HRT

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AKD 2001 2m 'starter'
Alinco DR-590
2m/70cm remote rig

JUNO
Project
Exclusive
Photos

HAM RADIO IN THE SPACE AGE
Harrogate Ladies College co-ordinate school QSOs

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AN ARGUS SPECIALIST PUBLICATION

NOVICE • PACKET • REVIEWS • PROJECTS • SATELLITES

HRT
HAM RADIO TODAY

CONTENTS

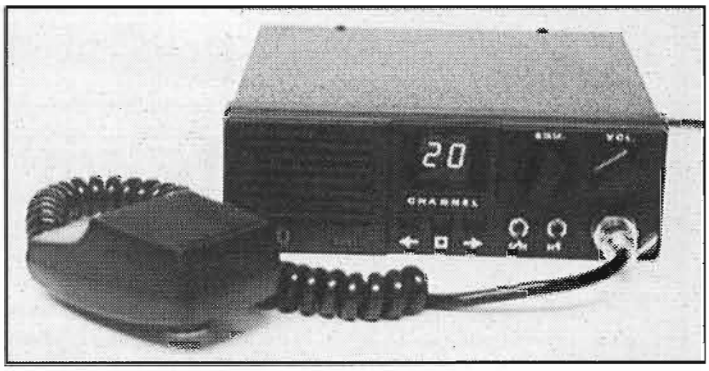
VOLUME 9 NO 7 JULY 1991

REGULAR COLUMNS

REVIEWS

FEATURES

PROJECT

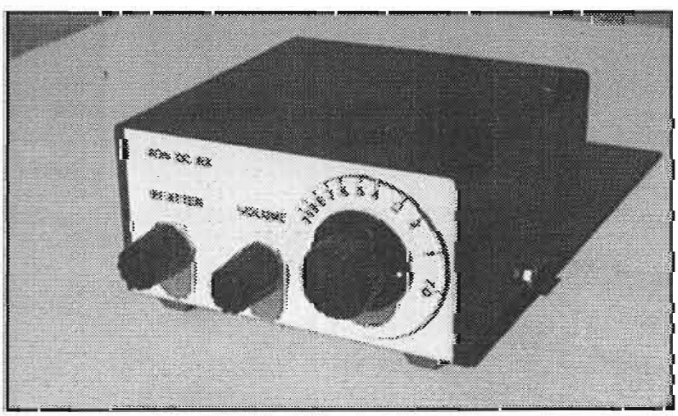


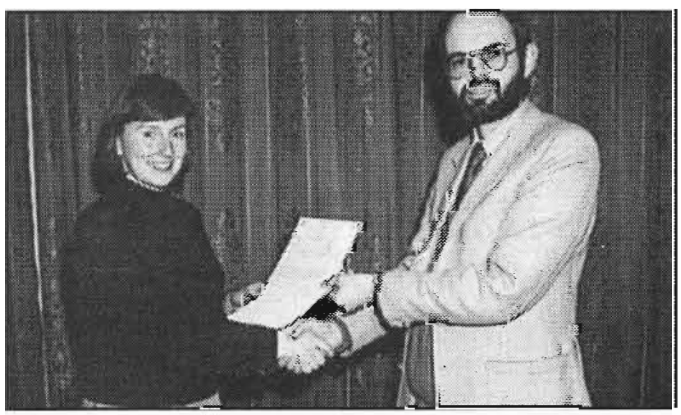
NEWS AND VIEWS

Top: The AKD2001 2m transceiver

Bottom left: Portable Direct Conversion Receiver for 7MHz

Bottom right: Richard G3XWH of the Harrogate Ladies College presents Helen Sharman with her GB1MIR Licence from the RA





CQ de G8IYA

Novices — Young or Not?

We had a busy time at the NEC Exhibition this year, the colourful walk-in HRT stand area attracted many visitors who we were very pleased to chat to. Many new subscribers took us up on our subscription offer and received a free bound logbook at the show as well as their names being entered into our prize draw. As well as HRT staff of Kaye, Donna, Sarah and Bryan, Chris and I were of course present at the show. Our small 'sit-down area' on the stand proved popular for a casual chat about radio matters and the like, with subjects such as the new Novice licence being on almost everyone's lips.

Young Novices?

What age group do you think the Novice licence is aimed at? We see multitudes of publicity photos of 9 and 10 year olds tuning radios, building receivers, soldering components, and many amateurs have questioned whether they want 'their bands' filled with newcomers of this age group. Well read on. I recently received a copy of a specimen Novice RAE paper from the City and Guilds of London Institute, together with a further couple of question papers from the RSGB meant for 'practice and revision'. As an example, here are the two from the latter on propagation;

"The maximum distance normally achievable with single-hop HF propagation is about;
a) 1600km (1000 miles)
b) 4000km (2500 miles)
c) 800km (500 miles)
d) 50km (30 miles)."

"During a period of low solar activity, (i.e. low sunspot number), daytime skywave communication would generally be reliable on;
a) 3MHz
b) 7MHz,
c) 20MHz,
d) 50MHz."

As in the normal RAE there's one that's 'ways out', another that's rather improbable, leaving two 'possibles' to choose from. Easy or not? The two above are probably 'average', here's an 'easy' one;

"Which of the following controls is unlikely to be found on the front panel of a receiver?;
a) Tuning control,
b) Mode switch,
c) Drive control,
d) RF gain control."

But here's an example of I consider one of the 'hard' ones;

"If a transmitter or aerial is incorrectly matched to an aerial system or an aerial is incorrectly matched to it's transmission line, the result would be;
a) Excessive harmonic radiation,
b) Serious damage to the aerial,
c) A high VSWR and impaired radiation efficiency,
d) Parasitic oscillation in the transmitter PA."

So then, what's the correct answer to the last one? I'm told it can certainly be all of them. When showing the specimen City and Guilds Novice question paper individually to six licensed amateurs from a large UK radio communications company, after the initial comments ranging from "It's a bit over the top for Novices" to shrieks of laughter and "You've got to be joking!" several of these licensed amateurs couldn't answer all the questions correctly, and the Head of R&D took some time in discussing which was the correct answer to one question with the Commercial Director!

HRT Editors Sheila G8IYA and Chris G4HCL are always happy to chat with readers.

Do **you** think these are aimed at the level of young children coming into the hobby? I don't. The Chairman of the Training and Education Advisory Committee of the RSGB told HRT he envisages an age group of 11-12 upwards getting their Novice licence, although he added there will of course be examples of 'extra bright' younger licensees. Our local school's Information Technology teacher, who we're planning a Novice class with, told us he considers the level of the questions being "suitable only for his older pupils, those aged around 15, who are already studying science subjects".

Both these statements appear sensible after seeing the sample questions, and although we may of course see a number of 'bright youngsters' of less than this becoming Novices in the same way as we see 5 year old Novices in the USA (though I'd be surprised to see a 5 year old UK Novice), I feel that anyone who is educated to this standard, and has completed the practical training course as well, **must** be a dedicated person who probably would be unlikely to abuse the airwaves, knowingly or unknowingly. What do you think? Write and tell us, the RA have asked us for our findings in the 'early months' and we'd be pleased to again meet with them to put **your** views forward.

We'll soon be hearing the first of the Novice '2' prefix licensees on the air, if you hear them why not give them a call to congratulate them, they may even know more about the practicalities of radio than we do!

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LETTERS

Letter of the Month

It is appreciated, by many people I'm sure, that HRT puts much effort in presenting an alternative view of Amateur Radio in the UK and you demonstrate that commitment. However we must recognise that Amateur Radio continues to exist because the authorities have no legitimate reason to refuse to issue licenses. It is because licensees operate within the law and the terms of the licence that Amateur Radio is not vulnerable. If there were no organisations representing the licensees then it is not likely in these circumstances that there would be any serious consequences.

If there is to be an organisation representing the licensees then it must either represent the majority, and be able to prove it, or accept that it shares the decision making process with other representatives. The RSGB is living in the past and must totally change its culture and attitudes before it deserves to represent the majority. Even then the majority has the right to decide otherwise.

I might be wrong but I do not feel that you include me in the 'leave it to everyone else brigade'. I am trying to promote a view that if the existing licensees representative, the RSGB, does not enjoy majority support then there is an opportunity for others to step in. OK so we are not frightened of treading on the RSGB's toes but we are frightened of kicking it up the proverbial!

Due to many other commitments I cannot afford the time to make Amateur Radio anything more than a hobby, at the moment. I have registered my dissatisfaction with the RSGB by withdrawing my financial support, perhaps I am like many others before me.

Are you a member? Are you totally happy with the council members you voted in? How many Council meetings have you attended and felt your input was allowed, understood and acted upon? 'If you can't beat them join them' is not my philosophy and nor is it the life blood of democracy.

The RA are reasonable and will deal with any legitimate representative of Amateur Radio. That is why HRT and others are invited to contribute as unelected spokespersons. Accept the responsibility and do your best. You have my support.
73 Bob Ralph G4KSG, Solihull.

Editorial comment

(Bob's letter was received in reply to our earlier letter to him, here's the gist of what we said;)

We at HRT are also disappointed with the membership price increase for the RSGB, together with the recent apparent reduction of some of the direct benefits to members such as Raynet, repeaters etc. But the RSGB has of course made substantial losses in the past, and not surprisingly these must now somehow be recouped. A new RSGB management has now been introduced, and as you're aware there are what may be termed rather drastic changes being undertaken. Much of the society is run by volunteers, it looks like more of it will be soon. However our view is that we need some form of national society, and it's thus up to us to decide who we want this national society to be run by, and what it should do. The RSGB is here as our national society with council members elected by ourselves. Remember, AGMs, EGMs and the like all exist for the members to get things done, and it often works. The 'leave it to everyone else' brigade may however just like to sit around doing little, and we know what can happen to these if they sit around too much! You're quite correct in that we've been helping to shape the future of Amateur Radio by talking and meeting directly with the RA and putting a co-ordinated approach of our reader's views to them, and we'll be very happy to carry on doing so.

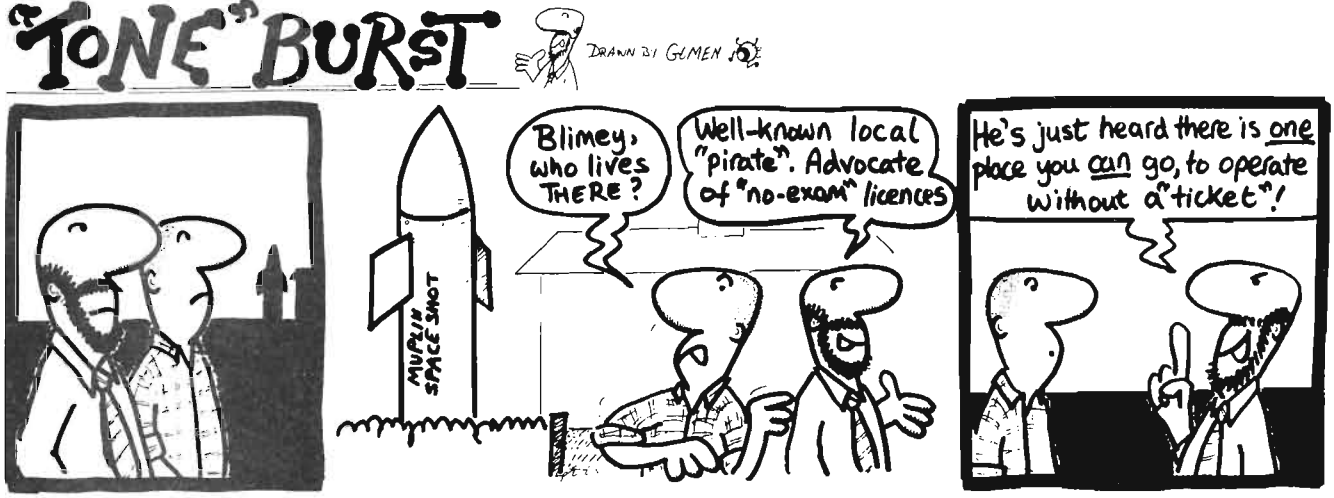
£10 for the Letter of the Month

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.

Dear HRT,
I am coming to the conclusion that a certain establishment actually prefers a Novice Licence holder to the thousands of class Bers, I've also wondered if the Novice Licence is going to be a bit divisive, as it appears to create two separate classes.

Statements given that Novices are qualified to operate on HF without supervision, having undergone a course of instruction, are in my opinion a bit much. This seems to daim that a Novice licence holder, who will have taken as part of a course running 30 hours or so some instruction on operation of a station, more fit to operate on HF than any 'B' licensee, whom one should remember makes a great study of operating practices and procedures. Not only this, even though a Class B may have constructed many things more than somewhat too advanced for a Novice with many years of operation on other frequencies, are not considered on (limited) HF without supervision.

A Class 'B', providing he or she has been licensed for a year, can take the RSGB's 5WPM Morse test. They can then operate on the limited frequencies granted for Novice use with a separate Novice callsign. To me this is the giddy limit! One minute we are told that Bs may not appear anywhere on HF without supervision, and yet after a brief CW test, we suddenly become different people. Really, this is ludicrous. As most people know, use of CW for emergency purposes is on its way out. It will only remain to keep giving pleasure to all those who love using it. Whilst it may raise screams of anguish in some quarters, it is unquestionably true that



packet radio is far more complex to study and operate, than the ability to use a twin-paddle at 30WPM. I cannot see why CW should be granted greater importance.

There is another problem with the future progress of Novice licence holders. After they have completed their course and can pound a key at 5WPM, what then? Clearly they cannot just take the 12WPM test to gain access to HF, and must return to take the full RAE, unless somebody somewhere is thinking about a observed test? I do hope not!

We have seen in other countries that CW is not now a limitation for HF work availability. It is surely time to consider a similar situation in the UK. We are all agreed that the average age of amateurs must be lowered if our hobby is to advance. Gaining the interest of the young computer buffs is certainly one way of doing just that.

It does occur to me that if CW was not a pre-requisite of HF operation, then it would have been relatively (!) easy to organise a situation where a Novice could say, have limited use on 144MHz and above to begin with. Then, after a year of operation and study could become a full 'B' user. After a further period of study (RAE?), the Novice holder would then progress to HF. Class B holders who at present have years of experience, would automatically gain access.

I know that these suggestions will bring down peoples wrath, but they are I hope, well meant. In some trepidation, madam Editor.
Yours sincerely,
G. Broadhurst, G1FGA

Editorial comment
The Radiocommunications Agency have told us there will indeed be 'teething troubles' at the beginning of the Novice licence introduction, and they've told us they'd be pleased to meet with us after a suitable period to discuss these and other points which may arise (the Novice RAE immediately springs to mind — see this month's 'CQ de G8IYA Editorial). During our last meeting, the matter of Class Bs having to wait a year was certainly discussed at great length, this is no doubt one of the points which will be raised again. So readers, keep us in touch with your views, we'll be pleased to air them!

Dear HRT,
Since my letter to you regarding the welcome situation in the February 1991 issue HRT, I have found an Amateur Radio society that actually welcomed me, and this was initiated over the air. I went with much trepidation but my fears where instantly allayed.

Not only have I joined this society, but am being encouraged to go for my CW. I have a fair knowledge of what is expected and the instructor is very proud of his achievements. As regards giving CW instructions he looks with pride at his work and what he has accomplished, his last pupil being 71 years old! His total to date is 20 passes.

So my congratulations to G4EYY of the Willenhall Radio Society, this society is also being asked to provide instructors for the Novice licence. He is trying very hard to put this particular society on the map, not forgetting the rest of the members.
J.H. Clifton, G7IOU

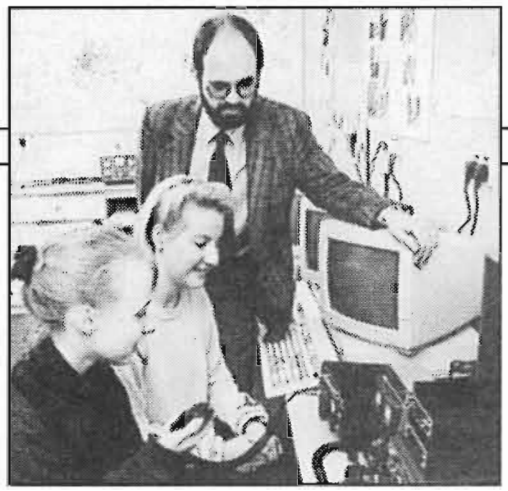
Editorial comment
Thanks for your letter Mr. Clifton, why not suggest to the Willenhall Radio Society that they send us their details of club activities so that others can also find out what this club gets up to! With the need to introduce currently non-licensed newcomers it's no good keeping quiet about welcoming clubs, as you say you had to be introduced over the air rather than through reading about the club!

Dear HRT,
There seems to be a part of our licence schedule which I think needs clarification. This would be concerning the permitted types of transmission on the 30m band (10MHz). The licence schedule states that telephony can be used with no restrictions. Then a quick look in the published bandplan, we also see that it states that telephony can be used. But, there is a note at the bottom which says, "SSB may be used on the 10MHz band during emergencies involving the immediate safety of life and property, and only by stations actually involved in the handling of emergency traffic".

Does this mean that SSB can be used any time on 10MHz or only during emergencies? The reason I question this topic is because recently I have heard SSB used on what I always considered a CW only band. Don't get me wrong, I have no preference for any mode, so I am not pushing the CW elitists' point of view. Finally a little topic to ponder on; why is it when operating CW if you ask the other station to QRS, after about two minutes they are back to their original speed?
Yours sincerely,
A. Williamson, GI0NWG

Editorial comment
Bandplans are only a 'gentleman's agreement' on the air, there's nothing to stop you operating SSB on 10MHz, like there's nothing to stop you having a QSO on SSB on the FM calling channel on 2m, as long as you're not construed as causing interference to others and the like. Where the 'no SSB' recommendation, and it is ONLY a recommendation, comes in on 10MHz is because of the limited frequency range available on the band. Thus to give everyone a fair chance of a QSO the 'gentleman's agreement' of narrow-band modes only has been published. All amateurs have their own interests of course, but we also have to live together on our shared bands, we do this best by having consideration for others. Maybe in the future it'll be a 'data only' recommendation in the interests of greater spectrum efficiency, in the same way as UK Novices may only use data in one section of their allocated bands.

The JUNO Mission No.1 Crew, from left to right; Anatoli Artsebarski, Helen Sharman, and Sergei Krialyov.



Richard G3XWH, Anna-Karin G7IRR and Olivia G7FTS getting ready for the link-up with GB1MIR/U

The Juno Project

UK Schools link up with Mir Space Station

As you read this, a few days ago (if all went well!) a historic moment in amateur radio will have occurred, that of schools and colleges around the country linking up with the UK's first ever cosmonaut via. amateur radio. This was briefly detailed in last month's HRT, now here's the story...

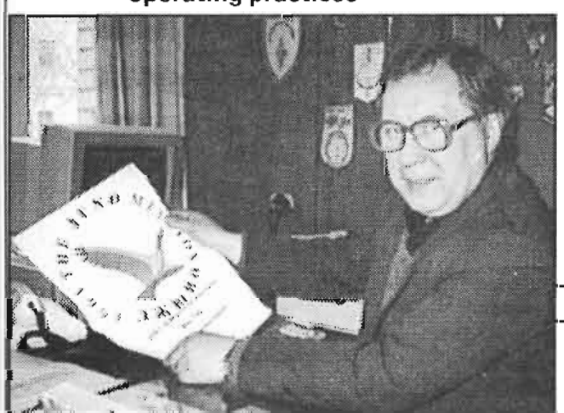
The amateur radio project was the brainchild of Richard Horton G3XWH, Head of Physics and Information Technology at the Harrogate Ladies College, and HRT were recently honoured to be able to meet with Richard together with students Olivia G7FTS and Anna-Karin G7IRR to gain the full 'background' information on their activities.

Harrogate Ladies College Station

The amateur radio station at the Harrogate Ladies College was started back in June 1980, when two of their staff (Richard G3XWH and David G4CWB, the Director of Music) decided, with the help of parent G3OGZ, to put a special event station on the air from the college's Science Lab. Resulting from this an RAE class was set up in September 1980, with four girls becoming licensed in 1981. Since then, amateur radio at the college has literally snowballed, with 29 new licensees to date and a further 6 undergoing the current class!

Over the years, the college station has grown from using borrowed equipment to having a permanently installed HF/VHF/UHF station, with equipment such as a TS430 and KW1000 linear feeding a TH3 beam for HF, plus a complete VHF/UHF satellite station with automatically tracked aerials using an IF-100 computer controlled system for the Oscar 10 and 13 satellites. If you've seen the RSGB 'Amateur Radio for Beginners' video, you'll have seen their station featured.

Boris UW3AX who trained the cosmonauts in Amateur Radio operating practices



JUNO Project

In August 1990, following the earlier reluctance of UK industry to put up money for a UK cosmonaut, the Moscow Narodny Bank stepped in with a generous offer of financial assistance and the JUNO project again got off the ground. The conclusion of this was that one UK cosmonaut accompanied by two USSR cosmonauts will have lifted off in late May to visit the permanently manned Mir space station, Helen Sharman being the first UK candidate for this position with Major Timothy Mace being the reserve UK candidate, both having received training in the USSR for the visit to Mir. Helen will travel up with cosmonauts Anatoli Artsebarski and Sergei Krialyov on the 18th May, reaching Mir on the 20th May, and return to Earth with the earlier Mir two-man crew of Viktor Afanasyev and Musa Manarov (U2MIR) six days later.

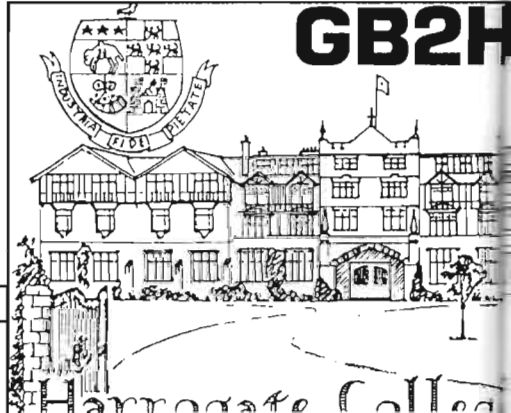
Special Licences

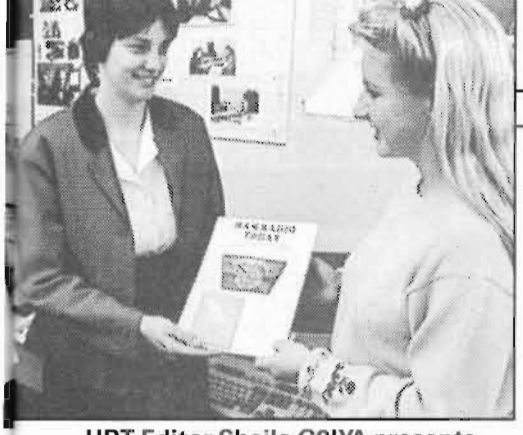
Following this development, G3XWH at the Harrogate Ladies College contacted the Radiocommunications Agency directly to investigate whether the UK cosmonaut would be allowed to use amateur radio to link up with schools and colleges around the UK, the answer from the RA being a resounding 'yes'! The result was the RA authorised the issue of a licence with the special event callsign of GB1MIR to Helen and GB2MIR to Tim, together with the callsigns of GB0JUNO to GB8JUNO to nine selected schools and colleges around the UK.

Operation ***Space Station Mobile*** organised by the Space School of Brunel University involves the running of several experiments by the UK cosmonaut whilst on the space station, one of these being the amateur radio link-up. Indeed it's hoped that Helen will be able to give 'live' results on the various school experimental projects via. the amateur radio link..

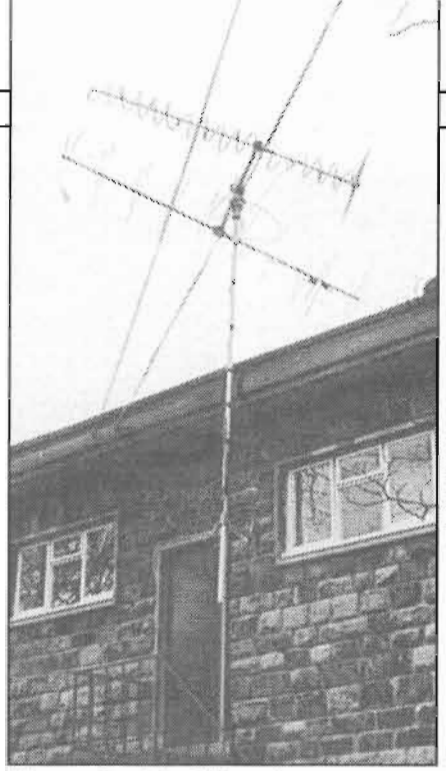
Although Helen isn't a qualified amateur, the special licence allows her to use the existing 2m packet radio station with its outside aerial already operational on board Mir, operating under supervision from Musa U2MIR who's already up there. Helen will have already been taught the rudiments of amateur operation by Boris UW3AX in the USSR prior to her take- off. If circumstances permit, a 70cm link-up using a small portable rig with its set-top aerial may also be attempted.

During Helen's period in orbit, the position of Mir should provide several 'slots' each of around 10-12 minutes to put her in range of the UK for communication. These should occur during the evening, to allow either 'live' voice communication or (particularly after the Cosmonauts have gone to sleep for the night) for automatic packet store-and forward communication using the 'personal mailbox' facility on the Mir packet station for communicating the results of





HRT Editor Sheila G8IYA presents Olivia G7FTS and Anna-Karin G7IRR with the space station crew patches



The tracked 2m/70cm beams

Dennis Goodwin of Icom UK came along with the loan of an Icom Base station for the link-up

schools experiments etc. However, the USSR cosmonauts may even let Helen 'stay up late' after their bedtime of 9.00pm to contact ground stations directly (we know Musa has stayed up late before to continue his hobby!). We also understand that Helen will be using the suffix '/U' following her callsign, i.e. GB1MIR/U, to signify that the station is on USSR 'territory' in the same manner as reciprocal licence operation.

Down in Harrogate

With last minute take-off changes (the original take-off date of 12th May has already been delayed to 18th May with a take- off time of 16.15 Moscow time as we write this) accurate calculations are required to see exactly when the space station will be in range at the given contact points in the UK. Also, if all the schools and colleges were to call at the same time, little communication would result! The tremendous amount of co- ordination and logistic work is being carried out by the Harrogate Ladies College, no doubt they'll be burning the midnight oil over their impressive array of tracking and communication computers in their shack!

The first orbital 'pass' is planned for communication between Harrogate and Mir, to test communication and make arrangements for the other schools to link up with Mir. With around three to four passes a day being available for communication, this should allow plenty of opportunities, but then again if a re-position of the space station needs to be made, or a significant change is again made to the take-off date, anything could happen! The priority however is to get *all* the schools in contact during the period.

As well as their automatically-steered 2m crossed yagi, the Harrogate Ladies College also have a 16-turn 70cm helical on the same boom, which should provide a reasonable 70cm link if this experiment is also allowed. If so this will be the first time 70cm will have been used from an orbiting amateur station.

Media Interest

The Harrogate Ladies College satellite station has already attracted a great deal of media interest, and we're sure their latest project will attract a good deal more! Their allocated special event callsign GB0JUNO will also be operational on other bands and times for general contacts, no doubt those of the other JUNO stations will be also, so give them a call and see how they went on! The Harrogate Ladies College 'normal' callsign is G0HCA, and they'll also be using their GB2HC (i.e. GB2 Harrogate College) callsign during their annual 24 hour sponsored station over their Sports/Open day period, this will be operational from 18.00GMT on June 20 for 24 hours, with operation mainly on 20/15/10m. Last year they celebrated their 10th anniversary on air, raising over £700 for Cancer Research from 410 sponsored contacts. Why not give them a shout this year?

Our thanks go to Richard and his team for inviting HRT to their station, we also took the opportunity of arranging with Dennis G4SOT of Icom-UK (he's also the licence holder of the GB4JUNO station in Canterbury) to visit the college with us, to present the college with the loan of an Icom base station for the Juno link-up. We at HRT did our bit with the gift of a couple of Soviet 'Mir' and 'Juno' cosmonaut crew patches which we'd 'acquired' for the college!

Letter of Variation

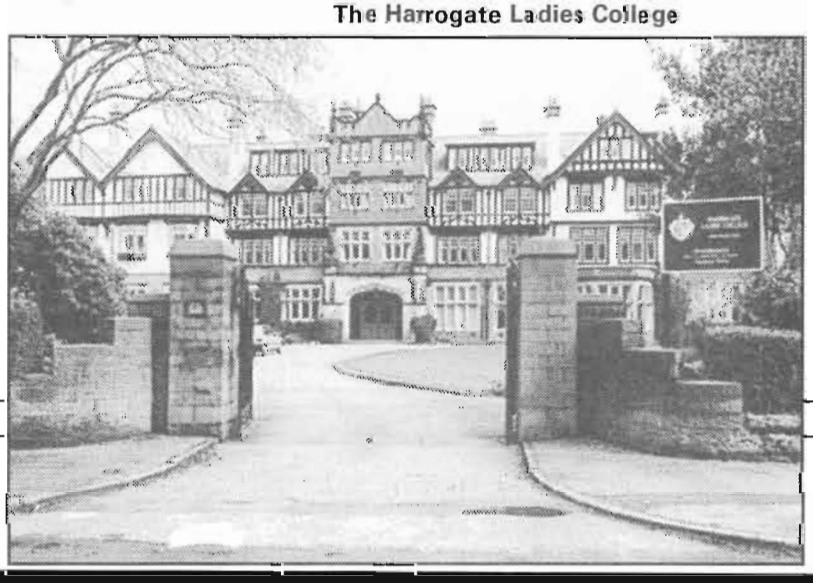
As a final note, readers may be interested to hear that the formal 'letter of variation' issued on behalf of the DTI to UK cosmonaut Helen Sharman reads; "Thank you for your application to use your amateur station at a special event . . ."

"1) Your station may only be established at; *EARTH ORBIT*"

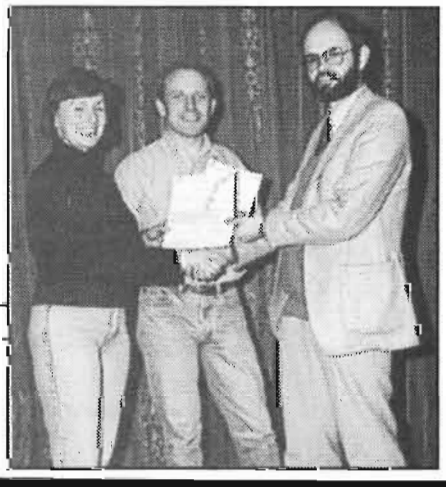
"4) *This notice and your current licence must be available for inspection at the station address referred to in 1) above.*"

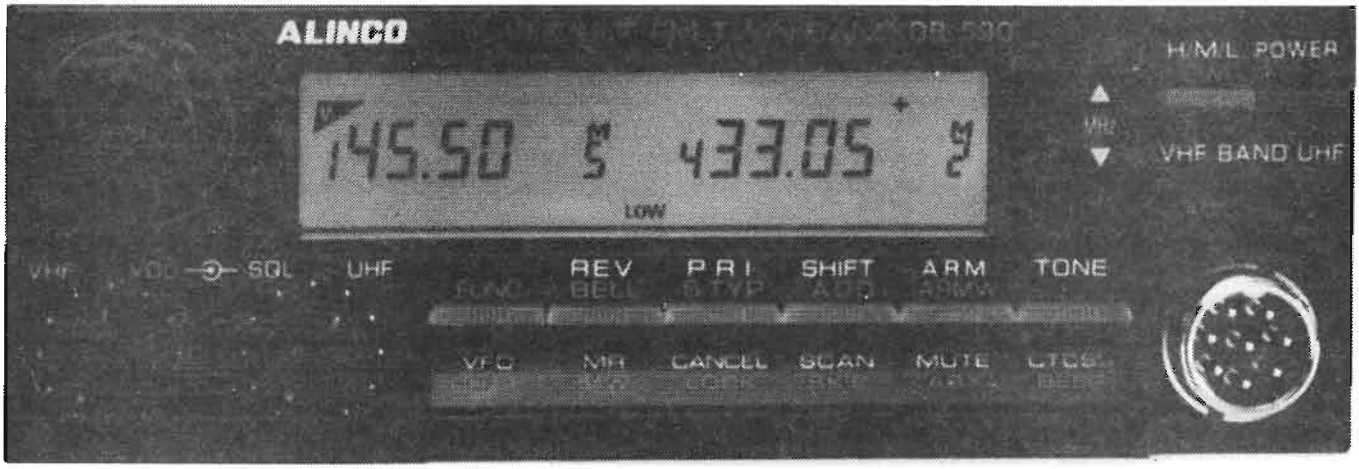
We at HRT wonder if the RA will be sending a couple of RIS officers to visit Helen in space to inspect her station!

The Harrogate Ladies College



Richard G3XWH of the Harrogate Ladies College travelled to Star City, USSR and presented Helen Sharman and Tim Mace with their GB1MIR and GB2MIR licences from the RA





The DR-590E

Alinco DR-590E Review

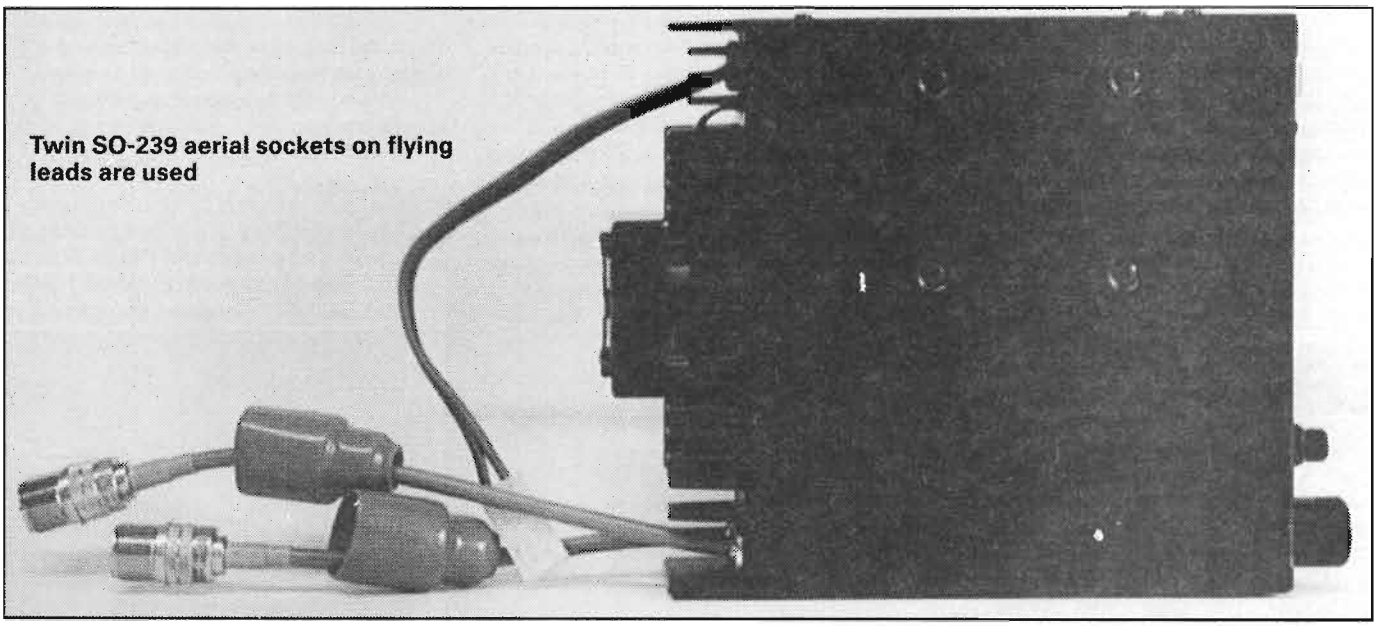
Alinco's latest all-singing all-dancing dual band mobile, reviewed by Chris Lorek G4HCL

There's an increasing number of dual-band mobile transceivers available today, and it seems a 'dual-bander' is the type many amateurs are searching out for their latest rig. In the never- ending game of 'bells and whistles', Alinco's latest transceiver the DR-590E has the capability through optional fitments of keeping even the most gadget-oriented amateur happy for quite a while!

Features

The usual 2m and 70cm coverage is provided of course, and I won't bore you with all the selectable step sizes, tuning control from the rotary knob or microphone up/down buttons, memory and VFO scanning, as I'm sure many HRT readers will have heard all this before! Various 'extra' frequency ranges on receive may also be programmed depending upon licensing regulations in force. Down to hard facts on the amateur bands, on transmit it offers a maximum of 45W on 2m with 35W on 70cm, with High/Mid/Low power switching provided, a thermostatically controlled fan on the rear panel coming into play when things get hot — this also keeps the heat-sink size and weight down.

Separate volume and squelch controls for each band together with a double row of pushbuttons on the front panel let you control the twin independent receivers and their functions to your heart's content, there's even an 'Automatic Band Exchange' (ABX) which switches the 'Main' band (i.e. the one you transmit on) to that which last had a receive signal present. A dual switch sensibly placed just above the microphone socket also lets you manually select which range you wish as the 'Main' band, next to this up/down front panel buttons let you change memory



Twin SO-239 aerial sockets on flying leads are used

The detachable front panel allows remote mounting

channels and the like of which there are 28 in total for VHF and UHF. There's even two extension speaker sockets on the rear panel, one each for VHF and UHF to provide separation of received signals, an internal speaker also being fitted to the set providing combined audio.

Remote Use

For the size-conscious, the unit measures 150mm(W) x 50mm(H) x 178mm (D), weighing in at around 1.5kg. However, with an optional remote mounting kit you can detach the front panel of the set and place the main body up to 5m away, for example under your car seat, in the rear, or indeed anywhere out of the way. With just a remote linking cable, this lets you place the control panel of the set where it's most convenient, rather than where you could otherwise fit the rig! A 'head-up' display on top of the car dashboard, at minimum eye-travel distance, is of course ideal for road safety, and simply unplugging the visible remote control and taking this with you when leaving the car could also reduce the appeal to the less-desirable elements of our population.

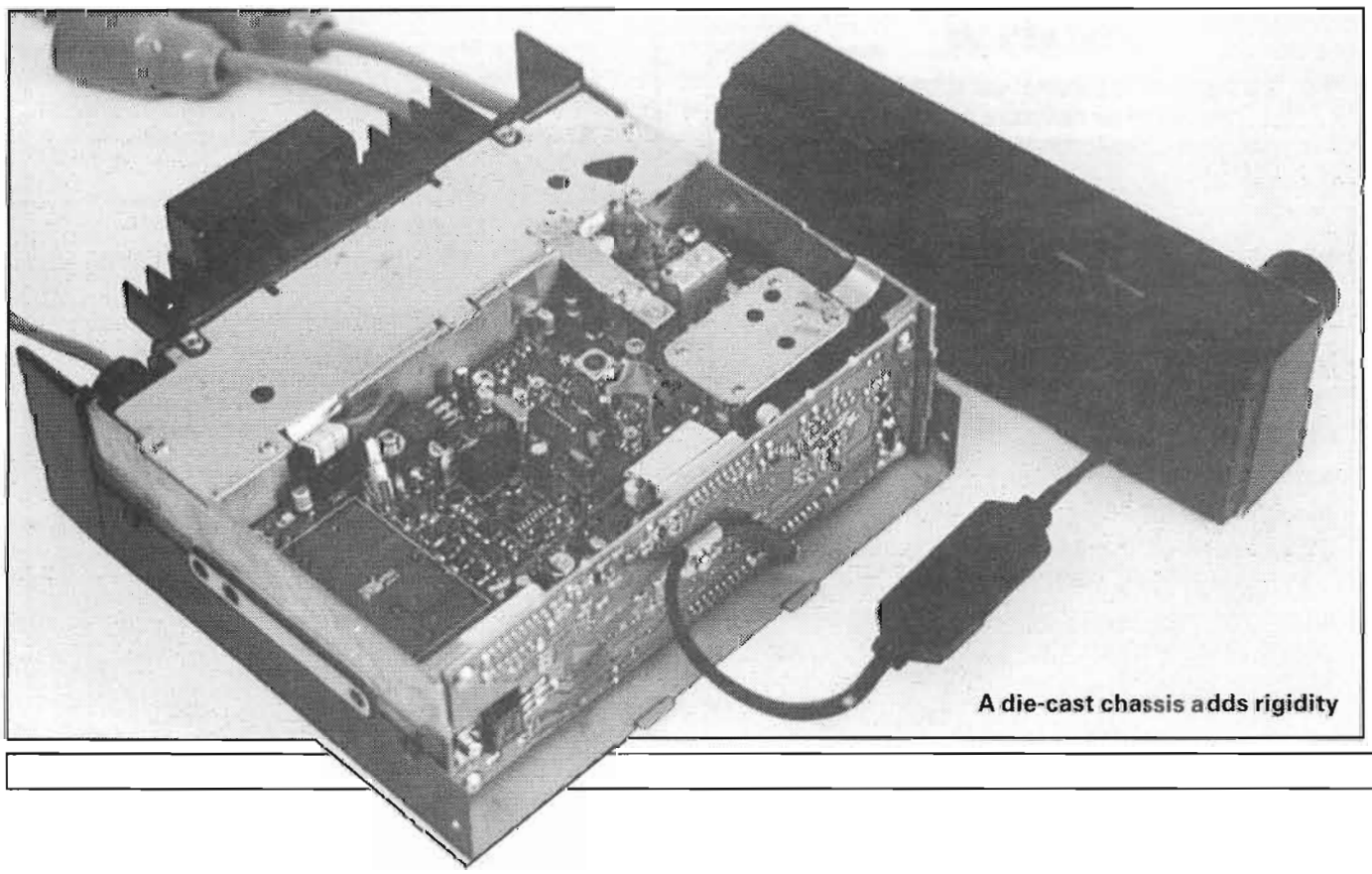
CTCSS and DTMF

There are many repeaters, in the UK and of course extensively in other countries, which employ CTCSS for controlled access and group monitoring use. The DR-590 may be internally fitted with an optional CTCSS encode/decode unit for the usual range of Sub-audible tones, the USA model DR-590T being fitted with a CTCSS encode-only facility in place of the European 1750Hz repeater toneburst unit. The decode option allows your receiver to stay silent until a signal modulated with the correct CTCSS tone appears.

A further option is the internally fitted DTMF unit (in addition to the DTMF encoder microphone, this being an option in Europe and standard in the USA). This allows a wide degree of selective calling facilities ranging from a simple three-digit received DTMF sequence to raise your receiver squelch, right up to 7 digit sequences for group calling and the like, your receiver bleeping away and storing the received DTMF sequence (i.e. the ID of the calling station, even in your absence) on the set's display.

Remote Control

By using the optional DTMF keypad microphone, many of the set's functions can be controlled from this without the need to even touch the front panel of the set.


A die-cast chassis adds rigidity

You can alter the VFO frequency, memory channel, select VHF or UHF as 'Main' band, select High/Mid/Low transmit power, even set the DTMF selective calling sequence. But wait for it, you can also do this over the air, for example by using a handportable with a DTMF keypad. The UK suppliers tell me they understand the transceiver may also be capable of being operated as a self-contained cross-band repeater, so if you put the two together then you end up with a 'remote base' on either 2m or 70cm, controlled from another set. Remember, the latest UK licence conditions allow *any* amateur to control their rig this way 'on air' at their QTH. So you could for example have the DR-590 up in your shack with your roof or tower mounted aerial system connected to one aerial socket, a dummy load to the other, and control it with your handportable while you're sitting in your lounge or sunbathing in your garden/backyard!

In Use

I regularly used a remote mount 2m/70cm mobile from a different manufacturer in my car, this had very similar dimensions to the Alinco DR-590E so finding a mounting position and installing the transceiver was very easy. What I had to get used to though were the very large number of completely different operating functions! I almost came to the point of tearing my hair out at one stage. Although I'm a confirmed gadget freak maybe the set was 'too clever' for me, eventually I decided that using many of the set's modes whilst on the move was just that bit too much, so I did my 'last resort' trick of loading the memory channels with my favourite frequencies and just using those instead.

Controls

I found the repeater access toneburst button sensibly placed just to the right of the easily located microphone connector, likewise the 'Main' band selector just above this, this allowed operation on the move by 'feel' alone although I really would have preferred the tone button on the microphone for fumble-free repeater access. With the variety of features provided, the set gives an audible dual-frequency 'double-bleep' when activating many of the functions. Some, like going from VHF to UHF gave a high frequency dual-tone, and a lower frequency dual tone when going from UHF to VHF which was very sensible. However a double bleep every time I changed channel, pressed the toneburst and so on, often became too much for me so I eventually just switched it off.

While using the set when driving at night, I found I could easily locate the rotary volume/squelch and channel controls as these were nicely backlit, likewise the twin rows of push-buttons although in the latter case none of the button functions were lit, so unless you have a good memory for all the double-key facilities these wouldn't be much use at night.

LABORATORY RESULTS:

RECEIVER;

Sensitivity;

Input level required to give 12dB SINAD;

144MHz;	0.130uV pd
145MHz;	0.135uV pd
146MHz;	0.140uV pd
430MHz;	0.185uV pd
435MHz;	0.175uV pd
440MHz;	0.185uV pd

Squelch Sensitivity;

	145MHz	435MHz
Threshold;	<0.060uV pd (<2dB SINAD)	0.110uV pd (4dB SINAD)
Maximum;	0.219uV pd (21dB SINAD)	0.250uV pd (19dB SINAD)

Adjacent Channel Selectivity;

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

	145MHz	435MHz
+12.5kHz;	40.0dB	45.5dB
-12.5kHz;	53.0dB	47.5dB
+25kHz;	74.0dB	67.0dB
-25kHz;	71.5dB	67.5dB

Blocking;

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

	145MHz	435MHz
+100kHz;	87.5dB	84.5dB
+1MHz;	95.5dB	95.0dB
+10MHz;	96.5dB	96.5dB

Intermodulation Rejection;

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

	145MHz	435MHz
25/50kHz spacing;	63.0dB	67.5dB
50/100kHz spacing;	62.0dB	68.0dB

Maximum Audio Output;

Measured at 1kHz on the onset of clipping;

3ohm load;	1.37W RMS
8 ohm load;	1.16W RMS
15ohm load;	875mW RMS

Image Rejection;

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

145MHz	435MHz
69.5dB	90.0dB

Audio

A small speaker is fitted to the top of the set, this provided an ample amount of audio for normal listening in a typical family car when travelling at speed. I did however find the internal speaker response rather 'toppy' and 'nasal', plugging in external speakers would probably improve on this. The receiver squelch on both VHF and UHF I found to be around or above the 'jittery' threshold point at the absolute minimum setting of each knob, hence I often couldn't defeat the squelch to pre-set the audio level before travelling to make sure I either didn't miss received signals or initially deafen myself by setting the volume too high. On transmit, unfortunately reports on my audio were of a very 'thin' and 'toppy' response, sometimes difficult to copy in the presence of local background noise at the receiver end.

Base Use

Use at home into an external roof mounted dual-band colinear showed the set had good strong-signal handling performance, this point being important as I know many amateurs use transceivers of this type purely for base station use. I found not one problem of blocking from the multi-frequency (including 2m and 70cm) packet node operating nearby — nor from my local friendly fire station transmitter, very good indeed! I found the adjacent channel rejection particularly good — tuning just one channel away from a strong local signal again allowing me to copy weak on-channel signals without any problems. During on-air 'ragchew' sessions however, I did find the rear panel fan noise a bit of a distraction although I soon got used to this — in my car this was hardly noticeable.

Technical Performance

The accompanying lab results show the set's measured performance in the standard HRT format for easy month-by-month comparison. For the non-technical, the sensitivity was reasonable although not over-sensitive on 70cm, the strong signal handling good, i.e. the adjacent channel rejection and blocking, with the IMD (where two off-channel signals combine to cause on-channel interference) rejection reasonable. On transmit, the deviation of the DR-590E was again 'over the top' of the absolute maximum of 5kHz for European usage, I've rarely found this with other makes but so often with Alinco rigs, this sometimes causing an overdeviation problem on repeaters as well as on packet if TNC audio levels are incorrectly set. Maybe Alinco's deviation meters are faulty, or maybe they just deliberately set it higher to make their sets 'sound louder' on air? The transmit power on 70cm was on the low side (it's specified as 35W), however the harmonics on both bands were adequately suppressed, this being important for base station use.

Conclusions

Alinco's latest dual bander again has the capability to be filled with the latest 'bells and whistles' for the amateur who wants everything, whilst retaining the capability of simple control by using just the memories. The possibility of remote control of the set from an external handheld sounds most interesting, this could prove a popular use for the set. I had a few 'niggles' about the set, such as the audio and squelch, however the reasonable selling price of £499 plus the cost of any options must of course be taken into account here.

My thanks go to Waters and Stanton Electronics for the loan of the review transceiver.

S-Meter Linearity;

	145MHz		435MHz	
Indication	**Sig.Level**	**Rel.Level**	**Sig.Level**	**Rel.Level**
S1	0.40uV pd	-17.3dB	0.44uV pd	-17.6dB
S2	0.84uV pd	-10.9dB	0.91uV pd	-11.2dB
S3	1.29uV pd	-7.1dB	1.36uV pd	-7.7dB
S5	1.79uV pd	-4.3dB	1.73uV pd	-5.6dB
S7	2.26uV pd	-3.3dB	2.24uV pd	-3.4dB
S9	2.94uV pd	0dB ref	3.30uV pd	0dB ref
S9+	4.22uV pd	+2.9dB	4.83uV pd	+3.2dB

TRANSMITTER;

TX Power and Current Consumption;

Freq MHz	Power	10.8V Supply	13.8V Supply	15.6V Supply
144MHz	*High*	23.8W/5.70A	43.1W/7.80A	52.5W/8.20A
	Mid	11.4W/3.70A	11.6W/3.75A	12.1W/3.80A
	Low	5.35W/2.75A	5.35W/2.80A	5.61W/2.80A
145MHz	*High*	24.3W/5.90A	44.1W/8.00A	51.5W/8.15A
	Mid	11.1W/3.70A	11.1W/3.75A	11.9W/3.80A
	Low	5.15W/2.65A	5.20W/2.80A	5.35W/2.80A
146MHz	*High*	24.7W/6.10A	44.4W/8.20A	49.3W/8.20A
	Mid	10.7W/3.65A	10.7W/3.80A	11.2W/3.80A
	Low	5.03W/2.50A	5.03W/2.80A	5.20W/2.80A
430MHz	*High*	19.7W/5.50A	30.1W/6.35A	30.3W/6.35A
	Mid	6.90W/5.50A	6.80W/3.30A	6.95W/3.45A
	Low	3.50W/2.60A	3.40W/2.60A	3.55W/2.80A
435MHz	*High*	18.9W/5.40A	28.0W/5.90A	28.3W/5.65A
	Mid	6.25W/3.15A	6.40W/3.15A	6.35W/3.15A
	Low	3.15W/2.50A	3.20W/2.45A	3.29W/2.55A
440MHz	*High*	18.3W/5.50A	26.2W/5.95A	26.5W/5.50A
	Mid	5.80W/3.15A	5.85W/3.00A	5.95W/3.00A
	Low	2.95W/2.45A	2.95W/2.40A	3.10W/2.50A

Harmonics;

	145MHz	435MHz
2nd Harmonic;	-79dBc	-72dBc
3rd Harmonic;	-82dBc	-73dBc
4th Harmonic;	<-90dBc	-86dBc
5th Harmonic;	<-90dBc	-
6th Harmonic;	<-90dBc	-
7th Harmonic;	<-90dBc	-

Peak Deviation;

145MHz	435MHz
5.63kHz	5.14kHz

Toneburst Deviation;

145MHz	435MHz
3.68kHz	3.31kHz

Frequency Accuracy;

145MHz	435MHz
-183Hz	-546kHz

AKD 2001 Review

A budget rig from a UK company — G4HCL reviews the new sub-£200 rig

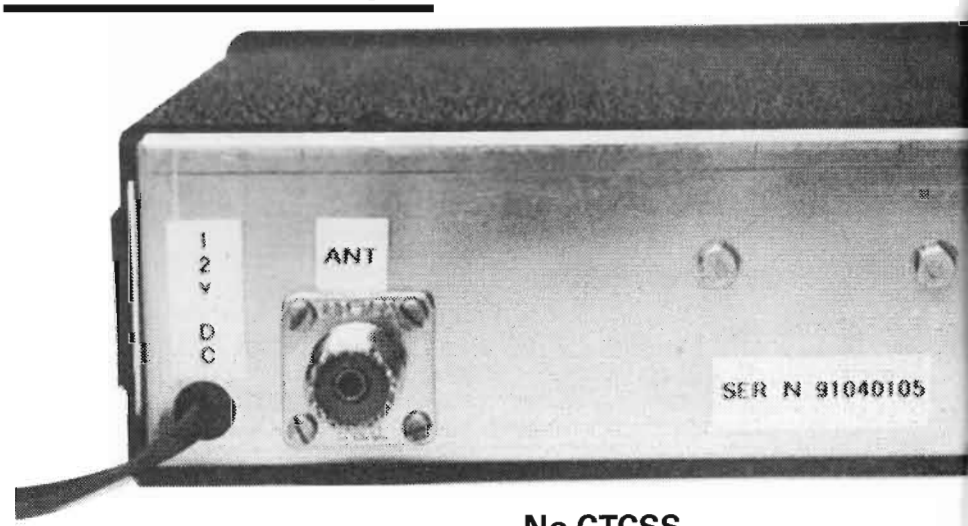
Many amateurs have in the past asked 'when is someone going to come out with a sensibly-priced 'starter rig' without all the bells and whistles?' Well they have.

The firm of AKD in Stevenage have done just that with their model 2001. No scanning, no programmable memories, not even an S- meter. Instead of digital keypads and the like, up/down buttons on the set's facia control the operation channel in 25kHz steps, with the large two-digit readout coinciding with the normal UK FM channels. Want S20, just select channel '20' using the buttons, R7? — select channel '07' and the transmit repeater shift is already there. Press the third button for 'listen on input' to see if you can hear your QSO partner direct, a simple press of the microphone PTT bringing you back to normal repeater mode.

With large rotary volume and squelch controls it was designed to be easy to operate on the move, the HRT review team put this to the test.

Features

The set provides a transceive range across 144.500MHz to 145.975MHz, with channels arranged in the usual 00-23 format corresponding to R0-S23, with further channel 'banks' of 60-67 and 70-77 giving simplex on the repeater input and output channels respectively, and channels 90-97 giving full 'reverse repeater' transceive. Further programmed channels of 24-43 give simplex communication on 144.500-144.975MHz and channels 44-51 provide coverage of 145.800-145.975MHz.



The transmitter gives a nominal output power of 25W maximum with a switched low power mode down to 5W, a fist microphone with a four pin plug being provided for TX control. The mating socket has connections for TX PTT, audio, common, and a fixed 400mV output level of RX audio independent of the volume control, this allows the control and audio lines of a packet radio TNC to be connected using a single plug. The loudspeaker audio output of up to 2W RMS is fed to an internal speaker fitted to the front panel of the set, this being a lot more useful than the more usual lid-positioned speaker, although an external speaker socket isn't fitted.

For repeater access, on the programmed repeater channels (00- 07) a 'double press' of the microphone PTT automatically sends a half second burst of 1750Hz at the beginning of your transmission, a nice touch which should make mobile operation that bit easier.

No CTCSS

However, there is currently no CTCSS encode facility provided in the set for repeater use and the like, although AKD have informed HRT this may be offered as a future option. The licence holders of all the UK repeaters have published a statement with their intention to promote the use of CTCSS as an alternative access method or UK repeaters, indeed some 2m repeaters such as GB3PE already use this (remember you can build up the HRT CTCSS unit published in the Sept 1990 issue).

In Use

Switching the set on brings it up

each time on its default power-up channel of S20, thus providing a 'reference' to start tuning from each time you switch the set on. Although the 'power- up' default to S20 makes the set illegal to use for unattended packet radio (if the shack power failed for a short period, your TNC could be forever sending packets out on the FM voice calling channel), when we asked AKD they told us they'd be pleased to offer purchasers an alternative plug-in IC for the set, to give a different stated power-up channel such as 144.650 or 144.675MHz, so this is worth bearing in mind when you order the set.

Using the set initially from home, connected to my rooftop colinear, showed it to be adequately sensitive although it did take me a while in getting used to the fact of having no S-meter! The receive audio from the built-in speaker was exceptionally good, and I found I could easily turn the volume up to an almost deafening level without any apparent distortion.

Living a few hundred metres away from a 2m packet radio BBS and node network, I did find some breakthrough occurring from these which lifted the receiver squelch on an otherwise quiet channel, more so than some other (albeit more expensive) mobile rigs I've tested.

On the other hand I found the rejection of signals on adjacent channels, even signals 12.5kHz away (which I couldn't tune to of course), very good indeed, although not surprisingly I found the odd high-deviation station a little distorted on speech peaks due to the narrow filters in the AKD2001.

Whenever the receiver squelch raised, a noticeable 'click' accompanied the audio, I sometimes found this useful as an 'activity indicator' in the absence of a busy LED or S-Meter when manually scanning through the channels to search for activity, doing this by keeping my finger pressed on one of the up/down buttons.

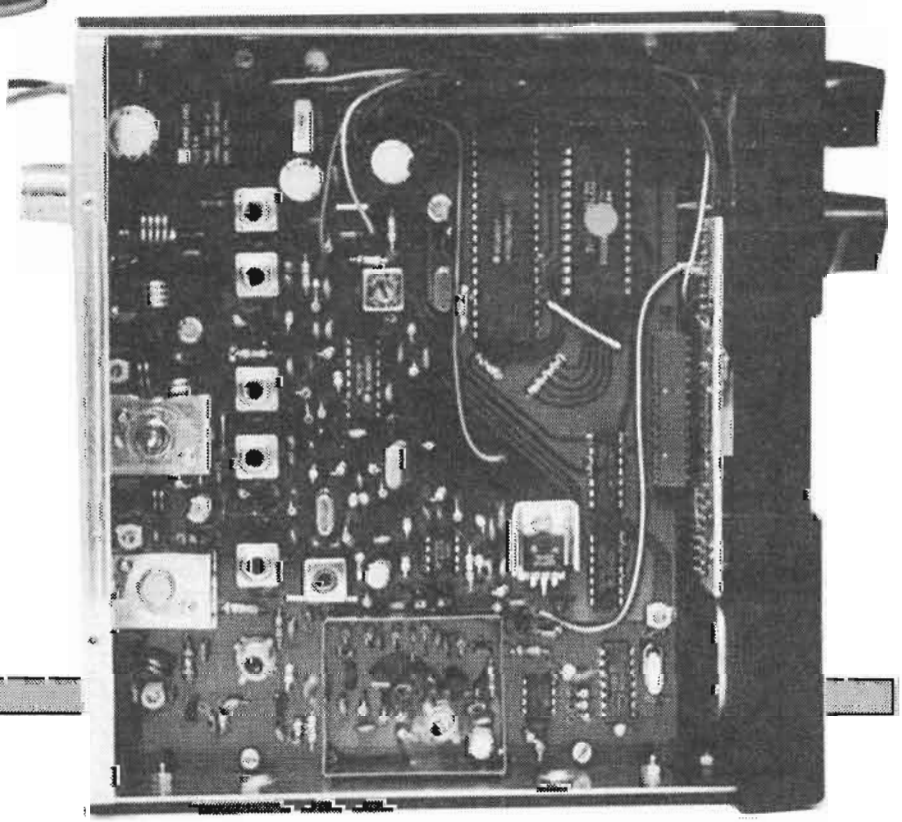
Going Mobile

The review set didn't come with a mobile mount, so I mounted it in my usual position on top of the dashboard in the editorial car, which often doubles as a review rig test vehicle, using proprietary stick-on mountings (I hate drilling holes in dashboards in any case!). The non-smooth black finish of the set's case was ideal — this hardly reflected sunlight etc. at all, whilst the recessed channel display gave good visibility without problems of bright light affecting the readability of this. All this combined with the simple controls promote safer driving through offering less distractions to the driver. However whilst on the move I did feel that I would have preferred a remote up/down channel change, such as microphone mounted up/down buttons or even a click-step rotary channel knob. I often had to watch the channel display whilst attempting a QSY, particularly after starting up with the set re-setting to S20 each time.

As found at home, the audio output on receive was very clear, and just as important there was plenty of it. However when driving through weak signal areas, I found the repetitive 'clicking' from the speaker as the squelch chopped in and out was very distracting, in these cases I tended to reach for the squelch knob to permanently open it. My transmit audio was described as very readable although a bit 'harsh', I also had the odd problem with overdeviation, this latter fault I subsequently cured by a quick adjustment inside the set after I'd worked out which was the deviation control (no internal adjustment information is supplied with the set).

Insides

The set measures 182 (W) x 58 (H) x 174mm (D), and weighs a light 800g. It's light weight comes from an alloy chassis



with alloy lids fitting to the top and bottom, a black plastic front panel completing the arrangement. Inside, discrete components are used throughout, making repair a lot easier than the more usual 'chip' components. The main PCB houses the RF circuits and much of the digital circuitry, both sides of this are accessible when the lids are removed — even I could fix it without a major disassembly job! A smaller PCB on the front panel houses interface circuitry for the up/down push buttons, this plugging into the main PCB.

The usual dual-conversion superheterodyne receiver is used, with IFs of 10.7MHz and 455kHz, on transmit discrete PA and driver transistors are used instead of the more usual 'block' PA module to keep initial and any subsequent repair parts costs low. An MC6802 microprocessor is linked to the two-chip frequency synthesiser to control the frequency division ratios etc, a plug- in 27C64 EPROM being used as a 'look-up' table for the programmed channels, this should allow for easy future updates if necessary due to band-plan changes etc.

Laboratory Results

The measured receiver sensitivity generally confirmed the reasonable on-air results gained, likewise the very good adjacent channel rejection of 12.5kHz spaced signals. The blocking and intermodulation figures weren't exceptionally good close-in, the latter probably due to the single rather than double dual-pole filter used at the first IF, however at greater frequency separations a good performance resulted. The transmitter power level was accurately set at a supply voltage of 13.8V, this did vary somewhat with the normal variation found in car battery voltage. The transmitter harmonics were adequately suppressed, and although the transmitter deviation was accurately with an audio frequency of 1kHz this peaked to over 7kHz as the audio frequency was varied.

Conclusions

The current selling price of just under £194 makes the AKD2001 the lowest cost 'Black Box' available to my knowledge on the UK market. As such, amateurs wanting a 'no nonsense' set at low cost, albeit without facilities such as scanning and CTCSS, can be assured of getting what they're after. The set operates in 25kHz steps only, so ensure your local usage doesn't require 12.5kHz channels. I understand that 4m and 6m versions of the set will also be released in the near future, and a 'Novice Package' is being put together (i.e rig, 12V power supply etc.) which sounds most interesting, watch this space!

Our thanks go to AKD for the loan of the review transceiver.

LABORATORY RESULTS:

RECEIVER;

Sensitivity;

Input level required to give 12dB SINAD;

144.500MHz;	0.21uV pd
145.200MHz;	0.22uV pd
145.800MHz;	0.23uV pd

Image Rejection;

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

89.5dB

Squelch Sensitivity;

Threshold;
0.17uV pd (9dB SINAD)
Maximum;
0.26uV pd (15dB SINAD)

Adjacent Channel Selectivity;

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

+12.5kHz;	56.0dB
-12.5kHz;	54.5dB
+25kHz;	60.5dB
-25kHz;	59.0dB

Blocking;

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

+100kHz;	75.5dB
+1MHz;	91.0dB
+10MHz;	98.5dB

Intermodulation Rejection;

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

25/50kHz spacing;	54.0dB
50/100kHz spacing;	64.0dB

TRANSMITTER

TX Power and Current Consumption;

Freq MHz	Power	10.8V Supply	13.8V Supply	15.6V Supply
144.500MHz	High	16.1W/2.65A	27.5W/3.50A	34.2W/4.00A
	Low	1.04W/1.00A	3.29W/1.50A	5.70W/1.95A
145.200MHz	High	15.6W/2.55A	27.0W/3.35A	32.6W/3.90A
	Low	2.06W/1.20A	5.05W/1.70A	7.96W/2.05A
145.975MHz	High	14.7W/2.45A	25.7W/3.20A	31.4W/3.70A
	Low	2.44W/1.25A	6.63W/1.85A	9.91W/2.15A

Harmonics;

2nd Harmonic;	-73dBc
3rd Harmonic;	-75dBc
4th Harmonic;	-74dBc
5th Harmonic;	-87dBc
6th Harmonic;	-82dBc
7th Harmonic;	<-90dBc
8th Harmonic;	<-90dBc
9th Harmonic;	<-90dBc

Peak Deviation;	7.16kHz
Toneburst Deviation;	3.53kHz
Carrier Frequency Accuracy;	+27Hz

Beginner's Guide to 2m DX

Paul Beastell G1WBZ details Sporadic E, Auroral, and Meteor Scatter Operation

In the February HRT I detailed Tropospheric propagation and contest and DXpedition activity, this article concludes with the more exotic forms of propagation yielding DX possibilities on 2m.

Sporadic-E

In my opinion Sporadic-E (or Es) is the most exciting mode of VHF propagation. One minute you can be tuning around a dead band and the next minute it is filled with exotic callsigns at phenomenal strengths. It is also the mode where many people work their best DX on 2m.

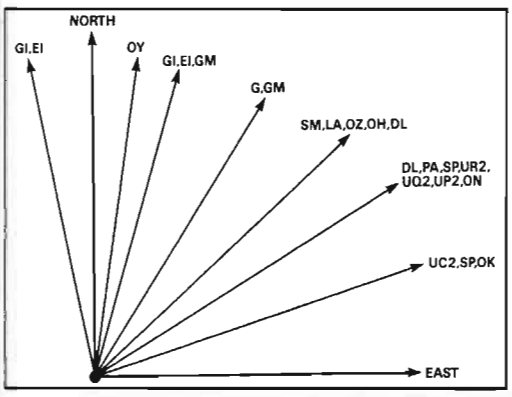
The best time for Sporadic-E appears to be between June and August with the beginning of June having a particularly good reputation.

The best time of day appears to be in the afternoon and early evening, so many people are still at work while the DX is about! While this is unfortunate for them, it means there is less of a rush to work the sought after stations for those who can get on the band.

Ionisation

In simple terms the propagation happens because of an intense ionisation of the E-layer in the ionosphere. This causes signals between about 25 and 250MHz to reflect and be scattered forwards. Whereas 28MHz can be open for Sporadic-E for several hours, even days, 144MHz often opens for only a few minutes or even only a few seconds at a time.

When monitoring for Es, Band 2 broadcast radio is a good place to choose. There are signals from all over Europe on the band and if that opens there is a chance that 2m will follow suit. Having said that, Sporadic-E is very unpredictable and the best thing to do, if you have the time, is to monitor the band for signals.



One interesting phenomenon is that as the MUF rises, the skip distance on a particular band, lower down in frequency, gets shorter. So if you hear a signal on Band 2 which comes from South-Eastern France then 2m could possibly open to Italy or Yugoslavia. You may ask how to identify where a signal is coming from, but with a little practice it is possible to identify French, German, Italian and other European languages which help you to place the stations approximately and tell you where to point your beam.

Listen Around

Once you have decided the band might open, you start to listen on 2m with your beam in the direction that you think the best. The best thing to do, if you can, is to get your rig to scan from about 144.29MHz to 144.31MHz and back again rather than sit on 144.3MHz, many modern rigs will do this. Unfortunately older rigs often used by VHF DXers such as the IC202 or FT225RD will not scan this range, even though they are high-performance sets. All the operator can do is sit on 144.3MHz and 'swish' the dial occasionally.

Having said that, even the simple FT-290R will scan this range. To do this, set the rig on 144.3. Press the 'Clar' button and then press one of the up/down scan buttons on the microphone. The rig will now scan the mentioned range and stop when you press the PTT. Unfortunately it will only tune the receiver and so if some choice DX is heard just up the band the operator has to remove the clarifier and tune the rig to that frequency, but this should only take a second or two.

In QSO

Once a DX station has been found, how does you work them? The main secret to working DX during Es and keeping other occupants on the band happy is to be as quick as possible. You should only exchange callsigns, reports and locators, nothing else. Because openings are so short, the station you are trying to work could fade out in the middle of a contact, especially if you tried to swap details of equipment, names and actual locations etc. If you are quick, it also gives more people the chance to work the DX.

A typical Sporadic-E contact is shown below. This was taken from a tape recording of the actual contact which I made in 1989, the contact taking just 17 seconds to complete.

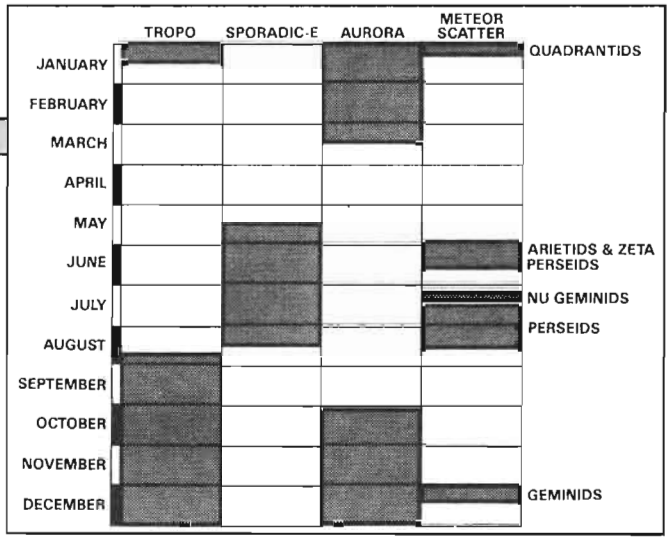
"QRZ? Italy Kilo Eight Italy Oscar Mike, QRZ?"
"Golf One Whiskey Bravo Zulu"
"Roger, Golf Three Whiskey Bravo Zulu. Fifty Nine. Juliet November Seven One Mike Whiskey."
"Roger. You're Five Nine. Italy Oscar Nine Two Italy Victor. The call's Golf One, Golf One, over"
"Yes, Golf One. Seventy Three, QRZ?"

As you can see the Italian station misheard my call sign in the initial pile-up call and so I repeated the prefix to him. It is essential to ensure that the station at the other end has your callsign, and really all the other details, correct. You should always be careful calling CQ. While you have your own cosy pile-up of Yugoslavs (often all in the same square), there could be a Greek station further up the band calling with no replies. An SV in anyone's 2m log must make it work while breaking away from a pile up occasionally and tuning around the band.

During large sporadic-E events the calling frequency is not often used. Sometimes a DX station will appear and people will work him on 144.3MHz but often people spread about up and down the band. I have heard people complain about contacts being made on 144.3MHz, but in an Es event the DX station could easily be lost during a QSY so it is generally seen as being justified to QSO with a station on whatever his calling frequency is. But having said that it is not advisable to call CQ on 144.3MHz and work your own pile up there unless you live a long way from civilisation.

Aurora

Auroras not only provide an amazing visual display when they occur, but also offer the chance to work some good DX on VHF if used properly. Signals are reflected from the auroral region with both stations beaming towards the reflecting area. Auroral signals are very distinctive, Morse signals have a very rasping note and SSB signals sound like the operator is talking in a hoarse whis-



per. This of course makes auroral signals very easy to identify.

When an auroral signal is heard, many people turn their beams due north, but this is often not the best direction. Much of the best DX will be heard with the beam towards the east and sometimes even south of east. During a good event, Scandinavia, the Baltic Republics and sometimes stations as far south as Italy and Yugoslavia can be worked.

Modes

Because of the distortion on received audio added by the aurora, Morse is undoubtedly the best mode of transmission. It is also where the best DX is usually to be found. Even so, SSB can be used and some fair DX can still be worked even if the operator is not proficient in Morse code. One thing to be wary of is that the reflected signal is often prone to Doppler Shift which causes the frequency to change. This means that a station will not be receiving on the frequency where you receive their transmissions and so RIT will usually have to be used. You can sometimes prove this Doppler Shift for yourself. If you hear a local station's auroral signal, then tune a little higher or lower and you may be able to hear their transmission direct with no distortion.

Beacons can be useful as auroral warning indicators. Three useful beacons to listen for are SK4MPI in northern Sweden on 144.96MHz, DL0PR in northern Germany on 144.91MHz and GB3LER in Shetland on 144.95MHz. These beacons provide a signal 24 hours a day and so even on an inactive band the aurora need not go unnoticed. If you hear some of the other beacons via aurora but not DL0PR, then listen for a while because it beams south for one minute in five.

Auroras often happen in 'phases' during an opening. The first phase is often between about 3pm and 7pm, the second phase between about 9pm to 11pm and a third phase from about midnight to 6am. This is a guideline but is not always true, sometimes an aurora will miss one or two of the phases but large events tend to follow the pattern more.

Operating

When you actually hear an aurora it will probably take a short while to become accustomed to the distorted sound. Once you have got used to this sound it is best to listen to a few contacts before actually transmitting yourself. This way it is easier to pick up the techniques of operating in an aurora. Most people will talk slowly using phonetics frequently whilst working an aurora. Often a pip tone will be used, this is a short tone, a bit like a tone burst, which is transmitted at the end of the over to let the other station know that the transmission is finished, this can be very useful for serious weak signal working. When a signal report is given an A will usually be added to the end to signify that it is an auroral signal. This is used on CW to replace the 'T' in RST where of course the hoarse note could not be given a T9 report.

In a large aurora, reasonable DX can be worked with low power but an output of 100W or so can be useful. Also in a large event it can sometimes be possible to decide which areas you wish to work by the beam headings. With a fairly small aerial, the beamwidth will be quite wide and so it will not be possible to be very selective as to where you want your signals heard.

Meteor Scatter

Out of the main four VHF propagation modes, meteor scatter is the most specialised, it occurs when meteors ionise the upper atmosphere whilst entering it.

Meteors arrive in large quantities at certain times of the year, these are known as meteor showers and the main ones are shown in the accompanying table.

Equipment

Operating meteor scatter involves a lot more skill than random chasing of DX on tropo. Because reflections are often less then a second in duration, high speed Morse is the normal method of transmission. The Morse is usually sent at speeds of about 200 words per minute from an electronic keyer or computer and tape recorded at the other end. The operator then slows down the tape recording to slow the Morse to a readable level, and using this method, even the shortest reflection (known as a ping) will yield relevant information.

SSB can be used for meteor scatter but unless the reflection is long enough, all that will be heard are short 'gulping' sounds. At the peak of a shower, it is perfectly possible, with care, to achieve good results using SSB meteor scatter.

Random contacts *do* occur at the peak of a shower, but most contacts are pre-planned.

People often write or telephone each other to arrange these skeds, alternatively there is a VHF net on 20m operating on 14.340MHz most of the time.

As signals are only received in short bursts, it is not possible to tell when an over is finished. Because of this, defined transmission periods are used. This means that, starting from the hour, one station transmits for possibly two and a half minutes, then the other station transmits for two and a half minutes and this is repeated until the contact is complete, the length of each period is decided when planning the contact.

Equipment requirements are a little more demanding for meteor scatter than the other modes of propagation. A transmit power of around 100W is very useful, as is a low noise receiver. Powers of as low as 10W have been used to work some of the well equipped stations but this is not the norm.

Meteor scatter activity takes place around 144.1MHz for CW and either 144.2MHz or 144.4MHz for SSB. Unless you have the equipment to decode the signals, there is little point in listening to CW meteor scatter, but SSB can prove interesting. Meteor scatter is a lot more involved than the other modes of propagation and I do not intend to go into any more depth on the subject. *Editor's Note: G4IJE will shortly be covering this in an authoritative article in HRT.*

Summary

The accompanying figure shows when the various propagation modes are most likely to occur. This is only a guideline, but it can help you decide where to leave your beam pointing at various times of the year. It also shows that late April or early May is probably the best time to service or improve the stations antenna system. With luck, nothing important should be missed at these times, but you can never tell.

Hopefully these articles will have encouraged more people to try their hand at 2m DXing. It **is** possible with low power and a simple aerial. With my 20W and nine element aerial, I have worked stations in over 100 locator squares and 27 countries. It is possible. Give it a try! I would like to thank Rex, G1LRI, for constructive criticism and proof reading the final copy.

From My Notebook

Geoff Arnold G3GSR explains how current meter shunts work

Having explored the use of test meters to measure voltage levels around a circuit, I shall, as promised, turn my attention this month to measuring current flow.

As a starting point, let's go back to our cheap 1mA, 75 ohm movement with its full scale deflection (FSD) of 75 millivolts. As it stands, this will happily measure currents of less than 1 milliamp; all you have to do is to connect it in series with the circuit under test. In other words, you break into the circuit by unsoldering or unscrewing a joint (turning off the power before you do it!) and connect the meter with the appropriate polarity, i.e. with its positive terminal joined to the more positive side of the circuit, and the negative terminal to the more negative side of the circuit.

You'll remember that when we looked at voltage measurements, we were very worried about the loading effect of the test meter and how it would upset the natural state of the circuit. For current measurements, connecting the meter in series with some part of a circuit can also upset its operation, but the effect is usually far less serious. So just what effect does the meter have?

Looking back to our summary of the meter movement's specification, there are two important figures. First the fact that its resistance is 75 ohms; this means that whatever amount of resistance there was in the branch of the circuit in which we insert the meter, it's been increased by 75 ohms. To put that in perspective, let's suppose first that the circuit branch had a resistance of 75 ohms too — what would happen? Pretty obviously, the total circuit resistance has been doubled, so the current flow would be halved (assuming that the voltage applied to the circuit remained unchanged).

But if the current originally flowing in the circuit was less than a milliamp (if not, we wouldn't be able to measure it on our 1mA meter), and the circuit resistance was only 75 ohms, the voltage applied across that branch of the circuit must have been less than 75 millivolts. Not impossible, but fairly unusual for a DC circuit!

The second important figure is the voltage dropped across the meter. I've already said that it has an FSD of 75 millivolts, which means that if enough current is flowing through the movement to make the pointer reach the end of the scale, the voltage across it is 75mV. This is, of course, directly related to the first figure, but you should remember that the resistance of the meter movement is a fixed amount, 75 ohms in our case, regardless of the circuit it's connected into whereas the voltage drop is a variable amount, dependent on the current flowing through the meter.

As a second example, let's suppose that we have a circuit with a 12V DC supply, and we want to check the current through a string of resistors in series forming a voltage divider across that supply. The resistors add up to 24,000 (or 24k) ohms, which immediately tells us that the current through the resistor chain will be 12/24,000 = 0.5mA. Now, the effect of adding the meter resistance of 75 ohms in series with 24k ohms will be virtually zero, or looked at another way, adding a voltage drop of 37.5mV (remember that the meter will be showing half-FSD because the current is 0.5mA) to the circuit is insignificant.

Extending the Range

Being able to measure currents up to one milliamp is all very well, but most circuits that we're likely to want to check in radio equipment will be passing currents far greater than that. How do we go about adapting our 1mA meter movement to cope with them?

You'll remember that last month, when we wanted to do the same sort of thing for voltage measurements, we added a multiplier resistor in series with the movement to absorb the surplus voltage. For current measurements, we go about things in a slightly different way. This time, we connect a resistor across the meter movement — in other words, in parallel with it — to shunt the excess current around it. Such resistors are called, appropriately, shunts! See Fig. 1.

For simplicity, let's suppose first that we want a meter that will measure currents up to 2 milliamps — double the previous range. We need a shunt that will take exactly the same current as the meter movement when the two are connected in parallel into the circuit under test. In Fig. 1, the circuit current ***I*** will divide into two equal parts, ***I1*** through the shunt, and ***I2*** through the meter. The voltage across the two components will be identical, so if we want them to pass the same current, the shunt must have the same resistance value as the meter movement — 75 ohms.

As seen from the outside world, looking into the terminals of the parallel combination of meter movement plus shunt resistor, the combination is a meter with the same voltage FSD, 75mV, but half the resistance, just 37.5 ohms. Just to complete the arithmetic, to produce the same voltage drop across a resistor of half the value, we need to pass twice the current. QED!

Taking things a stage further, suppose we now need a meter to measure up to 10mA FSD. I'm sure you can see that we must connect a shunt across the meter movement that will carry 9mA when there is 75mV across it, leaving just 1mA to pass through the movement itself. If the shunt must pass nine times as much current as the meter movement, it must have one-ninth of the resistance value, in other words 75/9 = 8.33 ohms. The sum is exactly the same if you look at from the point of view of 'ohms equals volts divided by amps' or in our case millivolts divided by milliamps. For a 100mA FSD, the shunt would need to pass 99mA when the meter movement passed 1mA, so its resistance value would have to be 75/99 = 0.76 ohms. And so on.

We're talking about very low resistance values for the shunts, so they're obviously rather specialised components, usually made just for the job. As current ranges rise, the resistance values become smaller and smaller, and the resistance of the connecting leads between the meter terminals and the

shunt resistor become significant. For this reason, switching circuits for selecting multi-range, high-current shunts are very specialised, and some of them make use of really clever techniques to reduce the scope for errors due to voltage drop, and to ensure that the circuit under test is not broken as the meter range switch is turned. For equipment panel-meters measuring very high currents, the shunts are usually screwed directly under the meter terminals.

Remember, I've been talking here about DC measurements. For AC current measurements, using a suitable meter movement or movement-plus-rectifier combination, you can use shunt resistors but it's more usual to use current transformers, something I don't propose to go into here.

Specifying Sensitivity

As on the voltage ranges, discussed last month, there are different ways of specifying the 'sensitivity' of a current meter. For single-range meters, it's easy to quote the current FSD and the resistance of the meter movement (or meter plus shunt if it's permanently shunted to increase the FSD). When you start talking about multimeters, or even just an ammeter with several switched ranges, life gets rather more difficult because both these figures change with changing range. So, instead, you will find the 'sensitivity' quoted in terms of full-scale voltage drop. As we've seen in the previous section, this stays the same regardless of what shunt is connected across the meter movement.

Figure 1.

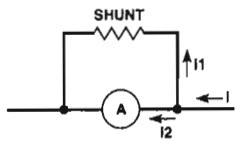


Fig 1. The circuit current I is split between the meter and the shunt according to their resistance values.

Figure 2.

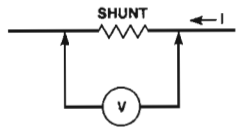


Fig 2. You can consider the shunt to be a sampling resistor, with the meter measuring the voltage drop across it.

There's a quite different way of looking at a current meter (ammeter) plus low-resistance shunt. That is to say that, in effect, you've connected a resistance (the shunt) in series with the circuit under test to sample the current flowing, and you're using a voltmeter to measure the voltage drop across that resistor (see Fig. 2). Although it's measuring voltage, the meter is still calibrated in current. Going back to our 100mA shunt with its resistance of 0.76 ohms, connecting a meter of 75 ohms internal resistance across it is going to disturb the conditions in the branch of the circuit only very little. That's exactly what we were looking for in our voltmeter circuits last month!

Incidentally, putting a small-value resistor in series with the circuit under test and measuring the voltage drop across it is exactly how electronic multimeters, regardless of whether they're digital or analogue, usually go about measuring current.

DIY Shunts

Because of the very low values required for shunts, they are usually specially made for the purpose, as mentioned previously. Most of the mail order component stockists list shunts in their catalogues, and if you're after accuracy of measurement, it's pretty well essential that you get the proper component.

In an emergency, though, when you need to make a measurement in a hurry that's outside the range of your instrument, it is quite possible to produce a makeshift shunt and calibrate it roughly. You can buy resistance wire either by the length or on reels, but this isn't always necessary. When I was in servicing and repair, I carried round in my toolbox a replacement spiral electric fire element (after all, what *is* a fire element but a length of resistance wire), and should I ever need a temporary shunt, I simply chopped off a short piece. It lasted for years - in fact I have the remains in my toolbox still!

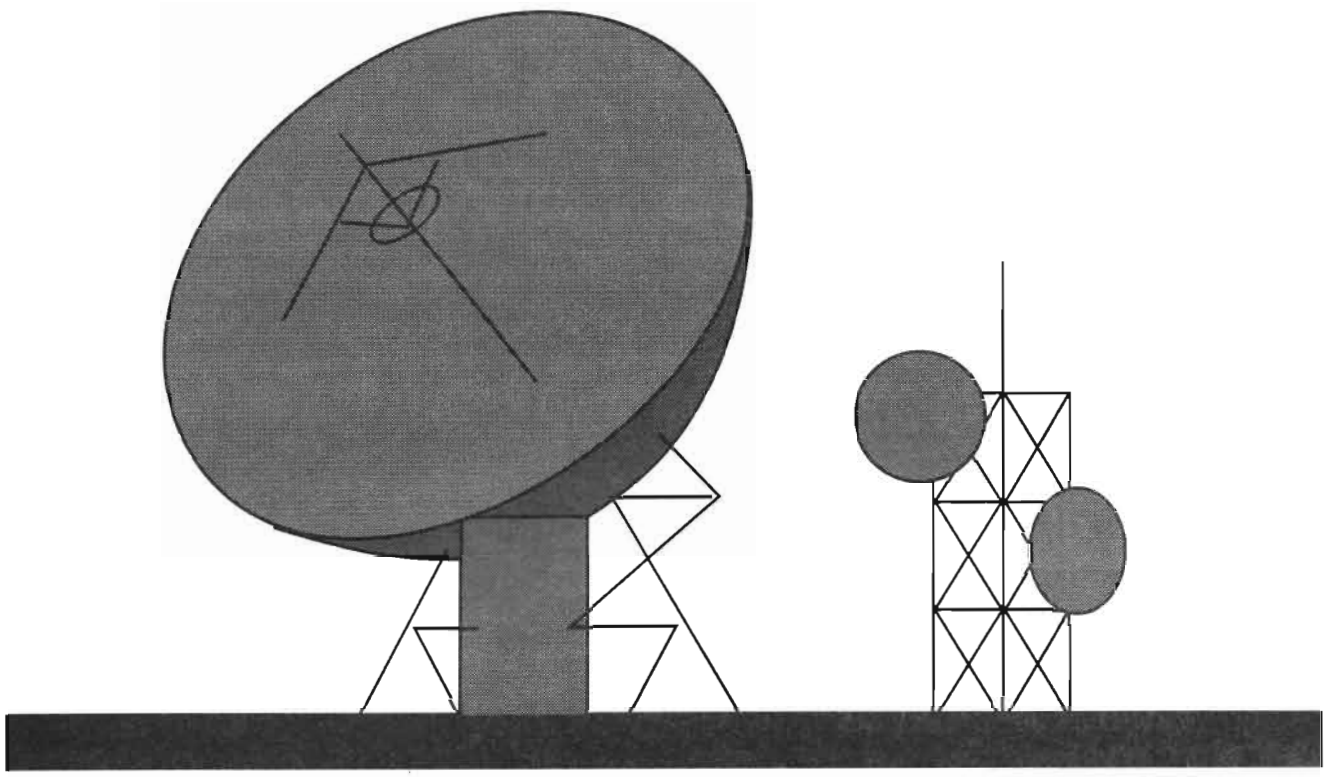
Calibration is simple if you have a means of producing a steady current flow somewhere near the upper limit of your meter. Say you have a multimeter with a maximum DC current range of 1A FSD. Connect it into a circuit passing (ideally) somewhere between 600mA and 1A, then connect a shunt of the resistance wire across the meter terminals. The meter reading will fall. Adjust the length of the shunt until the meter indicates half what it did previously, and you have produced a meter with double the FSD. If you can't produce a steady calibration current of more than about two-thirds FSD on the top range of your meter, you can do the job with less current, but you'll lose accuracy because you'll be down into that bottom third of the scale I mentioned last month.

There are two points to watch. First, don't take too long over the adjustment of the shunt, or when making measurements using it. Depending on the current and the gauge of wire, it will begin to heat up, and as it does so its resistance value will change, totally ruining your careful calibration! Taking the situation to the extreme, the shunt may get so hot as either to burn the meter terminals, your fingers, or surrounding equipment or furnishings. Beware the risk of fire or injury!

If you are the lucky owner of a multimeter such as an AVO, with a 10A maximum FSD, you may sometimes need to use this same trick to measure the current taken by a high-power mobile rig fed from a 12V supply. You'll immediately find a snag, which is that the distance between the meter terminals is too great to bridge with the short length of resistance wire needed to produce a low enough value. But don't despair as there's a simple solution, which is to use a length of thin copper wire, preferably PVC insulated to prevent short circuits. A length of around 600mm-1m of thin stranded wire such as 7/0.2mm connected across the meter terminals will increase the 10A range to 20A FSD. Use the same calibration procedure as outlined above, stripping and shortening the wire until the meter indication falls by 50 per cent when passing a test current of 6 to 10 amps.

Remember not to take too long about the calibration process or the subsequent measurements, You are, after all, going to be passing anything up to 10A through a length of wire that is rated to carry only 1.4A!

SCANNERS INTERNATIONAL



Bugs on the Air

The latest scandal to hit the UK has been the realisation of the very wide availability of eavesdropping bugs. These can be purchased ready-built for just a few pounds and in some countries they're classed as restricted radiation devices and as such are quite legal to use, albeit only for legitimate purposes such as baby listeners, wireless microphones and the like.

The recent discovery of a bug planted in an private meeting office of a local election candidate brought this well and truly home; out came hand-held scanners all over the country to check for the presence of other devices! One national newspaper even ran an advertisement for a £19.95 scanning receiver claiming to have a special band for bug detection, together with the other 98 bands it claimed to have!

One day, people may realise the airwaves aren't private, and that people can and do listen in. In some countries s ..... .rs covering certain bands are illegal. It's then only criminals who use them - the very people who you may rather not see equipped in this way! We wait in expectation to see what the "Something going through the Home Office" in the UK, as detailed in last month's issue, will be, maybe then we'll be legally allowed to listen to certain non-secure services such as aircraft, like we all do right now in any case. Maybe instead they'll say secure services should be encouraged to scramble their transmissions? Already the FCC (the USA radio regulatory department) has launched a formal enquiry into the feasibility of banning scanners capable of tuning to police, fire, and emergency medical services or whether other moves would be better justified.

Will certain bands be excluded on legal-to-use scanners in the UK, as they are in some countries? Of course, modification books are openly on sale in these countries, showing how to modify your scanner back to normal wide-coverage. No doubt further restrictions will promote more book sales! We wait in anticipation.

The WideBand Wastepipe

An easy-to-build wideband scanner aerial. Construction by Bill Wilson.

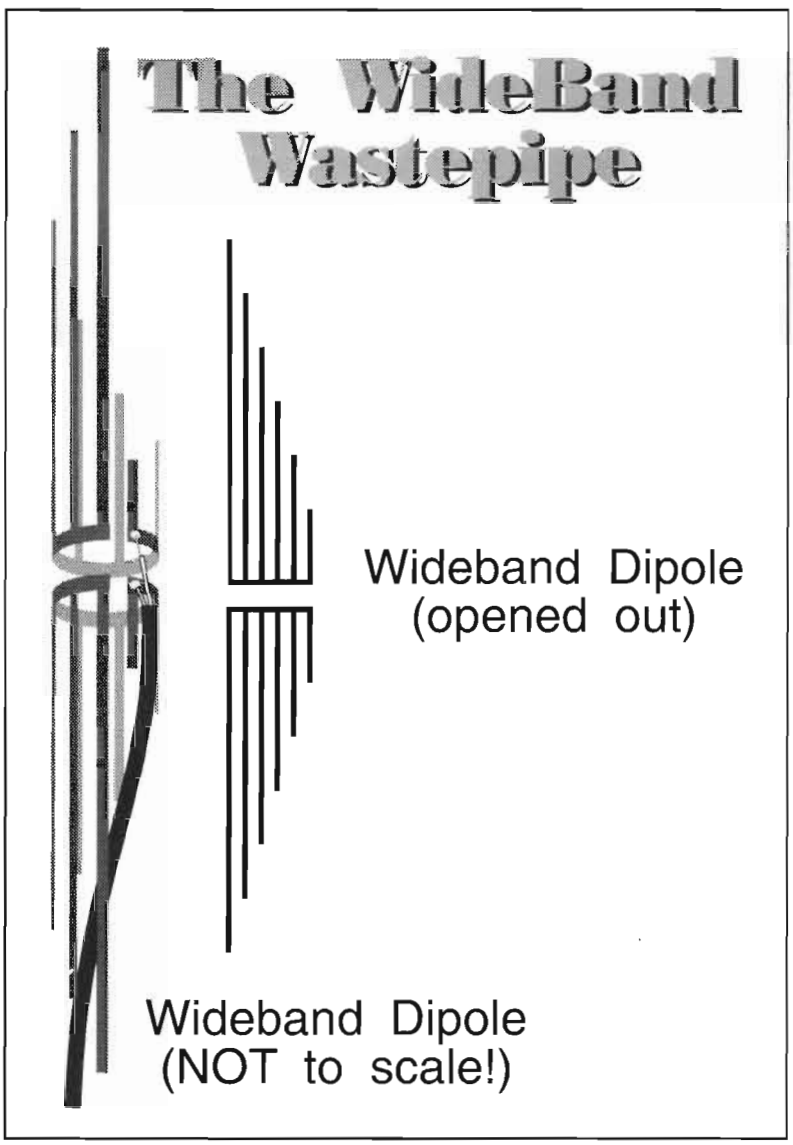
The appearance of a commercial nest of dipoles a few years ago inspired me to try a poor man's' version; after all I do live in Aberdeen! Ingredients? Just a length of plastic wastepipe which is available from your local plumbing store together with some self-adhesive metal foil tape.

This wastepipe is usually sold in 2m lengths, 38mm diameter (or 32mm diameter - see later). My first prototype was made up from the self-adhesive aluminium foil used in burglar alarm systems, but this was rather messy as it required the use of aluminium solder to bond everything together.

Breakthrough

The major breakthrough came when visiting my local radio dealer; as well as stocking radio components and books, this shop catered for the amateur stained glass worker and terrarium builder. Among these rather specialised materials were 36m rolls of self-adhesive copper foil in widths from around 3mm to over 6m. A couple of rolls were immediately purchased and a method visualised for the construction of an indoor wideband dipole. I deliberately avoid saying designed as I'd rather pre-empt any attack from electronic engineers who might tell me that the whole thing won't work! Dipoles in parallel have been used for some considerable time for HF, where several dipoles of differing lengths are parallelled at the feed point. The elements, which are cut to different operating frequencies, then diverge so that any interaction is minimised.

The method used in this VHF/UHF aerial is shown in the accompanying diagram. The dipole elements are cut to length to suit the bands of interest, the feed ends of each group joined together at the feed point and fed at the shortest element join with coaxial cable. This aerial will tend to peak at the resonant frequencies of the elements so that, although its response is not so flat as that of a discone, it should give better performance on the selected bands. There is a very useful chart in Peter Rouse's Scanners published by Argus Books (0442 66551) which gives element lengths for all likely frequencies.



Construction

First drill a hole half way along its length, to accept the thickness of your chosen coax cable. Stick down a length of foil from end to end of the tube and just touching the central hole, which will be the longest element and will consequently determine the lowest frequency for which you will have a half wave dipole. At the other side of the hole, stick down a short length of strip to correspond to the highest frequency you need to cover. Between these two strips assemble the other elements in order of length, up to six or so, evenly spaced out. It is best to have the elements rather too long at this stage; they can easily be trimmed later.

Then tightly apply two strips going round the circumference, either side of the centre hole, about 5mm to 6mm apart. This should provide a reasonable match to 50 ohm coaxial cable.

Now cut the sections of tape between the two loops with a sharp craft knife and remove, together with the two pieces between the longest and shortest elements (see accompanying diagram for clarification). Now prepare one end of the coax and solder to the tape at the shortest elements. Feed the free end into the hole and gently pull it out at the bottom of the tube, then clip it or otherwise secure firmly inside the bottom edge of the tube.

Terminate the cable in a plug to suit your scanner, and finally bond all overlaps in the tapes with a spot of solder to ensure reliable RF connections. Remember that the elements can be easily be shortened or lengthened at a later date so one doesn't have to be too exact at the beginning.

Outdoor version

That's all there is to it and if you find the performance as acceptable as I did, why not indulge in an outdoor version which can be mounted on a chimney or some other vantage point? Positioned among television aerials it can blend in nicely. For outdoor survival however, the construction is arranged somewhat differently.

Firstly assemble the elements on a 32mm

pipe together with the required length of cable. When soldering the joints, take care not to have large blobs of solder, otherwise the next stage of assembly will be difficult. Having checked the whole device carefully, insert it into a length of 38mm pipe. Cap the outer tube with one of the fittings available for just this purpose, using a suitable sealant to achieve a waterproof joint. You can use a couple of stainless steel or nylon screws at the bottom to secure the inner pipe but don't be tempted to seal the bottom opening, which would just encourage condensation. It would however be useful to cover the opening with a fine mesh to prevent the aerial being used as a safe retreat by various forms of insect life. There are various fixing devices available for the wastepipe so fixing the whole assembly in position should not be too much of a problem.

In some cases the RF properties of the material used in the manufacture of these plastic pipes may be fairly glossy but in this application there is likely to be little or no apparent effect. Ed's note - a fibreglass tube would be suitable for the perfectionists amongst us or those building one for transmitting applications.

The wideband wastepipe is cheap, easy and quick to build, certainly performs well, and once constructed you'll be able to say that your scanner has a custom built, made-to-measure aerial.

Coming up

Planned for next month's Scanners International is a matching simple-to-build broadband amplifier to transform this project or indeed any wideband receive aerial such as a discone into an amplified type. This may prove useful in weak signal areas or for when long coax feeder runs are involved.

Scanning USA

Peter Rouse GU1DKD reports on the latest in the North American scanning scene

Scanners under computer control died a death in Britain, but that's the name of the game in the USA where a variety of interfaces and software are now available.

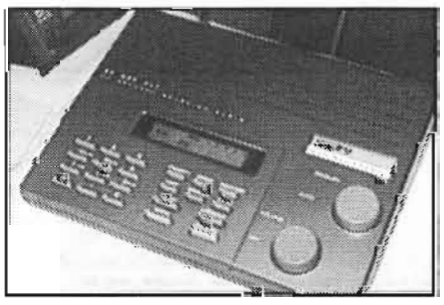
In the UK, interfaces and software have come and gone for the AORs, Yaesus and Icoms, but why? I think two reasons predominate. Non-existent controls over computer generated hash on UK computers, and the relatively high cost of computers compared with the USA where enthusiasts can afford to dedicate a PC to a single task such as controlling a radio. In the UK, machines such as the BBC Model B and Sinclair models were virtually mini-transmitters spewing out squeaks and squawks all over the radio spectrum. It's been the classic case of cost shaving by company accountants and appalling sluggishness on the part of legislators to force manufacturers to cut down the pollution.

In North America it's a very different situation, with the FCC laying down strict rules on hash suppression. As such, radio amateurs and scanner enthusiasts can attach a computer to an HF receiver or scanner without the radio locking up every few kHz. Hence computer control and logging has caught on big, and good scanners can be turned into incredible scanners. The latest development has been to offer suites of frequency lists to work with the control software, this means you need not to go and buy frequency listings nor enter them into the scanner - the software will load whatever you want.

A variation on the scanner/computer control theme is a plug-in IBM/PC card which converts the computer into a 10Hz to 2400MHz digital frequency meter. The interface and software can also be used to control an Icom IC-R7000. The card and software are available from Optoelectronics (all addresses given at the end of this article).

One of the most impressive systems comes from Data Communications International who can supply interfaces and software for virtually any current Icom, Yaesu, Kenwood or JRC model. They can supply 16 add-on frequency files ranging from TV channels to weather and press FAX frequencies. These files show mode, callsign, description, schedules and even helpful comments. If you just want better control and more memory channels (i.e. 3000) for your IC-R7000 or IC-R71 then Systems and Software International are now offering a set-up for the IBM or Apple Macintosh. Similar facilities are offered for the IBM-PC only from Datametrics and their interface and software also provide a spectrum analyser facility. Yet another system is available from Delta Research for the IBM-PC.

The new Bearcat/Uniden 855XLT desk top scanner



New scanners

Tandy (Radio Shack in the USA) and Uniden/Bearcat still dominate the scene, and at the Tropical Hamboree in Florida in February both had their latest models on display. Tandy's PRO-2006 is already here in the UK (this was reviewed in last month's Scanners International) and with its 400 channels scanned in just 16 seconds it seems to be selling well on both sides on the Atlantic.

The Bearcat Radio Club had two new models on display; the general purpose 855XLT desk-top and an interesting professional unit designated the MR-8100. This is a robust panel-mounting unit with a large display and chunky control knobs. It's intended for use in emergency vehicles and the like, and covers 29-956MHz with some gaps (one being the 54-88MHz segment which is used extensively in the UK). It has 1000 channels in 10 banks of 100 and information labels can be stored together with the frequency. It can scan at up to 93 channels per second but would be of limited use in the UK market because AM/FM is not selectable.

The Bearcat Radio Club is based in Ohio and accepts membership from overseas (address at the end). The membership fees vary from $17.50 to $29.90 depending on the level of service you want, typical benefits include six newsletters a year, frequency lists and a technical advisory service which has access back to the manufacturer.

Bargain of the year

AOR Scanners are marketed on a mail order basis in the USA and sold by Ace Communications. They, together with AOR (UK) on this side of the Atlantic, are now promoting the latest model, the AR2500, covering 500kHz-1500MHz with no gaps and modes of AM, WFM, NFM, and SSB/CW with the built-in BFO, which can be programmed alongside the frequency. It has 1,984 memory channels arranged into 62 banks and scans at 38 channels per second. The receiver is quadruple conversion with a first IF of 750MHz and the quoted sensi-

tivity is excellent; there's also an RS-232 port thrown in for good measure (look for the forthcoming review in Scanners International - Ed). The cost in the USA was an amazing $499, at which price I believe the sales must be damaging AOR's other model the AR3000, although the AR3000 offers substantially better technical performance.

Other bargain buys on the American scanner scene are the simple 10 channel VHF/UHF FM-only base/mobile units which sell at low cost. Although they'd have limited use in the UK they'd still be ideal as a simple monitor for amateur 2m or marine band monitoring (watch out for the forthcoming Realistic Patrolman review in Scanners International - Ed).

The cellular scene

The boom in cellular communications in the UK brought a parallel boom in sales of scanners capable of covering the 900MHz bands. Many UK enthusiasts re-equipped to cover the cellular frequencies and exactly the same has happened in the USA. During my latest visit, Bell South Mobility completed their cell coverage from Miami to Key West and Radio Shack dealers in the Florida Keys were reporting increased sales of equipment that could cover the bands. In the USA, cellular phones operate between 825-851MHz and 870-896MHz and this explains why some scanners such as the Standard AX-700 do not tune above 905MHz.

Contacts

Most US firms seem quite happy to mail order overseas addresses, so here's the contact information;
Bearcat Radio Club, PO Box 291918, Kettering, OH 45429
Data Communications International, 7678 Venetian St, Miramar, FL 33023.
Datametrics Inc., 2575 South Bayshore Drive, Suite 8A, Coconut Grove, FL 33133
Delta Research, PO Box 13677, Wauwatosa, WI 53213
Optoelectronics, 5821 NE 14th Avenue, Fort Lauderdale, FL 33334
Systems and Software International, 4639 Timber Ridge Drive, Dumfries, VA 22026.

SCANNERS Free Readers Advertisements

FOR SALE

JIL SX400 scanner, 26-520MHz no gaps, boxed as new, complete with Revco discone, cable, may part-exchange for basic hand-held scanner, £350 (Chorley). Tel. 0257 792451

Sony Air-7, mint condition, £120 (Bristol). Tel. 0272 845351, ask for John.

Uniden 2830, mint condition, 26MHz to 29.99MHz, £260 (Wolverhampton). Tel. 0902 735832

Yaesu FT-980 computer-aided transceiver, frequency range 160m-10m bands, good condition, £750 or part-exchange for Yaesu FT-102 with cash adjustment (Chesterfield). Tel. 0246 825154

FDK RX40 hand-held VHF digital receiver, 144-146MHZ, marine, amateur, public service etc., nicads and charger, instructions, £85 or would exchange WHY? (Herne Bay). Tel. 0227 740093

Dressler Active Antenna, 50MHz-900MHz, site problems bad location, very low mileage. Bought for £139, will take half price, boxed (Burton-on-Trent). Tel. 0283 713727

Realistic PRO-2006 Hyperscanner, 400 memories, 25-520MHz, 720-1300MHz, AM/FMW/FMN, mint, £275, could possibly deliver (London). Tel. 081 579 7038

EXCHANGE

Alinco DJ120E 2m TX/RX, mint, case, car lead etc., for Bearcat 200XLT or AR1000, must be mint, cash adjustment (Grantham). Tel. Ray, 0476 66047

WANTED

Bearcat UBC50/55 10 channel scanner, must be cheap (Weymouth). Tel. 0305 834224

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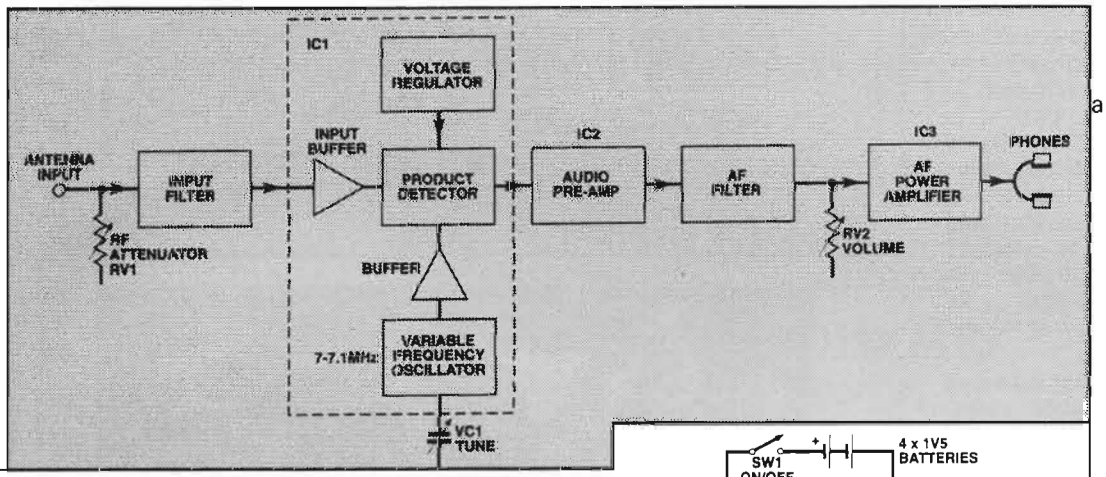
Portable Direct Conversion Receiver for 7MHz

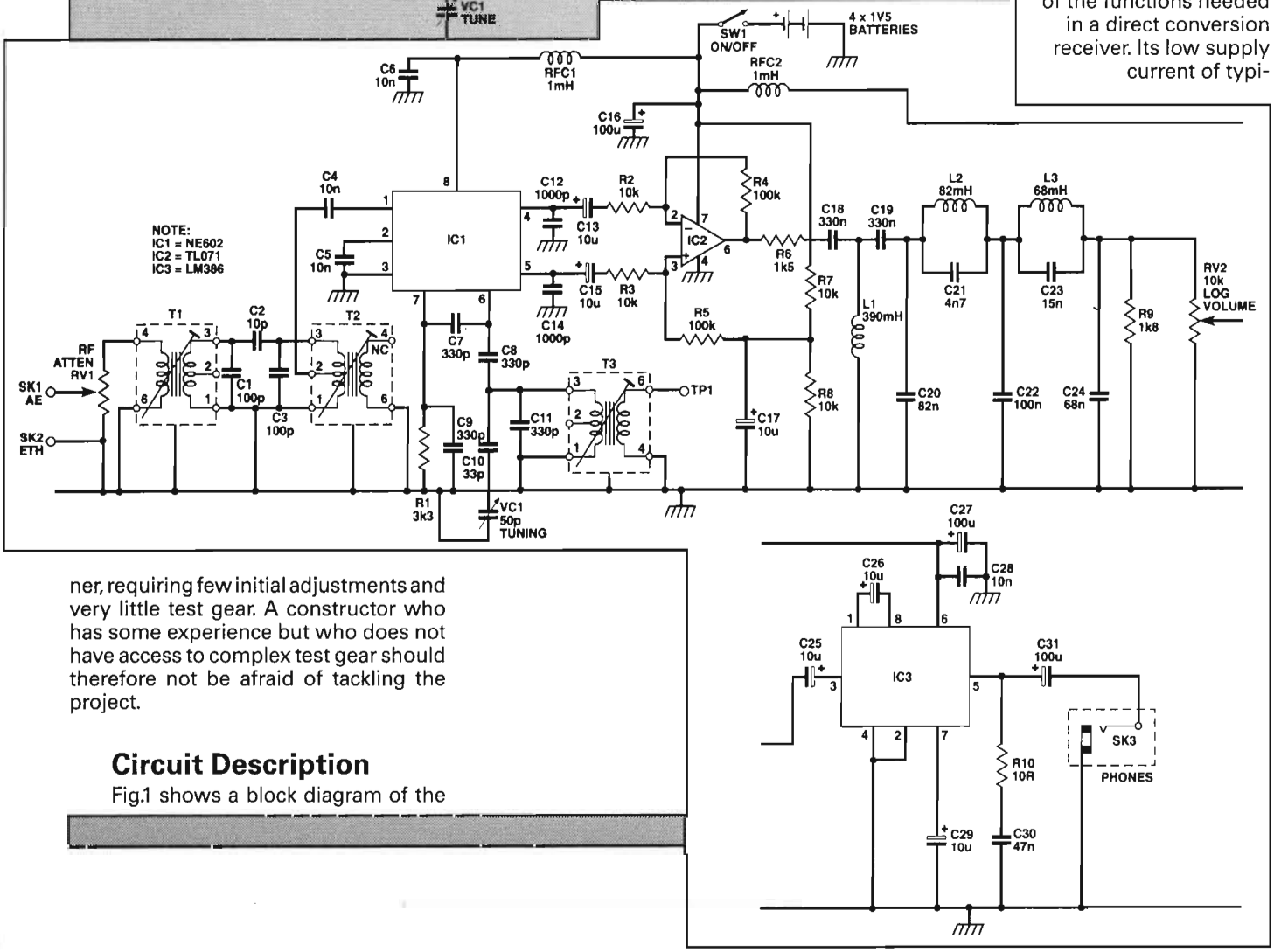
Stef Niewiadomski shows how to build a handy 40m receiver

This article describes the construction of a compact battery-powered receiver for the 7MHz (40m) amateur band. The use of a single printed circuit board and pre-wound inductors make construction of the project, alignment and fault finding very easy. The project is ideal for a beginner, requiring few initial adjustments and very little test gear. A constructor who has some experience but who does not have access to complex test gear should therefore not be afraid of tackling the project.

Circuit Description

Fig.1 shows a block diagram of the receiver and Fig.2 is the detailed circuit diagram. The aerial input is fed via the 'RF Atten' control RV1, to the input filter network of T1, T2 and associated capacitors. RV1 helps to eliminate problems caused by high power commercial broadcast stations which tend to cause breakthrough in 7MHz receivers, especially at night. Pins 1 and 2 of IC1 can be used as balanced inputs, but in this application a single-ended input on pin 1 is used. The NE602 is a versatile evice, containing a double balanced mixer with input amplifier, on-board oscillator capable of running at up to 200MHz, and a voltage regulator. This complexity means that it fulfils three quarters of the functions needed in a direct conversion receiver. Its low supply current of typi-





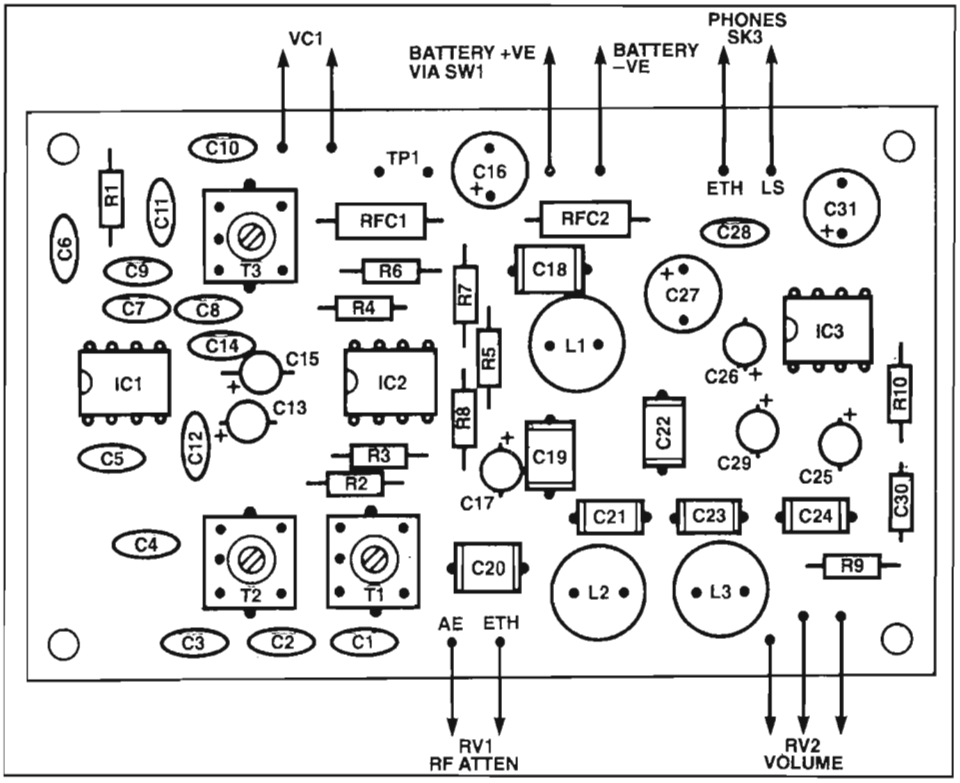
cally 2.4mA also makes it ideal for battery operation.

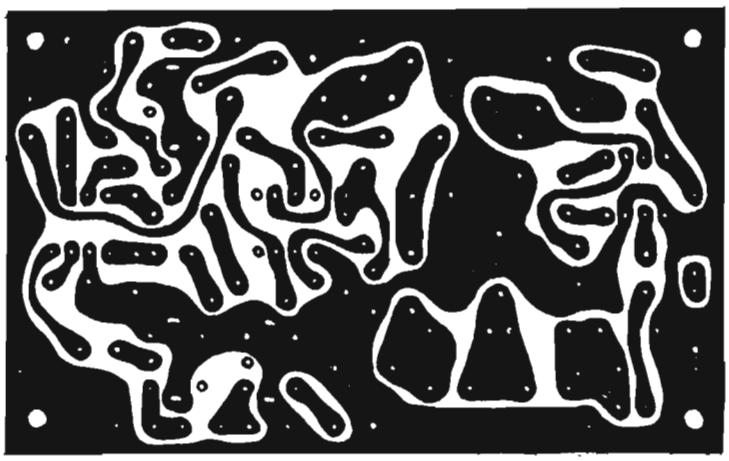
Pins 4 and 5 of IC1 are the product detector balanced outputs which drive the inputs of a low noise op-amp, IC2. A TL071 is recommended for this position as it combines low noise, low power consumption and low cost. The ratio of R2 to R4 sets the gain of this audio pre-amp to 10. Capacitors C12 and C14 filter the RF products from the product detector outputs, preventing them from reaching the audio stages.

The output of IC2 drives a 300Hz third-order Butterworth high pass filter (formed by C18, C19 and L1) cascaded with a fifth-order 3kHz elliptic low pass filter (formed by C20-C24, L2 and L3). The low pass section achieves 60dB of attenuation at 5kHz and maintains at least this level of attenuation to well outside the audio band. The high pass section provides 47dB of attenuation at 50Hz and 29dB at 100Hz, helping to eliminate a common problem found with direct conversion receivers, mains hum. The components used to construct the filter are entirely off-the- shelf and require no winding, tuning or selection. Correct source and termination impedances are provided for the filter by R6 and the parallel combination of R9 and VR2.

The wiper of the volume control RV2, is connected to the audio power amplifier IC3, a LM386. This IC produces less output noise than the popular LM380, and is housed in a more compact 8 pin DIL package. A standard output stabilising Zobel network is fitted, consisting of R10 and C30. IC3 drives the phones socket SK3 via C31. With the 6V supply voltage from the batteries there is inadequate output power to drive a speaker at reasonable volume.

The prototype receiver was powered from 4 AA size alkaline batteries. If long periods of portable operation are anticipated, saving in battery costs will be made by using nicad rechargeable batteries. Because a single nicad cell produces about 1.2V, as opposed to 1.5V from an alkaline cell, five AA size nicad cells will be needed to produce the 6V for the receiver. It would also be handy to fit a recharging socket on the rear panel so that the batteries do not have to be removed to be recharged. If a 12V version of the receiver is built (see later), the available power is considerably greater and a speaker can be incorporated into the receiver.





Construction

With the exception of the front panel controls, sockets SK1-3, switch SW1 and the battery holder, all the components are mounted on a single-sided printed circuit board. The PCB track pattern and component placement drawing for the board is shown in Fig.4.

A ready-etched board will be made available by firms providing this service (i.e. HRT retail network advertisers Badger Boards) but the board is easy and cheap to make at home. The first stage is to either photocopy the pattern shown in the tracking diagram or trace the hole positions onto a piece of transparent or translucent paper. If the photocopy method is used, make sure the original dimensions are maintained on the copy, as photocopiers may sometimes produce distorted copies.

Cut a piece of single-sided copper-clad board to the correct size and stick the photocopy or tracing onto the board. Mark the position of each hole (including the 3mm fixing holes) onto the board with a centre punch and hammer. Then remove the paper, and drill and de-burr the fixing holes. Clean the board with a liquid abrasive cleaner such as Jif, then thoroughly rinse and dry it.

The track pattern can now be carefully drawn on to the board with an etch resist or Dalo pen, using the hole marks as a guide to the track positions. When all the tracks have been drawn, allow the ink to dry for at least 15 minutes. Insert a piece of insulated wire through two of the fixing holes and immerse the board track side up in a bath of ferric chloride solution (this solution is **very** corrosive so keep it away from your skin and metal surfaces such as kitchen sinks). Agitate the solution by moving the board around the bath using the wire until etching is complete.

Remove the board from the solution, rinse it, and clean off the resist ink with a suitable solvent. Drill the remaining holes with a 1mm drill, and open out

the holes for the transformer lugs to 1.5mm. The board is now ready to have components mounted on it.

Mounting the components on the board should be done methodically, starting at one corner and working towards the opposite corner mounting each component as it occurs. In my opinion, this is to be preferred to mounting say all the resistors first, then all the capacitors and so on, as it tends to result in less errors. Sockets were used for all the ICs on the prototype without any instability problems arising. Fault- finding is much easier if an IC can be substituted without unsoldering.

When the board is complete it should be checked carefully for assembly faults. Check the orientation of the polarity sensitive components, including polarised capacitors and ICs. Ensure also that no solder splashes or bridges, especially between adjacent IC pins, exist.

On the prototype receiver, 1mm pins were used for the connections to and from the PCB.

slight dimensional modifications.

Fig. 8 shows details of the bracket which is used to mount VC1, the tuning control. The PCB is mounted on a deck consisting of an aluminium sheet screwed to the rear of the case. This allows a side-by-side battery holder to be positioned below the deck, allowing a compact layout inside the case. Mechanical details of this deck are shown in Fig. 9.

The slow motion drive and dial

The slow-motion drive arrangement for the receiver tuning can be seen in Fig. 5. Because the tuning range of the receiver is only 100kHz, a single 6:1 reduction drive is adequate and no fine-tune control is needed. The drive used has a flnge which turns at the same rate as the moving vanes of VC1, a 20mm diameter cut-out in the front panel allows the flange to protrude through the panel. The tuning dial consists of a

nents and so on. When the current looks reasonable, the alignment procedure can begin.

The first step is to check that the VFO is oscillating and to set the VFO coverage. Attaching a frequency meter probe to TP1, or dangling a length of wire connected to the aerial input of a digital read-out receiver near to IC1 should give an indication that the oscillator is running. Set VC1 to be fully meshed and using the correct type of trimmer tool (not a screwdriver which will probably result in a broken core) adjust the core of T3 to give a frequency just below 7.0MHz. Then open the vanes of VC1 and the frequency should rise to beyond 7.1MHz. This procedure can be repeated until approximately the same overlap is obtained at each end of the tuning range. On the prototype receiver, the overlap was reduced by removing a couple of vanes from VC1.

All being well, it should be possible to hear signals on the receiver when an aerial is connected. The RF tuned circuits

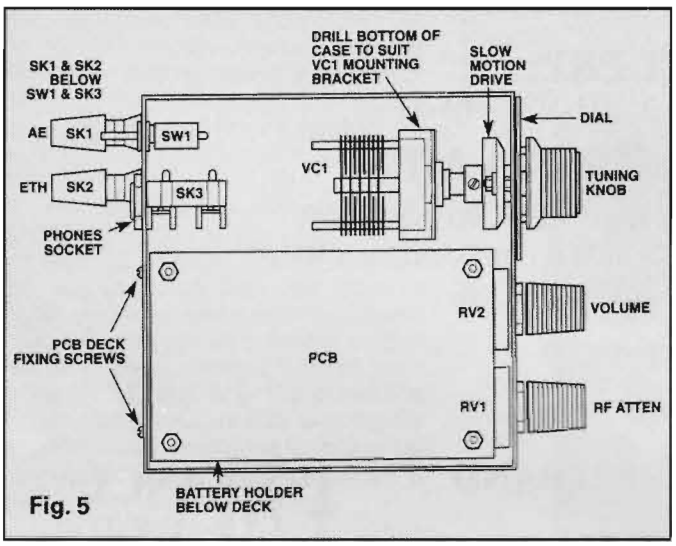


Fig. 5

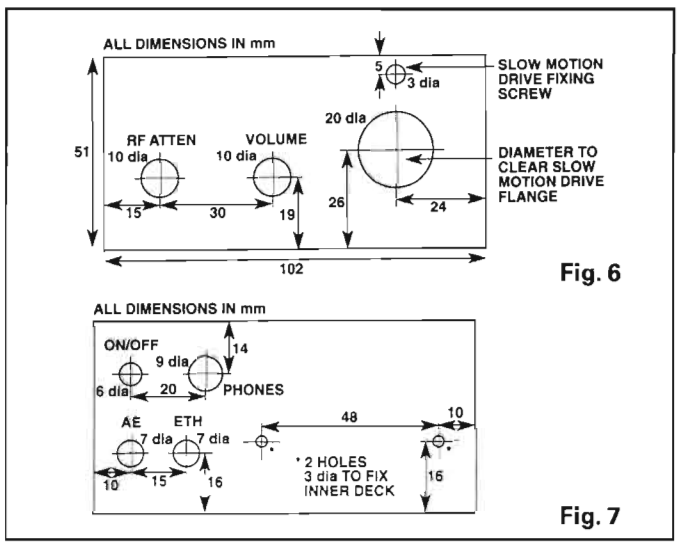


Fig. 6

Fig. 7

Mechanical Construction

A ready made case can usefully be used to house the receiver, greatly simplifying the metal working required. The Minffordd A32 case consists of an aluminium chassis with a wrap- around aluminium lid. A general idea of the placement of the major components in the receiver can be gained from Fig.5.

Drilling and cutting details for the front and rear panels of the chassis are given in Figs. 6 and 7. RV1 and RV2 are mounted on the front panel, along with the slow motion drive for VC1. SW1 and SK1-3 are mounted on the rear panel. It is best to obtain all the components which have to be mounted on the chassis before starting work because their physical details might differ from those used on the prototype, necessitating

disc fixed to the flange using two 8BA screws, details of this disc are shown in Fig 10. For the prototype, PCB material was used for the dial, although other materials are suitable for this. Any rigid sheet material, such as aluminium or brass can be used.

Testing and alignment

Being a single band receiver, constructed on a single PCB, testing and alignment is relatively simple. When carrying out initial tests, it is useful to monitor the supply current of the receiver, this is always a good indication of whether things are drastically wrong. If a milliamp meter is available, insert it into one of the battery leads, when power is applied the current should be about 10mA. If it is much more than this, turn off quickly and look for solder splashes, wrong compo-

can be aligned by adjusting the cores of T1 and T2, either using a signal generator at about mid-band, or by peaking them on received signals. Several adjustments will need to be made as their settings tend to interact.

When the correct VFO coverage has been obtained, and the receiver is opera-

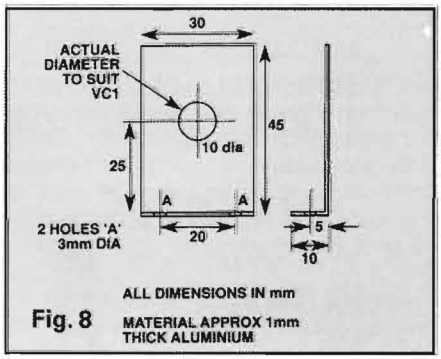


Fig. 8

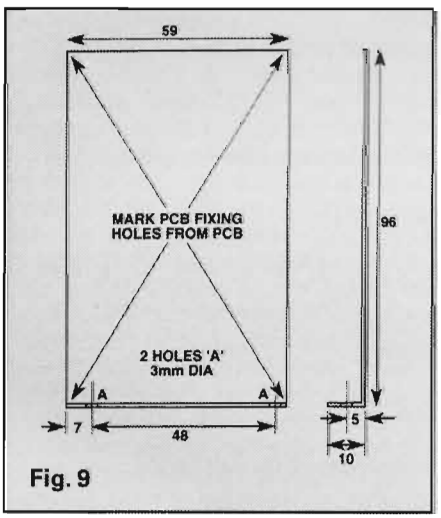


Fig. 9

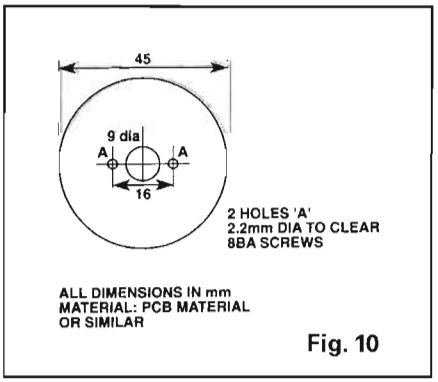


Fig. 10

ting correctly, the dial can be calibrated. The prototype was calibrated at 10kHz intervals, this being the finest that could be achieved on the relatively small dial. If a larger dial is used, 5kHz calibration marks should be achievable.

Finishing off

A pleasing final appearance for the receiver can be obtained by using self-adhesive plastic material such as 'Contact'. This is applied to the smooth and clean front and rear panels, and is much more straightforward than painting. Rub-on lettering can be used to label the controls and sockets and a layer of clear 'Contact' carefully applied over the top of the lettering to protect it from scratches. The dial can be finished off neatly by applying 'Contact' to its front surface, having first drawn round it and marked the calibration points onto a sheet of paper. Then transfer the calibration marks from the paper back onto the dial. Lettering is then applied showing the tuned frequency and finally a transparent layer applied over the top to protect the lettering. On the prototype, the lid was painted using a spray can of car touch-up paint. Alternatively, 'Contact' can be used again.

Stick-on plastic feet are then fitted to the bottom of the case to prevent scratching of any surface on which the receiver is stood.

Using the receiver

The receiver is very simple to use. Connect an aerial (and earth if possible), set the *RF Gain* and *Volume* to about one quarter clockwise rotation, plug in the headphones and switch on. As signals are resolved, the *Volume* control will need adjusting for a comfortable listening level and the *RF Atten* control setting to prevent any overloading or breakthrough of broadcast stations. The tuning rate is slow enough to make tuning of SSB signals easy without need for a fine tune control. Stability of the VFO is surprisingly good, the prototype receiver achieved good stability from 'cold' without any special capacitors being tried for the VFO components. Experimenters might wish to try different types for the VFO capacitors to improve stability even further.

Using higher supply voltages

As designed, the receiver is only suitable for use with supply voltages below 8V. This is the maximum supply voltage to IC1. Modification for use from higher voltages, for example from a 12V

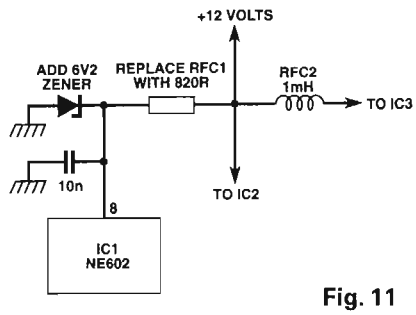


Fig. 11

mains derived supply is fairly simple. Fig. 11 show the modifications required. RFC1 needs to be replaced by a 820 ohm resistor, and a 6.2V Zener diode must be added from the supply pin (pin 8) of IC1 to ground. This is probably best positioned on the track side of the PCB. The supply to IC2 and IC3 do not need to be modified, as these devices will operate quite happily from 12V. With this higher supply voltage, more audio output power will be available from IC3.

The 7MHz band

The band plan for 7MHz recommends CW operation below 7.04MHz and CW and phone above 7.04MHz. Some frequencies of interest include; 7.03MHz QRP (low power) CW, 7.07MHz QRP SSB within the UK and 7.09MHz QRP SSB international.

During the daytime, the band tends to be populated mainly by local stations (Gs and Fs in the UK) 'ragchewing' and numerous nets will be found. The 7MHz band is capable of supporting inter- continental working, this is due to signals being reflected by the ionosphere, a layer of ionised gas above the Earth and the Earth's surface itself. Propagation depends on the time-of-day because of the effect of the sun on the ionosphere. Sunshine disturbs the ionosphere, so that signals are reflected better on the dark side of the globe, and therefore the band is open to DX mainly in the evening and at night. Because signals are depending on reflections from the ionosphere and the Earth for propagation, a DX signal thousands of miles away may be clearly audible, but you may not be able to hear a local signal in a QSO because his signal has not returned to Earth within the distance between you and him. Seasonal variations in the ionosphere also occur, as well as long term changes due to sunspot activity.

In Conclusion

This very compact receiver will give hours of fun with its surprisingly good performance. Because of its small size and low weight, and because it is battery powered, it is ideal for taking away on trips where a simple long wire aerial can quickly be erected and your hobby indulged in.

Components List

R1	3k3
R2,3,7,8	10k
R4,5	100k
R6	1k5
R9	1k8
R10	10

All fixed resistors are 0.25W 5% carbon film type

C1,3	100p ceramic plate
C2	10p ceramic plate
C4,5,6,28	10n disc ceramic
C7,8,9,11	330p ceramic plate
C10	33p ceramic plate
C12,14	1000p ceramic plate
C13,15,17,25,26,29	10u miniature radial electrolytic
C16,27,31	100u miniature radial electrolytic
C18,19	330n polyester layer (7.5mm lead spacing)
C20	82n polyester layer (7.5mm lead spacing)
C21	4.7n polyester layer (7.5mm lead spacing)
C22	100n polyester layer (7.5mm lead spacing)
C23	15n polyester layer (7.5mm lead spacing)
C24	68n polyester layer (7.5mm lead spacing)
C30	47n polyester layer (7.5mm lead spacing)

RFC1,2	1mH axial RF choke
T1,2	Toko KANK3334R
T3	Toko KANK3335R
IC1	NE602
IC2	TL071
IC3	LM386

8 pin dual in-line sockets for IC1,2,3 if required

Printed circuit board
1mm (0.040") terminal pins

VC1	50p air-spaced tuning capacitor, Jackson C804 or similar
L1	Toko 390mH 10RBH inductor
L2	Toko 82mH 10RB inductor
L3	Toko 68mH 10RB inductor
RV1	1k linear potentiometer (RF Atten)
RV2	10k log potentiometer (volume)
SW1	Single pole toggle switch (on/off)
SK1,2	4mm insulated sockets, various colours (aerial, Earth)
SK3	mono headphones socket

Battery holder: 4 AA size, side by side

Knobs: 1 large, 2 small
Slow motion drive 6:1 reduction, 6.3mm spindle, with flange, Electrovalve type 4511F or similar

6BA	nuts and bolts
8BA	screws to fit dial to flange

PCB material for dial (see text)
Case size 102 x 102 x 51mm
Stick on feet for case
Aluminium sheet for VC1 bracket and PCB mounting deck (see text)
Connecting wire

Novice Notes;
Netting for the New Operator

Dick Pascoe G0BPS gives advice on Tuning for Results

How often have you heard people complaining they've had problems tuning between stations when chatting in a net on SSB. But think, how these problems multiply themselves for the new operator, especially those new to operating on sideband. All too often the new licensee is confronted with an all singing, all dancing rig, complete with bells, whistles, hundreds of buttons and the dreaded 'clarifier'. Some old hands may ask "What is a clarifier?". Well it's a modern term for tuning the received signal away from the transmitted signal, sometimes known as RIT (**R**eceiver **I**ncremental **T**uning).

Let's assume two stations are operating. If both are using a separate TX and RX, and both are on exactly the same frequency as each other (i.e. correctly *'netted'*) there's no problem. But all to often the two signals instead aren't *netted*. More problems occur when three or more stations try to *net* and one or more end up trying to tune between the stronger stations.

Let us look at what usually happens. G7ABC calls for his friends on 51.300MHz, and G7DEF and G7GHI answer, all agree to QSY to 51.350MHz. So all three stations are tuned, according to their bright, gleaming digital display, on 51.350MHz. But here we have a problem, as each transceiver may not be exactly on the same frequency! So the first station QSYing to the agreed frequency will call the others. All are sitting (according to their dials) on the same frequency saying to themselves, "they're all off frequency!". The second station to transmit, having used his clarifier to tune to the first station, will now be off frequency according to the first station, who will use his clarifier to bring in the second station.

Both stations are on frequency according to their displays, so we end up with two stations who are operating split-frequency. The third station trying to join the QSO will have a horrendous time trying to net between the two signals as they each talk! If only we could throw away that awful clarifier.

Zero Beat

What is 'Zero Beat?'- no it's not the time when the drummer falls asleep! Instead, this is where the receiving station is *exactly* on the same frequency as the transmitting station. So when the receiving station presses his mike, he transmits on exactly the same frequency as he receives on. Listen around on SSB on either HF or VHF/UHF and you'll understand the term!

I have several times been involved in the sequence where a group of stations on VHF have moved frequency and we've had to explain to the new licensees the way to solve problems of netting. So for the uninitiated here is my answer;

First, *forget* you have a clarifier, very important!

Second, if changing frequency with a friend, agree who will call first. The second station will then tune to the first using the main tuning dial, ignoring what the frequency read-out shows! Once the station is on frequency, i.e. the received speech sounds natural and clear, providing there are no problems with the transceiver then when the PTT is pushed the rig should transmit exactly on the same frequency as the first station, and they should have to do no re-tuning at all. The readout on the dial may not indicate exactly the agreed frequency, but so what! It should be reasonably close, or there is a problem with the rig.

Third, if moving frequency in a group it's better if it's agreed that one station should call first and all others should net onto him. This means that irrespective of the indicated frequency, if all stations tune into the main 'controller station', then all the operators will be should be able to understand each other with very little difficulty. Again, it doesn't matter if your rig shows a few Hz difference to what you think the frequency should be, as long as all stations in the net can understand each other it doesn't matter what frequency the dial says.

Split Frequency

However, one advantage of the clarifier is split frequency working, for example for DX working by calling or listening a few kHz off by prior arrangement during a 'pile-up'. Some rigs are even sold complete with two digital VFOs now which makes this even easier, some transceiver can even do cross-band 'duplex' (i.e simultaneous transmit/receive) operation. Remember it's perfectly OK to transmit in, say the 6m band and listen on 10m, even if your licence doesn't allow you to transmit on 10m. But remember the rules, during a 'split frequency ragchew' state your call-sign and both working frequencies, and remember the other stations signals must not be retransmitted if you're operating 'full duplex'.

The golden rule here is try not to use the clarifier at all until you understand exactly what it does, and then only use it rarely when you need to.

Ed's Note — this is the first in a series of a guide to understanding transceivers and operating techniques. We've already lined up articles on 'Choosing your first transceiver', 'Do you need all the knobs and buttons', 'CW procedures' and suchlike. If you feel you'd like a specific subject covered, do write and tell us! A small 'mystery prize' suitable for beginners goes to the reader whose subject we feature each time.

Clarifiers, RIT, and split-band operation are all features of modern high-performance transceivers the beginner can use.

Satellite Rendezvous

Oscar-13

The latest news on AO-13 is that because of magnetorque operations, **all** AO-13 transponders will have to be switched **off** from MA 200 through perigee to MA 035 until 24 Jun 91 even though magnetorquing will not start until 17 Jun 91. Having the transponders off will also give the hard-working satellite command team an opportunity to gauge the state of the on-board battery prior to the start of the solar eclipse in June.

In late March, AO-13 was scheduled for a reorientation (to a target of BLON=180 and BLAT=0), this coincides with the end of Mode-BS. This is because Mode-S operation whilst the Mode-B transponder was active was impractical due to interference from Mode-B users.

The new transponder schedule until 19 June 91 is expected to be:

Mode-B : MA 000 to MA 095
Mode-JL : MA 095 to MA 125
Mode-LS : MA 125 to MA 130
Mode-S : MA 130 to MA 140
Mode-BS : Discontinued
Mode-B : MA 140 to MA 256
Omnis : MA 240 to MA 030

Amsat-NA Operations Nets are normally scheduled for North American geographic coverage and time zones, but other parts of the world are often within the footprint and check-ins from everywhere are welcome. The following will be in range from UK about the time you're reading this: *02 June*, 00.45 UTC, Mode B; *09 June*, 02.00 UTC, Mode J/L; and *15 June*, 17.00 UTC, Mode B. Mode B nets are conducted on an AO-13 downlink frequency of 145.950MHz, and Mode J/L nets are held on an AO-13 downlink frequency of 435.970MHz. The Operations Nets feature guest speakers approximately every other week to provide up-to-the- minute information on topics of interest to a variety of satellite users' interests.

Oscar 10

Oscar-10's beacon and transponder signals are FMing again and the satellite is obviously not receiving sufficient solar panel illumination to support even the beacon let alone the transponder. Therefore, please don't attempt to use Oscar-10 until further notice, as soon as Oscar-10 can support transponder operations it will once again be released for general use.

The Amsat-UK Colloquium takes place next month.

Richard G3RWL of AMSAT-UK tells us the latest on what's up there

Russian Satellites

Listeners to RS-12 Mode A may have heard what seems to be an inordinate amount of CW in the passband. These are in fact the sound of navigation satellite's signals from 150MHz, getting into the amateur 2m receiver. This is the same as happened with RS10/11 and its parent, Cosmos 1861.

RS-12 will be kept in mode KT for the time being and RS-13 will stay in reserve. RS-10 will stay on in mode A until QRM occurs when the primary Navsat payload commences full time operation.

Andy MacAllister, WA5ZIB, reports success on Mode K of RS- 12; "At 1625 UTC on 24 March 91 I heard the 10m telemetry beacon of RS-12. The signal was relatively strong as usual, but the annoying 'garbage' in the passband was gone. Instead I heard SSB activity from what appeared to be shortwave amateur activity. It was. The Mode K transponder was operational. After a few short CQs using an uplink frequency of 21.237 MHz, Judd, W1PEA, came back and I had my first 'K' QSO via RS-12. My HF antennas are inverted-Vs in the attic and the power output on 15m was about 20W. The new bird is working well!"

Oscar-21

AO-21 command stations had a problem earlier this month and ran up to 10kW trying to get through to the command receivers, desensitised by 12dB, but without luck. They finally regained control, possibly by means of the GEOS ground-stations main command link. The spacecraft will later be gravity gradient stabilised by a deployable 9m boom.

Once they got it going we heard its voice, coming from the downlink frequency of 145.983MHz saying the following words: *"I'm completely operational and my circuits are functioning perfectly."* This voice mode is referred to as 'Mode 8' among the Amsat-DL and Amsat-U-Orbita groups responsible for AO-21's design and assembly; at this time I don't know how often Mode 8 will be in operation, however an operations schedule is expected soon from AMSAT-DL.

Once software was uploaded to Rudak-2, it was switched to 1200 Bit/s PSK AX.25 (like Fuji, Pacsat etc.) transmitting telemetry and short bulletins. The Robot modes and Rudak mailbox (RBBS) will be switched on later after the final check-outs, watch the Rudak beacon, UO-14, and local bulletins for further information.

Amsat-U-Orbita and Amsat-U-Sputnik tell us they send thanks to all satellite enthusiasts for sending them telemetry and Rudak- 2 data on disc, they now **don't** need any more telemetry sent to them. At present they are working on the new command programme, hoped to be ready by the time this appears.

MicroSat Software Crashes

Just when Amsat-NA thought they had a stable and robust version of the file server software running smoothly aboard AO- 16, it crashed! It seems that while AO-16 was over Western Europe and experiencing heavy usage, a critical software timer ran out. The purpose of timers in the Pacsats are to prevent any part of the software from getting stuck in an 'infinite' loop and thereby preventing the ground command stations from sending commands. This one was set to three minutes and led the PHT module to 'think' that something had 'bogged downed' the OBC and therefore it did exactly what it was programmed to do, reset the OBC so the command team then had to reload the software.

In order to prevent this sort of problem again, they have now set the timer to nine minutes and also 'patched' the software aboard LO-19 to prevent the occurrence of this problem there. In summary, as more users start showing up on the PACSATs, the BBS software will need some 'tweaking and fine tuning' from time-to- time.

In the last week, operators around the world have reported difficulties accessing Lusat. Ordinarily, connection can be established but little other traffic can be handled. The Lusat command team in Argentina are examining various possibilities including Pacsat software problems and satellite receiver problems in various hardware configurations. Lusat is transmitting a short beacon message to users alerting them of the degraded situation.

Pacsat Access

The AO-16 command team recommends that users of the AO-16 PBBS system use only uplink channel D (145.960MHz) for downloads and directory requests leaving channels A, B, and C (145.900, 145.920, and 145.940MHz) for file uploads, digi users, and bulletin requests.

A new PG.EXE was released early this month and is called PG0207.ZIP. It is on UO-14, CompuServe's Hamnet DL5, and G8LWY's telephone BBS. This version has a couple of fixes and enhancements which may help solve some of the problems people have been experiencing.

Webersat

WO-18 was reloaded early this month; the computer crashed as a result of command error two weeks before. This was the first interruption of operations on this spacecraft due to command error in its 13 months of use, and that despite extensive involvement of undergraduates and high school students in preparing and performing complex experiments.

After participating in the reload process, the Weber State University team took advantage of the event to add a few more improvements to the imaging software. After ground testing, it too was put aboard and is now running. Plans for the immediate future include night images, hopefully of the Earth, and the full moon. Camera specifications suggested that light levels would be near the lower limits of sensitivity. They recently began shooting pictures in the dark with wide iris settings to establish controls for the upcoming moon experiments and, in so doing, managed to get a picture that has what is almost certainly the crescent moon in one corner. We await further revelations.

Amsat-UK News

A date for your diaries, the Amsat-UK Colloquium held at the University of Surrey is over the long weekend of 25th-28th July, if you want to come and haven't booked yet, then get in touch with Ron G3AAJ. The G8LWY telephone BBS has a section for Amsat- UK office stuff so, if you were going to phone Ron up at midnight, don't, leave a message there instead. The phone number is 081-547 1479; multi-speed, 8 bits, 1 stop, no parity.

Following last month's information on the 'Satellite Experimenter's Handbook', they've been so popular that Amsat-UK have completely sold out! More are on the way from the ARRL, and may be in by the time this appears.

For further information about Amsat-UK contact: AMSAT-UK, c/o Ron Broadbent G3AAJ, 94 Herongate Rd, London, E12 5EQ. A large SAE gets you membership info, and SWLs/Novices/potential Novices are also very welcome.

Keplers

SAT:	OSCAR 10	UoSat 2	AO-13	UO-1	FO-20	AO21	RS-10/11	RS12/13
EPOC:	91087.13157047	91087.59505918	91065.03461838	91087.70628769	91069.51316501	91087.14616669	91087.84980366	91083.72491363
INCL:	25.8083	97.9121	56.8208	98.6784	99.0193	82.9427	82.9242	82.9293
RAAN:	153.6070	135.3744	107.0310	167.6671	70.4245	293.6967	118.2301	166.7116
ECCN:	0.6004385	0.0013772	0.7134717	0.0012203	0.0540988	0.0036275	0.0013169	0.0029654
ARGP:	228.6767	62.2623	248.7854	42.3198	165.0177	122.5402	54.1551	151.3646
MA:	61.5135	298.0072	25.7533	317.9034	196.7681	237.9267	306.0829	208.9150
MM:	2.05883150	14.66570353	2.09700788	14.29009848	12.83171893	13.74359194	13.72165370	13.73876059
DECY:	-9.1E-07	5.188E-05	-2.1E-07	1.612E-05	3.1E-07	2.89E-06	9.7E-07	2.92E-06
REVN:	3058	37763	2089	6149	5090	789	18857	654

SAT:	PACSAT	DO-17	WO-18	LO-19	Mir	NOAA 9	NOAA 10	NOAA 11
EPOC:	91087.18620936	91086.26097029	91086.44382880	91087.19266508	91088.12594994	91087.20021879	91086.97583158	91088.21240260
INCL:	98.6768	98.6766	98.6739	98.6767	51.6071	99.1731	98.5727	99.0216
RAAN:	167.4050	166.5200	166.7423	167.5436	333.5097	98.7687	113.2251	42.4460
ECCN:	0.0012088	0.0012095	0.0012699	0.0013001	0.0015537	0.0014218	0.0013806	0.0011494
ARGP:	48.9803	52.3672	51.3876	48.2439	116.0173	293.9234	160.0598	196.6004
MA:	311.2447	307.8631	308.8507	311.9890	244.2519	66.0445	200.1146	163.4793
MM:	14.29098619	14.29168280	14.29229004	14.29306365	15.64886640	14.12919510	14.24017780	14.12038892
DECY:	1.527E-05	1.581E-05	1.569E-05	1.497E-05	6.7853E-04	1.658E-05	2.033E-05	2.006E-05
REVN:	6142	6129	6132	6143	29262	32408	23499	12918

Packet Radio Roundup

TheNet Plus, beginners' books, and a new Mir space station packet crew, G4HCL reports

Rallies are a good hunting ground for ex-PMR rigs for packet.

Mir Activities

As reported in *Packet Radio Roundup*, Musa U2MIR has been very active from the Mir space station, and as I write this the next crew are getting for their period on board. Recently Sergej who operated as U5MIR back in 1989 and Anatoly the Mission Commander found time during their very busy training schedule and spent half a day with UW3AX for a training session on both voice and packet amateur operation using a duplicate station. Both Anatoly and Sergej are very enthusiastic about amateur radio, and this gives us a chance to have Mir on the air for whole of 1991.

It's planned that Anatoly and Sergej will be taking Helen Sharman to Mir in May as detailed elsewhere in HRT, and the original crew of Musa and Victor will bring her home a week later. So as well as QSOs between UK schools and GB1MIR/U, we should be able to continue our packet link-ups with the Mir space station for some time yet.

Pocketfones on Packet

For access to your local BBS or node, there's often no need to run high power of course, and many amateurs have recently taken to using handportables to 'free' their main shack rig. The ex-PMR Pye 'Pocketfone 70' range of equipments are now widely available on the surplus market, ever some brand new TX/RX boards for from have become available such as those from Anchor Surplus (a *very* helpful firm if you've ever dealt with them). The bodyworn version (the type with an external speaker-microphone) is eminently suitable for packet, so if you get one of these without the speaker/mike (these sometimes being hard to obtain) don't think it's of no use!

The TNC connections you'll need are shown in Fig. 1, i.e. Pin 1 is ground, Pin 2 is TX/RX audio, with pin 3 as PTT (ground to transmit), the diagram of the accompanying speaker/microphone is also shown for reference. Note that a common audio line is used for both TX and RX audio in the set, so connect a 560 ohm resistor in series with both the RX and TX audio lines to your TNC for this to prevent one line adversely loading the other. Remember to keep 'FULLDUP' off on your TNC unless of course you want to check your audio connections out. If instead you're using direct connections to the internal PCBs, you'll need to connect TX AF to pin 1 of the first TX AF PCB (uppermost board in the TX assembly), RX AF to pin 9 of the RX Audio Amp (uppermost board on the receiver assembly, the one with the large 47uF capacitor fitted) and TX PTT to the negative coil connection of the on- board changeover relay.

With the 'greener pastures' of 4m packet now offering a good link into the BBS/Node/Cluster network, 70.4875, 70.325 and the recently allocated 70.3125MHz packet channels may be very useful and one of the low cost three-channel 'E' band (70MHz) PF2FMB (i.e. Pocketfone 70, 2W, FM, Bodyworn) sets could prove ideal.

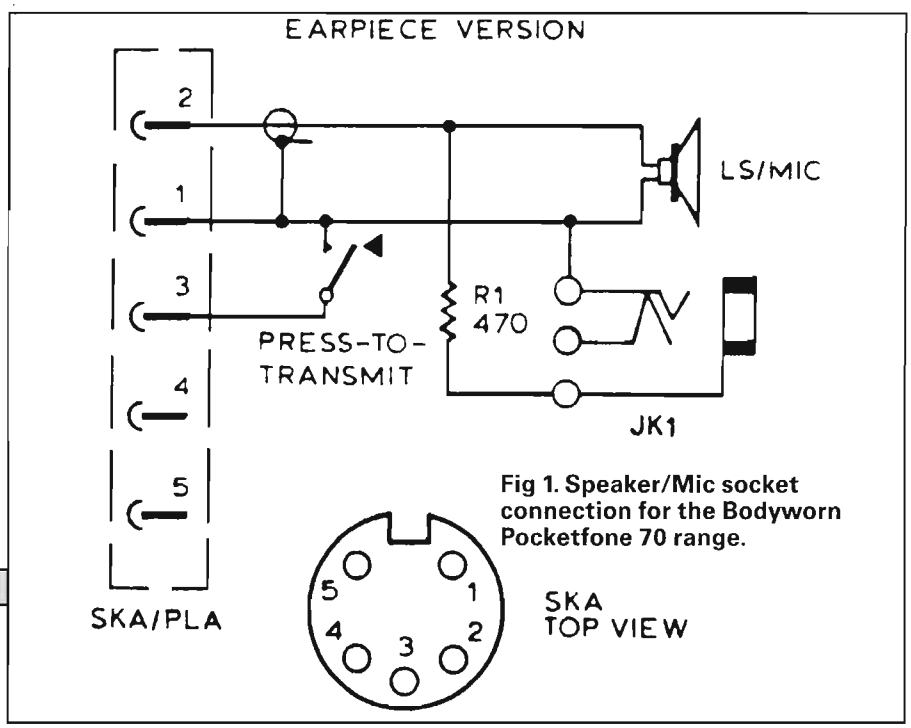


Fig 1. Speaker/Mic socket connection for the Bodyworn Pocketfone 70 range.

Novice Packet

The most common frequencies for user access on packet in the UK are on the three 2m frequencies of 144.625, 144.650 and 144.675MHz together with 432.675MHz increasingly being used. This month, we'll see the first prospective Novice licensees sitting their exam, and from the feedback we've received many would like to get into the 'network' on packet, with 70cm as their first choice. But how? — their 70cm allocation stretches from 433- 435MHz only, no 432.675MHz allowed! They can use their data-only 6m allocation from 50.620-50.760MHz, but apart from modifying ex- PMR rigs (which indeed many will do, albeit with the need to change many components) there's little low-cost gear around for this. The frequencies of 433.625, 433.650 and 433.675MHz are in the bandplan as packet radio channels, what's needed are nodes in this range, coupled to others linking the national network on 6m, 4m, 2m, 70cm and 23cm. Following the last South Coast sysops meeting I attended, we decided to place a 433.650MHz node in operation in Southampton, linked via 4m to a nearby 6m/4m/2m/70cm/23cm network node/PacketCluster system and even an automatically tracked packet satellite gateway. Packet is going to be a popular mode amongst the newcomers, the radio amateurs of tomorrow, let's help them join in lest they all just end up talking to each other and not learning very much! How about QSYing your dual port 70cm/2m KA-Node to 433.650MHz, even if this is only in 'attended' use? You may even find 433.650MHz relieving other packet frequencies of the current congestion in many areas.

New Books

With packet being the most rapidly increasing mode of operation, the newcomer is often put off by the 'technology' aspect. Handbooks which come with TNCs often give a very good, if lengthy explanation of what goes on, however what about those who build their own BSX TNCs or run Digiprom/Baycom? Questions often asked are 'what is a Network Node, KA-Node, BBS, PacketCluster, and how do I use them? The other day I came across the **'Practical Guide to Packet Operation in the UK'** by Mike G6AWD. In just under 100 A4 pages in a spiral-bound publication, Mike has attempted to collate a great deal of information on the packet scene. As well as describing the many TNC commands and their meanings, there is a large section simply devoted to reproducing typical off-air downloaded 'help file' listings and the like from BBSs and PacketClusters (saving the newcomer a great deal of time as well as reducing airtime congestion) together with typical examples of packet usage of nodes and the like. Mike says it's regularly updated, and being priced at £6.95 plus £1.50 p/p I'd certainly recommend it to both 'old hands' and newcomers alike. My thanks go to Siskin Electronics in Hythe (you can get yours from them, Tel. 0703 207155) for the provision of my copy, I'm still reading it!

Another book I came across while visiting Siskin was **'A Guide to Personal Computing'** by Don Bradbury. Although not packet radio, this offers an excellent user guide to the operation of IBM PCs and their compatibles, as used by many packet operators. Written in simple language, this is one book I couldn't put down, it explains the many things I've in the past just managed to 'muddle through'. A section in the book written by Rod Smith of the Public Domain Software Library is devoted to Public Domain and Shareware software, a topic much discussed by packet operators. Consisting of 71 A5 pages and priced at £3.95 inc p/p, I'd certainly recommend this to PC owners, available again from Siskin Electronics (thanks again Phil).

TheNet Plus

Following on from the popular German network node 'TheNet' comes 'TheNet Plus', I've just installed the latest version (2.06) in my five network nodes. For the uninitiated, this is EPROM-based software which replaces the standard user EPROM in a TNC. This converts it to a 'network node', used by Packet groups and often co-ordinated individual amateurs to provide a service to users. It's in the Public Domain, i.e. free to non-commercial users.

It is 'transparent' with other versions, however the main difference from the users' point of view is the addition of a 'Heard' facility to the available commands. Here, following your 'H' entry the node responds with a list of up to 20 callsigns heard by the node within the last 15 minutes. Note these aren't necessarily listed in the time order they were heard, and only those heard within a 15 minute 'slot' are listed. Another addition is the 'Bye' command, where you can enter 'B' to request the node to disconnect you rather than issuing a disconnect from your TNC. Also if you take a look at the 'Routes' listing, this now lists the aliases rather than callsigns of nodes it's directly heard, as most amateurs use the node alias in preference to the callsign as recognition. Entering the command 'N' followed by a space and the alias will as usual give you the callsign of the associated node.

CTRL-Z, End of Message

Pete G0JJI has been in touch to say that, through the inspiration of *Packet Radio Roundup*, he's become active on packet using a C64 computer, Digiprom cartridge, JSM modem, a b/w portable TV as a monitor and a Pye Europa feeding a homebrew aerial in his shack. He's currently thinking of investing in another ex-PMR rig to try 70cm as well. Welcome to the mode Pete, as we all know a station for Worldwide error-free packet certainly needn't be expensive!

That's it for another month, please keep your messages coming. Let's also hear what *your* local packet group is up to, either by packet, post to the HRT address, or Tel. 0703 262105. Until next month, 73 de Chris G4HCL @ GB7XJZ.

VHF/UHF Message

Ken Ellis G5KW with the latest roundup on VHF/UHF activity

The recent period of good propagation on 50MHz has provided some of the established successful operators, normally using high power, with exciting DX contacts. It is therefore my pleasure this month to report the success of a newcomer using low power and a modest aerial in a built-up area (see from the mailbag).

Last month after reporting the UK first DXCC by Geoff GJ4ICD and asking 'who will be the first to make DXCC from the mainland?' it will come as no surprise to hear that it is being claimed by Ted Collins G4UPS. Ted had a good start for March with DU, TL8MB, 4X1IF, KG6DX, PY5CC and his 100th was ZP6XDW on 10/3/91, with 97 countries confirmed. I believe, subject to confirmation, that these were the first two DXCC 6m claims for Europe.

Due to the few reports from other bands this month will mainly be 6m news, please send in your reports on other bands to keep interest alive!

Contests and DXpeditions

This month we see;

5-7th June; WA4VCC/VP9 50.085MHz and 28.885MHz.

8/9th June; UK Six Metre Group Sporadic E contest.

6/7th June; RSGB VHF Field Day.

8/9/10th June; International VHF contest.

Watch this space in future for details of National and International contests.

Meteor Scatter

Last month I referred briefly to the SM Meteor Scatter contest in August I'm happy to announce that Paul Turner G4IJE will be writing a four page special feature planned for the August HRT, concentrating on the practical side of 2m, 4m and 6m MS working, operating procedure for the SM contest, high speed operating and information on meteor showers. Remember meteor scatter is *not* influenced by sunspot cycle variations, it is with us all the time. Order your copy of August HRT early to avoid disappointment! With some notable exceptions (GJ4IJE, GM3WOJ, GJ4ICD, G4UPS and others) meteor scatter work has been rather eclipsed by F-layer work over the past two years, and since it is a mode that is always with us, 50MHz being the most useful band on which to exploit this mode of working, it should now become of increasing importance particularly during the winter months.

6m information from Ted Collins G4UPS

Bermuda; Four operators from the Carolina DX association, AA4SC, K4MQC, AA4R, and WA4VCC will be active on 6m from VP9 from 5th June 1991. They will operate from the West side of the Island, grid square FM72, with a clear take-off both to the US and Europe. The expedition will favour 50.085MHz and they will also be QRV on the liaison frequency 28.885MHz. Callsign will be WA4VCC/VP9. QSL information; Mr. Ted Goldthorpe WA4VCC, 209 Swamp Fox Drive, Fort Mill SC.28715 USA. This expedition is a timely reminder of the VHF contest 8/9/10th June, and the UK 6m Group summer sporadic E contest 8/9th June 1991.

Australia; Steve VK6PA asked me to pass along his QSL information as in the older callbooks this callsign is allotted to a club station. So for a direct QSL card, Mr. S. Hill VK6PA, 621 Ridley Street, Karratha 6714, W. Australia.

Finland; A new beacon from OH9 will soon be on the air using 50.067MHz, running 50W to an omni-directional aerial at locater KP36OI. Further details, date of commencement etc. will be published when I have the information to hand.

Togo On March 6th Harry Schools KA3B informed me during a QSO that he had sent a complete 6m station, a Heathkit SB110, 100W and a 5 element yagi to Steve 5V7SA in Togo. I understand that Steve is a missionary and will be very active on the band. QSL information is via. WB4LFM only.

Morroco; Tarik CN8ST, has applied for permission to run two beacons on 6m, one from Rabat and the other in the south of the country. Further information when the permits are granted. Tarik has now received the linear amplifier and the 6m aerial.

Diego Garcia; Tom VQ9TB has a full 6m station including linear amplifier, but is currently awaiting the arrival of a 6m yagi from Joel KG6DX. I Hope to be able to report activity from Tom in the near future.

Israel; Ralph 4X1IF left Israel for a six month overseas posting on 15th March. He hopes to fit in at least a week of home-leave around the 8th June 1991 to take advantage of the forthcoming Sporadic E season. Daniel 4X6IF (Ralph's son) has informed me that he will try to get on the band as often as possible, especially at weekends.

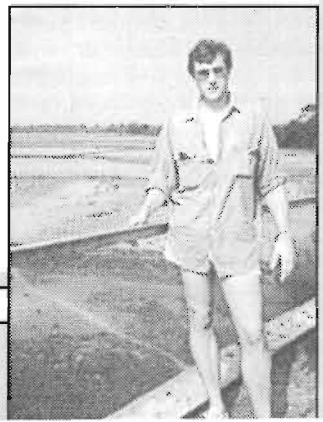
Brazil; The first ever widespread opening from Brazil to Europe took place on the 9th of March 1991 when PY5CC had a very large opening into GD, G, GW, GM, ON etc. and was heard in OZ. The opening lasted from 1220z for about an hour. Peter's QSL information, and you can send your QSL to either address with addressed envelope and funds for postage to; Mr. Peter Rprengal, POB 141, 80001 Curitiba, PR Brazil or Box 7, 83260 Matinhos, PR Brazil.

Paraguay; The first ever opening from Europe to ZP took place on Sunday 10th March 1991. Doug Wooley ZP6XDW had an opening from 1244-1447z using CW, during this time he worked more than 60 European stations. Gary ZP5ZR used SSB throughout and I gather that he worked more than 100 European stations during the opening. QSL information for both stations is direct. What a difference it makes when the operators at the other end are so efficient and patient during a short, first time ever DX opening.

Saudi Arabia; With life returning to normal in HZ, Burt of the Dhahran Radio Club station reported on 28.885MHz on 14th March that he was operating from a new location and only needed to put up his 6m aerial to be back in business. QSL via K8PYD.

Spain; By the time you read these words, EA stations could be very active legally on 6m. I heard today that the EA PTT has agreed to a 6m allocation and I understand that details of power, frequency spectrum and number of permits to be issued are expected to be announced very soon. It has been indicated that the number of permits, a figure of 20 having been mentioned, will initially be for a 12 month period.

ARRL Pile-up; With all the excitement generated by the first three 6m DXCCs issued by ARRL, a bit of an anti-climax is to learn that all ten plaques that were awarded by ARRL for DXCC 6m have been claimed, by K5FF, W5FF, VE1YX, JA4MBM, JA1BK, JA1BK, W2CAP/1, K5CM, K8WKZ and WA1OUB.



Dave Heil 9L1US in an earlier incarnation as J52US in Guinea-Bissaiu

New YV beacon; A new beacon from Venezuela, YV4AB has been reported by several stations. The frequency is 50.025MHz, very close to the ZP5AA beacon.

ZS8MI; A beacon, callsign ZS8MI will be activated very soon from Marion Island on 50.012MHz. Power output will be 12W and the locater KE83. The beacon was built by Mike G3JVL, and airmail postage from the UK to South Africa was funded by the UK Six Metre Group.

TF3SIX beacon; The TF3SIX beacon was reported 12 March 1991 as being off the air due to storm damage to the aerial.

From The Mailbag

Gordon Johnston G7IDZ, Deal, Kent writes; I was licensed on the 1st August 1990, and have been on 6m since January 1991. My first 6m contact was with G1EFN on 25/1/91, then on 6/3/91 with VK6PA at 1115z using 10W into a three element yagi. The next day 9L1US at 1240z and on the 15/3/91 PA0EUI at 1335z.

Steve Damon G8PYP Wimbourne reports; 50MHz 6/3/91 1100z QSO with VK6PA giving him WAC six. Other QSOs with OZ3ZW, OE2JG, VE1YX, 3X1SG, CG1YX, WA1VRH, ZS6WB. 144MHz 28/1/91 2208z DB8KJ, DC6KI, PA3EPA and ON4ANH all tropo. 432MHz 28/1/91 2322z PB0AEX, DJ9DL both tropo. 3/2/91 1649-2200z G3ILX Surrey, G6MXL Dorset, G4PIQ Essex, G4LDR Wilts, G1DSP Lincs and G8MNT Surrey, all tropo.

Dave Heil 9L1US (K8MN) Embassy of the USA Walpole St, Freetown, Sierra Leone W. Africa; Recent 6m conditions have permitted European openings to G-land and several hundred QSOs have resulted. My work schedule does not permit me to be at home during likely periods for peak openings except for weekends, and we've been lucky enough to experience such openings during the first three weekends in February. Quite a few of the Gs were worked during the January CQ 160m CW contest as well. I'll be in Sierra Leone until near the end of the year and as always, QSLs for my operations go to WA8JOC.

Alan Doherty GI0OTC (Ex GI8YDZ), Co. Antrim, N. Ireland writes; KM1E/C6A reported that he heard the GB3NGI beacon 559 at 1506 on the 25th Feb 1991, the only other signal heard from Europe was GM0EWX, no QSO resulted as Callum didn't hear him. A new VK6 6m record has been entered in the record books, GI8YDZ to VK6RO 28/02/90 14904.1 km, the previous one being VK6BP to JA8BP at 8833 km on 30/10/58. Alan is performing a detailed study of marine ducting on 50MHz and has had exceptional results on the Transatlantic path. In Nov-Dec he worked more than 3500 NA stations in 40 states.

50MHz report from N.Ireland 1 June 1987 — 30 March 1991

The number of openings to North America fell by half in 1990 compared to the previous year, but if we look at the percentage of days in which DX occurred, we find 16.7% at the peak of the cycle and 16.6% during the first three months of 1991. This tells a different story, the circuit to West Africa produces some interesting results as follows; 4.65% in 1989, 4.93% in 1990 and 23.36% in the first quarter of 1991. These figures may be the result of very much increased activity from that region.

The summer Sporadic E occurrence on the North American path has decreased as the peak in the cycle has approached. The circuit to Australia and the Philippines has shown an increase in the first months of 1991. As with all the Pacific openings, the beam headings have been well south of the expected direction by 37-63 degrees requiring the aerial to be positioned at 110-125 degrees. This suggests a scatter medium of some form over the mid Indian Ocean. Also noted on these openings was the occurrence of propagation to the Middle East, with the Cyprus beacon 5B4CY being audible, as well as crossband 28/50MHz contacts to Israel latterly in-band QSOs. This suggests multiple hops of approximately 2500 miles, with up to four being necessary to support Australian propagation. This is just a preliminary report of the 6m DX worked from N.Ireland, a lot more still needs to be done in proving the marine ducting theory over the Atlantic path. Note, the results obtained by G5KW by marine ducting during Cycle 21 whilst operating from the Isles of Scilly are still available from me (only a limited supply remain) on receipt of SAE.

Transequatorial Zonal Curving by GJ4ICD

Geoff GJ4ICD writes; I recently asked Mike G3JVL, well known for his propagation work on many frequencies, how when working KG6DX and many JAs on 50MHz that the QTF is usually wrong from the great cycle bearing. Mike explained that he thought it was possible that the path was like a sine wave around the earth. On the 15th March, word was put out that there had been an opening to PY and JA at around 2300z on the 14th from the UK, and at 1800z on the 18th I commenced monitoring activity. Signals began to appear from the south with the V51E beacon on 50.101 being very TEP sounding, the V51VHF beacon then appeared again very fluttery and TEP sounding. TL8MB appeared from nowhere on SSB with bad flutter, at 1915z Kosie V51E shut down the beacon and came on six with SSB, the QSO was hard taking several minutes to complete. Both beacons and Kosie had vanished by 2200z when the shorter path to 9L and W1QC opened. ZD8VHF appeared at S3 with flutter showing that the path was moving slowly westwards. At 2230z PY5CC was worked 529/529 in GG54, now just after this time JAs were reported working into LU, PY and ZP. At 2300z PY5CC was still in, 6W1QC was still S7 and now we started to JAs. During the next hour I heard JG2BRI and JJ3CF, ZP6XDW called on 28.885 to say he had a major opening to JA. Conditions continued until 0000z when the 9L1 beacon was still into GJ at 429.

Linking both paths by Zonal Bending?

Now, Mike's idea could start to make sense. If the signals were somehow refracted in the ionised TEP zone they may join another path already in motion, i.e. JA to LU/PY. Linking both paths together now becomes possible, and it happened. I rather doubt that the full long-path to JA was in existence and I strongly suspect refracted TEP zonal propagation. This idea of Mike's could also be the answer to many more of the unusual openings found at these latitudes, for instance most JA openings in GJ have occurred at a beam heading around 90-120 degrees, some have been at 60 degrees, but is difficult to measure accurately with small beams due to the beamwidth. The JAs also beam at around 240 into the Indian Ocean, this may not be side scatter but again entry into a TEP zone, as funnily enough these JA openings do happen when we have TEP to the south-east. This could also explain the strange heading for Joe KG6DX, at one point he was at 150 degrees, so the signal must be curved somehow.

Marine Ducting

Marine ducting and zonal bending has been observed frequently over a long period, mainly from stations near the shore, at a certain height above sea level it's too high and it is missed. I found about 50m ASL the optimum at the Scillies and in the Middle East, after a hot still day during the early evenings. Reports on other experiences would be welcome and will be passed to the Propagation Studies Group.

That's all until next month. Please keep sending your VHF/UHF reports to me at 18 Joyes Road, Folkestone, Kent CT19 6NX

QRP CORNER

Dick Pascoe G0BPS looks at useful books for the QRPer

A useful book hot off the press has just dropped on my mat, this being a follow-on from the very popular collection of modifications for Heathkit QRP HF rigs. Readers who have never come across these sets (i.e. those who didn't read the UK exclusive Heathkit reviews in HRT) have missed quite a lot! The Heath Company of Michigan USA have produced many kits for the radio amateur, hence the name`Heathkit', and several amateurs will have heard of the HW-7, HW-8 and HW-9 series of QRP transceivers, the current model being the HW-9 (reviewed HRT June 90). These are supplied as a kit and are very simple to build.

Because of this simplicity and amateurs being what they are, improvement modifications have been published at various times both here and in the USA to enhance the performance of these. One American amateur, Mike Bryce WB8VGE of the American QRP club has collated these modifications to the HW-7/8/9 series in a book, originally compiled and edited by Fred Bonavita way back in 1985 as the *'Hot Water Handbook'* detailing modifications to the Heath HW-8. Mike's version however covers the HW-7, 8, & 9 and is entitled *'The HW-8 Handbook'*. I'd encourage owners to get a copy as soon as possible.

Other books that find their way into this country by American authors are some of the superb books by the well known writer Doug DeMaw W1FB. Doug has the wonderful knack of making the difficult appear easy, his`QRP Notebook' published by the ARRL is very good for the beginner to construction (I hope to stay with Doug for a day or two during my visit to Dayton, watch this space!). Bob Locher W9KNI has produced the definitive guide to CW DXing called the`Complete DXer', it reads in a very laid back style yet giving huge amounts of information for the beginner to DX hunting.

A further book just out is *The Antenna Experimenters Guide* from Peter Dodd G3LDO. This gives guidance on measuring aerial performance, modelling HF aerials at VHF, measuring resonance, the noise bridge and much more. Mine is, of course, on order. Aerial books abound, in my opinion one of the best is *The ARRL Antenna Book*, it's full of information on aerials of all shapes and sizes, another 'classic' is the British publication *HF Antennas for all locations* by Les Moxon. A final bit on aerials, the W7EL aerial computer programme for PCs is also well worth having for anyone interested in testing and building aerials and playing with aerial design.

Books on all aspects of home construction are available of course, perhaps the best British book available for the home constructor is the one compiled by George G3RJV. This is a compilation of articles from the G-QRP journal 'Sprat' over the years, entitled the *G-QRP Club Circuit Handbook*, it's an excellent collection of ideas and circuits for the builder. Rumour has it that a further collection is in the offering soon.

Novice Newcomers

The first of the UK Novices will soon be receiving their licences and may be struggling to make head or tail of the hobby. Hopefully what can be achieved with their low power limit will stay with them for ever, and what these Novices achieve with their limited power levels may show the older hands what can be done. I would love to be a fly on the wall of some shacks.

Although there has been a slow build-up of commercial QRP equipment over the past few years with Heath's QRP series (some now collectors items) and also the Mizuho to mention two, it's much more fun to build the radio before going on the air! That's one of the beauties of the Novice course, the 'hands on' technique as part of the course where students are taught to handle a soldering iron. At our local club, these prospective Novices may be seen hard at work, their enthusiasm having been infectious. I for one look forward to hearing, and working the first Novices once they get their licences.

Crystals

One comment made to me recently at one of the rallies was about crystals. Most amateurs are able to throw together a simple crystal controlled transmitter, but where to get the required International QRP frequency crystal? A scan of the commercial adverts in the back of HRT may often bring results, Quartslab Marketing and Gollege Electronics immediately springing to mind.

Finally, for those of you in Europe who would like to join the ARCI, the American QRP club, an SAE to me will get details. They have a magazine called the (and delivered) Quarterly. It is almost as good as Sprat too. That's it for another month, comments and ideas to me please, Dick Pascoe G0BPS at 3, Limes Road Folkestone CT19 4AU, or via. HRT editorial, or on packet @ GB7SEK.