwards and upwards, stage by stage.

Yours sincerely,
J. D. Bolton, G4XPP

Editorial comment;
Things are changing in our national society, and from what has been seen lately the general manager is certainly very open, with us at least, in the direction the society is going. Let's hope he keeps it up. A society belongs to it's members, i.e. us, not some faceless wonder who we don't want. Stand up and do something about it is the motto. I wonder how many members actually bothered to use their voting papers during November last year, I know we did, and I am sure you did as well!

UK Exclusive — Drake R8E Review

Chris Lorek G4HCL takes a trip around the airwaves with Drake's latest receiver

Drake have had a justifiable reputation for being one of the 'top class' names in amateur radio equipment, their receiver/transmitter separates often being regarded as *the* equipment for top-ranking DXers of the world. Recently however, Drake have been rather quiet on the amateur radio side, concentrating instead on the satellite side of the market. Until now, with the launch of the Drake R8 at this year's Leicester Exhibition. The R8 is accompanied by it's European model the R8E, we're told that both sets have identical features RF-wise although the AC mains supply arrangements are different. There was just one working R8 model in the UK, and HRT were proud to be granted the opportunity of an exclusive review!

The styling of the set is a departure from Drake's usual front panel layout, this time sporting a professional looking all- black facia with rubberised buttons for the various controls. It is of course what lies inside that's of the greatest importance, as in today's crowded HF spectrum it's a receiver's capability to resolve weak signals in the midst of rock-crushing QRM that separates the 'performers' from the 'lookers'. This is where Drake have scored with their traditional reputation for technical excellence, and their name on the front of a receiver will often simply be enough to convince many experienced HF devotees that 'this is the one' to go for. Is it? Let's see .....

Features

The set covers the HF spectrum of 100kHz to 30MHz, with the usual reception modes of CW, LSB, USB, AM, FM, and RTTY, with tuning in either 10Hz or 100Hz steps and a digital frequency display indicating down to either 1kHz, 100Hz, or 10Hz resolutions depending on what you've set it to do. Receiver bandwidths are 500Hz, 1.8kHz, 2.3kHz, 4.0kHz and 6kHz, with specified 6dB/60dB shape factors of 2:1 for all bandwidths apart from 500Hz (shape factor 3:1). The set's ultimate selectivity is specified at better than 95dB, with intercept points of -20dBm at 5kHz spacing and +5dBm at 20kHz spacing.

It's frequently discussed that manufacturer's specifications mean very little, if anything at all, without reference to the method of testing, for example at what bandwidth each figure is measured, whether sensitivity figures are with the preamplifier 'on' and whether strong-signal handling figures are made with the preamplifier off and the attenuator switched in! So following the on-air tests, later on in the review the signal generators came out as usual!

Controls and Indicators

Together with rubberised push-buttons for the digital features of the set, the flywheel weighted tuning knob is accompanied by concentric rotary controls for AF/RF Gain, Squelch and IF Passband Offset, and Tone and AF Notch tuning. A transmissive (i.e. the light shines through the digits) LCD panel is used as an indicator of what the set is doing in terms of receive frequency, bandwidth, mode and so on, with an adjacent analogue S-meter. As well as the labelled buttons and controls, six further 'soft keys', i.e. with their functions varied according to the function mode selected, are arranged in a row beneath the LCD to 'double up' on their control features.

Modes and Defaults

The receiver 'default' bandwidth can programmed on a mode-by- mode basis, typical uses for example would be either 4kHz or 6kHz for AM, 1.8kHz or 2.3kHz for SSB, 0.5kHz or 1.8kHz for CW and so on. The 'passband offset' control may be used to vary the centre of the IF passband in relation to the wanted signal, which is useful to reduce the level of an adjacent unwanted signal. A manually tuned audio notch filter is also fitted to give your ears, if not the S meter, a rest from constant heterodynes and the like, together with a tone control to vary the receiver's audio response.

As well as 'normal' AM reception, the set also has a synchronous AM detector circuit, switched in by the push of a front panel button. Dedicated HF broadcast listeners will be aware of the advantage of synchronous AM reception, where the receiver is 'locked' to the received carrier with subsequent reduction in distortion caused by signal fades.

To help with QRN rejection, a noise blanker may be switched into circuit, this having selectable wide and narrow pulse blanking widths. A switchable 10dB attenuator is provided for when multi-megawatt HF broadcast signals

start causing problems, and the AGC may be set to either fast, slow, or completely off for manual control with the RF gain knob. At the other end of the scale, for example on 'quiet' bands such as 10m, a 10dB pre- amplifier may be switched in to help weak-signal reception.

The aerial input may be selected from either a 50 ohm coax socket input ('Ant 1'), a three-way connector allowing either 50 ohm or 500 ohm inputs ('Ant 2) for example for use with an end- fed wire, or a further 50 ohm coax socket input for use with a VHF converter.

Memories

As well as two selectable VFOs, the set has 100 memory channels arranged into ten blocks of ten channels each, these storing receive frequency, mode, bandwidth, AGC setting, RF preamp/ attenuator selection, aerial selection, notch on/off, noise blanker setting, and synchronous detector on/off. The usual scanning modes are fitted, with a variety of 'halt' modes controlled by the receiver squelch. Together with this, the receiver may be set to search between two pre-programmed frequencies, for example when you're looking around a quiet band for signals.

For unattended use, a tape recorder timer is fitted which may be used to control an external tape recorder over a preset time period on a given HF frequency/mode etc., the set having an internal clock for this function. When the set is switched off, (or alternatively on command by a button press), the display shows the current time, with two time zones being stored.

Computer Control

Together with the various front panel keys and buttons for control of the set, the rear panel of the receiver is fitted with a 9 way D-type connector for RS-232C control of the set's digital functions (i.e. those not controlled by the front panel analogue controls). The set's manual gives full details of the control codes required, stating that just a simple terminal emulation program is all that's necessary to remotely control the set. Drake also advise that they can also supply an optional software remote control package for the receiver for those who like their control software ready-written.

In Use

I tested the set over several weeks, with a variety of aerials including dipoles, verticals, a beam and an end-fed long wire, also taking in the November CQWW HF contest with the receiver to give it a thorough test. My reactions? Well, they were mixed, although to be fair I must say that I was constantly aware of the targeted user of the set who would often be seeking 'top-end' usability and performance.

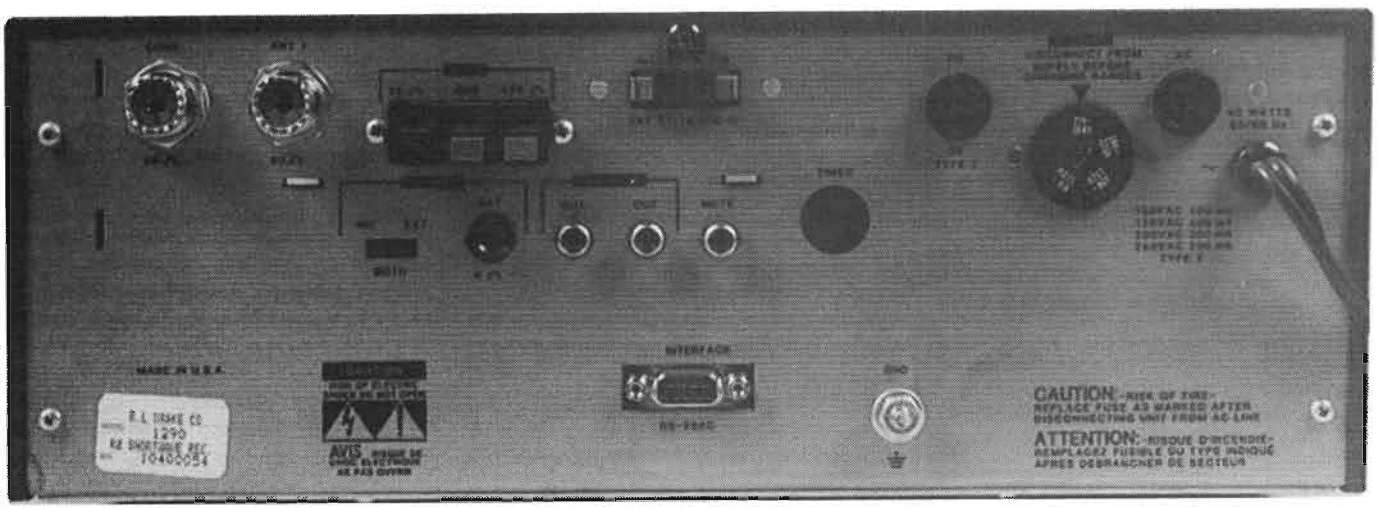
On the performance side, I found was that the set performed impeccably on air, especially when used on 40m CW listening for weak signals with my full-size quarter wave vertical connected, fed against an extensive ground plane. At night, the 7.1MHz broadcast stations normally cause me some degree or other of blocking and intermodulation problems with their S-meter needle bending strengths, but seeing the many exotic 40m DX 'spots' come up on the PacketCluster system during the CQWW contest, then tuning there, often brought instant results. Reception on other bands was likewise without problems, even with the preamplifier switched in on the higher frequency bands.

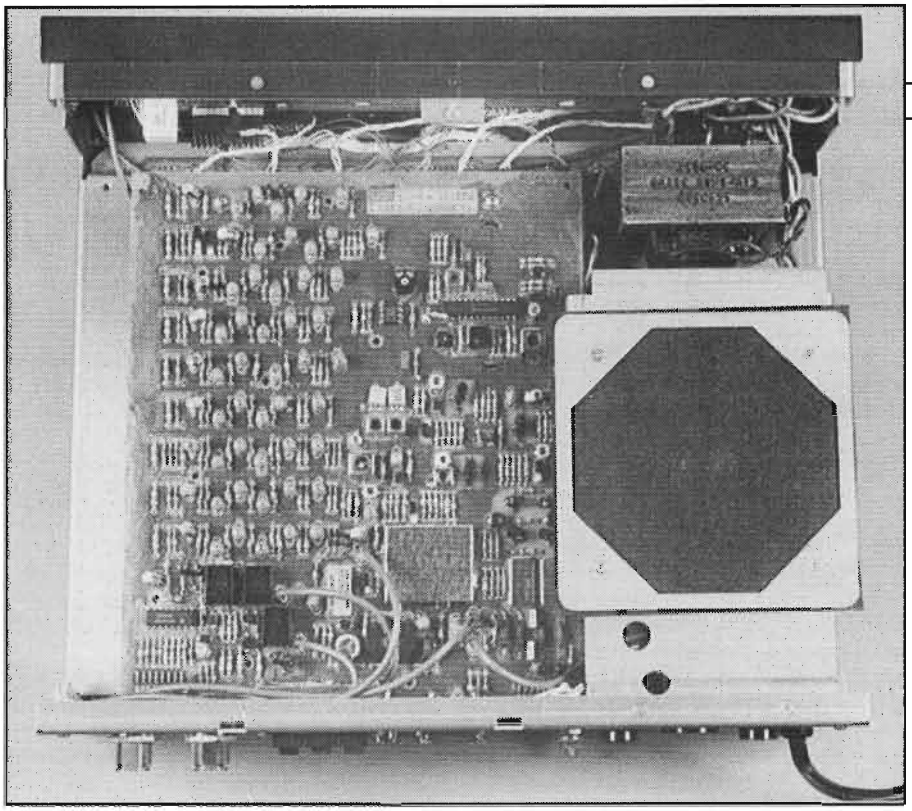
However one other thing I found in use was nothing to do with the set's RF performance. Rather, and I must be honest here, I found the ergonomics of the set an absolute pain to use.

As an example, the row of switches beneath the LCD panel are used as 'soft' keys, i.e. with their functions determined by the variable display shown immediately above on the LCD. Using these to change receive mode from USB to LSB, I had to cycle through AM, FM, CW, and RTTY modes with repeated presses of the 'mode' button. Likewise to change bandwidth between 0.5kHz for 'close-in CW work, to 1.8kHz to 'open up' the receiver for listening either side, this necessitated cycling through all the other filter bandwidths in between. The front panel buttons all had a soft, non-positive 'feel' to them which I disliked, although a switchable 'bleep' could be used to confirm depression of these.

This said, I found general 'tuning around' to be very pleasant, the tuning knob automatically speeding the stepping rate up when quickly rotated to help get from one part of the band to another, without having to key in the new frequency using the rubberised keypad buttons. An ergonomic feature in Drake's favour however was the ability to quickly switch between aerials, this allowed me to hop between my vertical and wire to 'winkle out' those weak ones quickly.

I found the selectivity very sharp indeed, tuning in between signals caused them to come and go very cleanly. The passband tuning control I found useful combined with the narrow filtering not only in setting the demodulated CW pitch to my preference for 'DX chasing' on that mode, but also for data monitoring in adjusting the narrow passband to the centre of my data modem's audio passband. Listening around the HF broadcast bands on AM was helped enormously by the synchronous AM detector, I found the IF passband could also be easily varied in this mode to reject the occasional strong adjacent signal.





LABORATORY RESULTS:

Sensitivity;

Input level required to give 12dB SINAD;

Freq. MHz	*SSB*	*AM*	*FM*
0.15	0.47	1.36	—
0.5	0.31	1.09	—
1.0	0.31	0.83	—
1.5	0.30	0.97	—
2.0	0.29	0.89	—
3.0	0.28	0.85	—
4.0	0.27	0.69	—
5.0	0.27	0.74	—
6.0	0.27	0.77	—
8.0	0.27	0.75	—
10.0	0.26	0.74	—
12.0	0.27	0.75	—
14.0	0.28	0.77	—
16.0	0.27	0.75	—
18.0	0.28	0.78	—
20.0	0.28	0.77	—
22.0	0.26	0.75	—
24.0	0.27	0.76	—
26.0	0.28	0.78	0.56
28.0	0.28	0.79	0.55
30.0	0.33	0.83	0.58

Selectivity;

Single Signal selectivity, measured at 10.7MHz

	0.5kHz	1.8kHz	2.3kHz	4.0kHz	6.0kHz
-3dB	270Hz	1.85kHz	2.33kHz	3.51kHz	5.40kHz
-6dB	420Hz	2.01kHz	2.54kHz	4.28kHz	6.09kHz
-10dB	560Hz	2.14kHz	2.68kHz	4.45kHz	6.41kHz
-20dB	740Hz	2.43kHz	3.01kHz	4.85kHz	7.19kHz
-40dB	960Hz	3.11kHz	3.82kHz	5.93kHz	8.82kHz
-60dB	1.06kHz	4.67kHz	5.52kHz	8.43kHz	10.94kHz

Although the audio from the internal speaker was quite acceptable, plugging in a good quality external speaker made a whale of a difference, this really bringing out the quality possible from the set.

I found the top panel of the set became very warm in use, often quite hot when a book was rested on top even when this didn't obstruct the cooling grilles, so I had to take care to ensure the set was adequately ventilated in use. I later found this to be a large ceramic high-power resistor, apparently used as a voltage dropper on the front panel display PCB.

Circuitry

The set is based on a metal chassis with several large PCBs fitted, a minimum of interconnections being used between the analogue circuit boards. This together with the use of screened boxes enclosing the various sensitive circuits should help in the reduction of microprocessor noise and the like getting into the RF side of the set.

The receiver uses a network of RF bandpass filters to select the wanted range of frequencies, and miniature relays are used, rather than PIN diode switches, to select the wanted aerial connection — this should help reduce non-linearity effects. Following RF amplification (or indeed attenuation, depending upon user selection) down-conversion to the first IF of 45MHz occurs, where a pair of monolithic dual crystal filters provide roofing selectivity. On FM, an intermediate conversion to 10.7MHz and ceramic filtering, plus further conversion to 455kHz in a standard MC3362 IF subsystem IC with further ceramic filtering is employed.

Reciprocal Mixing

Measured in CW 500Hz bandwidth mode, effective skirt bandwidth given from a single signal, measured at 10.70MHz.

-70dB; +/- 511Hz
-80dB; +/- 630Hz
-90dB; +/- 697Hz

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; 101dB
+200kHz; 103dB
+1MHz; 109dB

On other modes however, a relatively low IF of 50kHz is used, this together with the absence of any visible crystal or ceramic filtering suggests that either digital filtering or an analogue 'phasing' method of filtering is used in the receiver, as there are instead certainly plenty of ICs and ferrite-cored transformers on the main IF PCB. It looks like Drake are going away from the current 'norm' employed by their Japanese counterparts in receiver design!

Laboratory Tests

Those of us who make a hobby out of comparing technical specifications will no doubt see from the laboratory results, that, especially in terms of rejection of unwanted interfering signals with the good blocking and intermodulation figures achieved. When measuring the reciprocal mixing effects using the narrowest filter bandwidth, this normally giving an indication of the amount of synthesiser noise and the like, I found the performance was very acceptable indeed also noting that Drake's quoted shape factor of -6dB/-60dB bandwidths of 500Hz/1.5kHz to be very conservatively rated! However I noticed that on other filter bandwidths the selectivity started to 'broaden out' around the -60dB mark, so maybe they weren't incorrect on staying on the 'cautious' side. Finally, I found the S-meter to be accurately calibrated, with the S 9 level very close to the nominally accepted 50uV pd level.

Conclusions

As seen from the on-air tests, I had mixed feelings about the set. RF wise, it performed impeccably on air, the measured technical results backing this up, the ultimate skirt selectivity on some modes do doubt being due to Drakes apparent use of 'alternative' 50kHz second IF circuitry. I have reservations on the ergonomics of the set, at first I found it very tiring to use when changing between listening modes and bandwidths. Although in time I became used to it's operating modes, I still found it difficult to use, apart from general tuning around which was quite acceptable. Maybe Drake's computer software control package could be useful here?

For the dedicated HF DX chaser who isn't too worried about the ergonomics, I feel the set could be worthy of serious consideration, I wonder if Drake will be bringing out a matching transmitter?

My thanks go to Nevada, who are the Drake distributors in the UK, for the timely loan of the review sample.

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;	92.4dB
20/40kHz spacing;	89.2dB
50/100kHz spacing;	91.3dB

IF and Image Rejection;

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

Freq. MHz	*Image Rej.*	*IF Rej.*
0.15	97.0dB	84.0dB
0.5	106.5dB	87.5dB
1.0	106.0dB	85.5dB
1.5	103.5dB	90.0dB
2.0	108.3dB	95.0dB
3.0	>110dB	91.5dB
4.0	>110dB	93.0dB
5.0	>110dB	86.5dB
6.0	>110dB	87.5dB
8.0	>110dB	86.5dB
10.0	>110dB	87.0dB
12.0	>110dB	85.5dB
14.0	>110dB	85.0dB
16.0	>110dB	86.5dB
18.0	>110dB	86.5dB
20.0	>110dB	86.5dB
22.0	>110dB	84.5dB
24.0	>110dB	84.0dB
26.0	>110dB	83.5dB
28.0	>110dB	82.5dB
30.0	>110dB	81.5dB

S-Meter Linearity;

Measured at 14.25MHz, SSB, 2.3kHz bandwidth

Indication	*Sig. Level*	*Rel. Level*
S1	0.56uV pd	-39.3dB
S2	0.81uV pd	-36.0dB
S3	1.38uV pd	-31.4dB
S4	2.07uV pd	-27.9dB
S5	3.77uV pd	-22.7dB
S6	7.15uV pd	-17.1dB
S7	13.9uV pd	-11.4dB
S8	26.4uV pd	-6.8dB
S9	51.4uV pd	0dB ref.
S9+10dB	208uV pd	+12.1dB
S9+20dB	762uV pd	+23.4dB
S9+30dB	2.94mV pd	+35.1dB
S9+40dB	9.80mV pd	+45.6dB
S9+50dB	23.3mV pd	+53.1dB
S9+60dB	95.6mV pd	+65.4dB

Preamp Gain;

Measured on 10.7MHz

9.6dB

Attenuator Level

Measured on 10.7MHz

10.0dB

Conversion Project — PMR 2 Remote Mount

Chris Lorek G4HCL shows how to convert a high power mobile for 2m FM — or even just as a high-power add-on amplifier

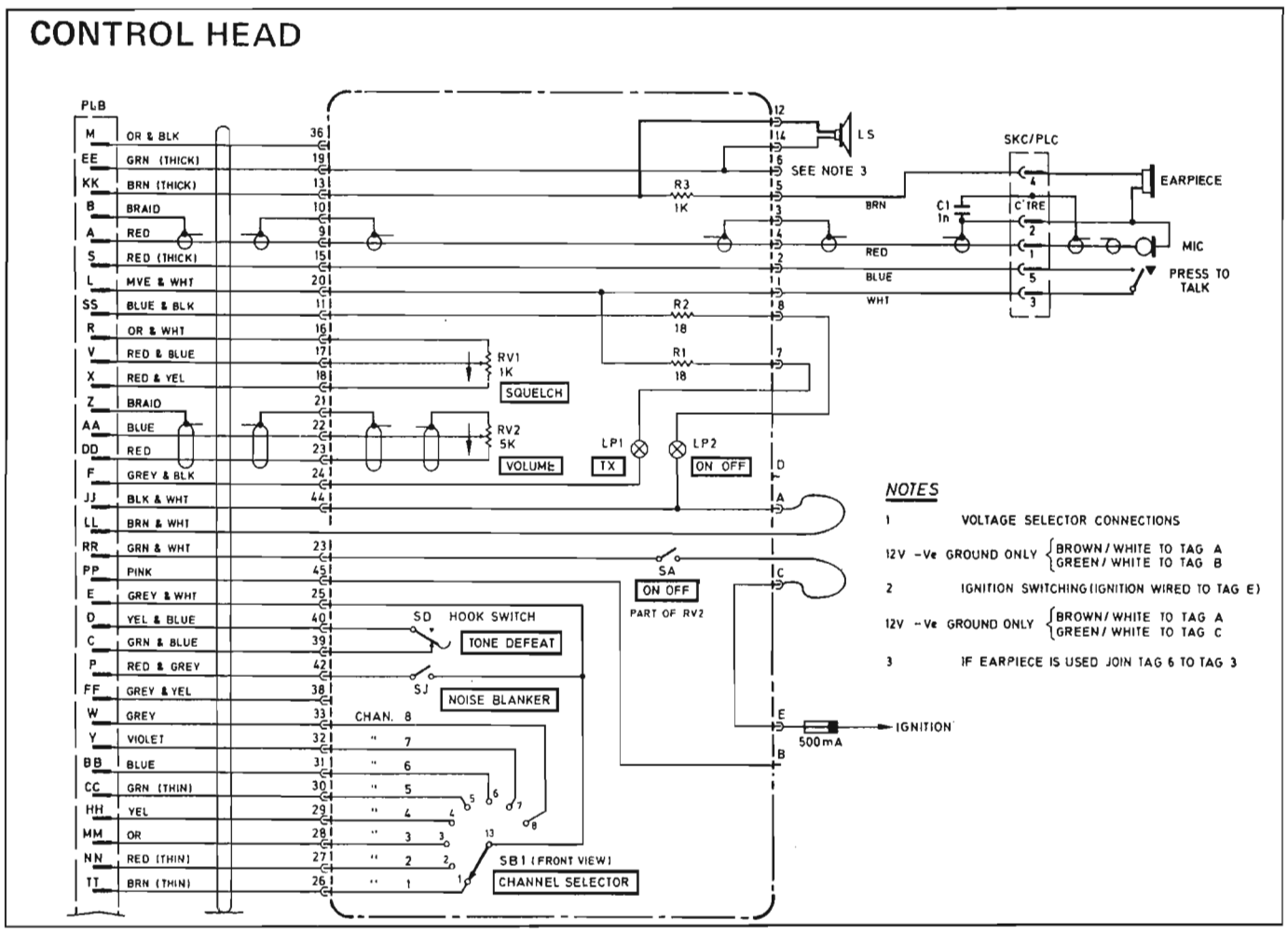
Some years ago, a mobile transceiver based on modular construction was manufactured for demanding uses, being termed the 'Precision Modular Radio', type No. PMR2 (I never knew what happened to the PMR1 if there ever was one). Built like the proverbial 'battleship' and weighing the part, inside the tough case was a high performance, high power VHF FM transceiver, designed for remote mounted use with operator controls mounted on the now-usual control box. Secondhand models of these used to be quite rare, although I did once come across (and purchase) a high- power PA board from one of these units at a rally. Later I kicked myself, because I found it happily gave over 100W of RF on 2m, and for several years I used it as an add-on amplifier for my 2m shack rig — maybe I should have bought a few more!

With the recent 'release' of a substantial number of these transceivers from professional service, this high-power facility I feel would also appeal to other amateurs. So here we go with yet another conversion project to get HRT readers a high performance rig at low cost.

Preliminaries

The set comes in a remote mount chassis, and if you wish to use it as a full transceiver then ensure you can get a control box and accompanying multi-way lead for the unit. You'll find that a standard Pye Westminster (e.g. W15FM series) control unit will interface nicely with the PMR2, with similar circuitry and connections used apart from a couple of 'add on' facilities used in the latter, which may be hard wired if required. The accompanying diagram shows the circuitry required in case you don't manage to acquire a suitable box, or of course if you wish to make your own control arrangements. Also worth checking, because it uses a key-locked method of fixing onto the mounting tray (which may or may not come with the set), is that you either buy the unit separate from a mount, or that if a mount comes attached to it then so does the key!

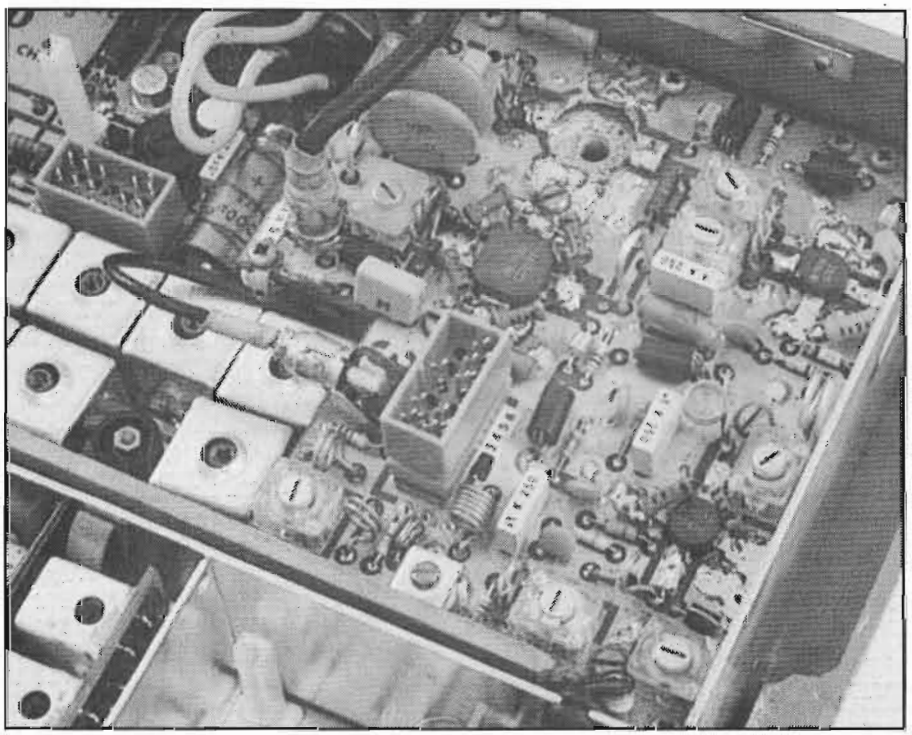
Together with the control box, you'll need to add a microphone (600 ohm dynamic type) and an 3-8 ohm speaker — the set has a powerful audio amplifier, together with a high current 12V DC power lead. This lead uses a large 'Jones' type plug, if you don't manage to get a suitable type with your purchase then simply solder the leads onto the chassis power connections and insulate these well.



The microphone connections are on a 240 degree DIN plug, with pin 1 mic live, pin 2 mic ground, and pins 3 and 5 as PTT. The aerial connector used is a TNC type, ensure you either have a matching plug for this or replace the connector with a type suited to your needs.

The standard TX PA uses a pair of large BLY90 transistors in the final stage, although I have come across sets with one transistor and it's accompanying coils retrospectively removed, an obvious large hole being present where this transistor fitted. A useful check before purchase would be to open the set (by loosening the four captive screws on the chassis) and taking a look at the prominently located PA board. But even so, one transistor will still give out a lot of power .....

Note that a different RX crystal multiplication is used for the 'B' band set (built for 132-156MHz), this being x 9 rather than x 12 as used on the 'A' band set (built for 148-174MHz), however to my knowledge no B band sets are generally available. A check may be made on the serial number plate, a typical equipment code being 'PMR2FMAA' for a surplus 'A' band set, a further check is for a black pen-marked '1' following the small printed AT27370 part number on the plug-in receiver oscillator multiplier PCB, this being fitted at the rear of the set. A '2' marked on this PCB signifies a 'B' band multiplier needing a 'x 9' substituted in the above formula. Both crystals are HC6u type, the commercial specification of these being type E25 in terms of loading capacitance etc.



Check if your PA has one transistor or two

Crystals

The set is crystal controlled, with facilities for up to either 4 or 8 channels being fitted on plug-in boards (each board having four crystal sockets, with either one or two boards fitted in both TX and RX circuits). The crystal frequencies you'll need are given by the formula;

$$\text{RX Xtal} = \frac{\text{RX Freq} + 10.7\text{MHz}}{12}$$

(see note below)

and;

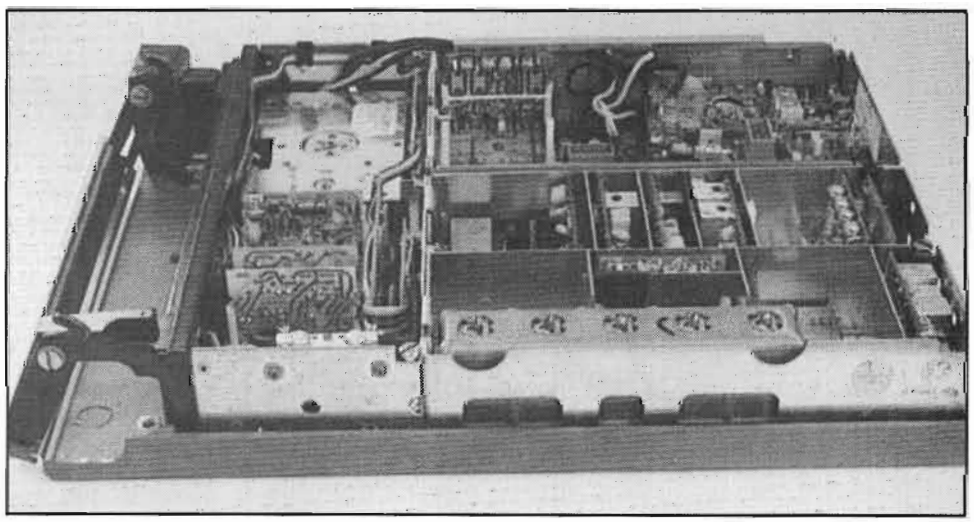
$$\text{TX Xtal} = \frac{\text{TX Freq}}{12}$$

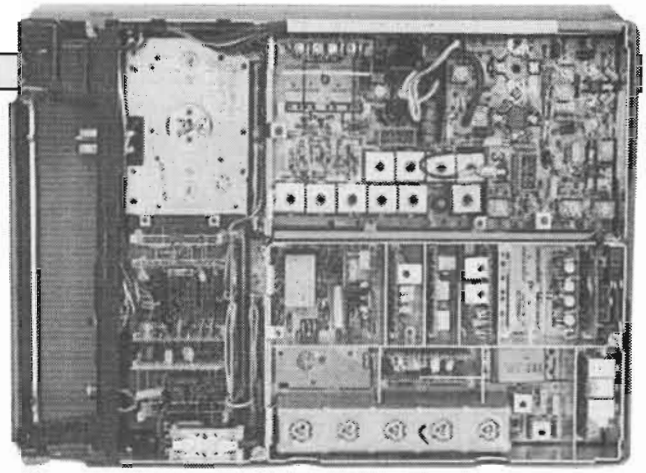
RX Alignment

First plug in your crystals, and either connect your control box or alternative method of control, making sure you've selected the correct channel to that which your crystals are plugged into (I know it's common sense, but you'll be surprised how often amateurs only realise this after they've mistuned nearly every adjustment in the set!). Referring to the accompanying alignment diagram check whether your set is fitted with a tone module, this being a PCB mounted above the metal plate behind the power connector. If one is, then you'll need to 'defeat' this by adding a shorting link between 'P' and 'E' on the control socket to replicate the 'tone defeat' switch on the standard control box. Check your speaker is connected, and you get squelch noise out of this with the set powered up, otherwise re-check your connections.

Now for the receiver alignment itself. You'll need a multimeter for the tuning stages, and a suitable non-metallic adjustment tool to fit the ferrite core slots on the oscillator multiplier module. Don't be tempted, under any circumstances, to use something like a metal 'jewellers screwdriver' for adjustment, this is almost guaranteed to break and subsequently jam the fragile ferrite cores.

Switch your multimeter to a DC voltage range of around 2.5V, and connect the negative lead to your DC supply negative. Connect the positive lead of your test meter to connection B1 (i.e. position '1', side 'B') on the multi-way test socket at the rear section of the set, i.e. the one in the adjacent compartment to the oscillator multiplier module and not either of the other two more visible sockets. Now tune L1 on the oscillator multiplier module at the rear of the set for a 'dip' in voltage, you should get around 1-1.5V.





Transfer your meter positive lead to connection pin A1 on the socket, and tune L2, then L3, on the oscillator multiplier module again for a 'dip' in voltage reading, then tune L1 for a peak in voltage, you should get around 0.5-1V indicated here. Now transfer your meter positive lead to A2 on the multi-way socket, selecting a lower voltage range if you have one, e.g. 1.0V maximum. Tune L4 on the oscillator multiplier module for a dip in reading, then tune L2 and L3 both for a peak in voltage, you should end up with around 0.25-0.5V indicated. Transfer the positive multimeter lead to B2 on the socket, and finally tune L4, then L1, L2, L3 and L4, all for a peak in voltage, the final reading again being around 0.25- 0.5V. That completes the crystal multiplier, now for the front end stages.

For this you'll need an initially strong off-air signal to tune against,

Inside the box

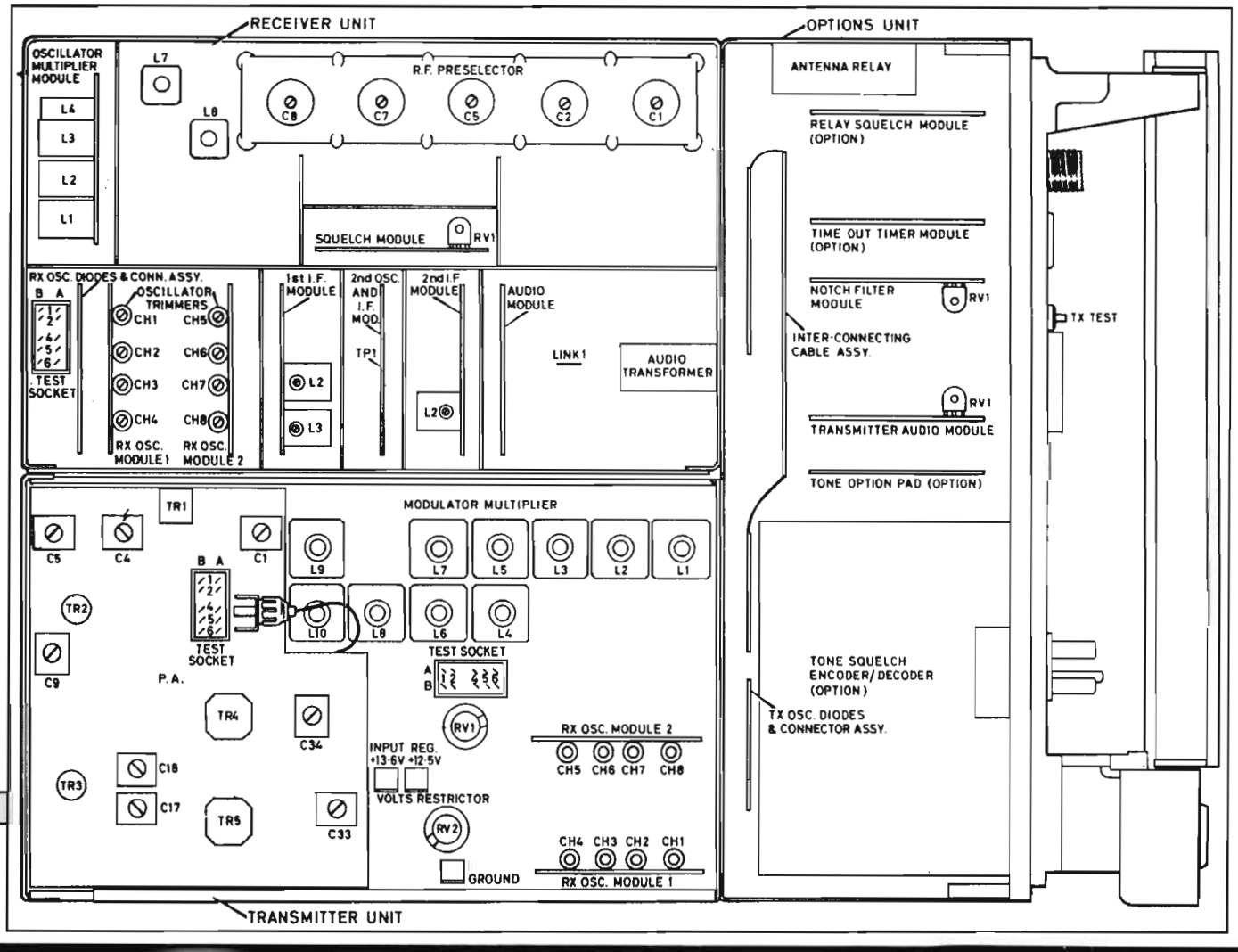
ensuring that you can reduce the level of this as you successively increase the overall sensitivity of the receiver (those who have access to a signal generator will no doubt know how to use this to good effect!). With the signal present, first adjust the appropriate crystal trimmer for spot-on reception, then adjust (not necessarily this time with a non-metallic tool) C1, C2, C5, C7 and C8 on the RF preselector for best quieting, reducing the level of the received signal as needed to ensure correct tuning. Finally, using a constantly weak off-air signal, fine tune these front end capacitors again for absolute best sensitivity, and re-check your crystal trimmer for correct 'netting'. As the IF stages should already be correctly aligned if the set came out of service, this completes the receiver side of things.

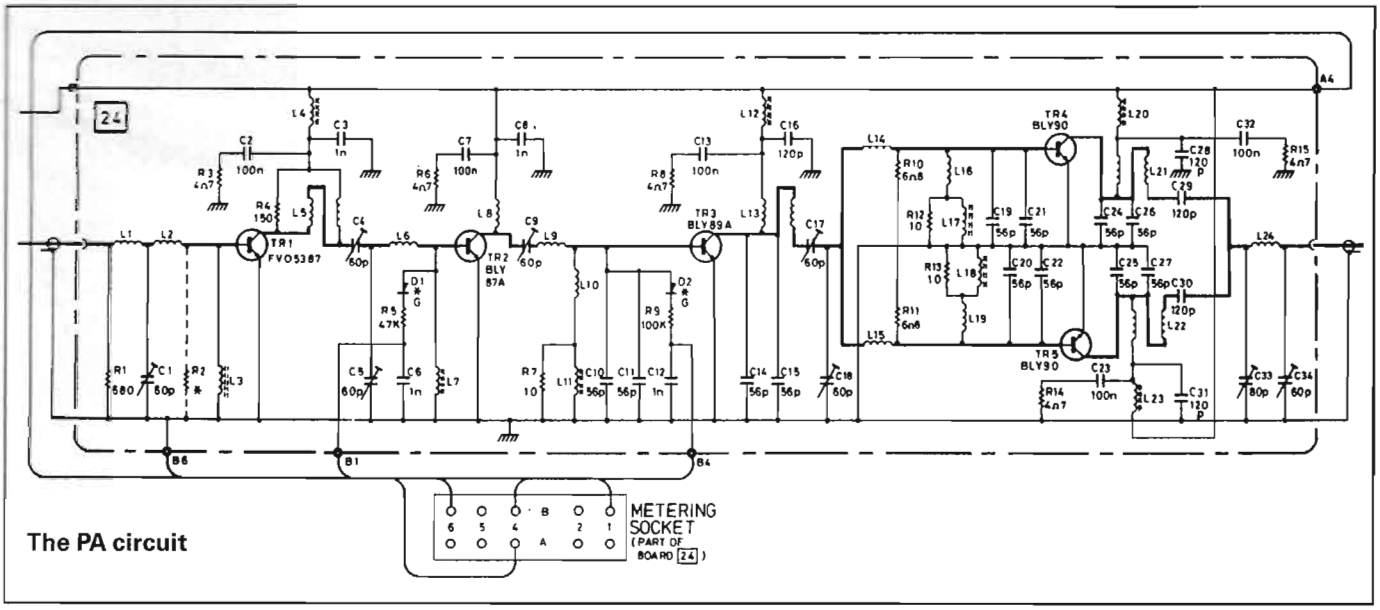
TX Alignment

Here as well as a 13.8V DC supply of sufficient current rating for the TX power (a car battery?), you'll need a dummy load capable of dissipating at least 100W and an RF power level indicator. If not, then disconnect the plug-in coax link to the PA and connect a low-power dummy load to this instead for the initial tune-up.

Some sets have a transmission timer circuit fitted, this being a vertically mounted plug-in PCB at the front of the set, see the accompanying alignment diagram for the position of this. This limits the maximum transmission period to around 60 seconds, disabling the transmitter after this time period and sounding a warning tone in the speaker. If you want to disable this then simply unplug the PCB, although it's handy to keep it in circuit at first to ensure you don't over-dissipate the PA in the following alignment stages.

Alignment diagram





The PA circuit

With your dummy load connected, set your multimeter again to its 2.5V DC range with the negative test lead connected to the DC supply negative. Remember to keep the transmitter keyed whilst taking readings, using either the PTT or the 'TX Test' button on the front panel of the set. Connect the positive lead of your meter to position B1 on the multi-way test socket on the modulator multiplier module. Now with your non-metallic trimming tool carefully tune the cores of L1 and L2 on this board for a peak in meter reading, then tune L3 for a voltage 'dip', you should end up with around 2.4V indicated. Transfer the meter positive lead to test socket pin A1, and tune L4 and then L3 for a peak in voltage reading, then tune L5 for a dip, you'll end up this time with around 2.5V indicated. Now transfer the positive lead to test socket pin A2 and tune L6, then L5, both for a peak in voltage reading, then tune L7 for a dip, you should get around 2V. Transfer to test socket pin B2 and if possible switch your meter to a lower DC voltage range, e.g. 0.5V or 1V. Tune L8, then L7, each for a peak in reading, then tune L9 for a dip, you'll end up with around 0.3V. If you have a low-power wattmeter, you can usefully disconnect the plug-in coax link from the modulator multiplier module and feed this to your power meter, tuning L9 and L10 for maximum power, you should get around 240mW. Now onto the PA.

PA Alignment

Reconnect the coax link to the PA input, remembering to terminate the set's aerial connection with a 50 ohm load, and initially set C4, C5, C9, C17, C18, C33 and C34 fully clockwise. With your multimeter negative lead connected to the DC supply negative, switch to a 2.5V DC scale and connect the meter positive test lead to pin B1 on the TX PA test socket. Remember now to keep the transmitter keyed only for the period it takes to perform each adjustment, dekeying it in between measurements. With the TX keyed, first tune L9 and L10 on the modulator multiplier module, then C1, C4 and C5 on the PA for maximum reading, all for a peak meter reading, you should get around 2.0V. Then with your multimeter switched to a higher DC voltage range, typically 15V, transfer the meter positive lead to test socket pin B6 and tune C9 for peak voltage, then re-tune C1, C4 and C5 in that order again for a peak, you should get around 15V this time.

By now if all is well you'll be getting some RF power from the aerial socket, so disconnect your multimeter and using a pair of trimming tools adjust C4 and C5 (tuning one, then the other, then back again etc.) together for maximum power. Repeat this for C17 and C18, and again for C33 and C34, tuning each pair for absolute maximum power. By now your dummy load may be getting nicely warm with all the power, this certainly being more than 60W for a two-transistor PA (my first PA, many years ago, pinned the meter needle on a 150W Bird Termaline meter).

Finally, adjust your crystal trimmer for the correct transmit frequency, then adjust RV1 on the transmitter audio module for the required transmitter deviation, this normally being 5kHz peak for 2m FM use on 25kHz channel spacing.

PA Board Use

If you just want to us the transmitter PA as a 'stand alone' amplifier, for example for a low power FM rig, this may be done by connecting a nominal quarter watt drive to the PA board input socket and taking the output from the output connector of the low pass filter unit, this being the screened box beneath the tone facility space, or from the aerial socket itself if you wish to make use of the aerial changeover relay for switching. As the PA is a operated in class 'C', don't try putting SSB through it without adding a suitable bias! It's beyond the scope of this brief article to cover every operating eventuality, but by referring to the PA circuit diagram together with one of the many reference books on RF amplifiers most experienced amateurs should easily find a suitable use for the board as an amplifier. For example, the driver may be connected via an 'L match' into either the BLY89A TR3 base circuitry (for a 5-10W input) or into the BLY90 TR4/TR5 base circuitry (for a 25W input). Suitable bias for SSB use can typically be added by the use of a forward-biased high current silicon diode fed from an external stabilised 13.8V supply via. a low resistance wire wound resistor, the cathode connected to the PA ground plane with the diode in thermal contact with the amplifier transistor (e.g. placed physically across the transistor case, adding a small dollop of heat-sink compound) for thermal stabilisation. One end of an RF choke is connected to the diode cathode/resistor junction, the other end to the base connection of the PA transistor(s), remembering to remove L16 and L19 in the final stage, and L10 if you're also using TR3. You can even try connecting the input RF into the existing input matching arrangement (i.e. C9/L9 or C17/C18), tuning these for best match. In my amplifier, I found that I had to replace C34, a 60pF type, with a higher-voltage rated airspaced capacitor to handle higher power for SSB use.

This completes the conversion details, I hope they prove useful in getting a low-cost, high power and high specification set on the air for many amateurs.

My thanks go to Anchor Surplus for the provision of the PMR2 used for photographs in this article.

QRP CORNER

Dick Pascoe G0BPS reports on unusual sermons at the G-QRP gathering

Several letters have graced the doormat since I last sat at the word processor. Judy G0POJ tells us she's had a lot of fun building a power meter and a dummy load. Like many of the ladies that come into the hobby she found that building her own equipment was *fun!* She said that she "breathed a great sigh of satisfaction" when they all came together, this is what building and QRP in general are all about. She is also waiting for her sister to get her 'A' licence so that they can chat in CW, this could bring a whole new meaning to the word 'ragchew'.

Rich Arland, the QRP editor of the American World Radio magazine, writes to say that he is building a QRP antenna tuner with SWR and power metering. This should prove interesting, more on this later I hope.

I also hear that the Berridge family of Deal is now complete. The whole family is now licensed, as 11 year old Rachel gained the 16th Novice 'A' call to be issued. The family all are interested in QRP operating and construction. Listen out for John G0OXX (Dad), Eileen G7HXJ (Mum), Andrew (14) G7IXL, and congratulations to 11 year old twins Richard 2E0AAK and Rachel 2E0AAP. Also, congratulations go to Andrew, who won the Dover ARC construction contest at his first attempt!

G-QRP, Rochdale 1991

The annual QRP gathering at Rochdale, at the church hall of the G-QRP club's secretary the Rev. George Dobbs G3RJV, was another huge success. The 270 plus people who attended all seemed to agree that it was a terrific day out for all who came.

The, now usual, gathering of visitors from abroad caused a lot of interest, hearing a broad Texan accent talking about construction techniques to an East German accent with comments from the side in a Dutch accent made the whole affair seem very cosmopolitan.

One of the very valuable points of the gathering is that the officers of the club are available to chat with members. Gus G8PG, the club's aerial expert spent many hours with members discussing the advantages and disadvantages of various aerials, Peter G3LDO helped on this one too. David G4HYY, the club's membership secretary also managed to answer many of the problems that always occur in this post. David receives many requests for information about the club from abroad, often from countries where it is almost impossible to get money out. The G-QRP club runs a scheme where UK members may sponsor a person from another country. By paying their membership, the foreign member will gain the benefits of the club without difficulty. David was also the recipient of a Trophy for all the hard work that he and his wife Jennifer put into the club, can you imagine 5000+ letters with membership renewals arriving during January! A good recommendation for Direct Debit payments!

Your scribe was also pleased to chat to many people about that little used part of the hobby, QRP sideband. Although not often used it can sometimes be very productive (I have over 25 countries so far on QRP SSB).

I was very pleased to receive a gift from Klaus Y24TG, he presented me with a very nice Russian Morse key, a PA valve as used by a lot of Russian amateurs in their transmitters. Both of these almost put to shame the bottle of East German Brandy that accompanied them. The gathering at Rochdale is just that, yes there *are* traders there, but about 70% of the floor area in the hall is set out with tables and chairs for those who just wish to sit and chat about their latest project. Even the talk-in station, located just inside the main door so that all visitors could see what was happening, was using homebrew gear. There was yet again a large amount of 'junk' for the taking, together with other more expensive goodies to be had in the bring and buy. Many youngsters went home with their arms full of old magazines and other 'useful' things.

Once again, Paula WB9TBU came over, she is president of the American QRP club, the Amateur Radio Club International. This year she managed to persuade her husband Wally to join her, and on this his first trip out of America, all he could say was *"Wow"*. We gathered that he was enjoying himself! Another American visitor this year was Luke W5HKA (the Texan). Other visitors included the annual visitation from 'The Dragonslayers QRP club' a Dutch group who love building things, and they don't care who knows it!

Unusual Sermons

As is usual at this event, the speakers use the church for their lectures. This does at times limit the language used, but almost everyone enjoyed the talks. The highlight of the talks was the annual question time hosted by David GM4ZNX, he is an acknowledged expert and takes any and all questions on radio theory, explaining 'how it works'. David has that enviable ability to make the extremely difficult seem easy. Another highlight of the weekend was the ceremony of 'Putting up the aerial'. It's not that usual to see a 2m co-linear on the top of a church spire, but the HF dipole running from the spire to a nearby tree did cause a few raised eyebrows in the following morning's congregation.

The church hall at Rochdale cannot hold many more than attended this year, and if the event is to grow as it surely will, then an alternative venue will have to be found. I think that this will detract from the gathering and make it appear much more commercial than it is at present. An informal meeting of like-minded folk makes for a terrific day, and it seems a shame to spoil it.

Rumours

Many rumours abound about the 'day after the night before' but it has become a custom for those who stay over after the gathering to show their faces at the church service the next morning. One amateur, who shall be unnamed, skulked out of his caravan dressed in an old track suit grunting "going to get a paper". His wife appeared seconds later in her Sunday best, ready for the service. Ridicule, abuse and lots of taunts eventually got him into his Sunday best too. Unshaven though he was, he went!

Rallies

You'll often see me behind a QRP equipment stand at various rallies, and I'm often asked as I do the rounds of the shows if the G-QRP club is in attendance. Even if not, I'm always happy to answer questions about the club, or QRP in general, and even sign you up for the club!

That's it for this month, if any of the above has whetted your appetite then you can send your G-QRP club member sponsorship enquiries to D. Jackson G4HYY, Castle Lodge West, Halifax Road, Todmorden, W Yorks. ARCI Membership enquiries to me via HRT editorial, P. O. Box 73, Eastleigh, Hants SO5 5WG, or to 3 Limes Road, Folkestone.

SCANNERS INTERNATIONAL

Here's 1992, and we at Scanners International wonder what this year will bring? 1991 saw a 'clarification' in the law on scanners in the UK, with the RA reinforcing the message to all and sundry that listening into things such as aircraft and boats was illegal, never mind the far more serious offence of listening into such things as police transmissions. One UK citizen was widely reported as being imprisoned for five years for using his scanner and noting down the frequencies of the local police transmissions he heard on it.

In some countries, a handy accessory for a scanner receiver is a sensitive handheld frequency counter, the type you hold near a radio user to see what frequency they're using so you can tap it into your scanner. Shock, horror, we wonder when these are going to be outlawed in the UK! Maybe it's only a matter of time. Alternatively, some people might get wise and see that scrambling their signals is a better way to prevent unwanted reception, rather than trying to uphold unenforceable laws. We'll wait and see . . . .

Scanmail

Dear Sir

Regarding third party reception of transmitted information, with the proliferation of multimode, wideband scanning radio receivers, most having many memory channels, the question of the legality of their use has become of general interest, with particular application to both Fire/Police/Medical mobile radio, also cellular and cordless telephones.

The current state of legislation, I understand, seems to mean that although it is legal to manufacture, sell, and buy such apparatus it is illegal to listen to signals on many frequencies.

I suggest that unless the transmitting authority takes reasonable precautions (i.e. transmitting a signal with digitally scrambled modulation, and/or frequency agile carrier following a 'random' frequency sequence, i.e. hopping) to ensure confidentiality, then they cannot expect confidentiality, and it should not be a crime to listen to or use such information so effortlessly obtained.

The human eye is sensitive to a small segment of the E-M spectrum, so there is nothing 'unnatural', or devious about receiving such signals. Compare the situation regarding E-M waves with that regarding sound waves (atmospheric pressure waves), is it illegal to receive ultrasonic sound signals, or to overhear a conversation? To continue the analogy, the emergency and law enforcement services literally 'shout (their E-M signal) from the rooftops' at a front end deafening volume. If a simple superhet receiver intended to receive amateur or broadcast band signals has an image frequency which happens to coincide with an unnecessarily strong and uncoded 'protected' signal, whose fault is it that the information thus carried is not secure?

The means to achieve such scrambling and/or hopping, as I mentioned above, are now well established in the defence sector, and the technology is sufficiently mature to be available at reasonable cost and with little penalty in terms of weight and power requirement. Furthermore, with the thawing of the Cold War, the design and manufacturing ability is probably also available to domestic emergency services, these days.

Outlawing unlicensed manufacture/sales/purchases and use of equipment capable of receiving such coded transmissions would be a great deal easier to understand and justify. Careless signals cost lives, radiotelecomms service providers should be encouraged to protect their customers' signals confidentiality, rather than Joe Public be commanded to plug his ears and ignore anything interesting wafted to him on the ether; it is like commanding him not to eat of the tree of knowledge!

Joseph H. D. Barry, G8SLP

Editorial Reply;

Some countries have a policy of 'the airwaves are public' in as much as whatever is present in the ether, may be received by individuals, although some matters of privacy sometimes must be complied with, e.g. private telephone communication via. radio are often illegal to 'tap into'. Other countries, such as the UK, make it illegal to tune into virtually anything except authorised broadcast stations or radio amateurs. As we all know, many people listen in to a lot of other things, often without even realising it's against the law to, civil aircraft communication for example. Does this sound nonsensical? What people do in private, when it affects no-one else, often can't be enforced by law. When people are constrained in such ways, drastic steps sometime occur, like the government gets changed. It's human nature for people not to tolerate such 'hard line' ruling.

SCANNERS INTERNATIONAL

Realistic PRO-35 Review

One of the latest scanners on the streets is the Realistic PRO- 35, a 100 channel handheld scanner covering VHF and UHF. With it's wide availability, Scanners International thought we'd take a look . . . . .

Features

The set covers the frequency ranges of 68-88MHz, 137-174MHz and 406MHz-512MHz on FM, together with the civil aircraft range of 108-136.975MHz on AM. Although the set is limited in having AM reception only on the aircraft band, it has the advantage of having the full aircraft band programmed for AM use. Some scanners cover only up to 136MHz on AM, which precludes reception of the newly introduced 'top end' of 136-137MHz for air-band communication (but see Peter Rouse's article on adding AM to FM- only scanners in last month's issue).

The PRO-35 operates in fixed 5kHz steps on VHF FM, and fixed 12.5kHz steps on VHF AM and UHF FM. Frequency entry is a simple matter of tapping in the required frequency on the keypad followed by a press of the 'enter' button, the set automatically selecting the nearest tuning step to the entered frequency.

Memories

The set has 100 memory channels, arranged in ten banks of ten channels each for scanning. As well as the being able to individually lock channels in and out of scan mode, you can switch any number of the memory banks in and out of the scan mode. Hence you can put one group of channels, i.e. locally used 2m FM channels, into one bank, 70cm local channels in another and so on.

Scanning

Together with scanning of the memory channels, a 'search' mode allows you to program lower and upper frequencies for a band search. A press of the 'up' or 'down' button then sets the receiver looking for signals across this range, halting when a signal is found. On both the 'search' and 'scan' modes, the set resumes scanning either immediately the squelch closes, or alternatively following a programmed two-second delay to allow you to hear replies on the same frequency. In memory channel scan mode, this 'delay' can be programmed on a channel-by-channel basis to provide a degree of flexibility, for example a delay on simplex channels but no delay on some talkthrough repeater channels.

To make sure you don't miss signals on a given frequency, a 'priority' mode allows you to select a given memory channel which is automatically checked for activity every two seconds. Regardless of what other channels the scanner is receiving, a signal on this 'priority' channel causes the set to lock onto it for the duration of the activity.

Physical Features

The set comes in a sturdy polycarbonate case measuring 189mm x 69mm x 35mm overall, the lower half being a self-contained slide- on nicad battery pack. A plug-in AC mains charger, with the correct UK three-pin plug moulding (as opposed to the two-pin variety one often finds) comes supplied with the set, together with a belt clip as a carrying aid, and a plug-in ear-phone for private listening. A set-top BNC aerial socket lets you plug external aerials in when at home or in the car, and a rugged 'rubber duck' helical aerial comes supplied with the set for portable use.

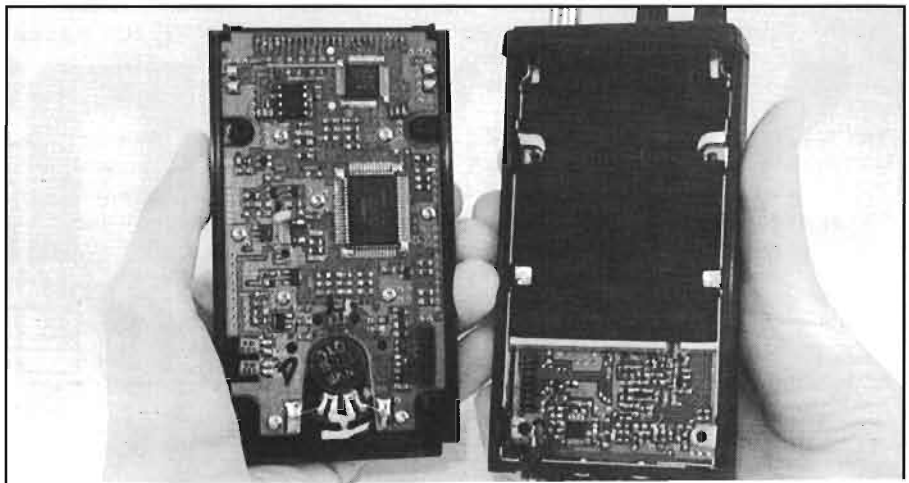
Opening the PRO-35 up reveals a well-uilt interior with 'chip' components by the score, showing the set should cope with the odd knock or two in use (although we decided not to try the 'drop test' in the review!). The control unit is comprised on a single large PCB on the front half, this interfacing directly with the front panel keyboard, the remainder of the set with the many RF and AF circuits being fitted on the rear half, the two simply plugging together. For the technical boffins the set uses a dual conversion superhet with IFs of 10.85MHz and 450kHz, the first IF rejection is specified as being greater than 60dB at 155MHz, with greater than 50dB spurious rejection specified at 77MHz, 120MHz and 154MHz.

In Use

Handling the scanner gave me an impression of a tough, resilient unit, the positive push-buttons on the facia reinforcing this image. On the air, the performance, I'm pleased to say, matched my expectations. The built-in speaker gave a clear, readable audio level when used out of doors without distortion rearing its head, and the easily-read display gave a clear indication of what the scanner was doing.

On scanning around after I'd programmed by favourite frequencies in, I was pleased to find few problems from strong out-of-band signals, although when listening on 145MHz FM I did sometimes find AM breakthrough from strong aircraft signals, due to image reception. I found the set was reasonably sensitive, but comparing it with a purpose-designed 2m and 70cm handheld it was noticeably less sensitive than these.

In 'search' mode on VHF, although the scanner uses 5kHz steps I discovered that when a signal was found the set correctly locked onto the correct centre frequency, rather than simply when the squelch raised either 5kHz or 10kHz off-frequency as with some other scanners. A nice touch, thus saving me having to keep pressing 'up' or 'down' buttons on the facia to bring signals



New Products

Lowe HF-150 Receiver

At just 185mm x 80mm x 160mm, this new receiver from Lowe Electronics packs in 30kHz-30MHz reception on USB, LSB, AM and even Synchronous AM, with two IF filters (2.5kHz and 7kHz) and simple-to-use front panel controls. If the RF performance of this set follows the usual Lowe Electronics reputation gained by the HF-125 and HF-225, this one could be a HF receiver to watch out for. Selling for £329, we've a review sample on the way.

Yupiteru MVT-8000

Nevada, that well-known UK name in scanners, have announced the release of a new scanner, the MVT-8000 from Yupiteru in Japan. Selling at £299, it's a mobile version of the MVT-7000 scanner as reviewed in the Sept 91 issue of Scanners International. It's specifications give a frequency range of 8-1300MHz with 200 memory channels, and FM (Narrow), FM (Wide), and AM modes of reception. The MVT-8000 should be available by the time this appears in print, further details from Nevada Communications.

into tune. In the case of 12.5kHz spaced VHF signals, I found the set necessarily stopped 2.5kHz away from the wanted signal, although due to the fairly wide IF bandwidth of the receiver, undistorted reception was the result even though the display read the incorrect frequency.

Conclusions

The PRO-35 is a well-built unit, with reasonable RF performance. The measured technical figures show it has good immunity to out- of-band signals apart from image reception, which is rather poor although similar to other scanners of this type. In use I found the set performed well, it was easy to operate and gave good audio in noisy surrounds.

The review sample was kindly loaned to us by Link Electronics in Peterborough, and our thanks go to them for the kind provision of the unit for test.

LABORATORY RESULTS:

Sensitivity;

Input signal level required to give 12dB SINAD;

Freq. MHz	Sensitivity
68	0.33uV pd
78	0.33uV pd
88	0.33uV pd
108	0.72uV pd (AM)
120	0.71uV pd (AM)
136	0.63uV pd (AM)
145	0.38uV pd
160	0.44uV pd
174	0.49uV pd
406	0.48uV pd
435	0.48uV pd
450	0.52uV pd
470	0.61uV pd
512	0.54uV pd

Adjacent Channel Selectivity;

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

+12.5kHz;	12.5dB
-12.5kHz;	4.5dB
+25kHz;	47.0dB
-25kHz;	48.5dB

Image/IF Rejection;

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

RX Freq.	Rejection
145MHz;	20.5dB
435MHz;	7.0dB

Blocking;

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

+100kHz;	59.0dB
+1MHz;	81.5dB
+10MHz;	93.0dB

Intermodulation Rejection;

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

25/50kHz spacing;	54.5dB
50/100kHz spacing;	57.5dB

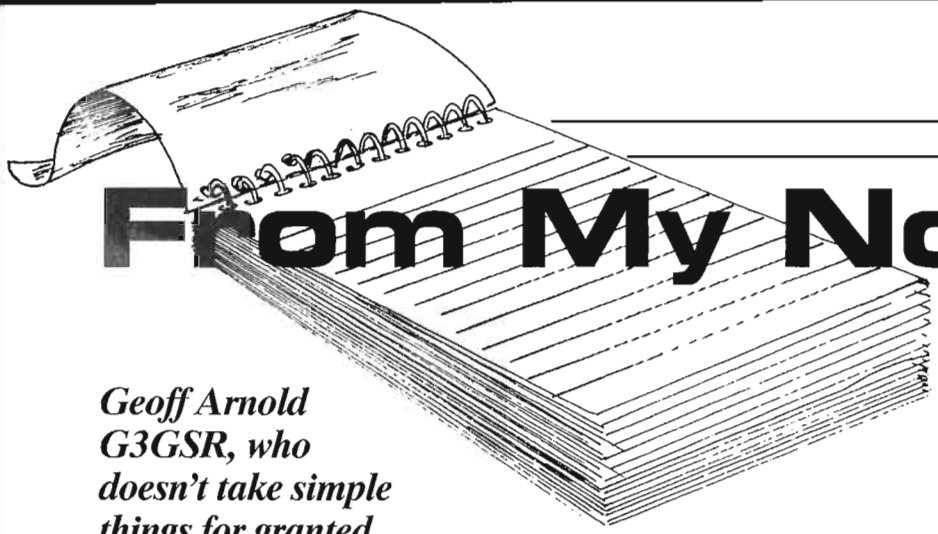
Maximum Audio Output;

Measured at 1kHz on the onset of clipping;

3 ohm load;	174mW RMS
8 ohm load;	186mW RMS
15 ohm load;	162mW RMS

Current Consumption;

Scanning, no signal;	46mA
Receive, mid volume;	66mA
Receive, max volume;	115mA



From My Notebook

Geoff Arnold G3GSR, who doesn't take simple things for granted

There are lots of things in radio or electrical engineering that we tend to take for granted, until, that is, we fall foul of some hidden property. This is perhaps nowhere more true than in a connection between two points on a circuit, or between a power supply and another piece of equipment. *'It's only a piece of wire!'* is the cry.

The idea of impedance matching between rig, coaxial feeder, and aerial has been well-aired (no pun intended!), though often not well understood by radio hobbyists. However, there are other, more basic properties of connecting leads waiting to catch you out, no matter whether they're a single wire, a pair of wires, or a screened or coaxial cable.

I'm talking about resistance, capacitance and inductance — R, C and L, but you should not forget the other factors of current- carrying capacity and safe working voltage.

Resistance

This month I shall look first of all at the simplest one, resistance, which is very much tied up with current-carrying capacity. Because of its low resistance, copper is the most frequently used material for wires and cables. It's suffered some astronomical price rises in recent years, but it's still a lot cheaper than anything of lower resistance!

If you've got an electrical engineering reference book handy, you can see immediately what the resistivity of copper is - you may even remember coming across the term in physics lessons at school. The resistivity of any material is a measure of how good an electrical conductor it is. Knowing the resistivity and the cross-sectional area of a conductor wire, you can calculate its resistance per metre, or whatever measure of distance you prefer. But what sort of figures does this produce in the practical world?

As an example, let's take a standard PVC-insulated flexible wire of the sort used for internal connections inside hard-wired radio equipment (in other words, not based on a printed circuit board). In catalogues you'll see it described as '7/0.2mm equipment wire', meaning that the conductor contains 7 strands each of 0.2mm in diameter. The total cross-sectional area of those strands is 0.22mm^2; you can confirm it for yourself by a simple 'pi-r-squared' calculation. The current-carrying capacity is quoted at 1.4 amps, and the resistance is 88 milli-ohms per metre length (0.088 ohms/m). With a typical thickness of PVC insulation of 0.3mm, the overall diameter of the insulated wire will be about 1.2mm, and the safe working voltage 1kV.

A wire of that size and current rating obviously isn't going to be much good for connections feeding upwards of 5 amps at 12V DC inside a typical mobile amateur rig. You need something a lot beefier!

Incidentally, if the reference book or catalogue you use dates from the days before wire and cable sizes were metricated, you will find conductors specified in decimal inches. For example, 14/0.0076 (commonly spoken of as 'fourteen-double-oh- seven-six') meant a conductor containing 14 strands of wire 0.0076 inches in diameter. The total cross-sectional area was 0.0006in^2, equivalent to 0.4mm^2, and the current rating was 3 amps.

Wire whose conductor is made up of several strands is used because it is more flexible than wire with a single solid conductor — useful where there is a need for flexibility, because the wiring is likely to be moved or is subject to vibration. Often, though, the rigidity of the solid-conductor wire is acceptable or even desirable, and it has the advantage of being a lot cheaper than stranded wire of the same gauge.

Current ratings are set by the wire makers and the standards organisations, and are related to the wire's ability to dissipate the heat generated by the current passing through it, and how hot it can safely be allowed to get. For the same total cross- sectional area, stranded and solid wires intended for use in the same sort of applications have similar current ratings. For a different application, where conditions of use are different, they can vary quite a bit.

But let's get back to the question of the resistance of a length of wire. The figure I quoted of 88 milli-ohms per metre is obviously not going to be a problem for wiring within a piece of equipment, unless you're talking about cabling up a 2m tall rack cabinet! But once you get into longer lengths, such as in a twin cable connecting a power supply to its load, things start to change.

Operating Alfresco

To demonstrate the point, I'll take a fairly extreme (but by no means impossible) example. Picture the scene — it's a hot summer Sunday but there's a contest on and you decide you'll take the rig down to the bottom of the garden to a table under a tree where it's cool and shady. The rig is a typical 100W HF job, requiring around 20 amps maximum at a nominal 12 volts. For reasons of safety or convenience you don't want to take the AC mains power supply out of the shack and down the garden, so you run the 12V down on a gash length of 2.5mm^2 house-wiring cable instead. It's rated at 28 amps in free air according to the IEE Regulations, so no problem!

But wait — the cable run from the shack to the bottom of the garden is almost 50 feet, or around 15 metres. What's the resistance of the cable? Well, a 2.5mm^2 copper conductor has a resistance of about 8 milli-ohms per metre, so 15 metres of it will measure 120 milli-ohms. But the current has to go down one conductor and return along the other, so there's two lengths of 15 metres to take into account. Two times 120 milli-ohms is very nearly a quarter of an ohm. It doesn't sound much, does it, but a current of 20 amps flowing through 0.25 ohms is going to suffer a voltage drop of 5 volts, which doesn't leave a great deal of your shack supply's 12V output by the time it reaches the rig.

The solution, of course, would be to take the AC mains power supply unit down the garden along with the rig, and feed 240V AC down the cable. The current drawn then by the PSU would not be much above an amp for full power output from the rig, so that the voltage drop along the feed cable would be a lot, lot less. Even supposing you did want to use some appliance drawing a current of 20 amps at the bottom of the garden, a drop of 5 volts in 240 would be pretty insignificant.

Two Cables

There *is* an alternative solution, providing that your PSU has the capability.

For this, you need to run a second twin cable down the garden. This extra cable can be very much lighter in gauge, for it will have to carry only a negligible current. At the rig, you connect the two cables in parallel at the power input terminals, but at the shack end, you connect the second cable to a DC voltmeter or multimeter set to suitable range to measure 12V DC. You then turn your rig on and adjust the output voltage control on your PSU until the voltmeter in the shack reads 12V. Because the voltmeter draws virtually no current, the voltage drop along the second cable will be very small indeed, so the voltmeter in the shack will for all practical purposes indicate the voltage across the rig input terminals at the bottom of the garden. The PSU must, of course, be able to give an output of at least 17 volts (12V plus the 5V drop) at the maximum load current.

Although this solution works very well for a load which draws a constant current, that drawn by an HF transmitter-receiver is unfortunately anything but constant. It will vary according to whether you are receiving or transmitting, and, especially when transmitting on SSB, according to how loudly you're speaking. What you need is a power supply with a facility called remote sensing. In these, instead of the sensing input to the voltage regulator being connected directly across the PSU output, it is brought out to a separate pair of terminals. These are linked to the output terminals for normal (local sensing) operation, but can be separated for applications where the need is for a constant stabilised voltage at some distant point. Instead of connecting the second cable to a voltmeter, you connect it to the sensing terminals on the PSU (having first removed the local links). The regulator circuit will then adjust the output for a constant voltage at the distant load (the rig) regardless of the current drawn. The current drawn by the sensing input of the voltage regulator is negligible — probably even less than the voltmeter took.

To use a remote sensing PSU with a radio transmitter, it's essential that the supply has adequate RF decoupling on its sensing input, otherwise the voltage regulator is likely to go haywire each time you press the key or the PTT at the transmitter, and there's no knowing what voltage the supply may give out when that happens. With cheaper power supplies, this can happen even when local sensing is being used, especially if the rig earthing is a bit suspect.

Summing Up

Voltage drop due to wire resistance is important when trying to send significant amounts of power at low voltage over a long distance. You can use thicker wires, of course, but that will put the cost up considerably. It's more practical to send the power at a higher voltage, assuming that the equipment and system will allow it.

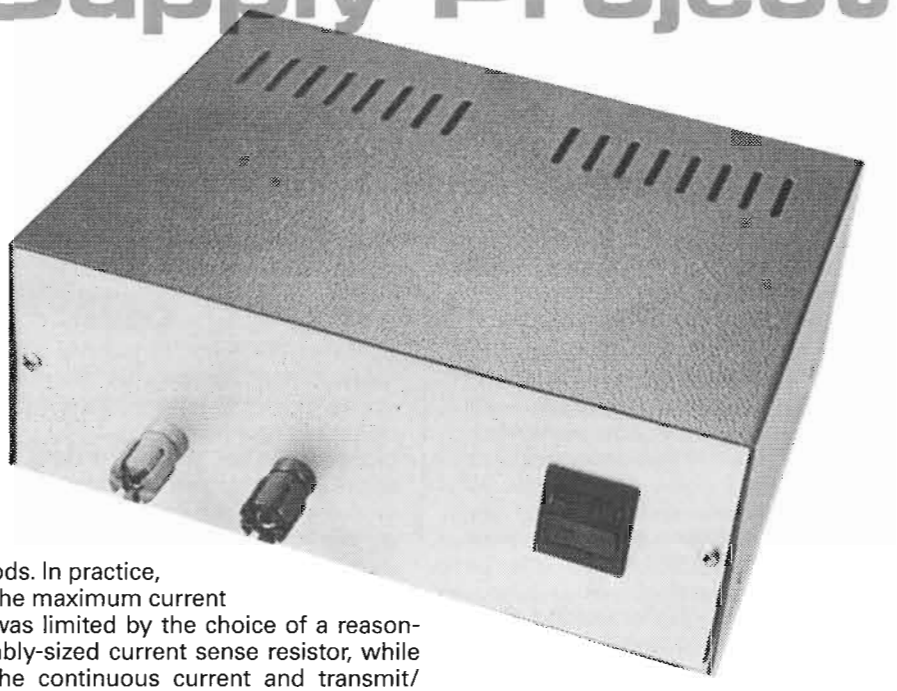
This is the principle behind the National Grid for the distribution of electrical power from the generating stations to factories, offices, shops and homes, etc. Because the public electricity supply is AC, it is simple to use transformers to step the voltage up for transmission at many tens of kilovolts over long distances, and then step it down again in stages at various sub-stations until it reaches the 240V level which we use in our homes. It would be an impossible engineering feat to run the whole National Grid at 240V — the cables would be enormous!

There's a penalty to be paid, of course, which is that these very high voltage cables have to be carried across the country suspended on enormous insulators from very tall pylons. Rather different from the third of a millimetre of PVC which gives safe isolation of our 7/0.2mm equipment wire up to 1kV!

That's it for this month. Next month I shall be looking at the effect of capacitance and inductance on a humble piece of wire.

High Current 12V Power Supply Project

Andrew Armstrong G3YZW describes a switched-mode PSU to build for your shack



More and more of the mobile transceivers on sale give output powers in excess of 40W, and need correspondingly more power than the previously popular 10W or 15W rigs. It was the purchase of my FT-4700 dual band mobile transceiver which prompted me to design this power supply, as this rig needs a 12V supply capable of providing around 100W. My previous linear power supply (published in HRT in 1985) went into current foldback at any attempt to transmit on high power, so a higher-current design was needed. (Ed's note — remember that mains voltages are involved in this power supply, if you are in any doubt about your construction skills, seek experienced help.)

Switched Mode Supply

The old linear power supply used a re-entrant regulator to minimise the voltage drop across the pass transistor, hence the power dissipation. Even then, the size of heat sink needed for a supply giving more than 10A is inconvenient. The obvious answer - was to design a switched mode supply!

Switched mode supplies haven't been used as much as they might in amateur designs, perhaps because switched mode supply design is something of an 'engineering speciality', and also because of misplaced concern over radiated interference. The switched mode supplies used in commercial computers and televisions certainly *can* radiate any amount of troublesome interference, but *these* supplies have not been designed to run radio equipment — far from it!

Circuit Principles

In *this* design, care has been taken to produce a clean, reliable supply with a straightforward construction using, as far as possible, components which are easy to get hold of and which many amateurs will already have in their collections.

I wanted a supply at 10A continuous output at 12V, with higher currents available for reasonable transmission periods. In practice, the maximum current was limited by the choice of a reasonably-sized current sense resistor, while the continuous current and transmit/receive duty cycle was limited by the power dissipation of several components. If L1 is wound with 1.5mm wire, it gets quite hot with a continuous 10A flowing, and the temperature rise at higher currents is unacceptable.

The bridge rectifier in the prototype is mounted on the case, but not specifically on the heatsink. If more current were demanded from it, a larger heatsink would be needed, and the rectifier would need to be mounted on it. The mains transformer itself heats up over a period of 20 minutes if the supply is set to 13V out and connected to a 1 load.

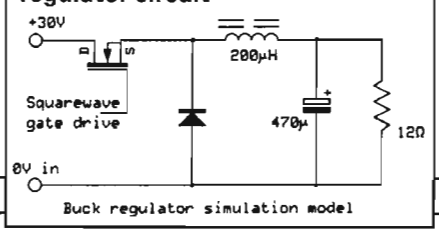
The choice of components in this design has resulted in a compact unit capable of meeting any reasonable amateur radio requirement in the range for which it is designed.

Many switched mode power supplies do not use a mains transformer; instead, they have switching circuitry before the isolation transformer, so that the isolation transformer operates at a high frequency and is thus small and light. It is difficult to wind one's own switched mode transformer in such a way that the voltage isolation between primary and secondary is adequate to provide safety isolation from the mains, while maintaining the high mutual inductance and low leakage reactance which are essential if the supply is to function. For amateur radio purposes it is better to use a conventional mains transformer and follow that with a switched mode regulator. We can use a smaller mains transformer than would be required with a linear regulator, because most of the power drawn from the transformer is fed to the load, not dissipated in the regulator.

For those unfamiliar with switched mode voltage regulators, the principles are illustrated in the simplified circuit of Fig. 1, while typical waveforms are shown in Fig. 2. When the FET is switched on, energy is transferred from the reservoir capacitor to the inductor and via the inductor to the output. Energy is stored in the inductor during this part of the cycle. When the FET is switched off, current flows through the diode so that energy is transferred from the inductor to the output.

In a perfect inductor the current changes at a rate proportional to the voltage across the inductor. These simulated waveforms have been produced assuming that the resistance of the inductor is low, so the triangle waveform is nearly linear. This type of waveform is achieved in practice at moderate load currents, but more curvature of the waveform is observable at high currents when the effects of wire and FET resistance become significant.

Fig. 1; Simplified switched mode regulator circuit



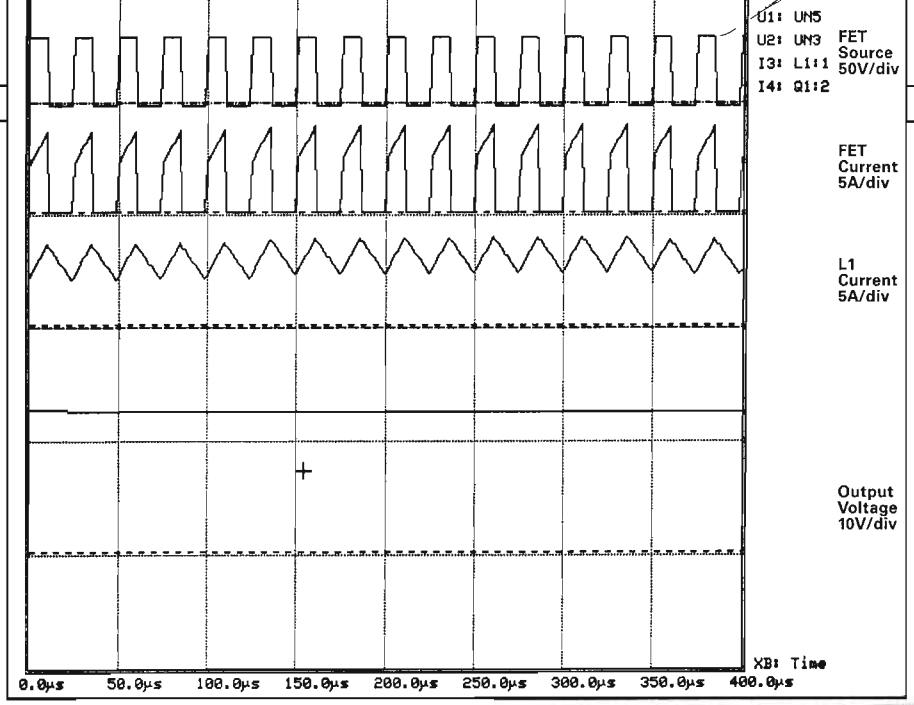


Fig. 2; Typical waveforms

PCB Circuitry

The heart of the power supply is the switched mode voltage regulator shown in Fig. 3. It is this part of the circuit which is built on the printed circuit board. Starting at the unregulated input, a capacitor with low ESR (equivalent series resistance) and low ESL (equivalent series inductance) is fitted to supply the sharp pulses of current demanded when the FET switches.

The FET chosen for this job is specified to have an on- resistance (when firmly switched) of 0.04, and it is rated to pass a continuous on-current of up to 30A with a peak current of 120A. The peak current intended in this design, under overload conditions, is 15A, so there is an adequate safety margin.

The inductor must pass a maximum current of 15A without saturating, and must have an inductance of 150µH. The design of the inductor is covered in more detail later. The power diode D3 must switch very rapidly so that, when the FET switches on, the diode does not continue to conduct for a significant period of time. If the diode did continue to conduct, due to charge storage in the junction, or if it had a high capacitance, the diode or the FET would dissipate far too much power. The diode chosen, a BYT30P-800, has a maximum switching time of 55ns and is rated at 30A. It is also rated at 800 volts, which is rather more than is needed in this design. Any diode with a switching time of up to about 80ns, and rated at a minimum of 20A and 50V, would be suitable.

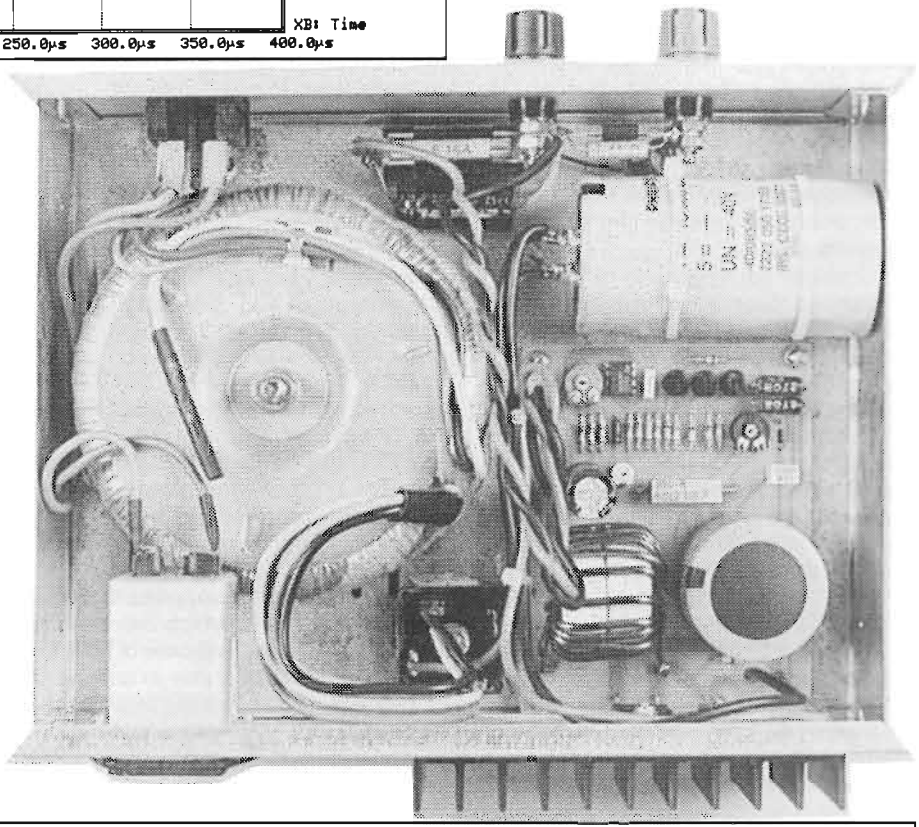
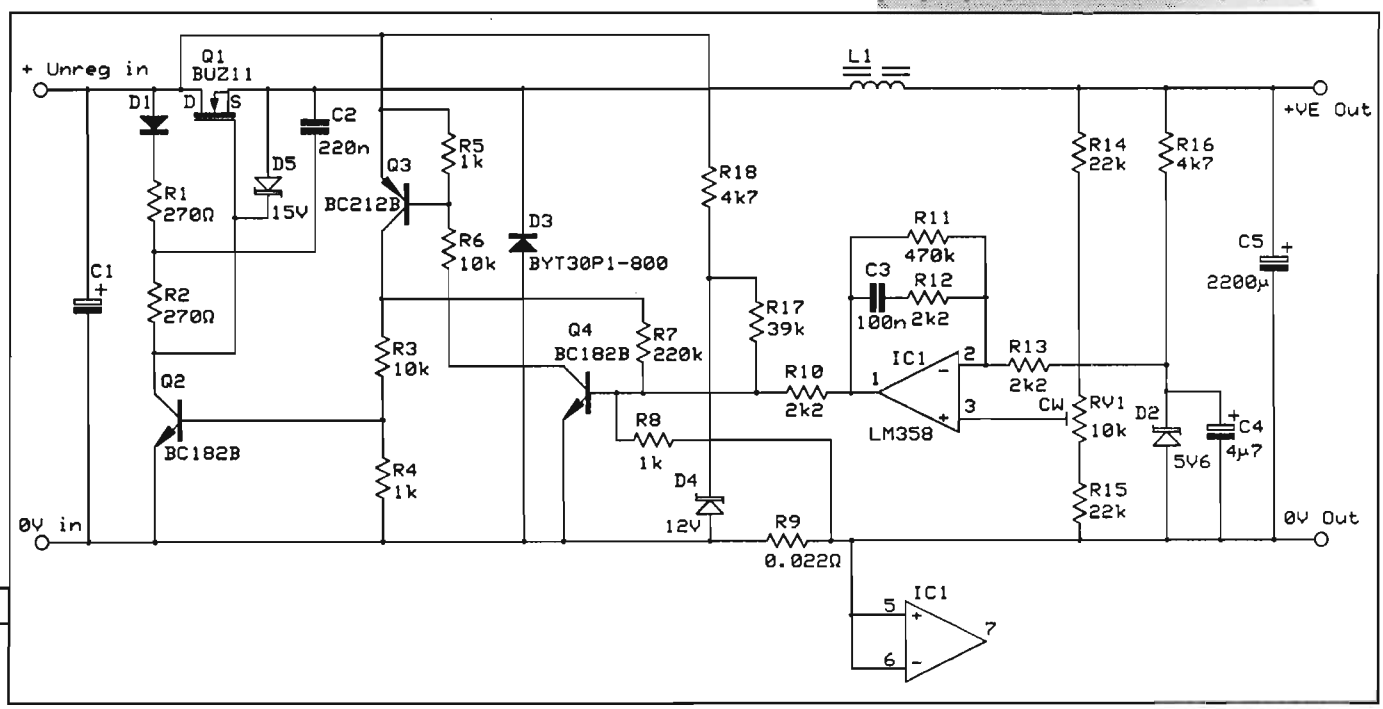


Fig. 3; Switched mode voltage regulator



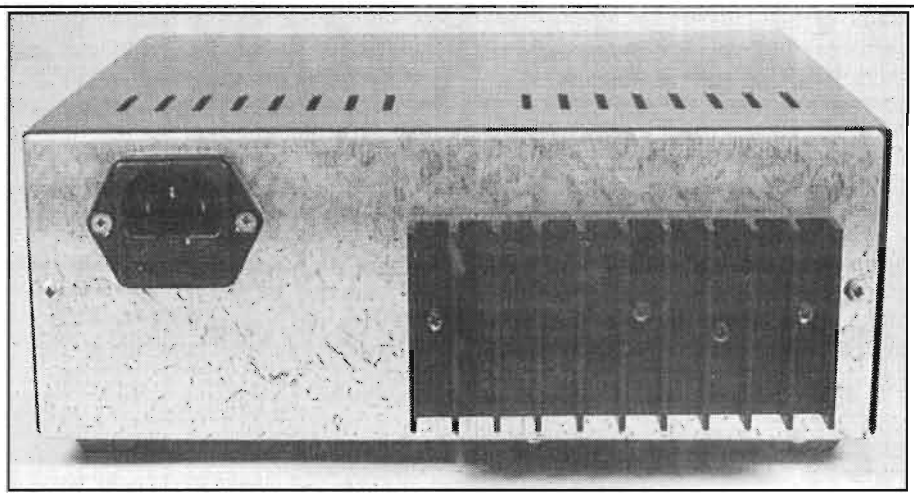
The control circuitry divides into two separate parts; the voltage control loop and the current control loop. This power supply is basically a constant-current source, with the current controlled by a voltage feedback loop. Assuming that the supply has been running for long enough for operating conditions to stabilise, the sequence of events is as follows:

Starting at a point when Q1 is switched off, current is flowing through D3 and L1 to keep C5 charged, and the current is ramping down as the inductor delivers its energy to the output. The voltage drop across R9 is gradually decreasing as the output current falls, and at some stage the conduction of Q4 begins to decline. As it declines, Q3 is switched on less thoroughly, so it starts to switch off, reducing the bias to Q4, causing that transistor to switch off more decisively. When Q3 and Q4 snap off, Q2 also switches off sharply. The FET starts to switch on, the gate drive being raised to an adequate level by the bootstrap capacitor C2.

Bootstrapping is absolutely essential to make this piece of the circuit work, because several volts of gate drive are required to switch a FET 'on' properly. If the bootstrapping capacitor were not present, the gate voltage could not rise above the input supply, and the source would be several volts below this, the exact voltage depending on the current flowing at the time. At full load, the average dissipation in the FET could easily reach 30W, whereas the actual dissipation of the FET in this circuit is of the order of 5W at full load.

The choice of current sensing resistor is critical. There must be enough voltage drop to switch Q4 cleanly, but the dissipation of the resistor at maximum load must be minimised to avoid defeating the whole object of the design. A 0.02 4W non- inductive resistor has been chosen for this design. At a continuous current of 15A this would dissipate 4.5W, a slight overload, but the design aim is that the peak current rather than the average current should not exceed 15A. Referring to the waveform diagrams, the average current cannot exceed a little under 14A, except when the output is short-circuited, when the average might rise a little over 14A. At 14A, the resistor will dissipate 3.9W, just within its ratings. At the continuous load rating of the power supply, resistor dissipation would be just 2W.

At 15A the voltage drop across R9 would be 0.33V. In order to make Q4 switch at this point, an extra 0.3V must be provided from somewhere. R18 and D4 provide a 12V reference which is fed to the base of Q4 via R17. This biases the base up by approximately an extra 0.3 volts, so that even with a short- circuited output, the current cannot exceed approximately 15A peak.



Voltage Control

In order to regulate the output voltage, the output is compared with a reference provided by a 5.6V zener. When the voltage on the wiper of RV1 exceeds the reference voltage, the output of IC1 rises. This increases the bias on the base of Q4, reducing the voltage drop which is required across R9, in order to switch Q4 on. This in turn reduces the duty cycle of the FET, and hence reduces the output current, so that the voltage feedback adjusts the current of the supply to match the load demand while maintaining the correct output voltage.

In current mode supplies, there is an inherent instability which can manifest itself at duty cycles in excess of 50%. This is counteracted to some extent by the non-linear switching characteristic of Q4, but in order to avoid even the remotest possibility of instability the loop gain of the circuit has been reduced at high frequencies by the addition of R12 and C3, while the DC gain set by R13, R11 and the voltage to current ratio of the current control loop, is high enough to keep the DC output closely regulated.

The reduced loop gain at high frequency could cause a poor transient response, with the output showing a brief dip as a sudden load is applied. This effect is largely removed by the use of a high-value output smoothing capacitor, which is needed in any case to make the output sufficiently clean for the use with radio equipment.

At low values of load current, the current in the inductor becomes discontinuous. In this mode, the current control loop provides one pulse of current whenever the output voltage falls enough to permit this. This effect may manifest itself as a ticking noise, which is not an indication of trouble.

In Use

Testing the supply with my FT4700 on-air, everything worked fine. A local amateur receiving a strong signal from me could not hear any trace of interference on the signal such as might be caused by a noisy power supply. There was no detectable transient voltage variation on switching from transmit to receive and back again.

The measured terminal voltage of the unit was 13.0 volts with no load. This fell to 12.8 volts with the transmitter on high power, drawing 9.1A. Some of that voltage drop probably occurred in the output filter choke, and is therefore unavoidable. But in any case, this small voltage variation is unlikely to inconvenience any normal rig.

My first prototype unit gave an audible 'whine' in operation on light loads, because the inductor had not been wound tightly. Part of the whine was undoubtedly caused by the use of two magnetic cores together to provide enough energy storage in L1, and part was almost certainly due to the wires vibrating. Hence the parts list specifies a higher-grade of magnetic core, of which only one will be needed. Constructors not wishing to use a complete kit of parts which should soon be available from HRT advertisers, but instead use two cores together, are advised to glue them prior to winding, and to wind the wire tightly in order to minimise vibration.

Experiments with a carefully-wound core of a superior grade produced a relatively quiet supply, with some residual noise caused by magnetostriction. Encapsulating the inductor in epoxy minimises this.

The supply survived a deliberate short circuit of thirty seconds' duration across its output terminals without complaint. It would probably survive for considerably longer, but a continuous short would eventually overheat L1, and perhaps melt the solder on R9. If there is a serious danger of this in any application, a thermal switch could be added in series with the mains supply.

PCB Construction

The first construction job is to wind the inductor. In order to make this design repeatable, it has been designed to make use of a pair of T104-40 iron dust toroidal cores. To make the inductor, wind, as tightly as possible, 32 turns of 1.5mm wire on a pair of cores held tightly together. The wire will not fit on in a single layer, and care must be taken to allow a reasonable space to fit a tie-wrap through to hold the inductor onto the PCB.

Construction of the pcb is for the most part straightforward. It contains no static-sensitive parts except for the FET, which should be fitted last. Special attention is needed to the inductor, which may need the supposedly self-fluxing varnish scraped off the terminations before they can be soldered with any reasonable-sized iron, and which must be fixed securely to the board by means of a tie-wrap or lacing cord. Under no circumstances should wire be used to anchor the inductor, because of the danger of forming a shorted turn, which would cause rapid failure of the FET.

The diode and the FET should be mounted on the board with sufficient lead length so that they can be mounted onto a heatsink. It is a good idea to make a double-bend in the leads to form a small loop to allow some flexibility of position when the diode and FET are screwed to the heatsink. The FET is static sensitive, so static precautions should be taken when fitting it.

Overall Assembly

As shown in Fig. 4, several external components are needed to make this switched mode regulator PCB into a power supply. The most obvious of these is the mains transformer, where there is room for individual choice. If more than 10A continuous current is to be drawn, then a larger transformer than the 160VA one used in the prototype is recommended. The voltage of the transformer should be in the range 20V to 30V to minimise losses without overvolting the FET. If higher voltage reservoir capacitors and FET are used, a 35V transformer could be used. Above this voltage, other components would have to be changed.

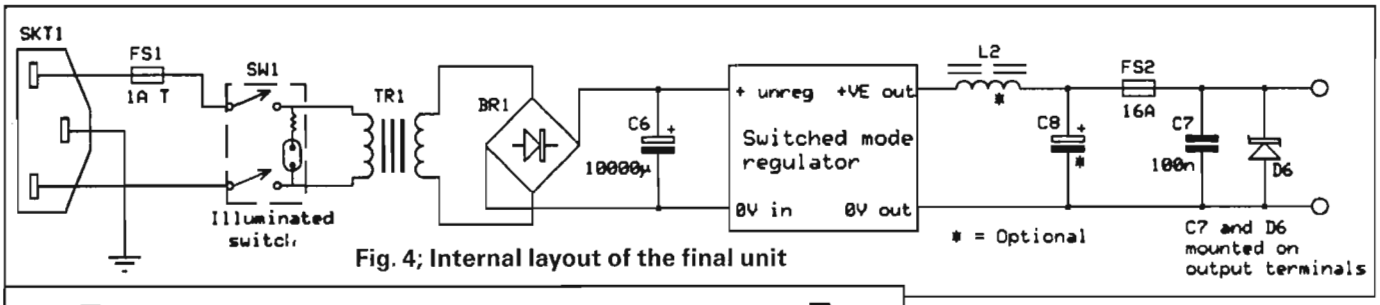
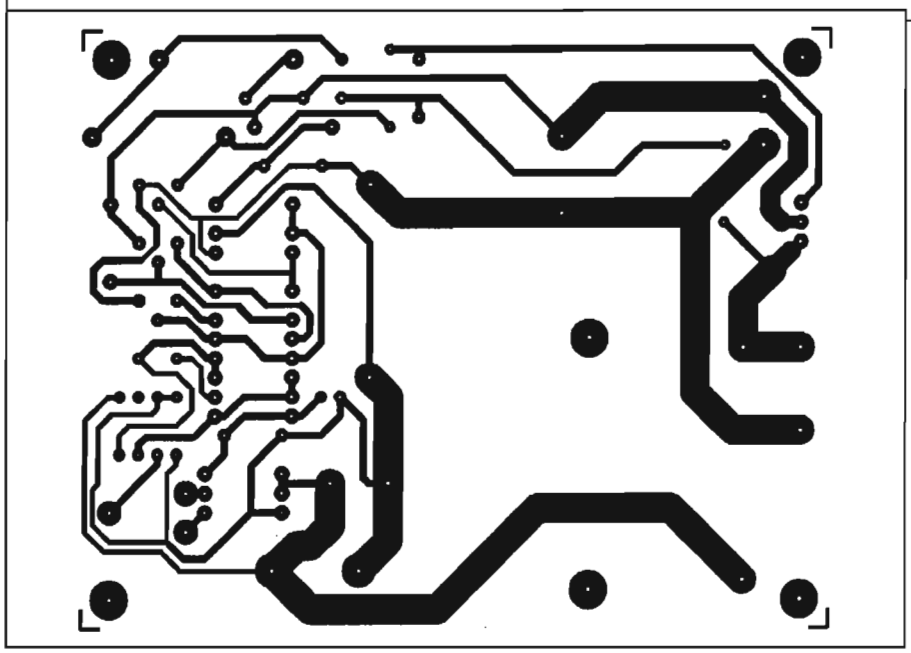
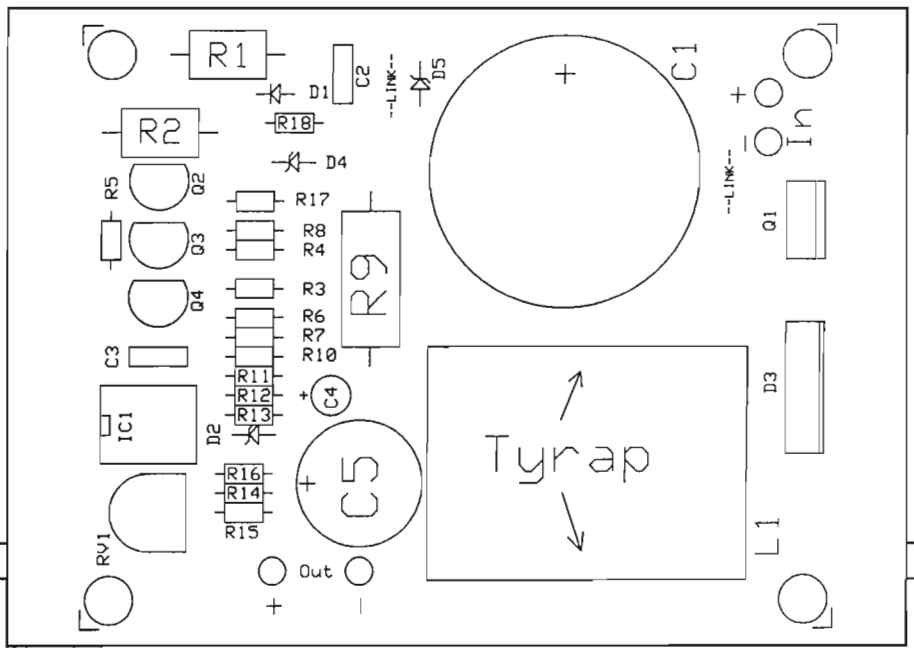


Fig. 4; Internal layout of the final unit





One option would be to use a filtered mains socket. In practice, this made little difference — with or without filtering interference could only be detected within a few centimetres of the mains lead. A faint whine was detectable on an AM radio tuned to a blank channel if the mains lead was looped over it, but not otherwise. No interference was detectable by these means on the DC output lead.

External output filtering components may also be added if a very clean output is required, but the 50mV triangular ripple waveform present on the output without extra filtering is unlikely to cause any problems.

An output fuse is shown in the overall circuit. This, in conjunction with a Transzorb connected across the output terminals, protects the rig against any failure in the power supply. A 100nF capacitor on the output terminals removes any remaining high frequency ring from the DC supply.

Finally, do not forget to use insulating kits when mounting the FET and diode on the heatsink, because the tabs are not isolated.

PARTS LIST

Resistors (all ¼W 5% unless otherwise stated)

R1, 2	270 2.5W (e.g. Welwyn W21)
R3, 6	10k
R4, 5, 8	1k
R7	220k
R9	0.022 4W e.g. VTM type KN350-8
R10, 12, 13	2k2
R11	470k
R14, 15	22k
R16, 18	4k7
R17	39k
RV1	10k preset pot (CP10H or similar)

Capacitors

C1	2200µ 63V 0.4" pin spacing low ESR e.g. Philips 054 58222
C2	220n polyester 0.2" pin spacing
C3	100n polyester 0.2" pin spacing
C4	4µ7 35V radial electrolytic 0.1" pin spacing
C5	2200µ 25V radial electrolytic 0.3" pin spacing
C6	10000µ 63V can electrolytic
C7	100n axial polyester.
C8	4700µ 25V axial electrolytic (optional)

Semiconductors

D1	1N4148
D2	5V6 400mW zener
D3	BYT30P1-800 or similar
D4	12V 400mW zener
D5	15V 400mW zener
D6	1N6277A 15.3V 1500W Transzorb
BR1	50V 8A bridge rectifier
Q1	BUZ11 or similar MOSFET
Q2,4	BC182B
Q3	BC212B
IC1	LM358

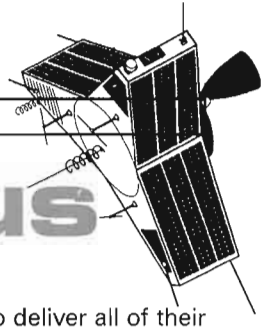
Miscellaneous

L1	100µH 15A inductor (see text)
L2	15 turns of 1.5mm wire on Cirkit T94-40 core
TR1	24V 160VA toroidal transformer
SW1	Illuminated DPDT switch
FS1	1A slow blow 20mm fuse
FS2	16A fast blow fuse
SKT1	Fused IEC inlet socket

Two chunky terminals, one red, one black, for output.
Metal case e.g. Maplin type XJ30H
Heatsink e.g. Cirkit type 21-08020

See HRT advertisers for PCBs, components, and complete kits including case for this power supply.

Satellite Rendezvous



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

The AREMIR project has now happened, although I personally didn't hear much about it while it was going on and there hasn't been much since it finished either. This was the Austrian Amateur Radio experiment on board the MIR space station, the main purpose being educational. The Austrian team constructed a large number of small receivers for use in classrooms in Austria and the Soviet Union, the downlink being on 145.975MHz. Students tracked MIR for the purpose of learning about physics and radio skills.

If you heard the experiment (or of course you know a school who did), you can get a QSL card with a statement of the receipt dates (time UTC start/end, date, place and the contents) from OeVSV, Theresiengasse 11, A-1180 Vienna, remembering to enclose sufficient IRCs.

ARSENE

F8ZS has announced that ARSENE will be launched on the Ariane V53 flight, together with the main passenger HISPASAT, in July 1992. ARSENE has packet transponders, using standard AX25 FSK at 1200 baud, using uplink frequencies in the 435MHz band and a single downlink frequency in the 145MHz band. A mode 'S' linear transponder will also be available.

The high orbit of ARSENE will provide a mean access time of nearly 12 hours per day for stations up to latitude 40 degrees. The orbit will be equatorial with perigee at around 20,000km and apogee about 36,000km, giving an orbital period of 17 hours 30 minutes. This should certainly be one for digital mode users to look forward to.

Packet Forwarding via Satellite

Last year, KI6QE and NL7NC established a packet forwarding gateway between Alaska and the 'lower 48' states using AO-16. This has proved to be so successful that it has now been expanded to every continent in the world. It also utilises all of the PACSATs now. There are more than 20 stations providing coverage for the USA, Europe, Asia, Oceania, South America, the Caribbean, South Africa, the Middle East, and even the Arctic Circle (Baffin Island). These stations have become so proficient at moving messages that it is now common for them to deliver all of their messages within 24 hours of receipt from the originating station *(Richard gave an excellent presentation on this subject at the recent UK 'SysOps 12' packet conference, if you'd like a copy of his 'handout' accompanying this send an SAE to us at HRT Editorial, P.O. Box 73, Eastleigh, Hants SO5 5WG — Tech Ed.)*

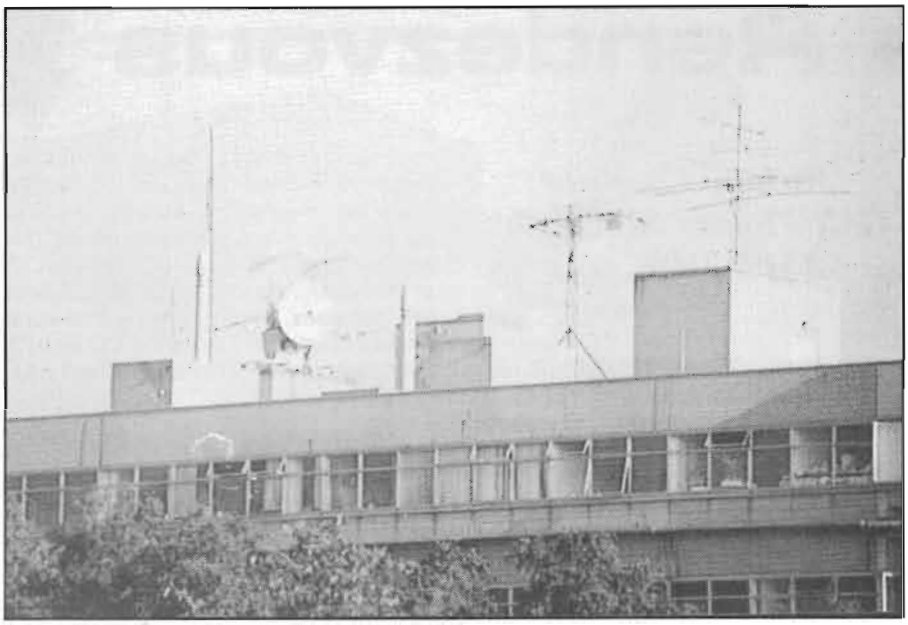
Software Changes

NK6K recently made two changes to the AO-16 software which will tend to give a larger percentage of the downlink to broadcast frames. This has the unfortunate side effect of slightly slowing down directory requests.

While Experimenter's Day operations are scheduled to be conducted weekly, users are reminded that these operations may be shortened or cancelled to allow uploading of improved spacecraft software. Watch for bulletins in the BBS and the telemetry text frame for changes to the schedule.

LO-19 had a software crash again on 4th Oct and the files were lost. It came back on the 18th Oct after the command team reloaded it, taking the opportunity to add a few enhancements.

The ultimate satellite shack? This one's the University of Surrey's command station.



Here's the aerial system to go with the 'ultimate' shack!

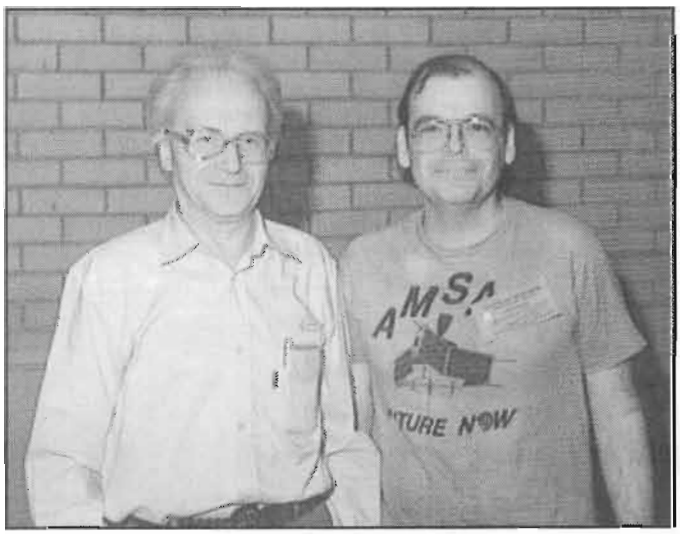
It now includes the broadcast hole 'fill' feature, beside other improvements.

AO-21

In an attempt to halt self oscillation, which rendered Transponder #1 and RUDAK useless, the GEOS command station removed all power to AO-21 on 28th Sept. The satellite remained in this power down state until 5th Oct, the payload was then reactivated and ran the MAILBOX Software. Initial check-outs confirmed everything worked ok.

Unfortunately, the RUDAK Beacon subsequently switched *off* without any command station interaction, and they lost command access for some unknown reason sometime during the night from Oct 5 to Oct 6 while AO-21 was out of range from the command stations. They would be grateful for any reports after Saturday Oct 05. They hope to repeat the Power Down procedure again in the future, meanwhile AMSAT-U and AMSAT-DL will continue efforts to recover AO-21/RUDAK.

European users are asked not uplink to RUDAK/AO-21 during commanding sessions, i.e. when the beacon returns to 400 Bit/s or when the mailbox is turned off.



A hobby of international friendship, Leo UA3CR (left) with Marty K2UBC (right), two well known names in the satellite world.

Oscar 10

As before, Oscar 10 is still currently available for Mode B operation when it is view. *Please do not* attempt to use it if you hear the beacon or the transponder signals FMing.

The AMSAT Organisation

Remember that around the world, AMSAT, the Amateur Satellite organisation, looks after the interests of satellite users and helps fund the satellites themselves. Many countries have their own national branches of AMSAT, so why not find out about joining? For further information on the UK branch, contact: AMSAT-UK, c/o Ron Broadbent, G3AAJ, 94 Herongate Rd, London, E12 5EQ. A large SAE gets you membership info, and SWLs as well as licenced amateurs are welcome. (*AMSAT-UK publish an excellent quarterly journal, and Ron their hard working 'main man' never seems to stop for a rest! — Ed)*

Keplers

SAT:	OSCAR 10	UoSat 2	AO-13	UO-14	FO-20	AO-21	UO-22	RS-10/11
EPOC:	91294.95842286	91292.61367705	91272.93675056	91294.72704378	91291.88220393	91295.06399255	91293.73639270	91294.86053871
INCL:	25.8503	97.8852	56.6605	98.6606	99.0429	82.9457	98.5334	82.9284
RAAN:	118.5460	332.8438	69.2389	13.3995	250.6443	139.8774	6.6686	325.2548
ECCN:	0.6063703	0.0012824	0.7241183	0.0011188	0.0541460	0.0033995	0.0007395	0.0011198
ARGP:	286.5582	129.0521	265.9374	152.9802	21.3122	266.5866	308.8332	188.4564
MA:	17.8565	231.1822	16.5174	207.1959	340.9627	93.1401	51.2192	171.6385
MM:	2.05880587	14.67532614	2.09707626	14.29307821	12.83191601	13.74418920	14.36236258	13.72222660
DECY:	-1.2E-07	2.408E-05	-1.76E-06	7.29E-06	4.7E-07	1.31E-06	9.03E-06	1.75E-06
REVN:	3485	40769	2525	9106	7942	3645	1373	21696

SAT:	PACSAT	DO-17	WO-18	LO-19	RS-12/13	Mir
EPOC:	91294.68487640	91293.74704748	91294.34396222	91295.15141493	91295.21167225	91295.73753056
INCL:	98.6644	98.6646	98.6644	98.6643	82.9230	51.6049
RAAN:	13.7770	12.9133	13.5587	14.4381	9.9335	7.0315
ECCN:	0.0011572	0.0011571	0.0012220	0.0012593	0.0028281	0.0004373
ARGP:	150.3036	153.2330	151.9729	149.6751	288.2662	2.5118
MA:	209.8805	206.9451	208.2106	210.5163	71.5417	357.5744
MM:	14.29385916	14.29483590	14.29511027	14.29591139	13.73933470	15.56486665
DECY:	6.81E-06	7.49E-06	6.65E-06	6.74E-06	1.33E-06	2.5195E-04
REVN:	9106	9093	9102	9114	3558	32505

Packet Radio Roundup

Chris G4HCL our resident Packet SysOp with news on the network

One of the fastest-growing uses for the network seems to be that of Packet Clusters. There's now a dozen full-time cluster nodes operational in the UK, these being; GB7BPQ (Nottingham), GB7DXC (Cheltenham), GB7DXH (Hemel Hempstead), GB7DXI (Wokingham), GB7DXM (Martlesham), GB7DXS (Haywards Heath, Sussex), GB7MDX (Manchester), GB7PDX (Plymouth), GB7SMC (Chandler's Ford, Hants), GB7TLH (East Dereham, Norfolk), GB7WDX (Crediton, Devon), and GB7YDX (Wetherby, Yorks), and there's also GB7SAT in London which joins the network from time to time.

A recent upgrade to the *MSYS* packet code has been a limited- protocol compatibility with some DX Cluster facilities such as 'DX Spots', with the first to come into operation being GB7PLY-2 in Plymouth. Although this new MSYS facility is currently in it's infancy, and is by no means fully compatible with all DX Cluster functions, the capabilities may of course vary in the future. MSYS of course is free to amateurs, whereas DX PacketCluster must be paid for. Opinions vary as to the compatibility of MSYS with the packet network, especially in terms of 'overheads' with resulting traffic caused, although one highly-respected UK network personality recently examined this and found few problems.

As well as the periodic meets between UK cluster SysOps in a midlands hostelry (yours truly certainly enjoyed the excellent Theakstons 'Old Peculiar' ale at the last one), recently at the Friendly Hotel in Daventry a group of UK Cluster SysOps joined Jay W6GO and Jan K6HHD on their holiday to the UK (their first break in many years I'm told!). As many DXers will know, as well as working closely on the development of PacketCluster, Jay and Jan jointly produce the monthly 'QSL Managers List' which is available on the UK PacketCluster network. The accompanying photo shows the happy bunch.

Who Pays for the Network?

Very simple this one, *we* do, voluntarily! You'll find throughout the UK SysOps set up nodes, BBSs, PacketClusters etc., all of these entailing some degree or other of expenditure. Normally the software comes free to amateurs, although as previously noted Packet Cluster is a different case, as the writer AK1A requires payment for this (currently $200 plus carriage and import duty, plus extra payment for various upgrades as time goes on). As a result, some SysOps actively seek contributions from regular users, in the same way as voice repeater groups do from their regular users. John G3HTA has been in contact to say that even though contributions may be requested by SysOps, there is no question of 'restricted/limited service' or whatever to users who don't 'cough up'! However, if you *do* regularly use a local BBS, node, Cluster or whatever, *do* consider joining the support group, you'll often receive handy information packs and newsletters in return — as has been shown in this column many times in the past year.

UK Cluster SysOps meet with their USA counterparts. From left to right is John G0CMM (GB7MDX), Steve G3VMW (GB7YDX), Ian G4LJF (GB7DXI), Jay W6GO, Jan K6HHD, John G4PDQ (GB7DXC), John G3HTA (GB7WDX), Chris G4HCL (GB7SMC), and David G3OUF (GB7DXH)

Group of the Month — SUNPAC

This is the Southern Users packet group, based in the central part of the south coast of the UK. As well as acting in an advisory capacity in coordinating nodes and BBSs in their area, their fundraising efforts have recently helped place a new 4m node on air in Salisbury, and further work is currently under way on getting better packet links established in the area. Their rally stands and demonstrations were recently complimented by the Sysops12 conference they hosted at the Royal School of Signals in Blandford, the home of GB7RS and GB7SIG.

With the enthusiastic help of Martin G7JCJ they produce several packets guides for their members, including User's guides to Network Nodes, BBSs, and complete UK and Ireland nodes listings in a bound format, a forthcoming addition to this lineup is a complete PacketCluster user's guide. Another project, aided by yours truly, is that of the provision of an 'at cost' complete 23cm TX/RX/Aerial package for SysOps, currently planned at £60 maximum plus the cost of two crystals, in an effort to promote 23cm linking on packet. You can get membership details by sending an SAE to their secretary Paul Martin G0AFF at SUNPAC, c/o P. O. Box 73, Eastleigh, Hants. SO5 5WG.

BARTG News

No sooner had a comprehensive package of photos from the BARTG rally arrived (shown in this column last month) did the latest 'Datacom' also drop through the Editorial doormat. Datacom is the quarterly BARTG journal, the latest issue being over 100 A5 pages worth of data news and information. As is usual with such groups, much of it seems to have been put together by the sterling efforts of one amateur, this being Ian G4EAN, I constantly wonder how he gets the time! The sad news in this issue is that the BARTG's GB2ATG packet and RTTY bulletins are currently no more. But if someone out there would like to resurrect this service, get in touch with the group — you'll find their details each month in the national clubs section in HRT.

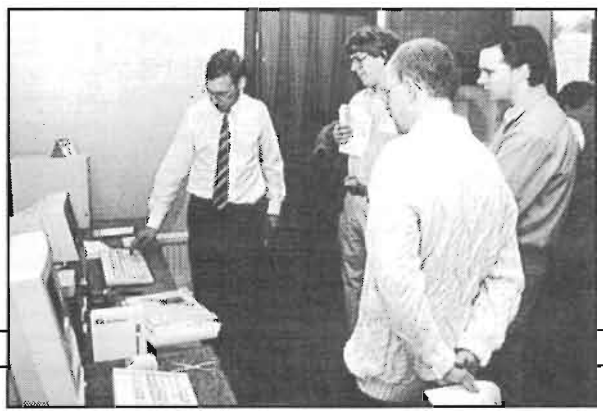
New Book — Packet Radio Primer

Just released by the RSGB, this 134 page softbound book comes from the pens (word processors?) of Dave Coom-

ber G8UYZ and Martyn Croft G8NZU. As the name suggests, the book is a 'primer' intended to get the newcomer up and running with the minimum of fuss. Written in an easily-read style, with cartoons by Paul G6MEN (of HRT's 'Tone Burst' fame) adding a light-hearted touch, this in my view could be an excellent book for the absolute beginner to packet who's confused with the different hardware connections required and the terminology used in setting up the TNC for communication with their computer or terminal. As well as sample on-air 'connections', a comprehensive list of various BBS 'help' files is also included to enable the book to be used as an ongoing reference. Available from the RSGB (details in HRT's National 'Club News' section) at £8.00 inc. p/p, or £6.80 inc. p/p to RSGB members.

Clusterm 2

I recently received a disk, from John G3WGV of Canberra Communications, of Version 2 of his 'Clusterm' program (see the Oct HRT for a full review of Version 1). All the basic functions have been essentially retained, but in my view the most attractive addition is the facility of a further 'multi-connect' window allowing different TNC streams. This way, as well as the many advantages of the original program for cluster use, you can also log into your local BBS to read and send mail etc., the program automatically handling the 'stream switching' for you. John says the program works best on a hard-disk based PC, I found this to be essential in use, and I would also recommend a colour- based display to take advantage of the multi-coloured lines of text from different streams in the 'new' window. You'll sometimes see John at the various specialised rallies, at this year's HF Convention he was often surrounded by eager potential users. I certainly feel the software is an excellent addition for dedicated cluster users with a hard disk PC.

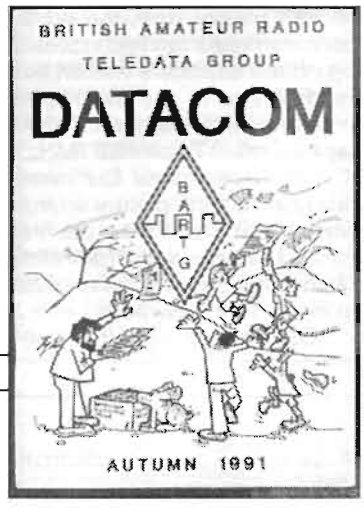


Left: John G3WGV demonstrates Clusterm 2 to a packed audience at this year's HF Convention

CTRL-Z End of Message

Laurie G0MRL has been in touch regarding moves to reduce congestion on 2m packet by the addition of extra channels, saying that by contrast, 70cm, 6m, and 4m are under-used and highly suitable for packet. With low-cost ex-PMR rigs available for these bands, especially 4m, yours truly is quite surprised they're not used as much. Maybe things will change!

That's it for this month, next time I'll be describing exactly what 'State DCD' is and how it can help your station, especially on bands such as 4m and 6m. Until next month, 73 from G4HCL @ GB7XJZ.



Right: Datacom, the quarterly BARTG journal.

VHF/UHF Message

Geoff Brown GJ4ICD reports on phenomenal conditions on 6m

This month, 50MHz dominates the column and you'll soon see why! October was expected to produce some choice DX from the far east, and from received reports, more DX was worked in the far east this year than what was the 'peak' in 1989. It does appear from the solar data available that we are now approaching the 'second hump', in other words a double peak of cycle 22.

VK on VHF

Openings to Australia really got going on the 14th October with many reports of VK4s been worked in the UK on 6m. The openings were very widespread, Paul GW0MDQ reported working into VK6 and VK8 areas, as did Brian G3SYC in Yorkshire. Chris GM3WOJ in the real north of Scotland reported that even he had worked his first JA.

Down here in GJ the band was very crowded, VK4s were calling on top of each other! This may seem a very strange situation to hear, but due to the vast size of Queensland and the amateur stations scattered around that area, they obviously cannot hear their neighbouring amateurs. This of course caused total confusion for myself with a GJ callsign, as I was often working them two at a time!

Choice DX flooded into Europe for around three hours each day, many JAs were worked all over the UK. VK6PA was pounding in to every corner of the British Isles, my own personal best for this day was VK2FLR in QF56OD. According to the records this may well constitute a new British Isles distance record for 50MHz at over 17,239km, at least that's the distance my computer tells me.

As the week progressed, word was put out about the fabulous openings taking place. More and more amateurs seemed to be struck down, sending sick notes to their employers stating they had F2 disease, a disease that can only be cured by sitting in front of a small box, and the wearing of headphones.

The 15th again brought VKs into the UK, but mainly from the *six* area. JAs were also reported widespread, and to top off the day, there was an opening to South Africa in the early evening for most of mainland Britain. The following day Australian TV on 46.171MHz from the '4' area (Queensland East) was a lockable good quality picture on my multivision system. These were the first quality signals I had ever seen from VK, however when I got back to work, *Neighbours* was on every TV in my shop!

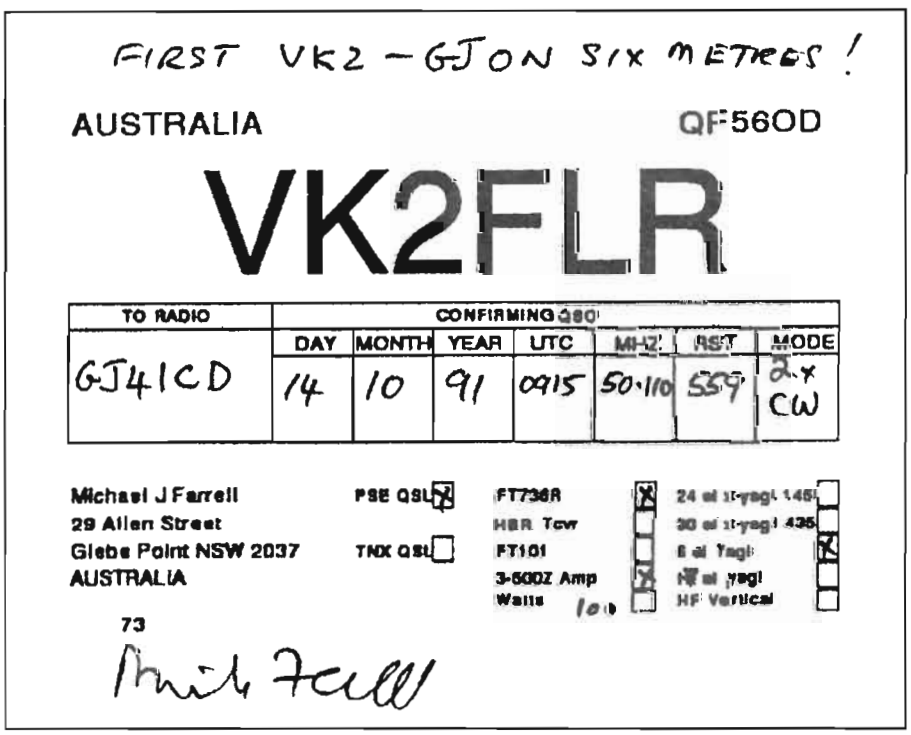
During that opening Neil G0JHC (Lancs) nearly worked KG6DX who was reported at S9++ in the north of the country, but the frequency Joel KG6DX was using was not very clear in some parts of the country (TV birdies), the liaison frequency of 28.885MHz was filled with people just rabbiting away, and so Neil couldn't get the word through the QRM to change the operating frequency. This situation seems to happen too often and in my opinion much DX is lost by everybody as a result. So, if you sit at home all day long and like the sound of your own voice, then please please move off 28.885MHz and keep the channel clear for DX reports, that's what it should be used for!

Neil G0JHC did manage to work his first JA, this being JR6WPT/PL36 who was a very strong signal all over Europe. KG6UH/DU1 was also heard 'up north' and VK3OT was heard 'down south'. On the 17th I believe that all the UK 6m operators were sat there waiting. The VK video appeared in the south of the country, VK8s were then worked in central and southern UK at 1010z and I heard the VS6SIX beacon on 50.0748MHz at S7 for at least 20 minutes. Paul G4CCZ telephoned Mike VS6WV at work in Hong Kong (that's dedication for you!) but Mike explained that it would take at least 30 minutes to walk home, and by that time you could confidently expect the band would be closed. I did think to myself that, during these good band conditions, Britain's economy must be going downhill with all these people off work, but the electricity network must be on the winning side.

On Friday the 18th again things looked good with early signs of VK video being received nationwide. Ela G6HKM writes; "the 18th was a disaster, the power went off!" The EEB were doing repairs to replace some cracked insulators, so Ela was going to miss out because the 50MHz beam was not pointing towards VK! ZL TV was also audible on 45MHz but it wasn't a lockable picture, well at least not here in GJ. VK4s and VK6s were worked all over the country, in fact judging by your reports it seem almost everyone who's contacted me has now completed WAC (Worked All Continents) on 50MHz.

The DX Goes On

Your reports on the 19th were unbelievable, again the band opened early, VK4s were widespread into the British Isles.


FIRST VK2 – GJ ON SIX METRES !

AUSTRALIA QF56OD

VK2FLR

TO RADIO	CONFIRMING QSO						
	DAY	MONTH	YEAR	UTC	MHZ	RST	MODE
GJ4ICD	14	10	91	0915	50·110	559	2-X CW

Michael J Farrell
29 Allen Street
Glebe Point NSW 2037
AUSTRALIA

PSE QSL ☒
TNX QSL ☐

FT736R
HBR Tcvr
FT101
3-500Z Amp
Watts 100

24 el yagi 144
30 el yagi 435
8 el Yagi
HF Vertical

73

Mick Farrell

DX Distance Record?

Ela G6HKM picked up a few new ones to make up for the previous days mishaps, these being VK4ALM in QG56, and VK4GUN, VK4FP and VK4FNO all in QH30. At 0930z came a very rare callsign in the shape of XX9JN (Macau), QSL via KU9C. The pile-up of stations calling was something else to hear, G4CVI made the first contact some 15 minutes later, and it took yours truly 48 minutes to crack the pile up despite XX9JN's signal being S9 plus 20dB.

At 1001z Ela worked VS6WV in OL72 for a new country and square, the VS6SIX beacon was very strong around the UK. Other goodies on the 19th include KG6DX on Guam, lots of JR6s on Okinawa (south of Japan in grid PL36/46). The next several days brought similar conditions but not as good as the 14th-20th, which at this point has to be said that this was the best propagation so far in cycle 22, just when everybody thought it was the end!

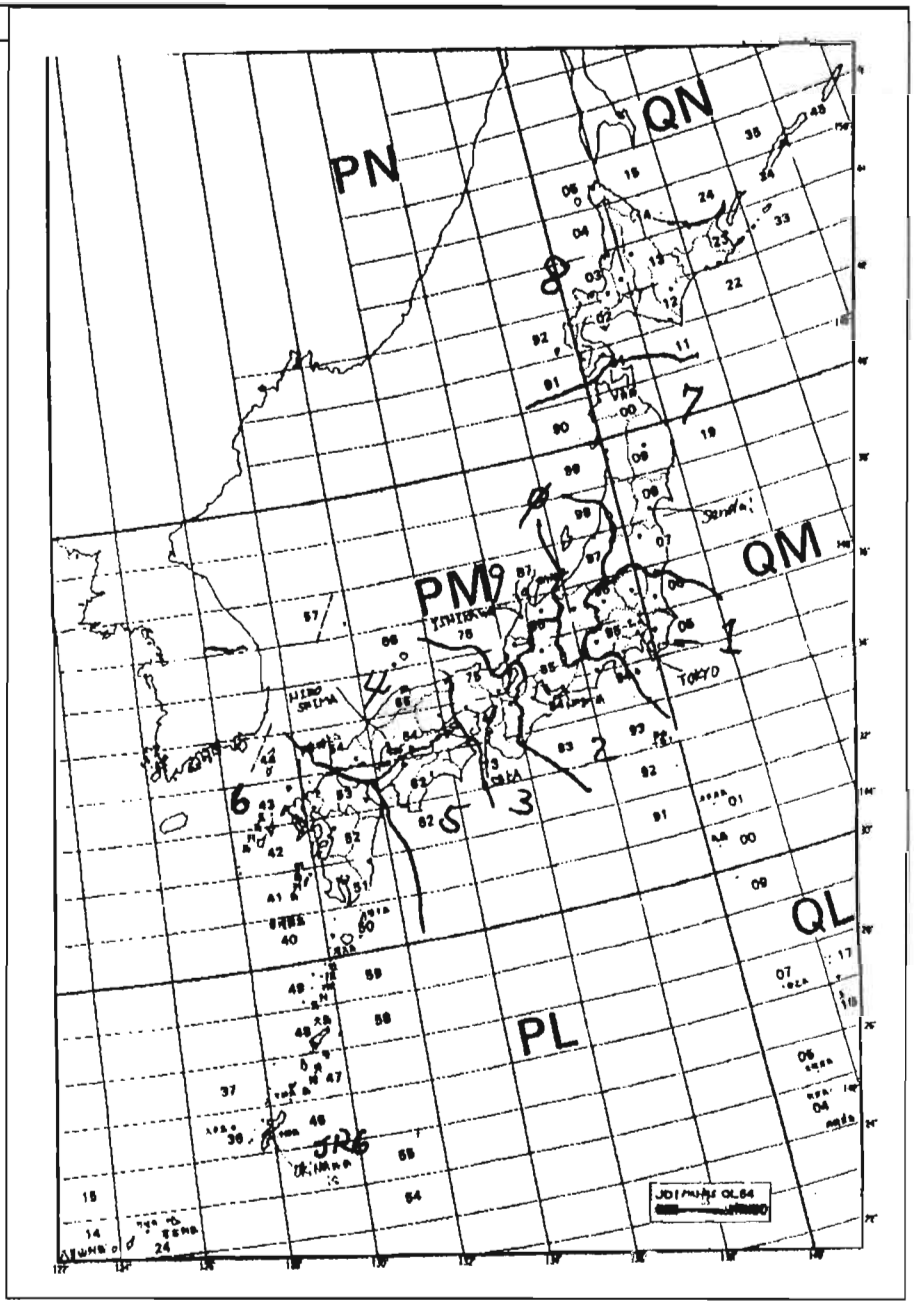
Large Storms Ahead

Things started to go quiet, in fact too quiet, solar activity was forecast, then it happened, the 'big bang' occurred, our friendly sun decided to go mad at 1055z on the 28th. At first it was thought to be a 'major' geomagnetic storm, but 24 hours later this had been changed to 'severe' category, 'A' indices were up in the 90s and 'K' indices were up to 8!, the solar flux had also shot up by at least 80 points during the period.

Aurora had to be coming, and sure enough it did. Ela G6HKM found things in action later on the 28th firstly on six, on SSB she managed to work lots of DLs, OZs, and SM7s adding two new squares to her total. On 144MHz Ela worked EI, DL, and PA0. I myself missed out as many of us did, that was because of the Leicester Show at Granby Halls, but it was great to chat with readers at the HRT stand and around the halls despite missing all the DX!

The poor conditions on six were dampening any of our chances of working the 8R1/G4SMC crew in Georgetown, and despite them having over 1000 QSOs on 6m with the crew specifically listening for UK stations, there were no G QSOs on that band. However, on the 31st, 8R1/G4SMC was quite plainly heard into GJ at 1140z, but they couldn't hear me, this was possibly due to higher noise levels nearer equatorial zones. This same day also brought ZA1ZLZ to a few dedicated 'sit by the radio' 50MHz operators, even I got it thanks to the warning net in operation, also operating from Albania was ZA1ZDB.

Early November saw the rise in propagation again as solar activity became quiet. However, there were a few hiccups, early on the 2nd saw a large flare,



whether that created the following propagation nobody knows, but take a look at what was worked from UK on 50MHz; *FY7, PY0, PY5, PT8, PT9,* (some of these regions are near Chile!), *PJ9, HI8, VE1, P43, PJ4, PJ2, TI2, W3, W4, W5, W2, CX8, LU, HC5, CN8, 9L1, YV4, KP4, CE, CP6, YN,* and that is *only* what readers have informed me of, signals were S9++ from everywhere to everywhere. The following day brought more choice DX into the UK with W6JKV/P/PJ7 worked by the south of England.

Now you can see why this month has been dedicated to 50MHz, October/November 1991 *has* to down as the *best* of cycle 22, and my thanks to you all for your input — get those DXCC claims off ASAP!

Late News

As I write this, reports are still coming in on stations worked during the large aurora which occurred on November 8, this even being reported as a visible aurora on the south coast of England. Much of Europe was worked on 6m from the UK, reported 2m QSOs with the UK included IK3ITS, SP5EFO, DG8DAE, DL0PR, and the DX PacketCluster network even had G8GXP (Yorkshire) reporting G4CVI (Hants) booming through at 59A on 432.100MHz. More on this auroral event next month.

Find where *you* worked in Japan!

With the news that OK (Czechoslovakia) should be allowed permits on 50MHz from 15th December 1991, that rounds it up for this month. Any news please to me, Geoff Brown GJ4ICD, TV Shop, Belmont Rd, St Helier, Jersey, Channel Islands JE2 4SA, Tel. 0534 77067 daytime, switched to fax after 6pm. 73 de Geoff.