

HRT

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VOLUME 9 NO 8 AUGUST 1991

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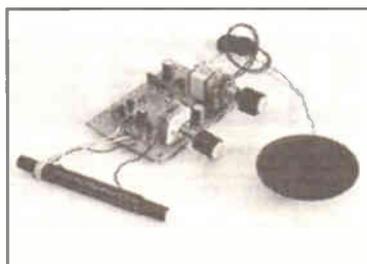
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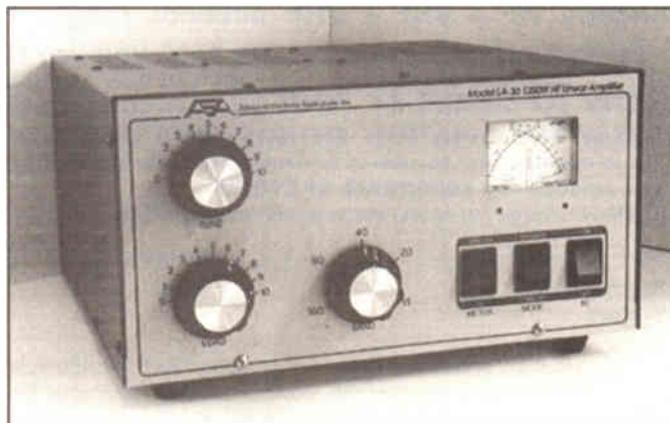
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Far left: The children who contacted Helen Sharman, GB1MIR
 Top: The M Band Pye Europa
 Left: Maplin Reflex Receiver Kit Reviewed
 Bottom: The LA-30 HF Amplifier



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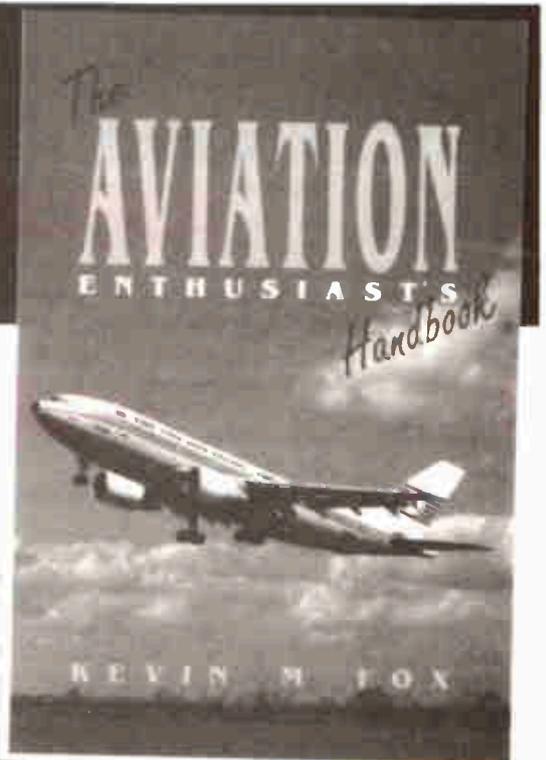
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CQ de G8IYA

Simple Projects, Forwards not Backwards

There's sometimes talk about 'simple' technology being needed in amateur radio, but what does 'simple' mean to most people? Well if you ask, you're likely to get very different replies!

Digital wristwatches are now everyday items costing upwards of around 99p, with pocket calculators and computers at not much more, so where's the 'magic' gone? Although it may have been something special many years ago, there's now nothing new to most people in picking up a microphone or telephone handset and chatting to others around the country or even around the World. If you proudly show your neighbours your latest one-valve CW transmitter built on a breadboard, together with its uncased HT power supply, they'll more likely than not thing of you as some sort of mild eccentric! But use a simple FM rig together with information from a computer satellite tracking program (remember, you can get a simple ZX81 computer now for a couple of pounds) to talk to cosmonauts on the space station, and, maybe as well as also being thought of as a mild eccentric, you'll instantly win the respect of those around you.

These people may often envy what you're doing, and eventually you may even find their interest is aroused to such an extent that they want to find out how to 'join in' your hobby. None of this 'Oh it's that guy down the road who makes a nuisance of himself breaking through on our TV' to 'Oh, it's the clever chap down the road who knows what he's talking about, which reminds me I must find out how to become licensed myself'.

HRT Projects

You won't find many one-valve early-technology constructional articles in HRT. Instead you'll find things such as construction articles for solid-state transmitters and IC receivers, add-ons to improve your station, ex-PMR conversions to get you a complete VHF or UHF transceiver for a few pounds, and reviews of equipment ranging from commercial black boxes down to simple kits. The simple-to-build HRT 2m and 70cm synthesised transceiver projects are coming along soon by the way, these needing no RF alignment whatsoever through the use of an IC digital RF synthesiser with its built-in binary adders and the like. The result — just a few ICs connected together, even the 3W PA is an IC, and one of these projects will probably take you less time to build and get going than a simple crystal controlled QRP HF transmitter. We've also arranged for complete kits of parts and a ready-made PCB to be made available for those who either don't have a well-stocked 'junk box' or simply prefer not to have to 'shop around' for components. Interested?

First Project?

The above could make a good 'first project' for the new radio amateur who'd like to end up with something useful at the end rather than possibly just a 'novelty'. So what was your first construction project? I built mine 15 years ago, it was a seven digit 30MHz frequency counter with 23 ICS together with separately hand-wired 7-segment LEDs. I must confess that I *did* purchase a ready-made PCB for it (I spent many hours fitting through-wires in the holes for PCB links before fitting the many separately-bought components!), and I *did*



build it from an available design, but I still considered it as a 'homebrew' project. It was almost magical when I found it worked first time, and I still have the completed project here. But times change, and a similar project can now contain just one IC with a custom liquid crystal display. Time and technology marches on, so why still do things the earlier, hard way? One day we may end up living in caves if no-one wants to go forward.

This month my youngsters have been listening to amateur radio activity from the Mir space station, they even spoke to GB1MIR on the last day of the UK cosmonaut's visit (see *Radio Today* this month). There's still two licensed cosmonauts up there of course, why don't you give them a call sometime? Our prospective Novices are looking forward to the day they get their callsigns so they can link up themselves with the Mir packet station as well as the low-Earth orbiting amateur packet satellites, all of these being 5 and 9 plus signals on a handheld.

There's an exciting World out there, maybe instead of spending time moaning about what we should or shouldn't do in amateur radio, maybe we should be doing something about it! Some of us are trying to.

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LETTERS

Letter of the Month

Dear HRT,

I have been reading HRT's letters for a little while now, and I have seen several passing packet messages. I think I would like to comment on the current situation with regard to the Morse test. Whilst I do not object to Morse as a mode of communication, I do object to Morse as the only means of getting the A licence. My personal interest in radio is packet with a little telephony. If I were to learn Morse, and subsequently obtain my HF licence, I would only use telephony and packet hence I see little point in this. What I am not suggesting is that we have only one class of licence, the HF bands are crowded and the authorities must have some form of limiting the number of people on the bands. Before I put forward my proposals, I shall outline my objections to various comments made in HRT. I disagree with those who say that Morse is a good mode of communication and that it should be encouraged. If Morse is as good as people make out, then surely it should survive on its own merits, i.e. as a good mode of communication. Secondly, I would disagree with the idea of replacing Morse with a packet exam. This would also be despised by the people who have no interest in packet!

My proposals for a replacement are;

First, replacing the Morse test with a different exam. This should not be one based on a particular mode of communication, for the same reasons that I object to Morse. It would make sense to make the exam one on EMC with specific reference to HF interference and EMC matters.

Second, by analysing results of the RAE, this method is perhaps an entirely new train of thought for some people. The results from the RAE would be analysed, and the RA could decide on who is allowed a Class A by their results. For example, all people with a distinction and a credit, or higher, could be qualifiers for the Class A licence. Those people who fail to meet the requirements would have to re-take the exam.

This is not as harsh as it sounds.

The RAE is not a difficult exam, really what does tend to happen though, is that there are 'rush through' classes that teach you just enough to pass the exam. I know someone who was a part of one of these classes, and he could tell that most people did not really have a clue about radio theory. They knew a few formulae and how to apply them in an exam situation, but not in real life situations. By enforcing this method of access to a Class A, you would rid the bands (VHF and HF), of people that are not really qualified. If there were a few people who cannot pass the exam to a high enough standard, then they would 'pick it all up' from being active on VHF. As it has been proven by SWLs taking the RAE, by listening and talking face to face with amateurs, many things become second nature on subjects which are examined by the RAE. There will be a few people that this method will not work with, for some reason. It would seem that a small amount of people could not get their Class A licence through reasons beyond their control, despite how much time and effort they put in. You must weigh up the people who cannot get a licence because of Morse, and the people who cannot obtain a licence because of the above method. You may find my method caters for more people, and ensures a higher technical standard, at least within the requirements of the C&G exam. It is said that the more musically minded you are, the easier Morse is. I am very poor with music and I have tried learning Morse, but find it very difficult even though I put an hour a day into it. If I were going to use Morse as a Class A, then the struggle, and it is a struggle, would be worth it.

The views herein are not the views of a lazy G7J... operator, but the views of an objective amateur. I am certainly not a lazy person who is not willing to work for a Class A licence. I am one of the youngest amateurs at the local club, the youngest fully licensed person. The RSGB for one, have been asking why there is a lack of younger people on the bands. My reply is that they are too deeply involved in nostalgic amateurs (soapbox time).

Contrary to what other magazines and the RSGB etc. would have you believe, I am not the slightest bit interested in valve transmitters and the like. Young people want to be involved in the advancement of radio, as I am. I am in the process of setting up a packet radio node, and writing tools for packet such as Sysop utilities, Interactive TNC control programs, playing with new protocols, experimental file transfer protocols, etc. I think this is far, far away from the dreadful misconception that young people want old-technology projects, choc-block MW receivers etc. On a practical level, why not publish some simple transistor and op-amp projects that use Veroboard. It's the explanations that counts also. Yours sincerely,
Martin Saunders (age 16), G7JCY @ GB7BNM

Editorial Comment;

Thanks for your constructive letter Martin. Last things first, your concluding suggestion as you'll have seen has already been put into action, with recent HRT solid-state construction articles using Veroboard such as the 'DX Audio Processor' and the 'Silent-tune Gizmo' featured in the last few issues of HRT. These have been very popular, and it's good to know radio amateurs appreciate this.

As for a replacement to the CW test for a Class A licence, many amateurs seem to simply want the Morse test to be ended but without offering any viable alternative and it's good to see a young amateur such as yourself taking the time to put forward a constructive proposal. The RA have told us that the Morse test cannot last forever as a means to a Class A, and that they will be happy to listen to ideas from us for suggested qualifications required for incentive licensing. What do other readers think? We won't suppress the views of amateurs, and we'll be pleased to publish constructive ideas for discussion through these pages with the end result of a submission to the RA of your views.

"TONE" BURST by GGMEN



Dear HRT,
With reference to your regular communications with the Radiocommunications Agency. A few years ago I wrote to RALU regarding callsigns and asked if I could have my G8 callsign back, but also hold my G4. The expected reply came that 'You are only allowed *one* callsign'. Well since then, the Novices are about to become licensed, and a Class B will also be able to hold a 'Novice A' callsign, therefore holding two callsigns.

Strange though it may seem, I would still like to have and use my G8UVS callsign and also use G4MYS. So what's good enough for a B is surely good enough for me? I am of course willing to put up the money for two callsigns. Maybe you could suggest this to the RA.
Andy Sillence, G4MYS

Editorial comment
The RA have told us they will certainly investigate 'value added' systems as long as normal licensing matters aren't held up, i.e. anything done must be self-financing through the increased revenue received. This sounds a classic case to us! Would anyone else go along with this we ask?

Dear HRT,
I opened my HRT this morning and jumped for joy. There on page 27 of the June 91 issue was the answer to every amateur's nightmare, namely the article on 'Check Your Earth'. We all know how incorrect earthing systems cause havoc with TVs etc, and the terrific amount of lost power that can be caused by the same problem. So I read on, with hope in my heart. But oh dear, oh dear, nearly at the bottom of

column one, and what hits me in the eye? The word *equations*. What's the next problem? The word *algebra*.

Do you not realise that there are many tens of thousands of amateurs out there that can't handle this sort of technical talk. I, like many other of today's operators, passed the exam by learning everything parrot fashion. Yet I am still capable of mastering the most complex of technical subjects, providing they are explained to me in a manner that I understand. Just because I, and all the others, can't handle equations and algebra, doesn't mean that we don't deserve to be able to sort out these problems, and end up with efficient aerials, and the least amount of TVI possible.

If only the author had written the article using everyday language, by all means incorporate the technical side of it as well, but at least give the rest of us a chance of achieving the same results as you boffins. A step-by-step guide using practical examples would not have taken too much space, and you would have many more happy followers.

Roger Isaac, G0HAE

Editorial comment
It may be worth bearing in mind the following:

- 1) It was a 'Novice Notes' feature, i.e. targeted primarily at beginners,
- 2) Typical prospective Novice licensees are aged upwards of 11-12 years, school-based prospective Novices are typically aged 15 (source — RSGB Training and Education Advisory Committee and school teachers/tutors involved in Novice teaching).
- 3) School children in the UK learn

algebra at the age of 11
As such, I hope you and other readers will agree the article was correctly aimed at, and gave full and complete information to, the targeted readers of this feature. However we do agree with your comments of the more senior readers who may not have learned algebra, many of whom we're sure also enjoy reading the 'Novice Notes' features. It's hard to pitch these at a level which doesn't insult the intelligence of the targeted readers though. If they are parents, they may of course be able to seek help from their children on the basic mathematics involved, but unfortunately space considerations in the magazine don't allow us to provide extensive 'background' knowledge of this type on every occasion, this being more suited to basic school-books etc.

In last months 'CQ de G8IYA' Editorial, evidence that the first Novice amateurs, young and old, may often know more about amateur radio technicalities, i.e. propagation, EMC etc., than some 'Full' licensees. It's also very true that teenagers of today can 'run rings round' some long-standing amateurs in terms of their knowledge of up-to-date technology, i.e. computers etc., however these teenagers are often not experienced in the 'ways of the World'. Through HRT we're proud to be able to pass on the great experience of long-standing amateurs such as Brian G3GDU and our other experienced contributors, to show our 'amateurs of the future' the 'right way'!

£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.

RADIO TODAY



Steven Lorek (aged 9), David Lorek (aged 7) and Carolyn Lorek (aged 4) speak to Helen Sharman GB1MIR on board the Mir space station.

JUNO Project a Success

Amateurs who have been following the progress of UK's first cosmonaut, Helen Sharman, on board the Mir space station will know that she's been linking up with amateur stations in the UK using her specially issued callsign of GB1MIR, this being issued to her after a direct approach to the Radiocommunications Agency by Richard Horton G3XWH of the Harrogate Ladies College.

The link-up with the specially licensed JUNO stations located in schools and colleges around the UK went well, with the majority of the stations getting in contact with GB1MIR. Pupils at the Harrogate Ladies College (GB0JUNO), Alford Academy in Aberdeenshire (GB1JUNO), Hewlett School in Norwich (GB3JUNO), Canterbury High School (GB4JUNO), Guildford Royal Grammar School (GB7JUNO) in Guildford, and Orwell Park School in Ipswich (GB8JUNO) all managed to contact GB1MIR during the week. Helen's final day in space on the Saturday was used to listen for calls from any amateur stations on the 2m split frequency being used (the uplink frequency of 144.500MHz was publicised on the PacketCluster network on the Saturday), when a few stations including the HRT crew also contacted her.

Co-Ordination

With orbital passes giving a communication window each of only around 10-12 minutes, the co-ordination between the schools was a tremendous affair. The link-up organiser, and control station authority, Richard G3XWH told HRT they were indebted to Mercury Communications for the vast amount of assistance given to them. Dedicated speech lines commencing ten minutes prior to each 'pass' were provided between the schools, and we're told the Mercury engineers went out of their way to ensure a successful land-line link, Mercury providing this at no cost whatsoever to the schools.

Packet and Voice Operation

Helen couldn't operate on voice modes during every orbital pass over the UK due to other activities on board the station, as she wasn't just up there for amateur radio purposes! Indeed during the period when she contacted the HRT crew, she told her listening audience that the window from which she photographed views of the UK was on the other side of the space station, and it was often 'one or the other' activity during the spare periods she had. At these times, the Mir packet radio station with its built-in 'mailbox' was operational on S22 simplex (see the HRT June 91 front cover), and on at least one such occasion there was a packet message to 'ALL' saying that Helen would be operational on FM voice on her next pass.

When operational on FM speech, as well as exchanging callsigns and the occasional brief message with the JUNO stations, because she knew she must have had a wide audience on each pass Helen normally gave a brief resume of her activities that day. Listeners around the UK were often surprised to hear such a strong signal from the space station, often receivable on just a handheld transceiver or a scanner operated with its set-top aerial.

We at HRT know this operation has given a tremendous boost to our hobby, with amateur stations being featured as a result on prime-time TV as well as in newspapers and periodicals. As we write this in the week following Helen's Mir visit, every other on-air contact we hear mentions the JUNO link-up! I'm sure we echo the thanks of UK amateurs to Richard G3XWH for his approach to the RA, and for his work in organising the amateur radio link-up with the UK's first cosmonaut.

HRT Team Novice Trainees Contact GB1MIR on FM

The day before UK cosmonaut Helen Sharman returned to Earth, she listened out on 2m for calls from any radio amateurs in the UK.

At just after 6.00pm local time on Saturday May 23, Steven Lorek aged 9, David Lorek aged 7, and Carolyn Lorek aged 4, each spoke to cosmonaut Helen, from the radio club Station of G4SMC, South Midlands Communications Ltd., near Southampton. Richard Diamond G4CVI, the callsign holder of G4SMC, called GB1MIR after she invited calls from the UK, Helen instantly replied "G4SMC, hearing you loud and clear, please carry on, over". On his reply, Richard immediately told Helen there were some schoolchildren present at the club station, and Steven, David, and Carolyn each passed a short greetings message to Helen, giving their names and their ages, using the GX4SMC facility granted by the Radiocommunications Agency for greetings messages.

Helen then told her listening audience that she was busy getting ready for her return in the Soyuz capsule, saying she probably wouldn't get much sleep that night with having to get up at three o'clock in the morning for her descent to Earth, adding that she was scheduled to undock from the Mir space station at nine o'clock in the morning, Moscow time. She said she'd like to stay on the space station, but that she unfortunately knew she had to return. She added that she'd got the 'hang' of some aspects of weightlessness such as pouring hot water without getting it all over the space station, but that some tasks such as putting on a pair of socks still caused her to drift around as she couldn't hang onto anything!

The children were very pleased to have been able to contact Helen, indeed Steven and David have just started their Radio Amateur Novice licence training programme, being taught by their parents Sheila GB1YA and Chris G4HCL, who as well as being the Editor and Consultant Tech. Ed. of

HRT are both registered Novice licence instructors. The parents were both present during the contact, and they are grateful to the management of South Midlands Communications for their kind provision of the radio club station facilities for the Novice trainees to make contact.

Annual RSGB HF Convention

A date for HF enthusiasts' diaries is this year's National HF Convention on the 28th/29th September at the Penguin Hotel, Daventry, Northants, the HRT team will of course be there! As usual, on the evening of Saturday 28th September there will be a dinner for DXers with a well-known speaker from the DX World. The provisional program for the Sunday includes talks by Martti Laine OH2BH on DXpeditions, Peter Hart G3SJK on transceiver reviews, Al Slater G3FXB on contesting, Roger Western

G3SXW on pile-up operating, John Allen of DTI Baldock with 'What's on 80m tonight?', Roger Ballister G3KMA on IOTA, together with a PacketCluster forum, Young Amateur of the Year Award, presentation of HF trophies, and a Novice Clinic. Overnight accommodation will be available in the hotel at a special rate, you can even meet the HRT Consultant Tech Ed and our 'HF Happenings' columnist in the bar there! For further information on the convention, contact Bob Whelan G3PJT, 36 Greenend, Comberton, Cambridge. CB3 7DY.

Hamming it up on HMS Warrior

The Fareham and District Amateur Radio Club recently held an exhibition of antique radio equipment on board HMS Warrior. The display included equipment from the earliest days of wireless telegraphy, and the club tell us that 86 year old Len Newnham demonstrated a Morse key (part of his own collection), as used in days gone by in the Navy, to a cluster of Captains. Many of the other artifacts on display also came from Len's collection, with others lent by HMS



(Left to right) Cpt. Wason of HMS Collingwood, Cpt. Allen of HMS Warrior 1860, Cpt. Sutermeister of HMS Mercury, and Len Newnham.

Collingwood which is the Royal Navy's electronics shore base in Fareham. The exhibition in Warrior's gun room on 'B' deck was opened by Captain Wason, the Commanding Officer of HMS Collingwood, and continued for a period of one month until 1st June.

When commissioned in 1860, HMS Warrior was the Royal Navy's only 'ironclad' battleship, and together with HMS Victory, the Mary Rose, and the Royal Naval Museum, she continues to provide an unrivalled insight into Britain's proud naval history.

Raycom launch synthesised 2m transceiver kit

Following his successful visit to the Dayton Hamfest this year, Ray Withers of Raycom has announced two new UK dealerships for amateur radio and commercial products in this range include a new 2m 3W synthesised transceiver kit with a direct interface for packet operation review organised! The second is with Optoelectronics Inc. who have a range of high accuracy and commercial pro-hand-held frequency counters, which are factory/laboratory built and calibrated. Raycom tell us they have been appointed as the UK distributors for these new products, further details from Ray Withers at the firm of HRT advertisers Raycom Ltd.



The Northern Ireland Amateur Award

Northern Ireland Amateur Award (WAGI)

This handsome new award, printed in colour, embodies the coat of arms of each of the six counties with the coat of arms of Northern Ireland as a centre piece. To get yours, the rules are as follows;

- 1) The award is available to licensed amateurs (and SWLs on a heard basis).
- 2) All bands, 1.8MHz to 1296MHz.
- 3) Cards must be for valid contacts on or after the 1st January 1979.
- 4) Contacts via terrestrial repeaters or with mobile stations are not valid for this award.
- 5) The award will be endorsed as follows;
 - A; By mode, i.e. CW, SSB, RTTY, mixed, etc.
 - B; By band, HF or VHF, but not a mixture of both.
- 6) A check list of QSLs, set out in log form and certified by 2 licensed amateurs or photocopies of QSLs must be submitted with all applications. DO NOT SEND QSLs.
- 7) The cost is Europe — £3.50 or 10 IRCs. Outside Europe — £4.00, US\$7.00, or 12 IRCs. Payment to accompany all applications.
- 8) Northern Ireland consists of six counties; Antrim, Armagh, Londonderry, Down, Tyrone and Fermanagh. The City of Belfast is divided by the River Lagan into Co. Antrim and Co. Down.
- 9) Stations outside Europe require the following cards; 2 from each of Co. Antrim and Co. Down, and 1 from each of the four remaining counties, a total of 8 cards. Stations from Europe require the following cards; 4 from each of Co. Antrim and Co. Down, and 2 from each of the remaining four counties, totalling 16 cards.

Further details from, and applications to; The Award Manager, WAGI, GI4BBV, 11 Drumawhey Rd, Newtownards, Co. Down, Northern Ireland. BT23 3RS

ICOM

IC-751A HF ALL-BAND TRANSCEIVER



- **Amateur Bands 160m - 10m.**
- **General Coverage Receiver.**
- **105db Dynamic Range.**
- **100W Output (40w A.M.)**
- **32 Memories.**
- **Electronic Keyer.**
- **CW Semi/Full Break-in.**
- **HM36 Microphone.**

The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attenuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

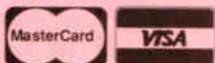
The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 desk microphone and SP3 external loudspeaker.

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2M, FM Mobiles



IC-3220E
Dual-Band
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IC-229E VHF Mobile. This VHF 25 watt transceiver measure just 140(w) x 40(h) x 105(d) mm. No need to worry about installation, its small enough to fit most vehicles. Also available the IC-229H 50 watt version where extra high power is required.

IC-449E UHF Mobile. High sensitivity with GaAs FET's and 35w output power provide optimum performance with this UHF transceiver. 20 Memory channels and a programmable call channel can be used to store most used frequencies.

IC-3220E Dual Band Mobile. Enjoy complete dual-band operation. In addition to cross band duplex operation this transceiver can receive both MAIN and SUB bands simultaneously. One of the smallest dual-band mobile transceivers available, the IC-3220E has a 25 Watt output on both bands. Where higher power is required the IC-3220H offers 45 watts on the 144MHz band and 35 watts on the 430MHz band.

Icom (UK) Ltd.

Dept HRT, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 741741 24 Hour. Fax: 0227 360155

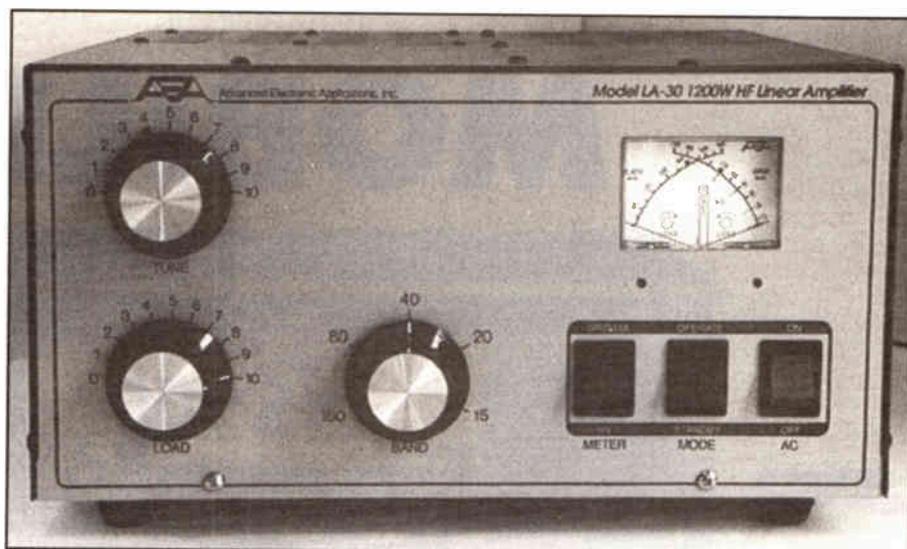
LA-30 HF Amplifier Review

G4HCL checks out AEA's latest 1kW 'Ionosphere Warmer'

The name of AEA is more often than not associated with data Terminal units in the UK, such as the popular PK-232 and PK-88 units. However they also manufacture at the 'other end of the scale', with the AEA LA-30 amplifier providing a 1kW input power level for HF band use to boost one's 'DX potential' somewhat. After the HRT Consultant Tech Ed. one day mentioned 'might be nice to try one out sometime, UK distributors ICS Electronics promptly sent round one of the very first models for evaluation.

Circuitry

In the same manner of other amplifiers to the now 'classic' design, the LA-30 runs a 3-500Z zero-bias triode in a Class AB2 grounded-grid configuration, a pressurised cooling system with a squirrel cage motor is used for cooling, a glass chimney fitting over the valve envelope for this. A band-switched pi-input network is fitted together with a pi-L output with silver-plated band-switch contacts and the usual variable load and tune capacitors. The amplifier is rated for continuous duty on SSB with 1.2kW peak input power, and 50% duty at 1kW input power on CW/RTTY/AM/SSTV and FM modes, the efficiency being stated as 60% (50% on 10m). An



The LA-30 Amplifier

anode voltage of 3kV is derived from a 600VA transformer, with the usual AC mains and HT interlocks fitted to the case. The amplifier measures 360 (W) x 190 (H) x 420mm (D) and weighs 15.9kg. The 3-500Z amplifier and chimney come separately packed for safety in transmit, with the well-written 15 page manual giving details of the required installation.

Connections

The rear panel of the amplifier carries a number of connections apart from those for the RF input, output, and AC power. An adjustable negative-going ALC output voltage is available, although inspection of the circuit diagram shows this detects the amplifier drive power rather than the output power. As well as

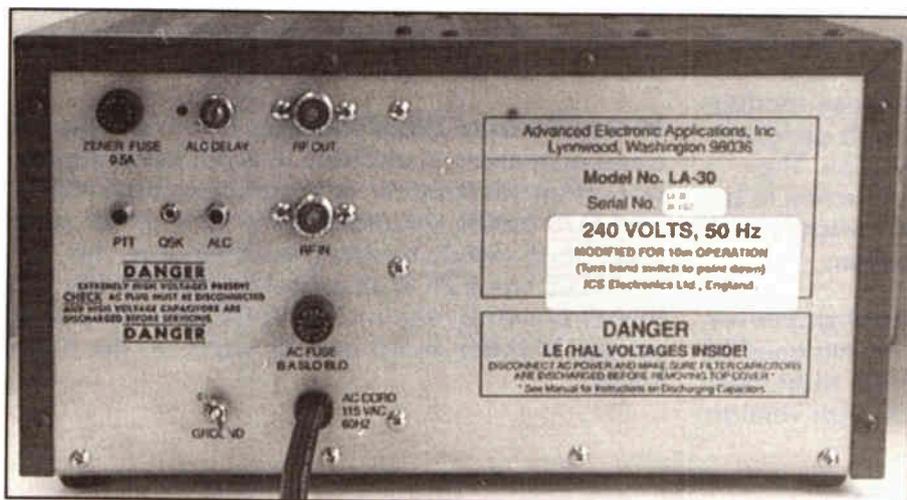
the 'PTT' input for the necessary transmit/receive switching of the amplifier from the driver transceiver, a 'OSK' socket is provided, this allowing external control if required of the internally fused grid bias switching.

Although the review amplifier came wired for 240V operation, it had the original USA 'flat' mains wire (which I wasn't very happy about) plus 120V rear panel markings, but I'm told current models now have UK-type three core cable plus appropriate panel markings.

Tuning Up

After pre-setting the band control to the appropriate range (the '10m' band indicator is missed out on USA versions although this range and switch position was fitted on the review model), reference to the supplied 'Amplifier Test Data' in the manual gives an indication of the positions of the Tune and Load controls for each band, which I found quite handy until I became familiar with the unit.

A unique 'cross-meter' indicator is used to display the amplifier's operating conditions in terms of the anode and grid currents. Between the two meter needles, a central 'Tuned' bar is shown to provide an indication of a 'correctly tuned' condition. If on tune-up the needles cross to the left of the 'Tuned' bar then an 'underload' condition exists, a small drawing on the meter reminding the operator that clockwise rotation of the 'Load' control is needed, this of course normally being followed by re-adjust-

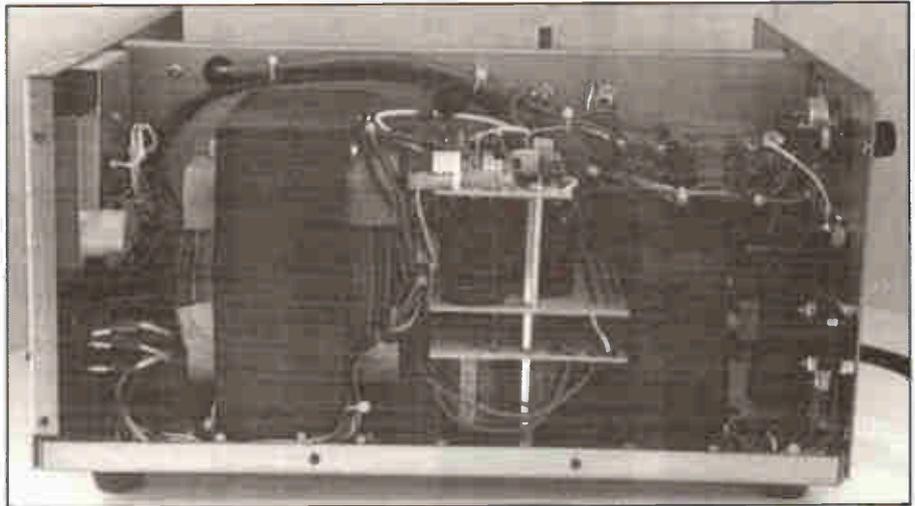


Rear panel connections

ment of the 'Tune' control for resonance. Conversely, if the needles cross to the right of the bar, again a small drawing reminds that the 'Load' control should be turned anti-clockwise. The manual states that a grid current trip if fitted, this being factory preset to 60mA, the operation of this extinguishes the meter light although this level would need adjustment to around 120mA peak to coincide with full power output.

On the Air

As I usually find with 3-500Z amplifiers, the output linearity was very good, and with my driver transceiver turned down to below 50W to correspond with around 400W output I found my amplified signal was indeed 'cleaner' than the 100W full output from my driver, due to the lower drive level producing greater linearity all-round. The expected boost



The power supply unit

to my received signals helped to obtain better readability at the far end in marginal conditions, again nothing different to

other legal-limit amplifiers really!

Although the amplifier specifications indicate an operational frequency range including the WARC bands (30m, 17m and 12m), I found I couldn't use the amplifier on 30m (20m band position) or 12m (10m band position) at all, further investigation revealed this was due to a grossly excessive VSWR on the amplifier input causing my driver transceiver to give up. The input VSWR also caused my transceiver to start cutting down its drive at the extreme bottom end of the 10m band. However 17m operation was fine with the amplifier switched to the 15m band range, likewise on the 'normal' 80m, 40m, 20m and 15m ranges.

Laboratory Tests

Testing the amplifier in the lab showed it had good linearity, and measuring the harmonics showed these were very well suppressed, in fact far better than I would have expected. I found that under constant-carrier conditions, the amplifier would run around the 400W output power mark happily for some time, the valve not seeming to worry at all although the large AC transformer did become fairly warm, possibly due to its design for 60Hz AC rather than 50Hz.

LABORATORY RESULTS

Two Tone SSB IMD Products

Measured at full output on 14.250MHz, figures shown as dB below PEP.

IMD Product Level	3rd	5th	7th	9th	11th
	-21dB	-33dB	-46dB	-44dB	-57dB
	-21dB	-33dB	-52dB	-44dB	-55dB

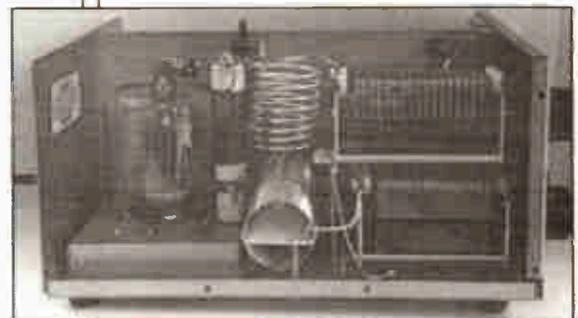
Harmonics

Freq.	2nd	3rd	4th	5th	6th	7th
1.9MHz	-57dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
3.5MHz	-62dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
7.0MHz	-69dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
10.1MHz	-71dBc	<-80dBc	-68dBc	<-80dBc	<-80dBc	-76dBc
14.0MHz	-56dBc	<-58dBc	-73dBc	-77dBc	<-80dBc	-72dBc
18.1MHz	<-80dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc	<-80dBc
21.0MHz	-70dBc	-67dBc	-70dBc	-74dBc	-69dBc	-72dBc
24.9MHz	-53dBc	-71dBc	-62dBc	-65dBc	<-80dBc	<-80dBc
28.0MHz	-69dBc	-70dBc	-53dBc	-62dBc	<-80dBc	<-80dBc
29.0MHz	-50dBc	-52dBc	-51dBc	-62dBc	-74dBc	<-80dBc

Input Match and Output Power

Standing Wave Ratio at amplifier input terminals, and single tone output power, measured with 50W drive power.

Freq.	I/P SWR	O/P Power
1.9MHz	1.1:1	617W
3.5MHz	1.1:1	623W
7.0MHz	1.2:1	653W
10.1MHz	6.2:1	-
14.0MHz	1.1:1	632W
18.1MHz	1.4:1	639W
21.0MHz	1.1:1	630W
24.9MHz	5.2:1	-
28.0MHz	2.8:1	406W
29.0MHz	1.3:1	582W



The PA compartment

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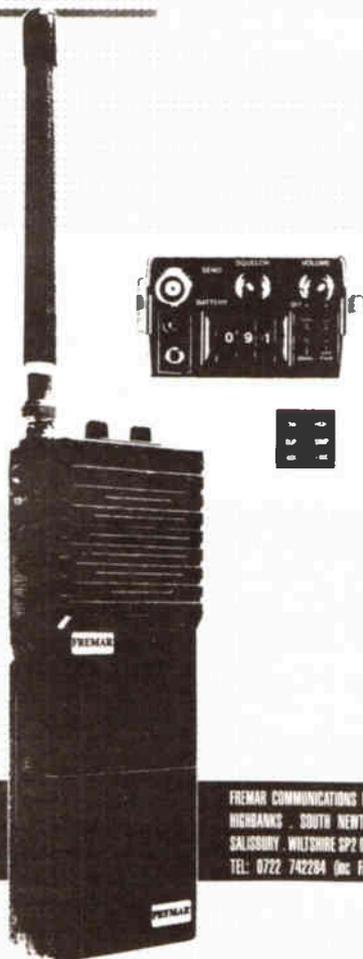
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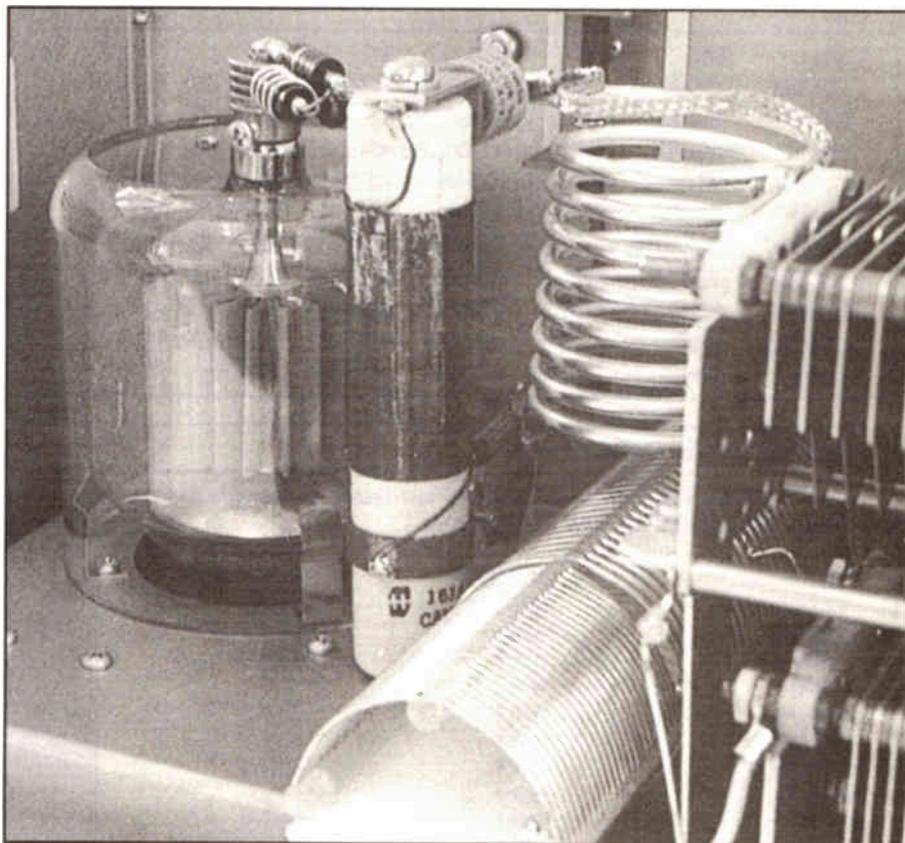
Conclusions

On the non-WARC bands, I found the amplifier gave good, clean signals at the legal UK limit from a drive power of less than 50W, although if you're planning to use it on 30m and 12m I'd advise checking with the suppliers first. The dual-needle tuning meter I believe would be very useful indeed to ensure a quick 'tune-up' when shifting frequency, this giving an instant indication of correct tuning and hence promoting 'clean' signals!

My thanks go to ICS Electronics Ltd. for the loan of the review amplifier.

Dealer's comments:

The LA30 was not designed to operate on the 10, 18, and 24MHz bands, and we regret that this error in our literature has gone unnoticed for some time, probably due to the fact that it can actually operate quite well with many transceivers. On checking with the designer, he tells us that the output circuitry is designed for all-band operation, and it would be possible to tune out the input match with an ATU between the transceiver and the LA30. We may well be able to introduce a true "all-band" version of this amplifier in due course.



The 3-500Z anode circuitry showing the glass chimney

Novice Notes: TV Breakthrough

Ian Poole
G3YWX shows how
to make a simple UHF
TV high-pass filter

Television breakthrough can affect the best run transmitting stations. Even if the transmitter is well filtered and no significant amounts of harmonics are present, breakthrough may still occur.

Transmitter Filtering

Many stations use additional in-line RF filters with their equipment to ensure that the levels of spurious signals which are transmitted are virtually zero. For HF operation, low pass filters are generally used. The idea is that the low pass filter will have its cut-off frequency above the highest frequency of operation but below the TV or VHF FM radio bands. Normally these filters have a fairly sharp cut-off just above 30 MHz, with commercially made items boasting harmonic attenuation figures of 60dB and more.

For VHF and UHF operation, band pass filters are normally used. These filters will allow only a small band of frequencies through, and they can be used at VHF and above because multiband operation is not normally undertaken in the same way as at HF. Even if a dual-band transceiver is used, then different feeders are sometimes used for the different aerials, hence different filters can be left in circuit permanently.

Band pass filters are frequently used for VHF and UHF, because the transmitters may generate a variety of spurious signals from their circuitry. For example, many older style transmitters use a low frequency crystal oscillator.

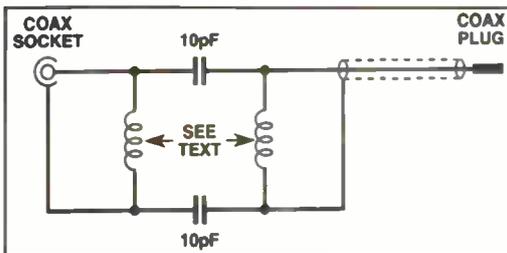


Fig.2 A simple TV high pass filter.

The fundamental frequency generated by this oscillator is then multiplied up many times until the final frequency is reached. Newer transmitters use other methods such as synthesisers, yet there is always the possibility of a small amount of an unwanted signal leaking out and these signals could have frequencies below or above the wanted one. However it must be said that many commercially made transmitters radiate quite low levels of unwanted signals, as HRT technical reviews show.

Aerials

It's possible that the interference is made worse by the type or positioning of the aerials which are in use. Obviously if the transmitting aerial is close to the house (or worse still, inside it) then the local strength of the transmitted signal may be very large. So it's worth trying to site transmitting aerials up high away from the house, or neighbours' houses.

Sometimes the actual type of aerial can have a bearing on the interference. Unbalanced aerials, especially long wires, can give problems. There are a number of reasons for this. The first is that the long wire will start to radiate immediately it leaves the ATU. Secondly it may need a good Earth with a short lead. If this is long, the Earth wire will radiate and RF may tend to find its way onto the mains wiring. The resultant effect of all of this is that levels of RF will be high in the locality of the house, and the conducted RF can find its way onto all sorts of equipment including televisions, radio tuners and the like.

Strong Signals

Assuming there are no significant levels of spurious signals being radiated from the transmitter, then you can often

assume that the front end of the television is being overloaded. One way to deal with this is to place a filter in the television coax down-lead to filter out the amateur signal. With HF and VHF operation the matter is fairly simple, in this case a high pass filter is used to allow through the higher frequency TV signals through and attenuate the lower frequency amateur ones.

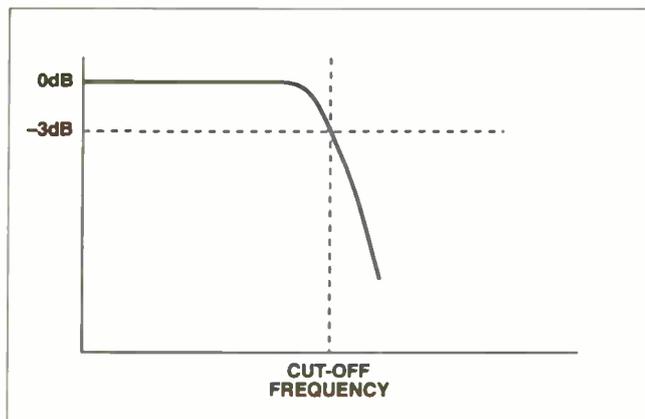
TV high-pass filters can be bought reasonably cheaply, but it can be even more cost effective to build one. A simple design is shown in Figure 2. The coils are made up from two turns of copper wire (about 18 swg) wound over a length of 6mm and with an internal diameter of 6mm. The capacitors should be good UHF types and all the leads should be kept as short as reasonably possible. In this way the losses can be kept to a minimum and the television picture degradation kept to a minimum. Once complete, the unit can be housed in a small metal project box.

It should be noted that the filter attenuates signals on both the inner and the outer of the coax. The reason for this is that the pickup of the amateur signal often occurs with the coax itself acting as an aerial. Filtering both conductors on the coax removes this problem. It may be well worthwhile to build one in readiness, rather than waiting for the 'knock at the door'!

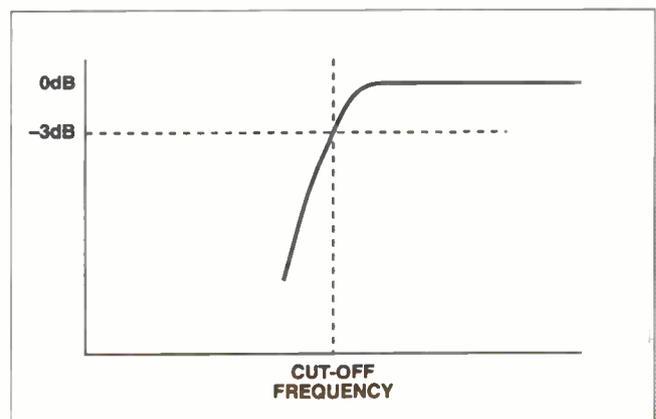
Summary

In many cases a few simple precautions can prevent any television breakthrough from occurring. However when it does occur, often a few simple filters or the repositioning of an aerial may cure it with a minimum of fuss. In-depth details may of course be found in various amateur radio handbooks, and don't forget that your local amateur club may have a 'stock' of simple filters of various types.

Fig.1 Filter characteristics.



(a) LOW-PASS FILTER CHARACTERISTIC



(b) HIGH-PASS FILTER

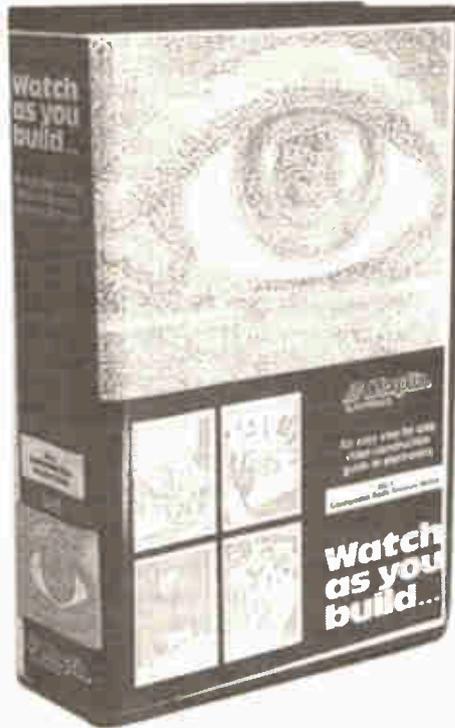
Kit Review – Maplin Reflex Receiver

Could Maplin's first 'Watch As You Build' kit spark off new interest in radio? Chris Lorek finds out

On visiting my semi-local Maplin shop, I came across something quite novel, something I'd not seen in the catalogue (for good reason, as it wasn't in it). This was their 'SK00A' No.1 Loudspeaker Radio receiver kit, complete with a instructional video cassette showing the complete beginner how to build it! It's designed specifically to help those who've never built a project before, and comes with every component needed to end up with a working receiver for the medium wave. Out came the credit card, and two prospective future Novice licensees (aged 7 and 9 – so they've some time to go yet!) later tried their hand at soldering for the first time.

The video was very well presented, offering step-by-step instructions on building the receiver, complete with details of how to solder safely and correctly. This was backed up by printed details of component identifications, colour codes, a circuit diagram and operational description diagram for the more technically minded, and a useful 11-page general 'Constructors Guide'. Maplin even offer a 'Get you working service' in case you can't get the project going, where they'll rectify problems due to faulty components free, or for a charge sort out your soldering mistakes!

It took each of our two youngsters around two hours in total to construct the receiver, with only the odd bit of parental guidance given. One kit had no less than four incorrect resistor values, with a total of just nine resistors in the cir-

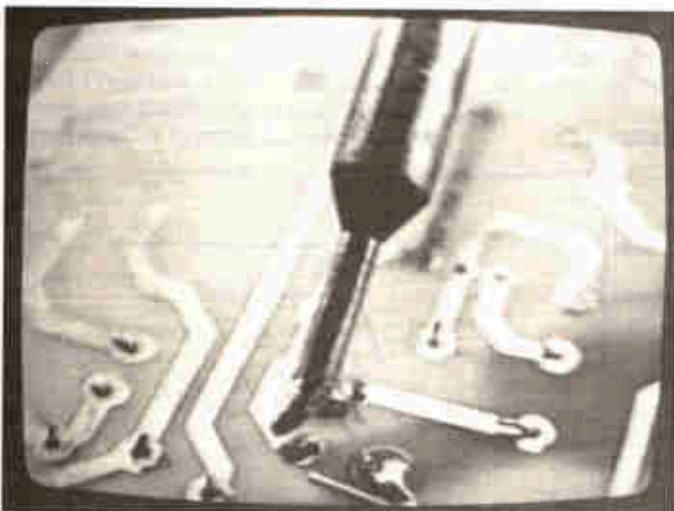
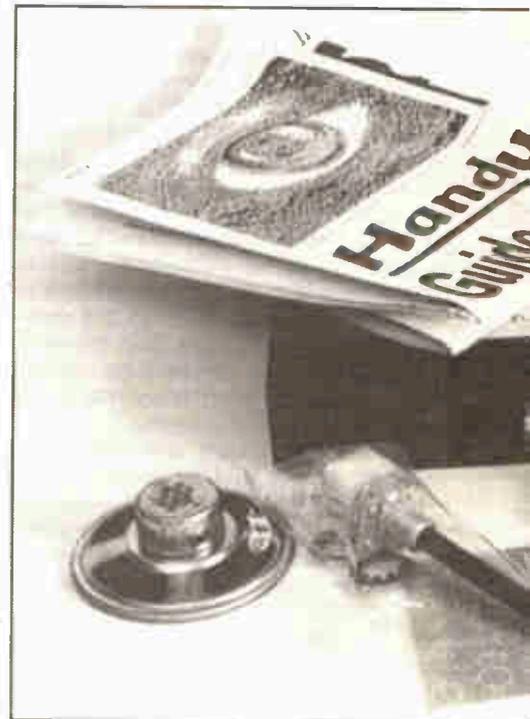


The kit comes in a smart presentation box

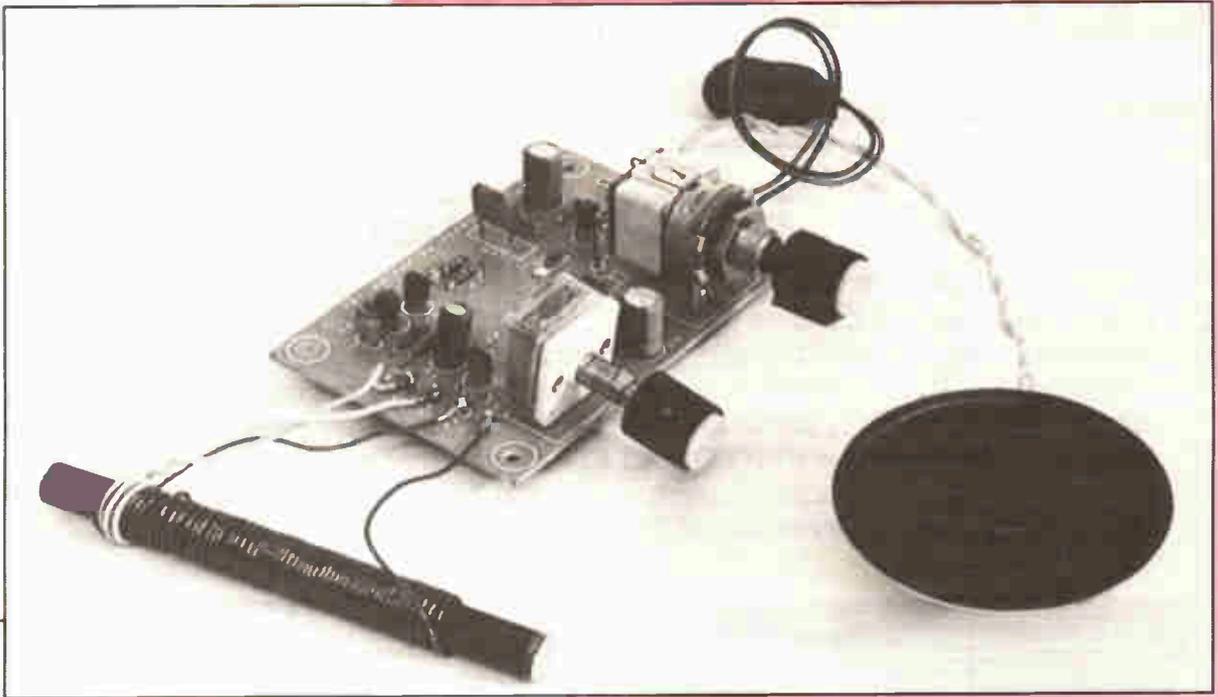
cuit this in my opinion is rather poor and would normally have meant a trip back to the shop or a wait for postal replacements. The other kit (this one actually having a "In case of complaint, please quote packer No..." stamp present) was

fully complete and correct though, so hopefully this may have been a 'one off' error.

The great switch-on time eventually came, so did they work first time? Yes! Although only barely audible signals were heard using just the ferrite rod aerial used indoors, the addition of a length of wire 'thrown out of the window' made each set then literally burst



The assembled unit — did it work first time?



All board-mounted components are supplied

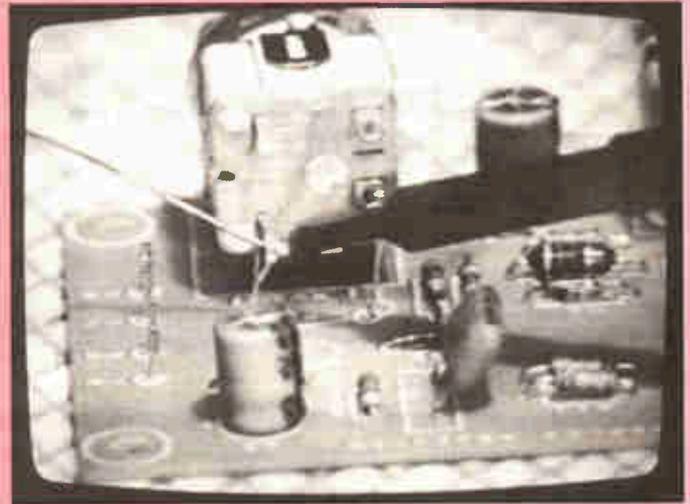
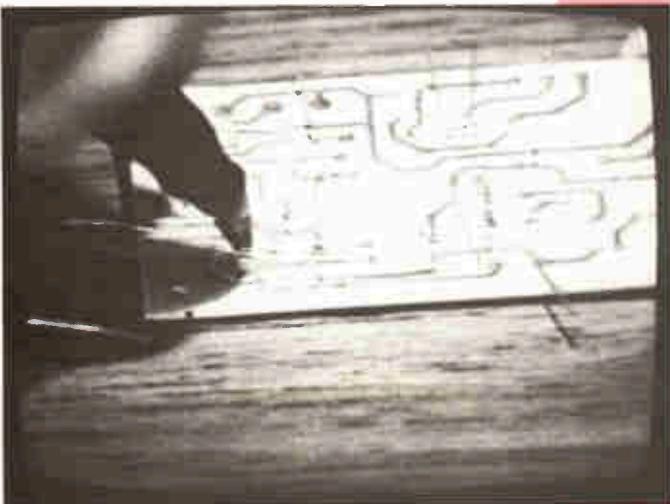
into life, and a caused broad smile to appear on the faces of our constructors.

Conclusions

At a selling price of just under £12, this including the instructional video and everything needed for the receiver apart from a case and battery, the kit would make an excellent 'starter project' for the beginner in electronics or radio who'd like to try or improve their hand at soldering, or indeed it could make a nice gift for a budding beginner as an introduction to radio construction.

We at HRT were so pleased with the kit, that we got in touch with Maplin with the result of the firm kindly donating six kits to HRT readers as small 'prizes' for our reader's survey, with a quantity of Maplin catalogues (normally over £2 each) for runners-up.

Step-by step instructions on video cassette come with the kit



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FT-1000

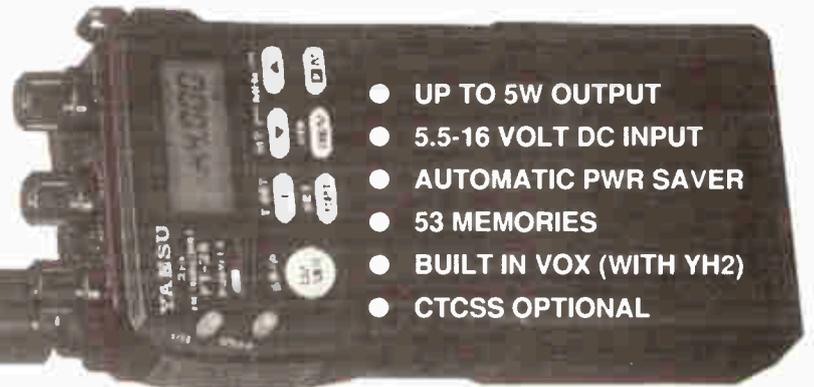
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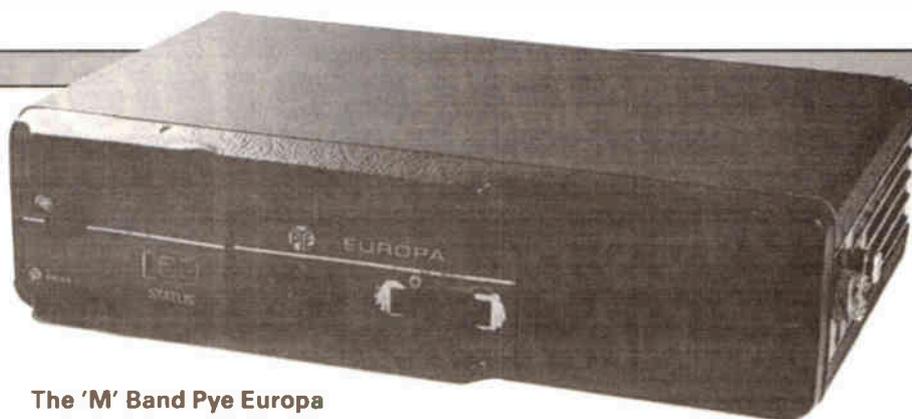
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G4HCL gets out the test equipment, and converts an ex-utility Europa to 2m FM



The 'M' Band Pye Europa

M-Band Pye Europa Conversion

Following the recent re-organisation of the UK PMR (Private Mobile Radio) frequency allocations, public utility companies such as Water Boards, Gas Boards and so on, have found they've been moved away from their original mobile FM frequency allocations of 141MHz receive and 107MHz transmit. In fact, many readers will realise the latter frequency is now the upper part of Broadcast Band II, and above this lies the AM Aircraft band. As such the transceivers couldn't really be used for anything else except adding to the scrap heap. That was, until the HRT team went into action!

These sets are commonly called 'M' band equipments (signifying the old so-called VHF 'Mid Band'), indeed the conversion of the M Band Westminster was

detailed in the March 1991 issue of HRT. This time it's the turn of the M Band MF5FM Pye Europa, a reasonably compact (as 15 year old sets go) self-contained set operating from a 12V supply and giving around 5-8W out on transmit, designed originally for dash mounting in a vehicle. The sets are capable of operating on up to six crystal controlled channels, and are ideal as a 2m monitor (the receiver needing no modification apart from a crystal change and a re-tune) or, following conversion, as a 2m transceiver for use on packet or FM voice.

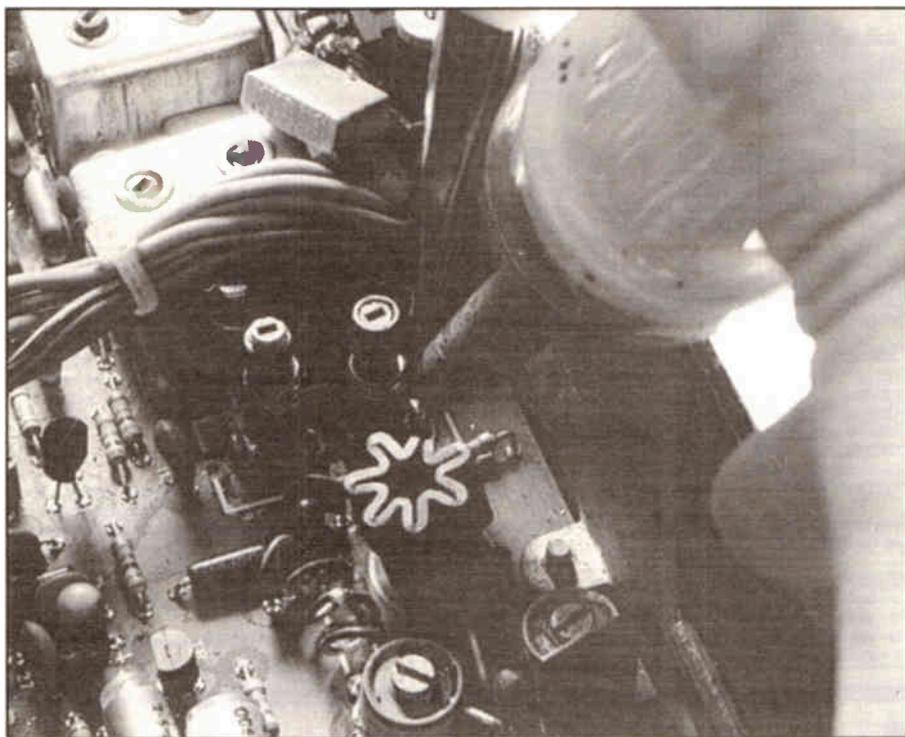
Identification

The appearance of the set may be seen from the accompanying photograph, but beware as the Pye Europa is a

range of equipment. Sets for 4m (E Band), 2m (A and B bands), and 70cm (T and U bands) as well as the 'P' Band (for conversion to 4m) and 'M' band sets look identical from the outside, and unless you inspect the internal circuitry the only *sure* way is to take a look at the rear-mounted metal identification label. On this, below the type designator of MF5FM (8W VHF), MF25FM (25W VHF) or MF5U (5W UHF) you'll see identification letters detailing the band of operation, i.e. A, B, E, M, P, T or U, and the channel spacing of V (25kHz) or S (12.5kHz). If you find you've bought a different type from the rally stand to the one you were after, don't despair too much — you can use it on another band, see past issues of HRT or the Argus 'Surplus 2-Way Radio Conversion Handbook' for details, much of the basic alignment (rather than conversion) details are indeed taken from here. However in the January 91 HRT where I detailed the 'P' Band Europa, I told readers to 'watch this space' for the 'M' Band version, and here it is!

Getting Started

The receiver will re-tune to the 2m band quite nicely, no component changes required here at all. If you only want a 2m receiver, you can skip the transmit conversion details, and just follow the receiver alignment details. You'll need a DC multimeter for this, together with an off-air signal on your required frequency for the final tune-up of the four adjusters on the front end block. Again, see past copies of HRT for ideas on this. For adjustment purposes, you'll need a small non-metallic adjuster to fit the ferrite cores (take a look inside — you can always file down a plastic knitting needle or whatever to suit). Don't be tempted to use a 'jeweller's screwdriver' as you'll break the brittle cores — and I can't help you find replacements, I get asked so often by people who have



Carefully modifying the coils

ruined their sets by ignoring this advice!

For the transmitter, as this originally operated on a frequency range rather removed from 2m, you'll have to make a few simple component changes, but if you follow the step-by-step instructions



Check the Rear label — this one's an 'M' band set

in this article you'll find this very easy. For this you'll need a pair of wire cutters, fine-nosed pliers or preferably tweezers, and a soldering iron. Don't, under any circumstances, try to re-tune the transmitter hoping to get it onto 2m without modifying it. You may find that you *will* get a sort-of signal on 2m, but a much, much stronger one on 108MHz due to incorrect crystal multiplication — you've been warned! For the alignment section you'll again need a non-metallic trimming tool and a DC multimeter, and this time a non-metallic screwdriver-shaped tool for the PA trimmers. A 50 ohm load capable of handling 8W and some form of power output detection will be needed for the final PA tune-up. The power meter accuracy isn't important as we'll just be tuning for maximum, a simple diode probe or absorption wavemeter will suffice.

Crystals

Crystal suppliers advertising in HRT sometimes keep popular 2m frequencies in stock for the A/B Band Europas, with this in mind I've retained the same crystal multiplication for the 'M' Band set as that for the 'A' and 'B' band equipments. For other frequencies, you can get crystals made to order, the crystal frequencies required are;

$$\text{TX Xtal Freq (MHz)} = \frac{\text{TX Freq (MHz)}}{16}$$

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

The crystal case size for the 6 channel set is HC25/u, the larger HC6/u size being used for the 3 channel set. You'll find it useful to quote the original specifi-

cation type T25 (3 Chan) or T80 (6 Chan) when ordering, but remembering to request an 'amateur spec' version of these.

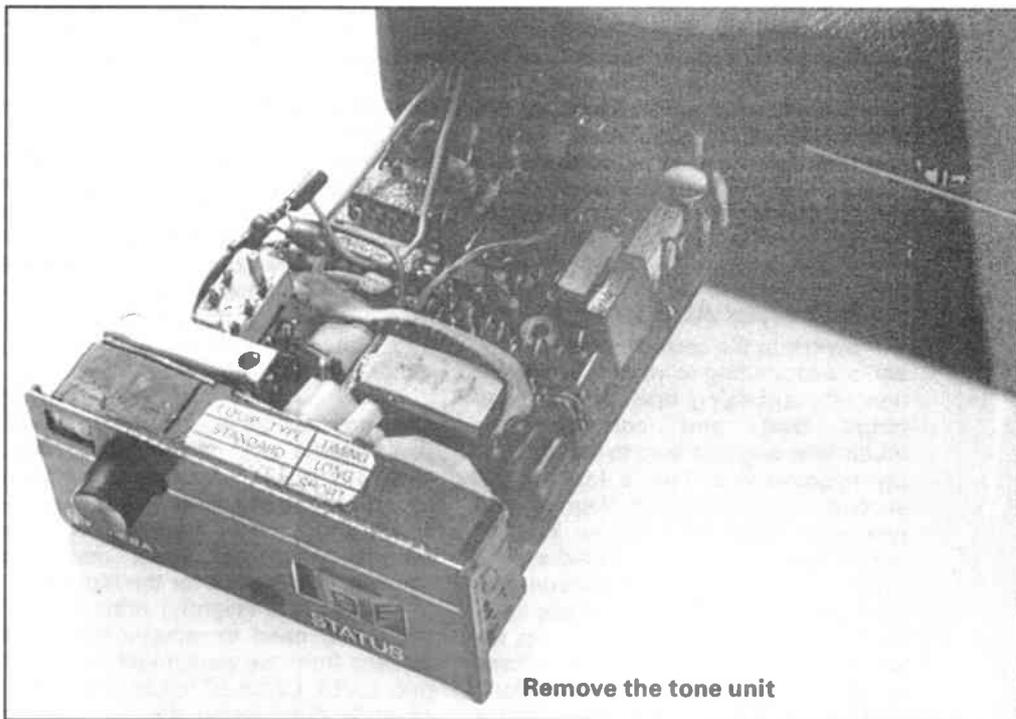
Preliminaries

Undo the screws at the rear of the set's top and bottom lids, lift these off and then remove the three screws securing the RX PCB, now hinge this upwards. Plug your crystals into their respective sockets on the TX and RX PCBs, these sockets being marked 'XL1', 'XL2' and so on. Check that Pins 8 and 12 are linked on the facility socket on the lower TX board (pin 1 is at the left looking from the front of the set), either by a PCB link on a blanking board or by a wire link at the rear of the socket. If the set has come out of utility use as is normally the case, you'll often find a tone option board fitted here. You can unplug this by inserting a small screwdriver blade into the front hole, then extracting the unit from the front of the set. The 'ME2' board as found on several sets initiates a multiple tone trans-

mission each time the set is switched on, and this sequence follows each transmission as a 'tail', hence I would recommend removing the board and fitting the appropriate link in its place before you go any further. You can always remove the front panel of the tone board and re-fit this to cover up the resulting hole.

messages I get requesting this information! The microphone connections are shown in the accompanying table, a 5-pin 270 deg. DIN type plug is used for this. Note that the pins are numbered logically as 1 to 5 around the socket, not to the 'DIN' numbering convention. TX PTT control is performed by switching the +10V line between pin 3 and pin 5, if you're connecting a packet radio TNC to this then bear the polarity in mind. If you want to use a 'ground to transmit' line from your TNC then connect this line via a 2k2 series resistor to the ground of a PNP switching transistor, the collector to pin 3 and the emitter to pin 5.

The receiver audio output goes to the internal speaker as well as the two-pin socket on the rear of the set. The speaker lines are floating, so **do not** connect any of these to ground via your TNC, you could easily destroy the audio IC which is the most common cause of a faulty set (as well as being expensive to replace). To feed RX audio to your packet radio TNC, link its audio input to the PCB pins 12 (live) and 11 (Ground) at the rear of

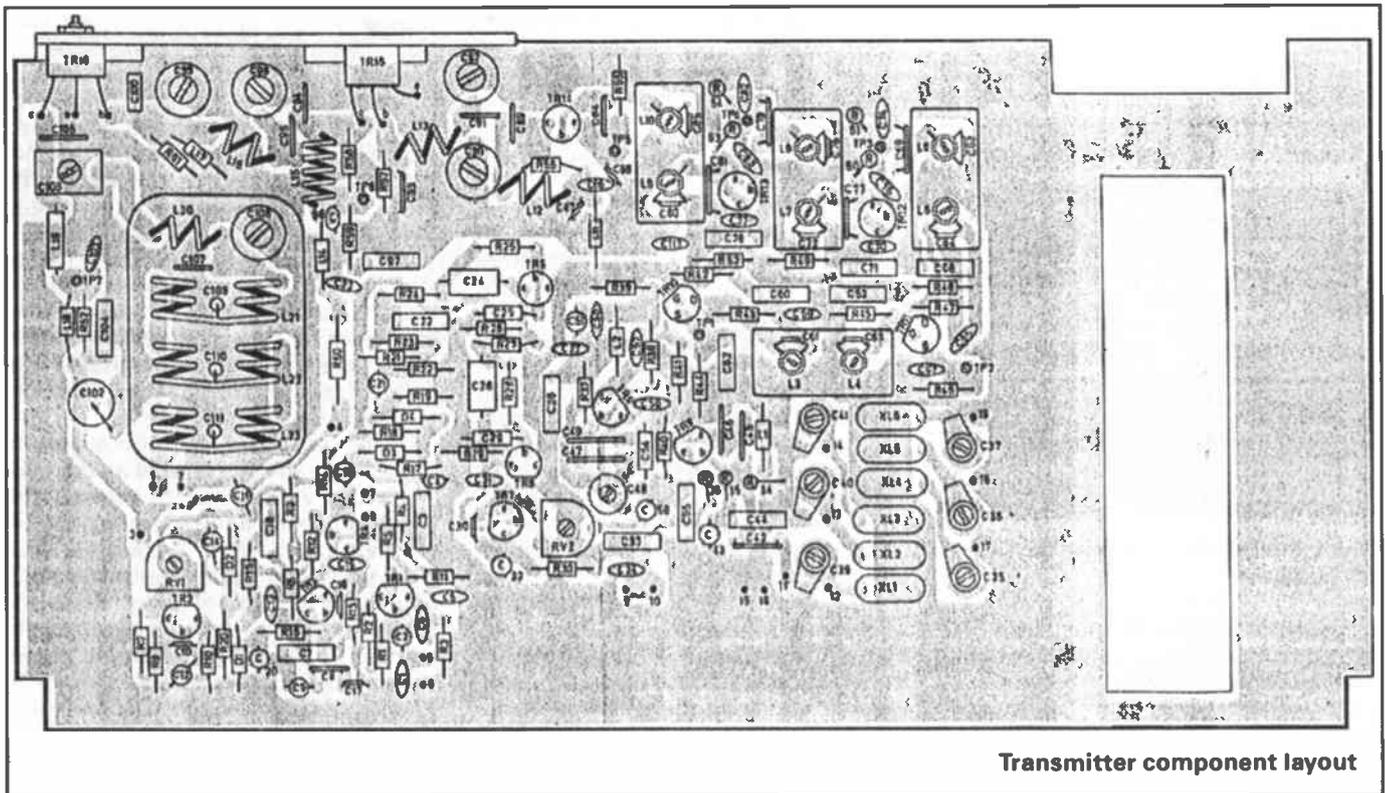


the plug-in facility PCB, this is the squelched audio feed to the volume control. You could even link the audio line to unused Pin 4 of the microphone connector for easy TNC connection. If you need a 'busy' squelch line output, the collector of TR14 on the RX PCB switches between 0.9V (busy) and 8.4V (no signal).

The rear panel 13.8V DC power connection needs a special 7 pin socket, so try and obtain one with the set if possible, alternatively you can wire up your own socket or just solder flying leads to the pins, adding suitable insula-

Connections

I make no excuse for repeating these, due to the number of packet



Transmitter component layout

tion. You'll need to link pin 2 to 3, and pin 4 to 5, connecting positive DC to pin 1 and negative DC to pin 7, all these are identified on the inner rear panel of the set. Use a 5A fuse in the DC power lead to the set.

Receiver Alignment

Switch to the correct channel number corresponding to your crystal position (it's surprising how easy it is to forget this), and connect your multimeter negative lead to the DC supply negative line. Take a look at the accompanying alignment diagram, and with your multimeter on its 10V DC range, connect its positive lead to TP7. Apply 12V power, switch the set on, and tune the core of L10 very carefully, looking for a 'dip' in the meter reading, re-adjusting carefully for minimum voltage reading. Transfer the meter positive lead to TP8, and tune L11 and then L10 for maximum reading, re-tune again for absolute maximum and then tune L12 for a 'dip', e.g. minimum voltage. Transfer the positive lead to TP10, and tune L13 and then L12 for maximum, then tune L16 for a dip. Transfer to TP6, and tune L17, then L16 for maximum, re-tuning again as required for absolute maximum, now we can tune the front end.

The front end selectivity is very 'sharp', and although it will probably already be near to 2m, the set will probably initially be very 'deaf'. To help you get it near to 2m, start by unscrewing the four threaded metal trimmer rotors (the

ones with small screwdriver-type slots in them) out from the die-cast metal case by about one turn, then open the receiver squelch by adjusting RV1 which is the squelch preset control. Now you need to receive a signal at the aerial connection, and before you adjust the front end trimmers make sure you first tune your crystal onto frequency, so you're then likely to receive at least something rather than nothing!

Now carefully peak the four front end trimmers for the best signal, you don't need a non-metallic tool for this, re-tuning these carefully for absolute best reception of a weak signal. Now re-check your crystal trimmer for each channel you have fitted, reset the squelch, and that's it for the receiver.

Here's the (slightly) difficult part! You'll first need to remove the metal screens from the transmitter multiplier coils L3/L4, L5/L6, L7/L8 and L9/L10 by carefully desoldering the two tags at each end of the screen from the PCB, and carefully lifting off the screens. You'll have to remove some turns from each one of the exposed coils, so you've two choices. To make the modification job easy, you can remove the coil assemblies from the PCB at the expense of time spent removing these, however make sure you only remove and modify these one by one, noting the orientation of the coil by the position of the small 'notch' on the base of the former, thus saving mistakes on re-assembly. Alternatively (if you've nimble fingers) you can modify the coils in-situ, although make sure you

carefully check your soldering connections if doing this.

On some coils you'll need to remove turns from the top of the coil, on others which are tapped you'll need to remove turns from both the top and bottom of the coils to retain the correct turns ratio. To do this, unsolder one end and using either fine-nosed pliers or a pair of tweezers carefully remove the required number of turns, don't unwind the whole coil. Cut the wire to length, and use your soldering iron tip with a small amount of solder to melt the insulation from the end of the coil, then re-solder this to the coil former pin. The details of numbers of turns required are given in the accompanying table. Note that the capacitors soldered to the coil connections on L3, L4 and L9 will need to be changed, use any small ceramic plate capacitor here ensuring you keep the connection leads short. After checking your solder connections, replace the screens and re-solder these into place.

Now for the transmitter PA and low-pass filter. Unclip the large metal screen covering the low-pass filter to expose the coils and capacitors here. Using a pair of sharp wire cutters, remove the required number of turns from the middle of each of the PA coils, close these turns up so they touch again, and solder the resultant join. On the low-pass filter, you'll see the coils are twin-section types with a capacitor to ground in the centre. Remove one turn from the middle of each side of these coils, again re-connecting these with a solder join.



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Now change the capacitors to the required values as given in the table, using either tubular ceramic types as originally fitted or ceramic plate capacitors, check your connections and replace the screen. Now for the tune-up.

Transmitter Alignment

Connect your dummy load and power meter to the aerial connection, switch to your crystalled channel and key the TX, remembering to keep it keyed when taking readings. Connect the positive lead of your multimeter, switched to the 10V DC range, to TP1 on the transmitter board. Initially tune C48

you to make an adjustment, to prevent overheating of the PA.

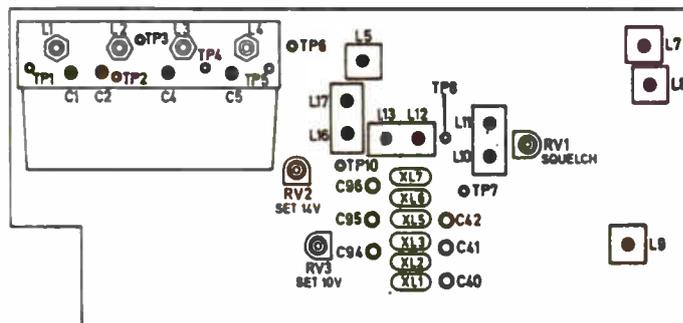
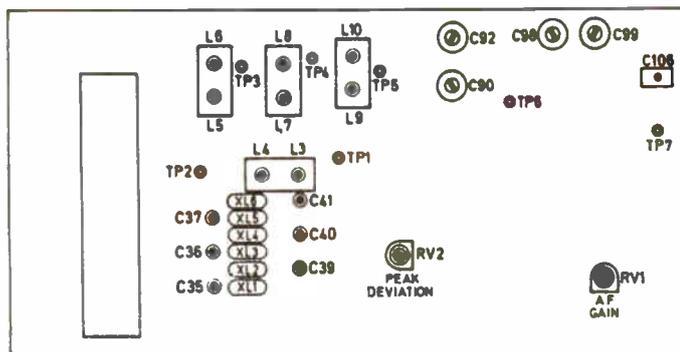
Tune C98 (and C99 if fitted — some M band sets do not have this but don't worry) for maximum indication on your multimeter, then tune C106 and C108, the latter accessible from a hole in the screening can, for maximum power, re-tuning the PA capacitors as required for absolute maximum, repeating several times to get the absolute maximum. You should find you get around 5W or so maximum output.

Now adjust the relevant crystal trimmer for the correct transmit frequency, and while modulating the transmitter, adjust C48 for maximum deviation as

heard on a receiver. RV1 which sets the microphone gain should already be reasonably set, but RV2, the TX deviation control, will probably need adjustment to give the required peak deviation, you'll normally set this to give just below 5kHz absolute maximum deviation

Conclusions

You should now have a working 2m transceiver for a cost of just a few pounds — ideal as a single channel packet rig or for clubs net use and the like. Have fun!



Transmitter alignment points

for maximum reading, then tune L3 for a 'dip'. Transfer the multimeter positive lead to TP2, and tune L4 then L3 both for maximum, then L5 for minimum. Transfer the positive lead to TP3 and change the multimeter range to 2.5V DC. Tune L6 and then L5 for maximum, then L7 for minimum. Transfer to TP4, tuning L8 and then L7 for maximum, then L9 for minimum. On to TP5 and tune L10 and then L9 both for maximum.

By now you may be seeing a 'glimmer' of RF power, if not you can try

Receiver alignment points

Table 1 Microphone Connections

Pin 1	Mic Live
Pin 2	Mic Ground
Pin 3	+10V for TX
Pin 4	Not Used
Pin 5	+10V

quickly tuning the following capacitors initially for maximum current drain from the power supply (place your multimeter in-line, switched to a 1-2A range). Alternatively connect the positive lead of your multimeter to the DC positive supply, and the negative lead to TP6. Tune C90 and C92 using a flat-bladed non-metallic adjuster for maximum indicated voltage or maximum power. Now remove the positive multimeter lead, change the range to 250uA DC, and connect the negative lead to TP7. From now on, keep the TX keyed only for as long as it takes

Table 2 Transmitter Modifications

Capacitor	Original Value	New Value
C61 (on L3)	33p	27p
C63 (on L4)	33p	27p
C80 (on L9)	5p6	10p
C109 (on L21)	27p	15p
C110 (on L22)	39p	22p
C111 (on L23)	33p	18p

Multiplier Coils

L3	Remove 14 turns from top
L4	Remove 14 turns from top
L5	Remove 9 turns from top
L6	Remove 9 turns from top, 3 turns from bottom
L7	Remove 4 turns from top, 2 turns from bottom
L8	Remove 4 turns from top, 1 turn from bottom
L9	Remove 1 turn from top, 2 turns from bottom
L10	Remove 3 turns from top

PA/LPF Coils

L12	Remove 2 turns
L13	Remove 2 turns
L15	Remove 3 turns
L16	Remove 2 turns
L20	Remove 2 turns
L21	Remove 1 turn
L22	Remove 1 turn
L23	Remove 1 turn
L21	Remove 1 turn from each end
L22	Remove 1 turn from each end
L23	Remove 1 turn from each end

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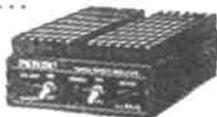
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E & EO.

NEC Show Report



Just some of the HRT staff on our stand!

The last weekend in April was a hectic time for many of the HRT staff, with Sheila, Kaye, Donna, Sarah, Bryan and Chris on hand to chat to readers over the two-day show, not forgetting Peter, Sally and colleagues back at the office who'd been busy preparing the many items on show on the stand.

Beginners into Radio

For the uninitiated, this show was the RSGB's major exhibition, where traders large and small offered their wares to prospective purchasers. The RSGB also devoted much space to the radio construction activities of the Scouts and Brownies, who were seen busy building up receivers and audio amplifiers. The large 'Project YEAR' (Youth into Electronics via Amateur Radio) area was, of course, devoted to providing information to newcomers to the hobby, with lots of leaflets, books, badges, tee-shirts and other goodies to tempt visitors with. There was always a cheery smile and free badges for newcomers young and old — even right at the end of the show when the HRT staff were ready to drop! Quite a crowd, from 8 year olds to senior citizens, were seen there watching the 'Project YEAR' video (as



Scouts show us the way it's done



Jim Bacon G3YLA visits the HRT stand

featured in the April 91 HRT). At the stand, the first copies of the new book *Amateur Radio for Beginners* was on sale, even the HRT staff dug into their pockets for a small pile of them for the local school!

Young Brownies building receivers





David Evans, RSGB Secretary (Amateur Radio), talks with the HRT Editor



David G3OUF, Hilary G4JKS, and David G4HYY enthusiastically manning the Project YEAR stand

HRT Visitors

On the HRT stand, a record number of new subscriptions were taken, as a 'thank you' to visitors we even presented each subscriber with a free 'posh cover' amateur station logbook, and dropped their name into the box for our 'usual' prize draw with over £100's worth of prizes. The HRT Editor and Technical Editor were pleased to be able to chat with our many readers and contributors, our small 'sit-down' area providing some welcome relief for our contributors, who



HRT Editor G81YA discusses licensing details with John Nash and his associates from the RA.

we made sure were kept well fed and watered!

Ford Fiesta Raffle

One of the highlights of the show was the draw organised by the RSGB for the Ford Fiesta and other prizes on dis-



Crowds flock to search out any bargains

play. With around 20,000 tickets sold at £1 each, after expenses this has resulted in an income of just over £8,000, this being put towards the provision of information packs (costing £1.45 each) for prospective Novice licensees. TV weatherman Jim Bacon G3YLA pulled the winning tickets out of the drum, ably assisted by Ron Broadbent G3AJJ of Amsat-UK with Sarah Church of HRT filling the large barrel up with 'last minute buy' tickets. As detailed last month, the Fiesta was won by HRT reader Bob Harrison G4UJS, who bought his ticket at the show.



Weatherman Jim G3YLA protects himself and Ron from the weather whilst drawing the winning ticket, Sarah Church of HRT looks on.

Trade Bargains

With most of the 'big name dealers' exhibiting, prospective purchasers of commercial equipment were of course spoilt for choice. However, even in the 'flea market' area, searching for surplus

components and low-cost gear such as ex-PMR equipment proved almost fruitless. Maybe this has now been relegated to the 'traditional' mobile rallies, i.e. those in lower cost accommodation such as fields and school halls, the relatively high £3 entrance fee to the RSGB show possibly endorsing this fact. The word amongst the traders following the first day differed, some thought trade at the show was good, others mourned at selling virtually nothing. However what must have been the 'bargain of the event' were the brand new, boxed, 6-channel UHF PMR portable transcei-



Anne Sanders, Aged 8, tries her hand at soldering



Joanne Duddles, Aged 9, with the receiver she built at the NEC

vers, being sold on the SMC stand complete with re-tuning details to 70cm for £29.95 a go — I hope prospective novices saw these!

See You Again

We enjoyed meeting our many visitors, even the PA system operator at the show kindly sent out a message inviting people to chat to the HRT Editors on the stand (we didn't even ask him to!). As well as the odd event or two (such as rallies and the Amsat-UK Colloquium later this month) the next large exhibition where you'll be able to meet the HRT staff is the Leicester Show in October — come and say hello!

Salyut-7 Fallout Contest

Arthur Gee G2UK with the results of the Salyut-7 contest

Predicting the date and time of the re-entry of spacecraft has become quite a popular exercise for space enthusiasts these days. The re-entry of Salyut-7 was no exception, and Pat Gowen G3IOR once again organised a contest for the recent re-entry of this well known Russian spacecraft.

Run on similar lines to the earlier Amsat-UK, Amsat and G3IOR contests for the re-entry of UoSAT-9 and COSMOS-1900, that for Salyut-7 created worldwide interest, with over 100 entries received worldwide. The re-entry of Salyut-7 also produced widespread media interest because this giant spacecraft, said to be the size of a double decker bus and weighing 60 tonnes, could conceivably cause considerable damage if it didn't completely disintegrate on entering the atmosphere, and fall in large pieces onto some populated area of the earth's surface. It was also expected to produce a spectacular display of 'fireworks' as it came into the earth's atmosphere!

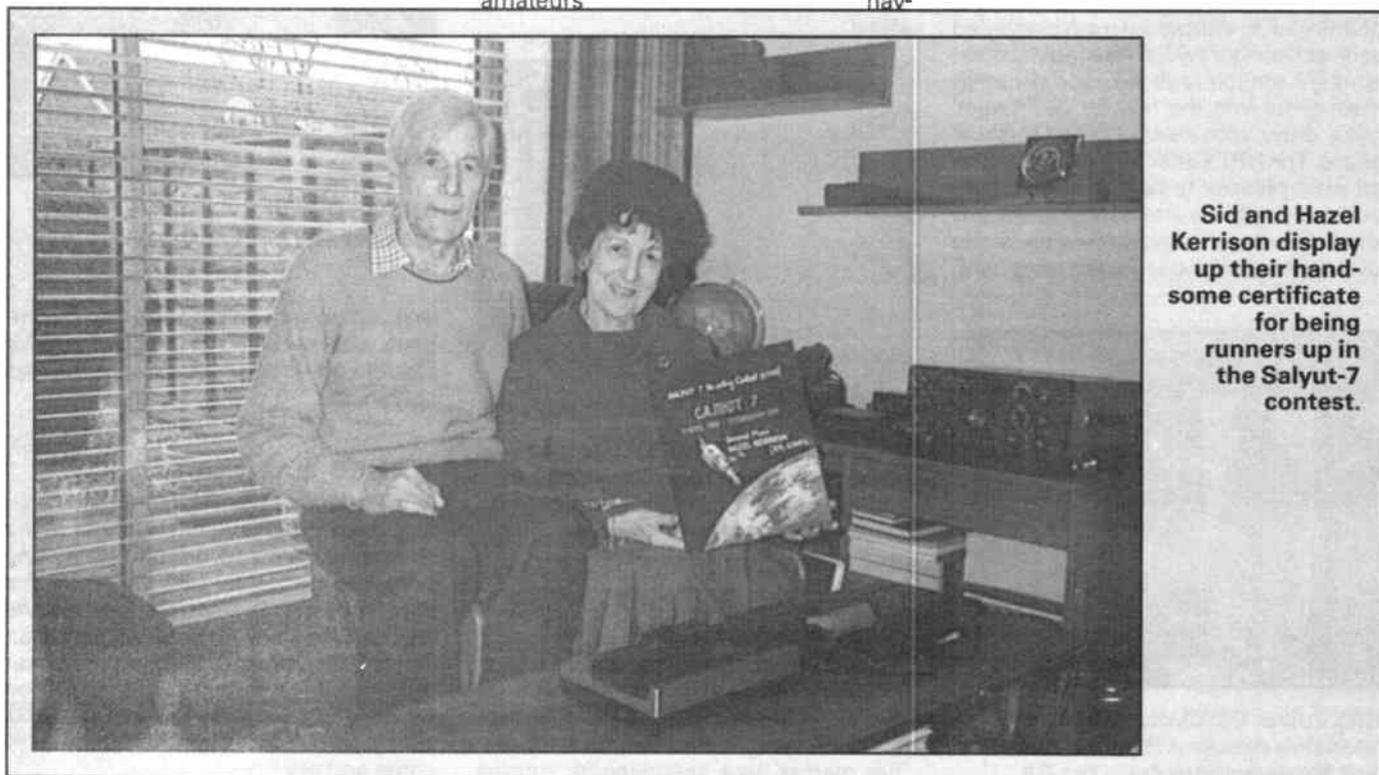
A prize of a handsome set of com-

memorative Soviet space stamps and a very attractive certificate designed and produced by Pat's XYL Norma, was offered to the first three people who came closest to predicting the date and UTC time of re-entry. Up to three calculations, or guesses, were permitted to each entrant and the entries had to be received at least one clear week before the actual spacecraft re-entry occurred. Re-entry occurred on the 7th February last at 34 deg 9' South; 63 deg 8' West, debris falling in the foothills of the Andes at 0347 UTC.

The person who came nearest to predicting re-entry was Mike Bilow N1BEE in Rhode Island, USA. He had studied celestial mechanics but says his prediction was 'pure luck', nothing to do with his knowledge of celestial mechanics! The honour of runner-up came to Hazel Kerrison, XYL of Sid G3MFO, of Sprowston, Norwich, keen spacecraft observers and true radio amateurs

ing no professional contact with celestial mechanics. Hazel was just 32 minutes out, whereas Mike Bilow was 17 minutes out. Third place went to Clive Wallis, G3CWV of Hertfordshire, he was several hours out.

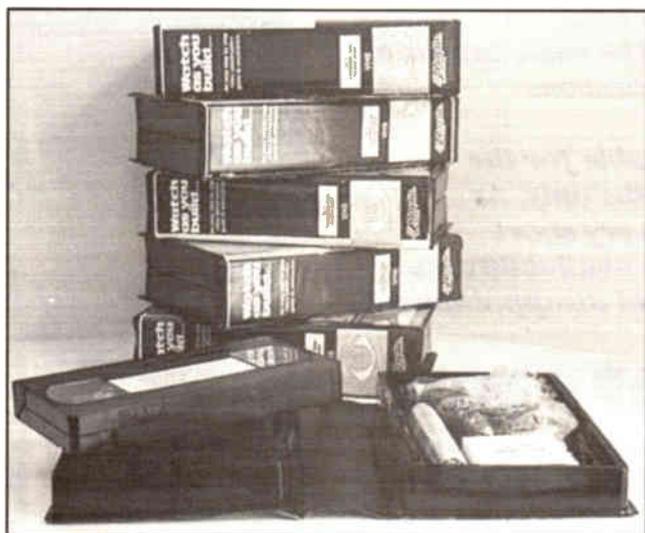
Sid says, "A lot of work went into our effort in arriving at the final prediction date and time, and Hazel became very interested in the calculations produced by the small computer we use, the 48k Spectrum. We would spend a lot of time working out the orbital time in seconds per orbit, which involved keeping records of lots of figures. It was all good fun really and whilst Hazel followed the tracking, I feel sure she introduced an 'element' or two of her own into the formulae we used to calculate re-entry! I say this because my prediction was sixteen orbits out — Hi! We started monitoring Salyut-7 in July last to see if we could detect any pattern in its orbital decay and checked from visual observations of the spacecraft when possible. Our next priority will be Mir!" Best of luck with this Hazel.



**Sid and Hazel
Kerrison display
up their hand-
some certificate
for being
runners up in
the Salyut-7
contest.**

Reader Survey

It's survey time again, and your chance to win one of six radio kits supplied by Maplin Electronics



It's been several years since our last survey and so it's time to see how we're doing! Although some of the questions here may not seem to relate directly to the magazine, please complete the whole questionnaire. Your answers not only help us steer the editorial content of the magazine in the direction you want but they also help us build up an overall profile of readers to present to the advertisers who require such data to select suitable magazines for their products.

No names and addresses will be disclosed to any third party and all information will be treated in the strictest confidence.

As an incentive for your hard work, all entries received by 10th August will be entered in the draw for the receiver kits. Maybe even if you don't use the prize we're sure your son/daughter/friend may welcome it, and who knows, it may be the start of a new radio amateur!

Are you an licensed amateur?
 Yes — Class A 001
 Yes — Class B 002
 No 003

If NO, are you intending to become a licensed amateur?
 Yes — full licence 004
 Yes — Novice 005
 No 006

Are you a member of the RSGB?
 Yes 007
 No 008

If so, will you be renewing your membership?
 Yes 009
 No 010

Do you regularly attend your local radio club?
 Yes 011
 No 012

Are you a member of;
 AMSAT-UK 013 014
 BARTG 015 016
 BATC 017 018
 RAYNET 019 020

What are your radio operating interests?

	Often	Sometimes	Rarely	Never
SSB	<input type="checkbox"/> 021	<input type="checkbox"/> 022	<input type="checkbox"/> 023	<input type="checkbox"/> 024
FM	<input type="checkbox"/> 025	<input type="checkbox"/> 026	<input type="checkbox"/> 027	<input type="checkbox"/> 028
CW	<input type="checkbox"/> 029	<input type="checkbox"/> 030	<input type="checkbox"/> 031	<input type="checkbox"/> 032
Packet	<input type="checkbox"/> 033	<input type="checkbox"/> 034	<input type="checkbox"/> 035	<input type="checkbox"/> 036
RTTY	<input type="checkbox"/> 037	<input type="checkbox"/> 038	<input type="checkbox"/> 039	<input type="checkbox"/> 040
AMTOR	<input type="checkbox"/> 041	<input type="checkbox"/> 042	<input type="checkbox"/> 043	<input type="checkbox"/> 044
Slow Scan TV	<input type="checkbox"/> 045	<input type="checkbox"/> 046	<input type="checkbox"/> 047	<input type="checkbox"/> 048
Fast Scan TV	<input type="checkbox"/> 049	<input type="checkbox"/> 050	<input type="checkbox"/> 051	<input type="checkbox"/> 052

Which bands do you operate?

	Often	Sometimes	Rarely	Never
HF — 40m and below	<input type="checkbox"/> 053	<input type="checkbox"/> 054	<input type="checkbox"/> 055	<input type="checkbox"/> 056
HF — 20m and above	<input type="checkbox"/> 057	<input type="checkbox"/> 058	<input type="checkbox"/> 059	<input type="checkbox"/> 060
6m	<input type="checkbox"/> 061	<input type="checkbox"/> 062	<input type="checkbox"/> 063	<input type="checkbox"/> 064
4m	<input type="checkbox"/> 065	<input type="checkbox"/> 066	<input type="checkbox"/> 067	<input type="checkbox"/> 068
2m	<input type="checkbox"/> 069	<input type="checkbox"/> 070	<input type="checkbox"/> 071	<input type="checkbox"/> 072
70cm	<input type="checkbox"/> 073	<input type="checkbox"/> 074	<input type="checkbox"/> 075	<input type="checkbox"/> 076
23cm and above	<input type="checkbox"/> 077	<input type="checkbox"/> 078	<input type="checkbox"/> 079	<input type="checkbox"/> 080

What type of equipment do you use?

	Mainly	Some	None
Commercial transceivers	<input type="checkbox"/> 081	<input type="checkbox"/> 082	<input type="checkbox"/> 083
Kit equipment	<input type="checkbox"/> 084	<input type="checkbox"/> 085	<input type="checkbox"/> 086
Ex-PMR gear	<input type="checkbox"/> 087	<input type="checkbox"/> 088	<input type="checkbox"/> 089
Home-made gear	<input type="checkbox"/> 090	<input type="checkbox"/> 091	<input type="checkbox"/> 092

Do you make your own PCBs?
 Yes 093
 Prefer not to 094
 Never 095

Do you feel the present CW test should be retained as the means of obtaining a Class A full or Novice licence?
 Yes 096
 No 097

If NO, should this be instead replaced with a different test such as knowledge of EMC?
 Yes 098
 No 099

Which of the following features would you like to see more, or less of, or do you feel the coverage we give is about right;

	More	Same	Less
Readers Letters	<input type="checkbox"/> 100	<input type="checkbox"/> 101	<input type="checkbox"/> 102
Equipment reviews	<input type="checkbox"/> 103	<input type="checkbox"/> 104	<input type="checkbox"/> 105
Construction articles	<input type="checkbox"/> 106	<input type="checkbox"/> 107	<input type="checkbox"/> 108
Ex-PMR conversions	<input type="checkbox"/> 109	<input type="checkbox"/> 110	<input type="checkbox"/> 111
Aerial features	<input type="checkbox"/> 112	<input type="checkbox"/> 113	<input type="checkbox"/> 114
Packet features	<input type="checkbox"/> 115	<input type="checkbox"/> 116	<input type="checkbox"/> 117
Amateur Television	<input type="checkbox"/> 118	<input type="checkbox"/> 119	<input type="checkbox"/> 120
Computing in amateur radio	<input type="checkbox"/> 121	<input type="checkbox"/> 122	<input type="checkbox"/> 123
Radio propagation	<input type="checkbox"/> 124	<input type="checkbox"/> 125	<input type="checkbox"/> 126
Beginners guides	<input type="checkbox"/> 127	<input type="checkbox"/> 128	<input type="checkbox"/> 129
Dealer profiles	<input type="checkbox"/> 130	<input type="checkbox"/> 131	<input type="checkbox"/> 132

DTI/Licensing News 133 134 135
 Rally/show reports 136 137 138
 What else would you like to see covered in more detail? _____

Which regular features do you enjoy reading;

	Often	Sometimes	Rarely
CQ de G8IYA Editorial	<input type="checkbox"/> 139	<input type="checkbox"/> 140	<input type="checkbox"/> 141
From My Notebook	<input type="checkbox"/> 142	<input type="checkbox"/> 143	<input type="checkbox"/> 144
HF Happenings	<input type="checkbox"/> 145	<input type="checkbox"/> 146	<input type="checkbox"/> 147
Novice Notes	<input type="checkbox"/> 148	<input type="checkbox"/> 149	<input type="checkbox"/> 150
Packet Radio Roundup	<input type="checkbox"/> 151	<input type="checkbox"/> 152	<input type="checkbox"/> 153
Radio Today	<input type="checkbox"/> 154	<input type="checkbox"/> 155	<input type="checkbox"/> 156
Readers Letters	<input type="checkbox"/> 157	<input type="checkbox"/> 158	<input type="checkbox"/> 159
QRP Corner	<input type="checkbox"/> 160	<input type="checkbox"/> 161	<input type="checkbox"/> 162
Satellite Rendezvous	<input type="checkbox"/> 163	<input type="checkbox"/> 164	<input type="checkbox"/> 165
Scanners International	<input type="checkbox"/> 166	<input type="checkbox"/> 167	<input type="checkbox"/> 168
VHF/UHF Message	<input type="checkbox"/> 169	<input type="checkbox"/> 170	<input type="checkbox"/> 171

Do you feel we could do anything to improve the readership appeal of HRT? _____

(please continue on a separate sheet, headed 'Attn; Editor, HRT' if required)

Would you like the four page 'Scanners' feature to continue as it is, or just appear as an occasional feature?

Continue each month 172
 Occasional feature only 173

Is the size of printing in the editorial features all right, or would you prefer it to be different (this of course would affect the amount we'd be able to fit in)?

OK 174
 Prefer smaller 175
 Prefer larger 176

Do you read any of the following magazines;

	Never	Occasionally	Regularly
Electronics Today International	<input type="checkbox"/> 177	<input type="checkbox"/> 178	<input type="checkbox"/> 179
Practical Wireless	<input type="checkbox"/> 180	<input type="checkbox"/> 181	<input type="checkbox"/> 182
CB Citizens Band	<input type="checkbox"/> 183	<input type="checkbox"/> 184	<input type="checkbox"/> 185
Elektor Electronics	<input type="checkbox"/> 186	<input type="checkbox"/> 187	<input type="checkbox"/> 188
Maplin Magazines	<input type="checkbox"/> 189	<input type="checkbox"/> 190	<input type="checkbox"/> 191
Radio Communication	<input type="checkbox"/> 192	<input type="checkbox"/> 193	<input type="checkbox"/> 194
Electronics and Wireless World	<input type="checkbox"/> 195	<input type="checkbox"/> 196	<input type="checkbox"/> 197
Everyday Electronics	<input type="checkbox"/> 198	<input type="checkbox"/> 199	<input type="checkbox"/> 200
Short Wave Magazine	<input type="checkbox"/> 201	<input type="checkbox"/> 202	<input type="checkbox"/> 203
Television	<input type="checkbox"/> 204	<input type="checkbox"/> 205	<input type="checkbox"/> 206
QST	<input type="checkbox"/> 207	<input type="checkbox"/> 208	<input type="checkbox"/> 209
73 Amateur Radio	<input type="checkbox"/> 210	<input type="checkbox"/> 211	<input type="checkbox"/> 212
Ham Radio (USA)	<input type="checkbox"/> 213	<input type="checkbox"/> 214	<input type="checkbox"/> 215

If read, please indicate what you think of these magazines?

	Not as good as HRT	As good as HRT	Better than HRT
Radio Communication	<input type="checkbox"/> 216	<input type="checkbox"/> 217	<input type="checkbox"/> 218
Short Wave Magazine	<input type="checkbox"/> 219	<input type="checkbox"/> 220	<input type="checkbox"/> 221
Practical Wireless	<input type="checkbox"/> 222	<input type="checkbox"/> 223	<input type="checkbox"/> 224
QST	<input type="checkbox"/> 225	<input type="checkbox"/> 226	<input type="checkbox"/> 227
73 Amateur Radio	<input type="checkbox"/> 228	<input type="checkbox"/> 229	<input type="checkbox"/> 230
Ham Radio (USA)	<input type="checkbox"/> 231	<input type="checkbox"/> 232	<input type="checkbox"/> 233

Would you be interested in reading a magazine featuring 'Consumer Communications' such as cellphones and personal radio together with scanners, short wave, beginners 'Novice' licence information etc.?

Yes 234
 No 235
 Maybe 236

How long do you keep your copies of HRT? for:

Less than one month 237
 One month 238

Three months 239
 Six months 240
 A year or more 241

If kept, how often do you refer back to issues of HRT?

Once a week or more 242
 About once a month 243
 Once every three months 244
 Less often 245
 Never 246

How long do you spend reading your copy of HRT?

Over 2 hours 247
 1½-2 hours 248
 1-1½ hours 249
 ½-1 hour 250
 Less than ½ hour 251

How long have you been an HRT reader?

Less than three months 252
 3-6 months 253
 7-12 months 254
 1-2 years 255
 2-5 years 256
 Over 5 years 257

How often do you buy HRT?

Occasional issues 258
 Most issues 259
 Every issue 260

How much of HRT do you read?

Read only some articles 261
 Read most articles 262
 Read all articles 263

With regard to the advertisers in HRT, do you?

Read or look through most or nearly all the ads 264
 Read or look through some of the ads 265
 Just read or look through the occasional ad 266
 Very rarely/never look at the ads 267

Thinking specifically about the advertising content, would you please rate the two main types of advertisement:

	Display	Classifieds
Very useful	<input type="checkbox"/> 268	<input type="checkbox"/> 269
Useful	<input type="checkbox"/> 270	<input type="checkbox"/> 271
Quite useful	<input type="checkbox"/> 272	<input type="checkbox"/> 273
Not very useful	<input type="checkbox"/> 274	<input type="checkbox"/> 275
Not at all useful	<input type="checkbox"/> 276	<input type="checkbox"/> 277

Which of the following would you most like to see featured with the magazine? (one box only).

Cover mounted gifts 278
 Additional supplements 279
 Competitions 280
 Money saving offers 281
 Other (please specify) _____

Does anyone else read your copy of HRT?

No, only myself 282
 One or two other people 283
 Three or four other people 284
 More than four other people 285

If your copy of HRT is read by other people, please give details of their age and sex:

Age:	Person 1	Person 2	Person 3	Person 4
9-14 yrs	<input type="checkbox"/> 286	<input type="checkbox"/> 287	<input type="checkbox"/> 288	<input type="checkbox"/> 289
15-24 yrs	<input type="checkbox"/> 290	<input type="checkbox"/> 291	<input type="checkbox"/> 292	<input type="checkbox"/> 293
25-34 yrs	<input type="checkbox"/> 294	<input type="checkbox"/> 295	<input type="checkbox"/> 296	<input type="checkbox"/> 297
35-44 yrs	<input type="checkbox"/> 298	<input type="checkbox"/> 299	<input type="checkbox"/> 300	<input type="checkbox"/> 301
45-54 yrs	<input type="checkbox"/> 302	<input type="checkbox"/> 303	<input type="checkbox"/> 304	<input type="checkbox"/> 305
55-64 yrs	<input type="checkbox"/> 306	<input type="checkbox"/> 307	<input type="checkbox"/> 308	<input type="checkbox"/> 309

Over 64 yrs 310 311 312 313
 Sex:
 Male 314 315 316 317

Are you aware of the scheduled publication date of HRT?
 Yes 318
 No 319

How do you normally obtain your copy?
 Chance purchase 320
 Newsagent shop collection 321
 Newsagent home delivery 322
 Subscription 323
 Passed on copy 324

If you are a subscriber, on which date did you receive this issue?
 / /

If you are a subscriber, how long have you subscribed to this magazine?
 1-6 months 325
 7-12 months 326
 1-2 years 327
 3-5 years 328
 6-10 years 329
 Over 10 years 330

If you do not obtain your copy by subscription, is it due to one of the following:
 Subscription too expensive 331
 Not every issue required 332
 Not aware subscription service available 333

Are you aware that to subscribe to this magazine in the UK costs the same as purchasing it in a shop?
 Yes 334
 No 335

Would you like to receive further details on taking a subscription?
 Yes 336
 No 337

If you do not subscribe, from which type of newsagent do you most often obtain your copy?
 High street shop 338
 Estate shop 339
 Corner shop 340
 Travel point 341
 Other (please specify)

Please tick the box which represents the annual total of your gross income:
 Under £6,500 342
 £6,501-£8,000 343
 £8,001-£10,000 344
 £10,001-£12,500 345
 £12,501-£15,000 346
 £15,001-£19,000 347
 £19,001-£25,000 348
 Over £25,000 349

What is your age?
 Under 15 yrs 350
 15-18 yrs 351
 19-21 yrs 352
 22-24 yrs 353
 25-34 yrs 354
 35-44 yrs 355
 45-54 yrs 356
 55-64 yrs 357
 Over 64 yrs 358

What is your marital status?
 Married 359

Single 360
 Divorced 361

Sex:
 Male 362
 Female 363

Are you a member of a book club?
 Yes 364
 No 365

Are you?
 In full time employment 366
 In part time employment 367
 Not employed at present 368
 Retired 369
 Student -- full-time 370
 Student -- part-time 371

If in full-time employment, please state your occupation:

If a student what subjects do you study?

If you have children, please indicate their age and sex (give details of the four youngest if you have more than four)?

Age:	First	Second	Third	Fourth
1-3 yrs	<input type="checkbox"/> 372	<input type="checkbox"/> 373	<input type="checkbox"/> 374	<input type="checkbox"/> 375
4-8 yrs	<input type="checkbox"/> 376	<input type="checkbox"/> 377	<input type="checkbox"/> 378	<input type="checkbox"/> 379
9-12 yrs	<input type="checkbox"/> 380	<input type="checkbox"/> 381	<input type="checkbox"/> 382	<input type="checkbox"/> 383
13-16 yrs	<input type="checkbox"/> 384	<input type="checkbox"/> 385	<input type="checkbox"/> 386	<input type="checkbox"/> 387
Over 16 yrs	<input type="checkbox"/> 388	<input type="checkbox"/> 389	<input type="checkbox"/> 390	<input type="checkbox"/> 391
Male	<input type="checkbox"/> 392	<input type="checkbox"/> 393	<input type="checkbox"/> 394	<input type="checkbox"/> 395
Female	<input type="checkbox"/> 396	<input type="checkbox"/> 397	<input type="checkbox"/> 398	<input type="checkbox"/> 399

Once you've completed your survey pop it in an envelope and send it to: **FREEPOST**
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Thank you for completing the HRT readers' survey. To qualify for entry in the free draw for one of the Maplin Receiver Kits, as reviewed this month, you must fill in your name and address clearly below. Pull out the centre pages and send to the Freepost address as shown, to arrive not later than 10th August 1991.

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SCANNERS

INTERNATIONAL

Scanner Scandals?

It's slowly coming, but the public are now becoming more aware of the growth in scanner usage. Some of this could be good, increasing interest in radio and communications technology, but a friend recently pointed out an advert in a UK tabloid newspaper to us. This offered a pocket scanning receiver which the ad stated normally retailed at £99, for a price of just £19.95. The specifications looked tempting, even incredible, such as 99 ranges, with coverage including bands enabling you to tune into your neighbour's phone calls, the drugsquad, police, fire, planes, taxis, the army, satellites, and government bugs, with all frequencies stored in the receiver's scanning zones. Not only that, but a free Private Listener's Guide apparently worth £9.95 came with the scanner. All for £19.95 plus £3.50 p/p, with a no-quibble refund if you're not satisfied.

Too good to be true? We thought so. To investigate, a member of the Scanners International staff ordered one using the firm's credit card order line, which turned out to be an answering machine.

The scanning receiver eventually came in the post, and as we thought it couldn't be described as a scanner at all, more like the plastic boxed radios we see on market stalls selling at £9.95. It covered the 27MHz FCC 40 CB channels on one range, and 54-176MHz in two further ranges, all manually tuned of course. We wondered how it could tune into your neighbour's telephone calls?

The suppliers also enclosed an invoice and credit card debit slip for £28.49, of which £5.00 was for a previously undisclosed credit card handling charge. Several days ago the suppliers received written notification from us in line with the provisions of the UK Sale of Goods Act, but as yet we've not heard anything - surprise surprise! I believe a certain Trading Standards Office may soon get involved! The moral - read the periodic Scanners International Buyers Guides when choosing a scanner (there's one planned for next month's issue), and we'll continue to keep you informed through these as to what you really get for your money!



▲ Do you see a pocket scanning receiver in this picture?

SCANNERS Free Readers Advertisements

FOR SALE

Realistic PRO-2021 scanner with instruction book, £150, also Realistic DX-400 receiver, with instruction book, £75, or will exchange both for handheld covering up to 1300MHz. (Rochdale). Tel. 0706 352335

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

Realistic PRO-2003, 60 channel scanner, VHF 68-136, 138-174MHz, UHF410-512MHz. Complete with manual, excellent condition, ideal for beginners, £150 ono. Also discone wide band aerial, 60-700MHz, £23. (Liverpool). Tel. 051 486 1386

FDK RX40 Handheld VHF FM digital receiver, 144-146MHz, Marine, Amateur, Public Service etc. Nicads and charger, instructions, £85 or would consider exchange WHY? (Herne Bay). Tel. 0227 740093

Realistic PRO-57, ten channel scanner, boxed with manual, As new, unwanted gift, £60. (Woodford Green, Essex). Tel. 081 505 9718.

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

Realistic PRO-2006 hyperscanner. 400 memories, 25-570MHz, 720-1300MHz, AM/FMW/FMN. Mint, £275, could possibly deliver. (London W13). Tel. 081 579 7038.

EXCHANGE

PRO-34 scanner, complete and boxed as new. Swap for best TX/RX or transceiver. (Ponypridd, Mid Glamorgan). Tel. 0443 204205

WANTED

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

Scanner frequencies for Northern Ireland area, anything accepted (no money paid). Contact John, 13 Fairview Way, Carrmoney, Co. Antrim. N. Ireland. BT36 6PX.

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Enter your advert in the boxes below			

YUPITERU VT-125

The most popular radio interest of Scanners International readers is VHF Airband monitoring. We know this from the hundreds of letters in our postbag! So when a new dedicated VHF Airband scanner became available in the UK, guess which magazine jumped at the chance of reviewing the very first sample?

The Yupiteru VT-125 scanner is a very small and lightweight set, covering 108-142MHz on AM with the facility of 30 memory channels. It's powered from just three AA size nicads which come supplied. With these fitted the set weighs just 220g, and sporting overall dimensions of 125mm (H) x 53mm (W) x 32mm (D) you'd hardly know it was in your pocket.

Frequency Steps

Some early versions of the VT-125 operated in 50kHz and 100kHz steps. I received a sample of this type some time ago, but the latest sets add a 25kHz step size in line with current VHF airband usage. In fact, my local airport uses a 25kHz sub-division for it's main frequency, so in my case this facility is a necessity.

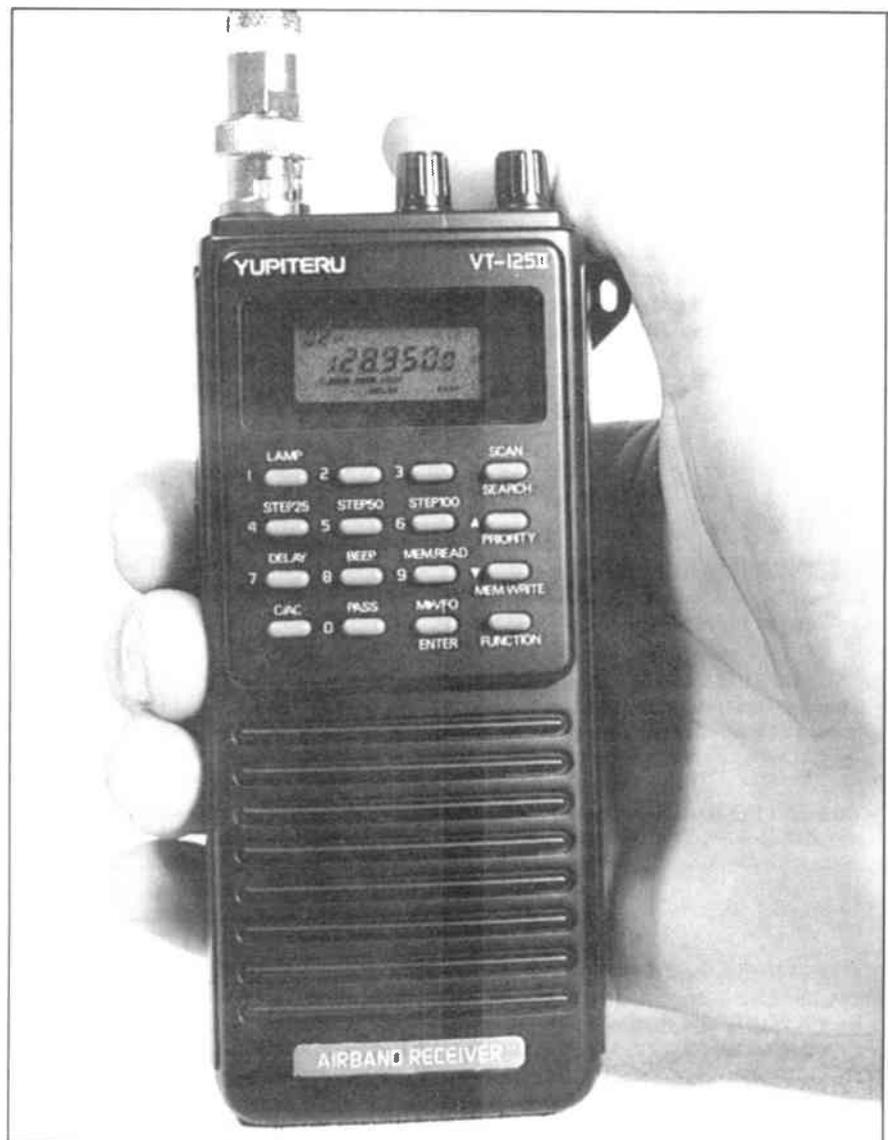
Priced at £179, the set comes with fitted nicads, a carry strap, set-top helical aerial, earphone, and DC lead. A car cigar lighter plug is fitted, and the suppliers of the review set also provide an AC wall charger for home use.

Controls and Connections

The set is encased in a black plastic moulding, 16 small tactile push buttons fitted on the facia controlling most of the set's functions, with the two rotary knobs on the set top for On/Off/Volume and Squelch. Together with the usual BNC socket for connection of either the supplied helical, or external aerial, an adjacent 3.5mm external speaker socket pro-

vides audio output for use with either the supplied earphone or an external loudspeaker. A side-mounted Key Lock switch saves accidental frequency shifts through inadvertent key presses when carrying the set around, and when all else fails a recessed Reset button lets you reset the receiver's microprocessor.

Up/Down frequency step buttons on the keypad are used for manual tuning, and numeric keys for direct frequency entry. As well as a memory channel scan with any number of selected memories being locked out with a Pass facility, a Search mode lets you search the entire VFO range for activity. A Delay



▲ The Yupiteru VT-125 handheld airband scanner

button lets you change the scan hold delay time to either two or four seconds, prior to the set resuming Memory Scan or VFO Search after a signal falls below the receiver squelch threshold. An LCD panel which may be backlit shows the tuned frequency and memory channel, together with a five-bar relative signal strength indication along the bottom of the display.

In Use

On taking the set out of its box I realised just how small and light it was, and following a nicad charge I spent a pleasant few weeks evaluating its performance.

After programming in my local and not-so local frequencies, I was surprised to find the set gave a very fast scan rate of its 30 memory channels, a quick timing in Search mode

showed this to be around 40 channels per second. On air, I found the VT-125 was very sensitive when compared to my usual all-band handheld scanner. I'm sure the specially-cut helical supplied with the set helped here, as many others tend to offer a compromise performance across a wide range.

I found the internal speaker to be very effective, with enough audio present whilst walking out and about in reasonably noisy locations. However if you're visiting an (even noisier) airshow then you'll probably be using an earphone in any case to save deafening others! I found the S-meter display quite handy in gaining an idea of the strength of the received signal, very few handheld scanners having this facility.

The IF filters (which determine the receiver selectivity) I found were quite narrow, this could cause re-

duced sensitivity or distortion in receiving (some deliberately) off-channel signals. On the other hand I never found the set to suffer from blocking, even with a rooftop aerial connected, although I live just a few km from an international airport with planes often flying immediately above my location.

When I used the set at home amongst noise sources such as unscreened computers, I frequently found the inbuilt carrier squelch circuitry caused the set to lock on to some channels due to these signals, thus halting the scan/search mode. However to be fair there's probably little that can be done in the set to overcome this apart from either a noise (ie FM based) squelch or an attenuator facility, the latter of which I would have liked.

Conclusions

In all, a good performance from such a small set, indeed looking inside the case shows the degree of miniaturisation involved! The set is a very handy small size, lightweight, and in my mind ideal for the dedicated civil airband enthusiast to take along in a top pocket when out and about.

My thanks go to Nevada for the supply of the two review samples.

LABORATORY RESULTS:

All measurements taken at 125MHz with 30% AM modulation at 1kHz unless otherwise stated.

Sensitivity:

Input level required to give 12dB SINAD:

Freq MHz	Level
118	0.35uV pd
120	0.35uV pd
125	0.34uV pd
130	0.34uV pd
135	0.34uV pd
140	0.37uV pd
142	0.38uV pd

Squelch Level:

Threshold: 0.22uV pd (9dB SINAD)
Tight: 1.58uV pd (24dB SINAD)

Adjacent Channel Selectivity:

Measured as increase in level of interfering signal, modulated with 400Hz at 30% modulation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal:

+25kHz:	61.0dB
-25kHz:	60.5dB
+50kHz:	66.0dB
-50kHz:	66.5dB

Image/IF Rejection:

Increase in level of signal at first IF image frequency (+90.0MHz), over level of on-channel signal to give identical 12dB SINAD signals: 68.5dB

Blocking:

Measured as increase over 12dB SINAD level of interfering signal modulated with 400Hz at 30% to cause 6dB degradation in 12dB SINAD on-channel signal:

+100kHz:	70.0dB
+1MHz:	89.0dB
+10MHz:	84.5dB

Intermodulation Rejection:

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

25/50kHz spacing:	50.5dB
50/100kHz spacing:	50.0dB

Maximum Audio Output:

Measured at 1kHz on the onset of clipping:
3 ohm load: 69mW RMS
8 ohm load: 63mW RMS
15 ohm load: 47mW RMS

Current Consumption:

Scanning, no signal:	40mA
Receive, mid volume:	71mA
Receive, max volume:	92mA

S-Meter Readout:

Reading Level	Signal Level	Relative
1	0.38uV pd	0dB ref.
2	0.56uV pd	+2.9dB
3	1.04uV pd	+8.9dB
4	2.14uV pd	+15.2dB
5	5.34uV pd	+23.1dB

The WideBand Wastepipe

Wideband Scanner Preamp

by Bill Wilson

Many scanner owners use their receiver from home with an external rooftop aerial connected, which can be very useful for bringing in signals that could not otherwise be received. However, if the aerial is connected by a long length of thin coax feeder, the use of a wideband mast-head preamplifier can reap benefits in reducing loss of signal due to the feeder attenuation.

Many such preamps use the now-common MMIC (Monolithic Microwave Integrated Circuit), the type used in this project being the MAR-6 available from Cirkit. As well as being easily available, it offers a low noise figure and thrives on a DC supply of just 3.5V, it's also a fraction of the size of the common AvanteK MMIC devices. The preamp to be described has a nominally high gain, and this may be adjusted by varying the supply voltage with VR1 on the PSU/junction box, thus forming a remote gain control. The PSU is mounted at the re-

ceiver location, with DC power fed to the remote preamp through the coax cable.

Construction

The preamplifier itself is assembled on a single-sided PC board as shown in the accompanying diagram, with all components mounted and soldered on the copper side for simplicity. The dot on the MAR-6 IC indicates the input pin, unlike the AvanteK devices where the dot marks the output - don't get caught out!

The PSU/junction box requires no special assembly methods apart from the usual precautions to be taken with AC mains, a chunk of stripboard being adequate to hold the low-voltage components. A metal box should be used for safety, making certain it is reliably earthed. (Ed's note - use a low-cost external 13.8V DC plug-in power supply if you're not sure of your proficiency and knowledge of AC mains safety, missing out T1, BR and C7, and connecting the DC output of the power supply to the 7812 regulator input).

As well as commercially available chokes for L1 and L2, as these inductor

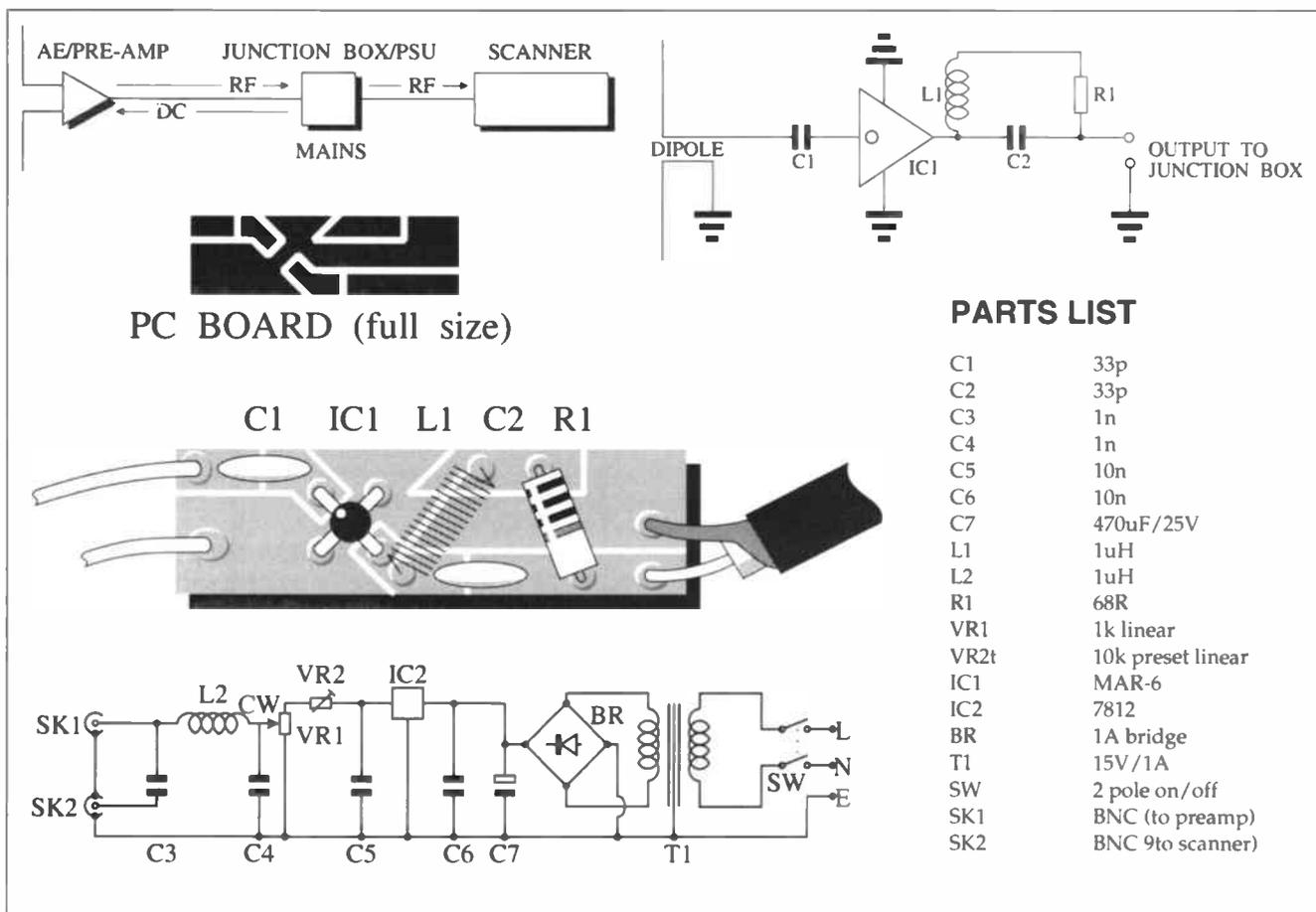
values are not critical they may alternatively be home-wound using 22SWG enamelled wire on a 3 or 4mm former, with 15-20 turns close wound. L1 is not strictly necessary although it's use is recommended for RF decoupling, if not used then R1 can simply be installed across C2.

Setting Up

After checking for correct assembly, initially set VR2 at maximum resistance and VR1 in the fully clockwise position. Connect a voltmeter across the terminals of SK1, and with the preamp connected and the PSU switched on (mind your fingers), adjust VR2 until the voltmeter reads 3.6V. VR1 can now be used to vary the supply voltage to the preamp.

In Use

Remember that many broad-band input receivers will not take kindly to further signal amplification, and strong signal overload may result in degraded reception unless you keep the overall gain down. However, if you need to overcome the losses of a substantial length of coax, this amplifier should work nicely. When used with the Wideband Wastepipe aerial described in last month's Scanners International, the preamp PCB can live inside the aerial with just the two input connections protruding through the centre hole to join the feedpoint.



From My Notebook

This month, Geoff Arnold G3GSR discusses ways of defining frequency accuracy

It occurred to me whilst talking about the different terms in which voltmeter sensitivity can be specified, a couple of issues back, that another area of measurement where there are several different ways of specifying accuracy (or more correctly inaccuracy!) is in frequency measurement.

Wavelength Can Change!

Before actually starting to look at this topic, let's consider the old argument of wavelength versus frequency as a means of specifying the spot on the dial where you will find a radio station. I'm never entirely sure quite why the early pioneers chose to use wavelength, rather than frequency, nor yet why it was measured in metres rather than yards or whatever, except that several of the pioneers came from countries where the metric system was the norm. Considering, though, that so much work on the development of wireless was done in Great Britain and the USA, where Imperial measurement was firmly in vogue, it does seem a little strange.

Wavelength does have advantages for some things - appreciating the length of aerials or tuned lines for example, but I've always felt that the disadvantages far outweigh the advantages. The frequency of a radio wave stays constant regardless of the medium it's travelling through, though it appears to change if either the transmitting or receiving station is moving rapidly, as with a satellite - due to the well-known Doppler effect. Wavelength, on the other hand, changes, sometimes quite considerably, according to whether the wave is propagating through free space or along some sort of transmission line.

A signal on the amateur 144MHz band, for example, will have a wavelength of about 2 metres when winging its way through the ether to your receiver aerial, but when it's travelling down the coaxial cable from aerial to receiver, that wavelength will be more like 1.3 metres, because it travels more slowly.

Anyway, let's head back towards the real matter in hand. Frequency is nowadays specified in hertz (note the small

initial 'h'), which is abbreviated to Hz (this time note that it's a capital 'H' and a small 'z'). This is exactly equivalent in numerical terms to the older 'cycles per second' (c/s), which was often shortened (quite wrongly) to just cycles. You cannot measure a frequency in cycles!

The same decimal multipliers (see Table) that were used with c/s are also used with Hz, in order to reduce the number of digits needed to specify a high frequency. It would be rather tiresome to have to write the frequency of Channel S20 on the 2m band as 145,500,000Hz, for example. Much easier to say 145.5MHz.

On Frequency?

Although we might blithely talk about S20 being 145,500,000Hz, the chances of finding a transmitter anywhere that was actually on that frequency are virtually nil. All of them will be off frequency to some extent, even if it's only by a few hertz. The same applies to every transmitter, receiver, oscillator, etc., in the world, even to the Standard Frequency transmitting stations, though for them the maximum inaccuracy will be only a small fraction of a hertz.

Channels

Where radio amateurs are concerned, it's not a licence requirement that we transmit on particular frequencies or channels, only that we keep our emissions within the specified amateur bands. The use of channelised systems on parts of the amateur VHF and UHF bands (such as S20 mentioned above) is simply for operational convenience, by agreement between amateurs. Commercial radio systems, on the other hand, operate on specific frequencies allocated to each service and user by the licensing authority, and the licence or equipment specification will state clearly what the maximum allowable frequency inaccuracy is.

Regardless of what the licence or specification says, wherever a channelised system is being used, with switched selection of operating frequency rather than continuously variable tuning, the various transmitters and receivers trying to communicate with one another must each be near enough to the correct frequency to produce intelligible results. But how near is near enough? It depends on the modulation mode in use, with SSB needing a far more accurately controlled carrier frequency than FM, for example.

So, how do we specify the inaccuracy of a frequency source? If you read the specification for a commercial radio service, or look in the handbook for a radio transmitter or receiver, or for that

matter a piece of test equipment which either generates sinewave signals or measures their frequency, you're likely to find any of three basic methods.

I've already used one of the methods in this article, which is to state the inaccuracy directly in hertz. Let's quote some typical figures to give an idea what we're talking about. For commercial SSB transmitters, a maximum allowable frequency inaccuracy (or 'tolerance' to use another term that's rather less of a mouthful) of plus or minus 100Hz is typical. In other words, an SSB emission that was nominally on 8.198MHz could actually be anywhere between 8,197,900Hz and 8,198,100Hz. That level of accuracy is reckoned to be close enough to give an intelligible audio output signal from a receiver with a similar frequency tolerance. If, though, this HF SSB link is part of a public telephone service, the aim would be not just to have an intelligible signal at the receiving end, but one in which a listener, knowing the person speaking at the far end, would recognise the voice. That requires far greater accuracy, generally reckoned to be better than plus or minus 20Hz!

Proportion

Where we're talking about equipment operating on only one channel, or perhaps on a selection of channels within a fairly narrow frequency band, it's sensible to specify frequency tolerance directly in terms of frequency (hertz). Where multi-band equipment is involved, though, the higher output frequencies are often derived from the same crystal oscillators as are used for lower bands. In older equipment, it might be by simple frequency multiplication from a selection of quartz crystals - crystals for the 3.5MHz amateur band used directly for that band, or doubled up for the 7MHz band, then doubled again for the 14MHz band or tripled for the 21MHz band. In more modern equipment it could be a single quartz crystal in a frequency synthesiser.

Whichever of these it is, the inaccuracy of the basic crystal is multiplied by the same factor as the nominal frequency, so that a 3.5MHz crystal that is 50Hz off frequency, when quadrupled to 14MHz will produce a signal that is 200Hz off frequency.

It gets a bit tiresome to have to quote different tolerances for each frequency band, so rather than specifying them directly as an absolute number of hertz, they are quoted instead as a proportion of the output frequency.

Probably the method most widely used in the past was to quote the tolerance as a percentage of the output frequency. It's still in quite widespread use today, but is being superseded by

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another method which removes an unnecessary (and confusing) step from the calculations involved. I'll come back to percentage methods shortly.

This more recent method is to quote the maximum allowable inaccuracy in terms of 'so many parts per million'. A simple example will help you to understand. If we have a nominal 1MHz crystal oscillator, and it is actually on 1,000,050Hz, the error is 50 parts per million. If we feed the oscillator output into a '16-times' chain of frequency multipliers, the output of the chain will be on 16,000,800Hz. The error is still 50 parts per million, or 50Hz for every MHz (50 x 16 = 800). You will find such an error quoted in specification tables as 50 p.p.m. or 50 PPM, standing for parts per million, or as 50 parts in 10⁶, or increasingly in the shorthand beloved of mathematicians as 50 x 10⁻⁶.

Where very accurately controlled frequencies are concerned, the error may be less than 1 part per million. It then becomes rather clumsy to stick to a million as the 'whole' part of the proportion sum, and so higher numbers are used. The maximum specified inaccuracy of a Standard Frequency station, for example, might be 1 part in 10¹¹, or 1 x 10⁻¹¹. Stated as 'parts per million' that would be 0.00001 PPM; not very convenient. Incidentally, that tolerance of 1 x 10⁻¹¹ would be equivalent to a maximum

error of 0.00015Hz on a 15MHz nominal emission!

Percentage

My reason for leaving the percentage method until last, is that it is easier to explain its disadvantage after I'd looked at the straightforward proportion method.

In fact the two are very similar, as percentage is really just proportion with a built-in multiplier of 100. So, for example, 1% is one part per hundred. Stepping on from there, 0.1% is one part per thousand (1 x 10⁻³); 0.01% is 1 x 10⁻⁴; 0.001 per cent is 1 x 10⁻⁵ and 0.0001% is 1 x 10⁻⁶ or 1 part per million. That business of having to step everything along by two decimal places isn't so difficult when you're talking about single-digit inaccuracies, as here. It's far too easy to make a mistake when multi-digit inaccuracies are concerned, though, as in say 12 parts per million (0.0012%). That's why I prefer parts per million!

Summing Up

In thinking about frequency inaccuracies, it's important to keep clear in your mind the figures which change with frequency band, and those which don't. If the output of an oscillator is multiplied in frequency, then its error is multiplied by

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the same factor. If, on the other hand, two oscillator outputs are mixed, their errors are added or subtracted in the output of the mixer. There are a number of things to be remembered when using different types of frequency measuring instruments too, especially where digital instruments (frequency counters or digital frequency meters) are concerned. That's a subject I plan to come back to another time, though.

Similarly with bandwidths. A carrier modulated to a given depth with a given audio signal occupies the same number of Hz or kHz regardless of whether it's on HF, VHF, UHF or whatever. I've always felt this was the biggest argument in favour of calibrating tuning dials in frequency rather than wavelength. That modulated carrier will occupy a totally different bandwidth in terms of wavelength depending upon the frequency band. An AM broadcast station on the medium wave band will occupy a bandwidth of about 1.8 metres, on the 13m band it will occupy just 3.3 millimetres!

Table

Decimal multipliers for Frequency Measurement

k = kilo = x 1,000 or x 10³

M = mega = x 1,000,000 or x 10⁶

G = giga = x 1,000,000,000 or x 10⁹

QRP CORNER



Author of 'Hot Water Handbook' and 'HW8 Handbook', Mike Bryce WB8VGE.

I'm sitting here still recovering from having just returned from the Dayton Hamfest in the USA, an interesting time was certainly had. The main news I found with regard to QRP gear was that concerning the Heath company.

Heathkit

I had a long chat with the Heath representative at Dayton, Wayne WB9TSO (that suffix is familiar!) who told me that the market forces had shown that the sale of the HW series of rigs was not now a viable proposition. Too few amateurs built their gear these days, (although I suggested he visit the UK to see the difference over here). I am sorry to say that we have now seen the end of the 'hot water' rigs. What a pity. However I'm pleased to say though that I did manage to find a secondhand HW9 at a low price to match my HW8.

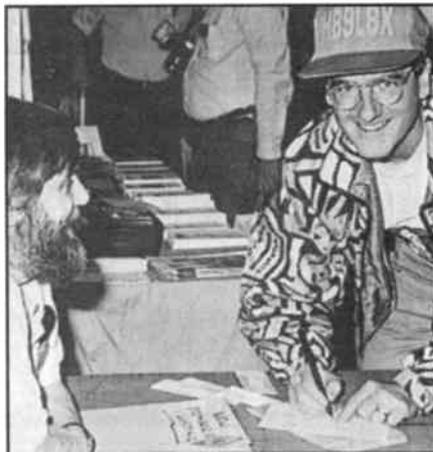


G0BPS (right) with one of the USA's top QRPers Randy Rand AA2U, checking out a 515.

Dick Pascoe G0BPS

At the show I found the Heath stand almost full of new and returned amateur gear which they were disposing of, it was apparent to me that they were 'clearing the shelves'. No new HW9s to be had for love or money, these were just not available in the USA. A few might remain in the UK stores, so if you want one, get in quick. I anticipate the second-hand value of all the HW series rigs will increase because of this very soon.

Whilst we're talking 'hot water' rigs, the author of the 'hot water handbook' and also as seen in last month's *QRP Corner* the 'HW8 Handbook' Mike Bryce stopped off at the stand long enough to autograph a few copies of his book. Rumour has it that a few copies of the book trickled back into the UK, contact yours truly if you'd like more information.



George G3RJV signs up Heinz HB9LBX to the G-QRP club.

Argonaut

The new Argonaut rig, long promised but seldom seen, was on show yet again at Dayton. Your scribe managed to get his sticky fingers on it for an 'on air' test after the show closed for the night mwhen Mike Bryce WB8VGE brought one to the QRP hospitality suite for all the QRP visitors to try out. The current price is said to be in the region of \$1400 (£840), but I'm sorry to say that I was not impressed. We found what appeared to be several faults on the rig, but it was a prototype model so I must not be too critical, and some hic-cups may have been our fault with our less than perfect knowledge of the new Argonaut filter system.

One of the joys for me at Dayton was finding an Argonaut 515, I have been told that only 800 of these fantastic QRP rigs were made. I went to the show hoping to get one, but to have one delivered into my lap at the G-QRP Club stand with the comment, "can you sell this for me on your stand, I am a member" seemed to good to be true. \$300 (£180) was a fair price by USA standards. One of the other surprises on the stand was to see a Swiss amateur signing up for the club, George G3RJV signed up Heinz HB9LBX. All the QRPers stayed in the same hotel with a hospitality suite on site, they looked after us proudly.

Local News

Peter PE1MHO called to say that he is 'working the World' on 50MHz QRP and has been having great fun. He also mentions that a 5/8th base loaded 2m whip will often work very well on 6m too. During our chat he also mentioned that PA3DUV worked ZL2BSJ on 20m SSB QRP and with a 80cm loop aerial at the PA end. QRP is not limited to CW!

Tim G4EZA has been trying out some new aerials for the HF bands and was excited to work 3A2LU and on phone too. Tim suggests moving our



QRPers gather in the hotel hospitality suite, here Colin G3VTT chats to Chuck W8VBE, with N8COA in the background

SSB QRP calling frequency on 10m away from our old spot of 28.885MHz because of the high power QRM to perhaps 28.785MHz.

Well, that's it for another month, Ideas and comments to me please, via HRT Editorial or at 3, Limes Road Folkestone CT19 4AU. See you next month.

Meteor Scatter

Many amateurs seem to regard meteor scatter (MS) as a rather exotic mode of VHF communication, one that is beyond the scope of someone with an average station. Newcomers to the hobby may also be put off by the rather formal operating procedures used on MS, which do seem rather complicated at first glance.

However, many rewarding DX contacts can be made by those prepared to take a little time to learn the special operating techniques used on MS. It isn't necessary to have a 'super station', although as with all VHF work, running high power to a large aerial can be a definite advantage.

This article is intended as a practical guide for anyone wishing to make a start on MS working on any of the VHF bands. Very little theoretical knowledge is required to work MS; it is much more important to grasp the special operating procedures. I would recommend the excellent article by John Mathews G3WZT, published in the February and March 1983 editions of HRT to anyone requiring more background information.

Meteors and Meteor Scatter

Meteors are small rocky or metallic particles which burn up upon entering the Earth's atmosphere. As they burn, they produce a long thin trail of ionisation at an altitude of about 100km. A meteor just 1mm across (a typical size) can produce a trail 50km long! The trail doesn't last for long, as it's disrupted by high altitude winds and the free electrons quickly recombine. It's this ionised trail, rather than the meteor itself, which is capable of reflecting or scattering VHF radio signals.

As most meteor trails are formed at heights of about 100km, simple geometry suggests that the maximum distance that can be worked by MS is about 2200km. The minimum distance is harder to specify, as it's largely dependant on the vertical beamwidth of the aerial you're using. With typical yagis at both ends of the path, it's not worth trying to work stations closer than about 600km on 2m and 400km on 6m or 4m.

There are many factors which determine the length of time that a trail can support propagation between two stations. These include the size and orientation of the meteor, the band being used, the path length and the equipment in use at both ends of the path. A burst of signal lasting 1 second is fairly typical, although many will be much shorter,

Paul G4LJE gives a comprehensive guide on getting started with everyday gear

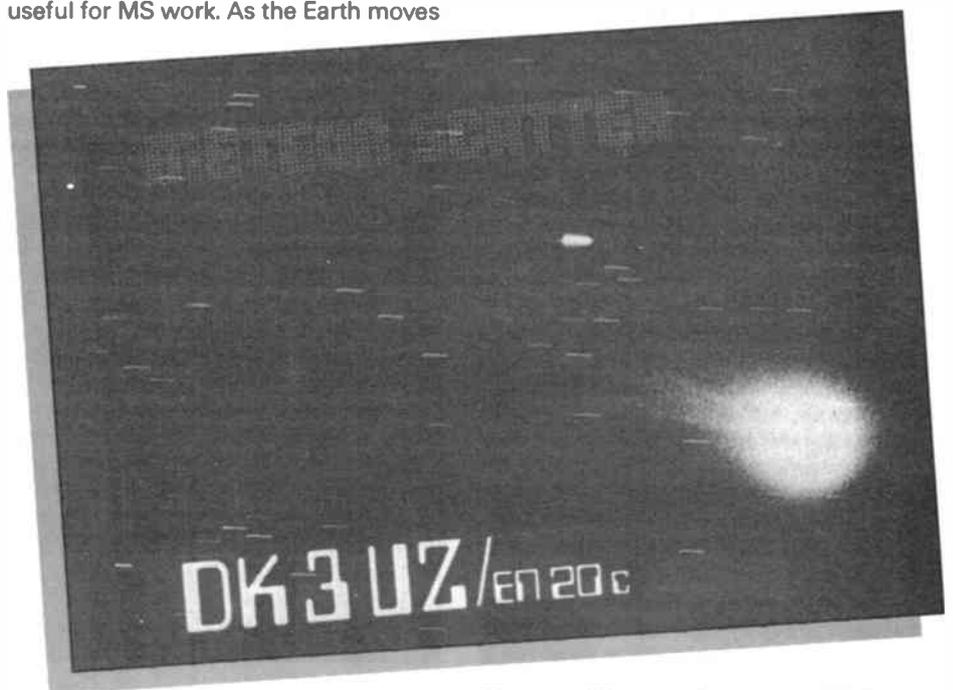
often producing just a brief 'ping' of signal. Longer bursts (30 seconds or more) do occur from time to time, especially during showers.

There are millions of so-called 'sporadic' meteors entering our atmosphere every day, although only a small percentage of these will be large enough to be useful for MS work. As the Earth moves

denser area of particles. These showers produce a considerable (and predictable) increase in the meteor rate and are an ideal time for a beginner to make a start on MS. A list of the major meteor showers is shown in Table 1. A set of 'Meteor Scatter Data Sheets' is available from the RSGB, which show the best times for MS contacts during all the significant annual showers.

Station Requirements

It's difficult to specify the lowest power and the smallest aerial that can be used for MS work, as during the large showers almost anything is possible!



around the sun at 30km per second, most meteors are swept up by the face of the Earth that is facing forwards. A given point on the Earth will be facing forward at about 06.00 local time, so the highest sporadic meteor rate occurs at about that time every day.

Meteor particles are not evenly distributed around the Sun and the Earth encounters more of them during the summer months (northern hemisphere summer) than during the winter. This means that the best time for MS contacts using sporadic meteors is from May to August each year, although contacts are possible at any time.

As well as the continuous bombardment by sporadic meteors, the Earth encounters many meteor 'showers' each year, as its orbit intersects a much

However, I'll try to give some guidelines for each of the VHF amateur bands available, including 4m.

A station meeting these requirements should be able to make several contacts during showers, and perhaps a few via sporadic meteors;

144MHz; 50W to a 9 element yagi
70MHz; 25W to a 4 element yagi
50MHz; 15W to a 3 element yagi

The power levels are for SSB or CW, although a little more power would be very useful if a lot of SSB work is planned, particularly on 144MHz. Aerial height is not too important, although a clear take-off towards the horizon is an advantage, especially when trying to work at extreme range (200km or more).

MS signals can be quite weak, so a sensitive receiver is essential. Most

modern 2m rigs will be just about good enough, but if you have an older rig or a long feeder run then a masthead preamp could be useful. On 6m and 4m almost any receiver or transverter will be sensitive enough already.

Good frequency accuracy is essential for MS, as most work will be done on 'sked'. It's highly desirable to get within 400Hz of the stated frequency, otherwise much time will be lost trying to find your sked partner. Again, most modern rigs will be close enough, but extra care should be taken when using transverters which can sometime introduce large frequency errors.

The only other requirement for MS working is an accurate watch which can be maintained within about a second of UTC. This accurate timing is a fundamental part of MS work and should not be overlooked. No further special equipment is needed to work SSB MS. High speed CW, which requires a memory keyer and a variable speed tape recorder, will be discussed later.

Meteor Scatter Procedures

As meteor reflections are generally very short, many separate bursts will probably be needed to complete a QSO. There is no way of knowing when a burst will occur, so a special operating procedure has been developed to ensure that all available bursts are fully utilised. Timed periods of transmission and reception (usually 1 minute on SSB) are used to prevent 'doubling', hence the accurate timekeeping requirement I mentioned earlier. The periods are timed from the hour, and the convention is that stations beaming east or south (as UK stations will be most of the time) should transmit in the second period. This means that a UK station working (say) an Italian on MS, would listen on the even numbered minutes and transmit on the odd numbered minutes.

The QSO exchange is kept to a bare minimum, consisting of both callsigns, a report and a confirmation that the report has been received by the other station. The MS reporting system consists of two numbers, the first indicating the length of bursts being received and the second the signal strength of those bursts. As both these parameters are likely to change all the time, MS reporting is not an exact science! The full range of MS reports is shown in Table 2, but there is no need to learn it by heart. Very few bursts will warrant more than a '26' or '27' report, except perhaps during showers. Once you have started to send a report it must never be changed, even though the signals heard may appear to warrant it.

The best way of explaining how an MS QSO is conducted is by way of example. Let's assume that GM3WOJ, in locator IO77, has arranged a sked with DL3MBG (JN68) on 6m. The date, time and frequency have been agreed, as well as the period length and who should transmit first. Let's say the sked is on May 10 at 07.00 UTC on 50.230MHz SSB and DL3MBG will transmit first, using 1 minute periods.

Both stations prepare for the sked by ensuring their watches are within a second of the correct time, and that their rigs are on the agreed frequency. They also beam towards each other along the great circle bearing. At exactly 07.00 UTC, DL3MBG begins calling GM3WOJ on 50.320MHz. He simply repeats for one minute;

GM3WOJ DL3MBG, GM3WOJ DL3MBG, GM3WOJ DL3MBG...

He does not use phonetics as both callsigns are already known to both stations. The message above is all that DL3MBG needs to say — there is no place in MS operating for phrases like 'This is DL3MBG calling GM3WOJ on sked

Meanwhile in IO77, GM3WOJ is listening hard on 50.320MHz. He hears a strong but rather short burst of signal containing '...3MBG..'. That's enough information to be quite sure that the burst came from his sked partner, so he would send a report during his first TX period at 07.01 UTC like this; *'DL3MBG GM3WOJ 27 27, DL3MBG GM3WOJ 27 27...'*

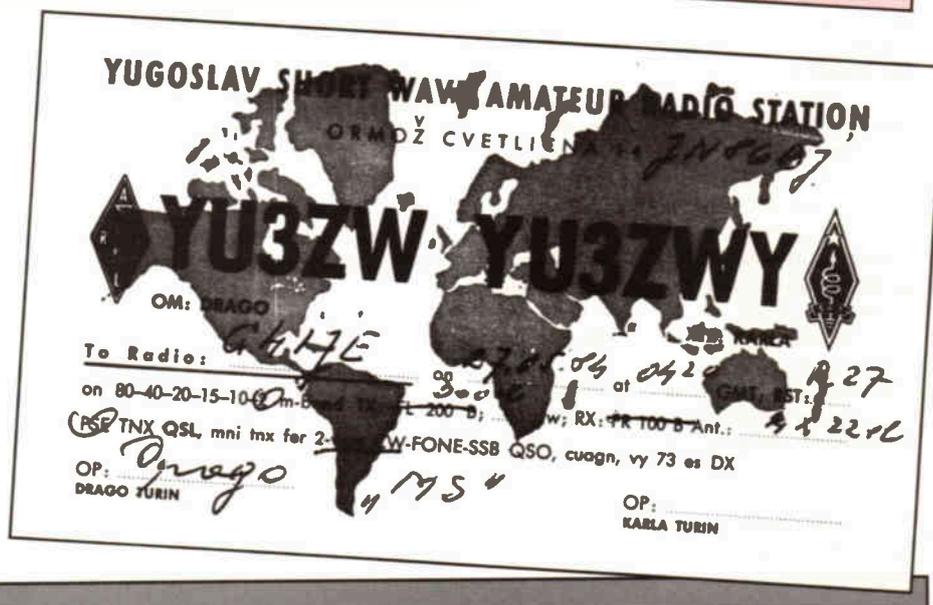
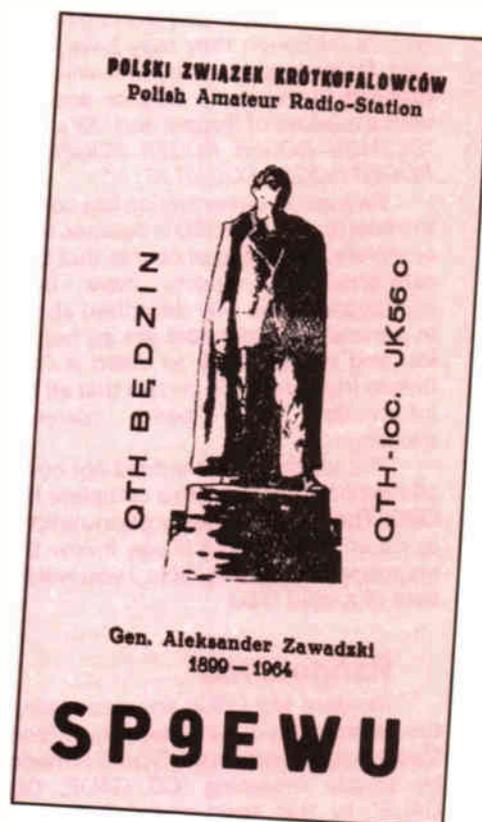
The report is usually sent two or three times per set of callsigns, though never more, as copying both callsigns is just as important as copying the report. If GM3WOJ had not heard enough to positively identify his sked partner during the first period he would have simply transmitted the callsigns only.

Let's assume that during GM3WOJ's first TX period a nice large

meteor comes along and provides a superb 10 second burst at S7 of his signal in southern Germany. DL3MBG hears the complete message that GM3WOJ is sending several times over, so he has now completed both calls and a report. DL3MBG decides that the long burst warrants a '38' report, and to indicate that he has received both calls and a report, he prefixes the report with a 'Roger' thus;

'GM3WOJ DL3MBG ROGER 38 ROGER 38, GM3WOJ DL3MBG ROGER 38 ROGER 38...'

Back in IO77, Chris receives a burst containing '... ROGER 38 ROGER ...'. The 'Roger report' indicates that



DL3MBG received both calls and a report, but as Chris still needs the call-signs (apart from the '3MBG' bit he copied earlier) he must continue with calls and reports on his next TX period. Note that it's quite in order to build up the information a piece at a time, it isn't necessary to get everything in one burst.

After a few periods of poor reflections, Chris receives a short burst containing '..GM3WOJ DL3..'. This means that he has now copied both call-signs and a Roger report, and he knows that DL3MBG has all he needs from him. To indicate this Chris must now send the final Rogers;

'GM3WOJ ROGER ROGER ROGER ROGER ROGER ROGER ROGER...'

With luck, DL3MBG will copy some Rogers (although they may have to be sent for several periods) and will then respond in the same way, or possibly with a mixture of Rogers and '73's;

'DL3MBG ROGER ROGER ROGER 73, ROGER ROGER ROGER 73...'

As soon as either station has copied the final Rogers the QSO is deemed to be complete, assuming of course that both call-signs and reports have been exchanged in the way described above. In general MS operators are an honest lot, and wouldn't try to claim a QSO unless they are 100% certain that all the information had been correctly exchanged.

The example above does not cover all the possible routes to a complete MS QSO. There are too many permutations to cover in detail, but if you follow the responses detailed in Table 3 you will be sure of a valid QSO.

Random MS

Random MS QSOs are made using the same techniques already described for scheduled contacts. A CQ call is made by simply repeating 'CQ G4IJE, CQ G4IJE' in the appropriate 1 minute period on or around one of the SSB MS calling frequencies. These are 50.350MHz, 70.150MHz, and 144.400MHz. Some operators still use 144.200MHz for random MS, although this frequency is no longer recommended.

Unless you have a particularly distinctive call-sign it is usually a good idea to use phonetics, although my particular preference is to use them for the call-sign suffix only, thus;

'CQ G4 India Juliet Echo, CQ G4 India Juliet Echo...'

The G4 prefix is fairly unmistakable, and leaving out the phonetic for the 'G' saves a little time. Similarly, when answering a CQ call I would use;

'Y02IS G4 India Juliet Echo 26 26...'

There's no point in giving the DX station's call-sign in phonetics as he'll recog-

HUNGARY ZONE: 15
 Adr.: NAGY OYULA
 SZENTES
 Szent Ferenc u. 43.
 6600
 op: Paul

HG8ET
 QRA: K08Z

TO RADIO:

DATE	GMT	BAND	MODE	RST/M
27. VII. 19 82	07 ¹⁵ -08 ⁰⁰	144	CW-MS	27 15B max 23P 50cc

DR OM PSE QSL TNX via: *off*
 VY 73!

Tx: 40A-250B
 HUNGARY QSL BUREAU
 BUDAPEST 5.

SWEDEN LAEN C FOR WASH II
 RUNE I. LARSSON - GAVSTA - RASBO - S-755 90 UPPSALA
 CONFIRMING QSO WITH STATION

SM5CUI

DATE	GMT	MHZ	STATION	RST	2-WAY	QSL
29-08-82	1100-1200	144	G4IJE	R36IT	SSB CW FM RTTY	PSE TKS

73 TKS QSO VY to MS GSO paul?
 I'm vry vry sorry that you haven't get the QSL earlier? I received 16 refl.
 best burst 50 sec. calls + R36 RL etc.

SARTG

nise it easily without phonetics.

Note that a report is usually sent immediately when answering a CQ call, although if conditions appear marginal it may be better to send call-signs only until you're sure the other station has identified you. It's quite in order to send 'QRZ' or something like 'QRZ HB9' followed by your call-sign if you're unsure of who is calling you.

When working random MS SSB, it is quite normal to hear several stations local to each other calling CQ on nearly the same frequency. Providing their timekeeping is good there should be no mutual QRM and the rather selective nature of MS will tend to separate the signals at the far end of the path. Having said that, it obviously makes sense to spread out a little from the MS calling frequencies when activity is high.

Another popular form of random MS is 'tail ending', where an MS operator listens in to another's sked (or random QSO) and calls in when the contact is complete. The best way of tail-ending is by arrangement with the stations involved but this is not essential.

Automated CW MS

SSB is generally preferred to hand speed CW (Morse code) for meteor scatter working, as the 'hand sent' information rate of 12-20 WPM CW is very much lower than that of SSB. However, a technique involving CW sent at very much higher speeds (around 200WPM) has been in use on 144MHz for many years, and is much more effective than SSB. MS operators tend to refer to CW MS speeds in terms of letters per minute, so 200WPM would normally be called 1000LPM. The period length for high

speed CW is normally 2.5 minutes.

Unlike SSB, high speed CW MS does require the use of equipment not found in every shack. The two main items required are a memory keyer or other means of sending CW up to 1000LPM, and a tape recorder capable of speed variations of around 10 to 1 to decode the incoming CW. Until a few years ago, some form of memory keyer was always used to generate the required high speed CW. However, many amateurs are finding that home computers, present in an increasing number of shacks, are also capable of producing high speed CW and are often easier to use than traditional memory keyers. Sadly, there is a price to pay for this convenience; most home computers generate so much RF 'hash' that they are virtually unusable, especially on 50MHz! However, if you are lucky enough to have a micro that does not wipe out the VHF bands, you'll almost certainly find that someone, somewhere, has written a CW sending program for it.

If you wish to use a memory keyer, several designs have been published over the years, although most require some modifications for MS work. The KM4000 keyer, published in the Feb 1982 edition of Radio Communication, is suitable provided the message recycling modification is carried out as described in G3WZT's HRT article.

Some attention may need to be given to the keying characteristics of a transmitter or transceiver to be used for CW MS work. The keying needs to be quite hard but obviously it is undesirable to radiate key clicks. Check your keying with a local MS operator before trying your first CW sked.

Decoding of high speed CW is

usually achieved by using either a multi-speed reel-to-reel tape recorder or a modified cassette machine. Details of modifications to cassette recorders are beyond the scope of this article, especially as there is no universal modification to suit all makes and models, but in general many older Philips cassette recorders are suitable for modification. These tend to us a motor control circuit to regulate the motor speed, rather than the mechanical governor as used in most other makes. You may be able to pick up a Philips model N-2234 at a rally or boot sale, to achieve a very wide speed variation this only requires the internal 'speed' potentiometer to be replaced by one with a higher value. This model is also fairly RF proof, and incorporates a tape counter, both essential for CW MS work

When the incoming signal is slowed down by the tape recorder, the pitch of the CW obviously falls as well. To counteract this, it is necessary to tune for a much higher beat note than normal. This precludes the use of narrow CW filters which are normally centred on 800Hz, and an SSB filter must be used instead, most SSB filters will allow a CW signal to be tuned for at least a 2kHz beat note without loss of signal. This will become 200Hz when the tape is slowed by a factor of 10 to 1 for decoding, still a little low but perfectly copyable.

Many modern rigs have an IF shift or passband tuning control which will allow an even higher beat note to be received without loss of signal. This can be very useful but should be used with caution by the beginner as the narrower passband can result in off-frequency signals being missed. An alternative approach is to use an 'up-converter' where the incoming audio is combined with a local oscillator in a balanced mixer which provides an output around 7kHz. When this is slowed down, the beat note is still a comfortable 700Hz or so. It is no longer necessary to tune to a higher than normal beat note, so a CW filter can be used if desired. A design for an up-converter by LA8AK was shown in 'Technical Topics' in the Sept 82 issue of Radio Communication.

Very little random high speed CW is used on 50MHz or 70MHz, but it is quite popular on 144.100MHz, especially during the major showers.

CW MS Procedures

The same procedures already discussed for SSB MS operation are equally applicable to CW. Calls and reports are sent in just the same way, with the 'Roger' sent as a letter 'R', the symbol 'DE' is not used between call signs as it serves no useful purpose. Take care not

to leave any long gaps in the message when programming your keyer, as these can waste valuable burst time. The period length is usually 2.5 minutes, and a sked would normally run for one hour.

During receive periods, you should record continuously and note down the tape counter reading of all bursts and pings heard. During transmit periods, the keyer is started and the bursts received during the last RX period are decoded. If the information received dictates a change in the message to be transmitted, it is usual to wait until the next RX period before re-programming the keyer. If a keyer with several memories is available it may be possible to switch to the required message whilst transmitting.

Getting Started

It's a good idea to spend some time listening to experienced MS operators before having a go. Try to find the MS operators in your area and ask them if

they have any skeds arranged which you can listen to. Be prepared for an early start, most skeds take place at 6.00AM or even earlier!

The easiest way to make your sked is on the European VHF net, this meets around 14.345MHz. There is some activity on the net each day, but it's busiest at weekends. Obviously Class B and Novice licensees can't use the VHF net, but you may be able to ask a local Class A to make the skeds for you. Most stations on the VHF net will be looking for 144MHz MS skeds, but you should be able to find a few interested in 50MHz as well.

Try to make your first few skeds (or random attempts) during one of the major showers. On 144MHz, distances around 1200km seem to give the best results, while on 50MHz and 70MHz something a little less than this is recommended for a first attempt.

If you learn the procedures carefully and have a little patience, I'm sure you will find meteor scatter very rewarding. Welcome to the model

Table 1. Major Meteor Showers

Shower Name	Limits	Maximum	ZHR	RA	DEC
Quadrantids	Jan 1-6	Jan 3-4	12	272	32
April Lyrids	Apr 19-24	Apr 22	12	272	32
Eta Aquarids	May 1-8	May 5	20	336	00
Piscids	May 3-10	May 7	30	26	25
Nu Piscids	May 11-14	May 12	20	16	27
Arietids	May 30-Jun 18	Jun 8	60	44	23
Zeta Perseids	Jun 1-16	Jun 8	40	59	22
June Perseids	Jun 22-30	Jun 26	30	68	34
NU Geminids	Jul 9-15	Jul 12	60	98	21
Perseids	Jul 25-Aug 18	Aug 12-13	68	46	58
Geminids	Dec 7-15	Dec 13-14	58	112	32

ZHR is the hourly meteor rate, RA and DEC are the celestial co-ordinates of the shower.

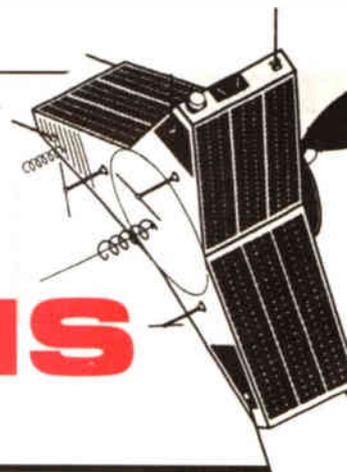
Table 2. MS Reporting System

First Number (Burst duration)	Second Number (Signal Strength)
2 — Bursts up to 5 secs	6 — Up to S3
3 — Bursts 5 to 20 secs	7 — S4 to S5
4 — Bursts 20 to 120 secs	8 — S6 to S7
5 — Bursts over 120 secs	9 — S8 or stronger

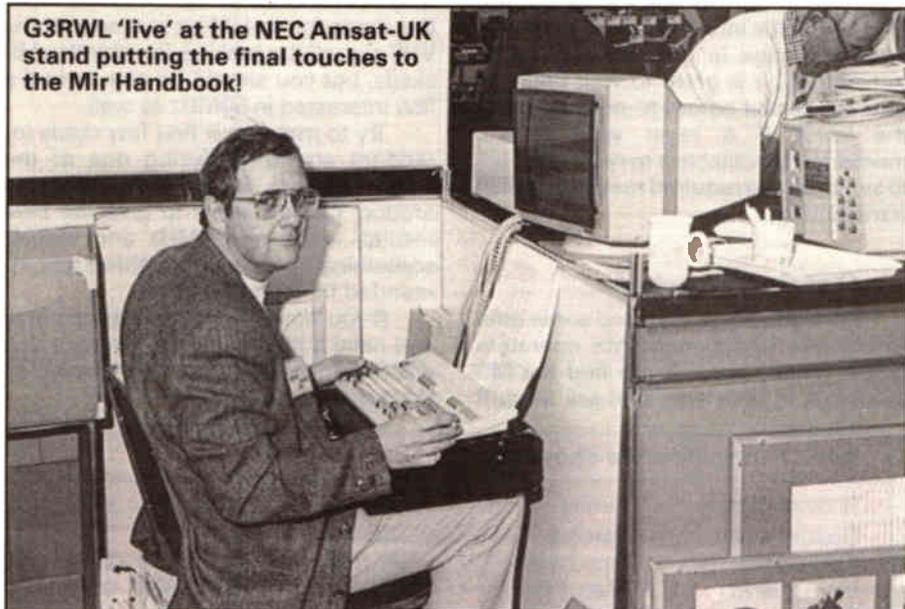
Table 3. Correct MS Procedure

Information Received	Correct Response
Nothing	
Pings but no positive ID	Both call signs only
Report but no calls	
Small part of either call	
Both calls but no report	Both calls plus report
Report but calls incomplete	
Roger report but calls incomplete	
Both calls plus report	Both calls plus Roger report
Both calls plus Roger report	Rogers
Rogers	

Satellite Rendezvous



G3RWL 'live' at the NEC Amsat-UK stand putting the final touches to the Mir Handbook!



Amsat-UK news on space age amateur radio, courtesy of Richard G3RWL

be sent to WA5ZIB either at the address above or via Amsat-UK. A report will be returned verifying the level of accurate reception. Good luck!

Oscar 10

Oscar-10's beacon and transponder signals were FMing again at the beginning of the time period of putting this together, this due to the satellite not receiving sufficient solar panel illumination to support even the beacon let alone the transponder.

Russian Satellites

With thanks and acknowledgements to G3IOR, here are the actual RS-12 Mode 'T' transponder frequencies, which have changed quite a lot since they were measured on the ground prior to launch.

Uplink 21.210-21.250 MHz gives (at TCA) a downlink from 145.9167 to 145.9556MHz, then allow for a total doppler shift of +/-3.5 kHz on an overhead pass. If you add 124.7067 to your 21MHz uplink frequency, you'll have the approximate 2m downlink, not counting doppler.

The CW TLM beacon is on 145.913 MHz The 2m ROBOT downlink is on about 145.960MHz.

By the way, congratulations to Pat G3IOR for working ZL via RS-12 recently.

As of late April as I write this, AO-21 remains deaf to commands. This condition is due to a faulty ground command which caused several attenuators to be switched in-line inside the command receiver. It has been determined that about 12 dB of attenuation was accidentally switched in.

The initial efforts to correct AO-21's problem using EME stations in Europe capable of 10kW of EIRP have proven so far to be unsuccessful. However, both the AMSAT-DL and AMSAT-U-ORBITA groups feel that they will soon be able to

The Amsat-UK Mir handbook is finally completed, although only through a lot of work! At the NEC show when most amateurs were looking at the goodies on sale, the HRT Tech Ed was looking at yours truly beavering away on the word-processor putting the handbook into a suitable form for submission to the printers. Good job the HRT stand hospitality suite wasn't far away. The photograph on the front cover of the book was reproduced by permission of Isabel J Carmichael, and is an original of the full-size 'Mock-up' of Mir-Kvant-Kvant 2-Kristal complex. Our thanks go to Geoff Perry for assistance on this one. (*The handbook is available from Amsat-UK for £4.95 plus 27p postage — I found it fascinating reading — Tech Ed*).

Oscar 13 'ZRO Test'

Readers may be interested in the Oscar-13 ZRO Memorial Technical Achievement Award Program, or just 'ZRO Test', this activity being a test of operating skill and equipment performance.

During a typical ZRO run, a control station will send numeric code groups using CW at 10 words-per-minute. At the beginning of the run, uplink power from the control station is set to match the general beacon downlink strength. This is level 'zero'. The control operator will

send and repeat a random five-digit number, then lower the uplink power by 3 dB (half power) and repeat the procedure with a new random number. This will continue down to a level 27 dB below the beacon (level 'nine').

Participating listeners monitor the downlink signals until they can no longer copy the numbers. Those who can hear the beacon will qualify for the basic award by copying the code group heard at level 'zero'. The challenge is to improve home-station performance to a point where the lower-level downlink signals can be copied (levels 6 through to 9). Mode 'B' and 'JL' ZRO tests are chosen for convenient operating times and favourable squint angles. Many of these are in range of the UK, you can get the latest times of these from the Amsat-UK nets. The 'B' tests (run by Andy MacAllister WA5ZIB) can be heard on 145.840MHz and the 'JL' tests on 435.945MHz (run by N5EM).

Recently updated ZRO brochures are available from WA5ZIB, Andy MacAllister, AMSAT V.P. User Operations, 14714 Knightsway Drive, Houston, TX77083 for an self-addressed envelope with enough IRCs for return postage. The brochure characterises test procedures, means for obtaining certificates and gives some historical background about the program. All listener reports with date of test and numbers copied should

get control of AO-21 using a new commanding scheme they are currently working on.

Musa U2MIR has been sending some information down on packet from his QTH of the Mir space station. In the true traditions of amateur radio he says the shack is a real mess! He also added a novel packet 'sketch' and description of the Mir space station, - see this month's 'Packet Radio Roundup'. During the recent test 'link-up' with the STS-37 shuttle, he tells us they succeeded only in exchanging call signs with the shuttle station.

Microsats

UO-14 has recently started switching its single downlink transmitter between its amateur frequency and a UHF downlink outside the amateur band. Amateurs will sometimes see the downlink disappear for as little as 250ms or as long as 5 seconds. So long as the downlink eventually returns to 435.070 MHz, there is nothing wrong with the satellite.

UO-14s is licensed to operate outside the amateur service to support experimental communications trials to and from stations in developing countries in association with VITA, an international organisation with long-standing ties to Amsat and UoSAT. VITA funded the construction of the UO-11 DCE and contributed to the development costs of the UO-14 Pacsat Communications Experiment hardware and software. As testing of the dual-frequency operation on UO-14 continues, UoS will issue further updates.

Picture 5 currently transmitting from WO-18 is easily the best quality image of the Earth achieved from Webersat to date. It was shot just west of Sumatra, and there are both clouds and land features visible.

AO-16 is still causing some head-scratching due to software bugs. The

Software Engineers feel that these sort of problems will eventually disappear and users will be left with a stable and problem-free file server system.

The Dove operating system apparently crashed sometime on 28th March. On 30th March the S band transmitter was successfully commanded on providing very limited telemetry data, power system balance, and (most importantly) evidence that Dove was still quite alive. A concentrated effort to place Dove into full service is planned following diagnostic memory dumps and an operating system reload. Currently its still off 2m and on S-band. Amsat-LU are thinking of having Fridays as experiment day, since Wednesday is the Amsat-NA experiment day. The CW Beacon will be on, operating on 437.125MHz simultaneously with the BBS and TX-A on 437.150MHz.

Short Bursts

SAREX on the STS-37 mission didn't have a lot of luck. An apparent

failure in the audio path from the transceiver to the Equipment Accessory Cabinet resulted in no audio at either the TNC or the SSTV equipment. There are suspicions that one of the 30 gauge wires in the audio cable to the transceiver interface module may have been damaged. One area of success was with fast-scan TV, the shuttle station reported good reception on at least four orbits of the mission. Most pictures were black and white, but some colour reception was reported.

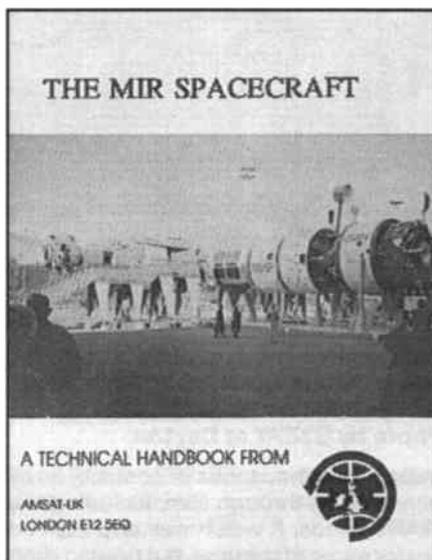
UoSAT-F being launched from Kourou with a European remote sensing satellite on an Ariane 40. The orbit height is around 780km, and I guess they'll call it UO-22 once it's up. More news as it comes.

A new Meteor (Russian weather satellite) was launched on 24th April, called Meteor 3-4. Some 120 line per minute imagery has been received on 137.3MHz, it had 12 sync bars with reverse grey-scale and excellent APT imagery. The Kepler elements for this are listed below if you'd like to have a try at receiving it.

The latest expectations for the launching of the French radio-amateur satellite ARSENE are for September 1992 on the Ariane 54 flight, the configuration will be a 44LP with the Telecom2 and Satcom C4 satellites.

See you at the Amsat-UK Colloquium later this month if you can make it (25-28th July, at the University of Surrey), with a bit of luck there should even be plenty of early copies of the Sept 91 issue of HRT on sale on the Amsat-UK stand. Get a mag there and you'll get a free ticket for a HRT prize draw taking place on the last day for an IF-100 satellite tracker unit.

Remember you can always get further information on Amsat-UK by contacting: Amsat-UK, c/o Ron Broadbent, G3AAJ, 94 Herongate Rd, London, E12 5EQ. Big SAE gets you membership info, SWLs as well as licensed amateurs are welcome.



The Mir Spacecraft Handbook

Keplers

SAT:	OSCAR 10	UoSAT 2	AO-13	UO-14	FO-20	AO-21	RS-10/11	RS-12/13
EPOC:	91097.32732770	91108.60790668	91078.38609337	91102.19987967	91105.45830526	91107.96751220	91107.90229248	91106.59276242
INCL:	25.8493	97.9080	56.8112	98.6689	99.0224	82.9386	82.9219	82.9240
RAAN:	151.9623	155.6266	104.6916	182.0325	99.5356	278.2797	103.4085	149.7673
ECCN:	0.6008503	0.0012633	0.7140389	0.0011166	0.0541596	0.0037042	0.0011775	0.0031147
ARGP:	231.4593	7.3169	249.8316	5.6581	83.6151	67.3972	1.9123	90.4620
MA:	58.2833	352.8348	25.0884	354.4337	282.6307	293.1098	358.2087	270.0106
MM:	2.05882614	14.66747077	2.09695125	14.29044588	12.83176352	13.74370702	13.72176641	13.73886869
DECY:	2.4E-07	4.729E-05	2.15E-06	1.197E-05	7.4E-07	3.03E-06	5.21E-06	2.27E-06
REVN:	3079	38071	2117	6356	5551	1075	19132	968

SAT:	PACSAT	DO-17	WO-18	LO-19	Mir	Meteor 3-4
EPOC:	91102.23899255	91102.22307942	91098.62500630	91098.67315919	91107.85243023	91114.50941607
INCL:	98.6743	98.6742	98.6723	98.6722	51.6067	82.5439
RAAN:	182.3695	182.3927	178.8625	178.9615	233.4307	262.4118
ECCN:	0.0011900	0.0011905	0.0012888	0.0012935	0.0010040	0.0016965
ARGP:	8.1550	9.4054	16.0879	16.0300	120.4867	184.4062
MA:	351.9729	350.7186	344.0710	344.1292	239.7062	175.6948
MM:	14.29135378	14.29212936	14.29256413	14.29331789	15.64417562	13.15965265
DECY:	1.191E-05	1.295E-05	1.031E-05	9.48E-06	8.0629E-04	5.0E-08
REVN:	6357	6357	6306	6307	29569	5

HF HAPPENINGS

The big news, which broke just as I was about to put this in the mail, is that Romeo of 1S0XV and YAORR fame is saying he has permission to operate from Myanmar (formerly Burma). XZ has not been on the air legitimately (there have been a number of unlicensed operations from embassy compounds) for over 30 years, so almost all DXers will be needing this one. No date is given, and no call-

Don Field G3XTT details the latest HF DXpeditions, work 'em now while the sunspots are high!

The story of Romeo's operation from Afghanistan earlier this year is a saga in itself. It appears that, although they had permission to operate, the two operators had to move QTH almost every day due to local government requirements, meaning that they were forever setting up and dismantling the station. Nevertheless they were able to

H44VU, before moving on to Tahiti to sign FO0VU. DL2GAC showed up as H44MS from a number of the more remote islands of the Solomons group, running low power but nevertheless workable from Europe by those with a reasonable beam aerial. Last but by no means least, G3TXF, G3SXW and G3WVG went out there with a large amount of gear and signed H44XF, H44SX and H44VG respectively with big signals, exclusively on CW (all three are members of FOC — the First Class Operators Club — and seasoned expeditors). QSLs should go to their home calls. It's great to see UK amateurs putting on a major effort like this. At one stage H44SX was 599 on 24MHz and was the only signal audible on the band, when I checked back 4 hours later he was still going strong! It just shows that working the Pacific need not be too difficult when a major DXpedition makes the effort to put out decent signals.

The St.Peter and Paul Rocks expedition came off as planned. The operators signed PY0SK and PY0SR, and were very active. QSLs go to Karl Mesquita Leite, PS7KM, Box 385, 59001 Natal, RN, Brazil.

Jim Smith travelled to Bangladesh in late April and was able to get on the air briefly, however I would guess any return visit is unlikely in the near future. Following the dreadful cyclone in May I'm sure the Bangladeshi authorities have other priorities. At the time of writing Jim was due to show up from Bhutan, but although he and Kirsti (his wife) arrived there safely, for some reason as yet unexplained the authorities didn't let them operate. As I write this the latest news suggests they have returned to Norfolk Island.

Nearer to home, there was a major effort from 1A0KM in late April/early May. This station is located in the Rome premises of the Sovereign Military Order of Malta, and access to the building is limited. SMOM is one of the most unusual 'countries' on the DXCC list, but the organisation is recognised internationally as having sovereign status and has a fascinating history going back many hundreds of years.

DJ6SI also showed up unexpectedly as SY/DJ6SI from Mt. Athos. This is another unusual 'country', a rocky peninsula on the Greek coast, and the resident monks can only very occasionally be persuaded to allow amateur radio operations to take place. I don't know how Baldur pulled this one off, but his documentation satisfied ARRL who have said they will allow the operation for DXCC credit.



Seth, one of the operators of XU1SS, with W1RAN who helped Seth leave Kampuchea and move to the US. Photo by G3ZAY at Dayton.



Ken K1EA, author of 'CT' contest logging software, with the PacketCluster stand providing an appropriate background. (Photo G3ZAY).

sign, in order not to encourage pirate activity. You will just have to keep your ear to the grapevine. The plan appears to be to take at least four operators along in order to keep two stations on the air round the clock for at least two weeks. The operation will take place from one of the offshore islands, and is expected to cost in the region of \$46,000. Let's hope they manage to pull this off.

make many thousands of contacts on all bands 160m through 10m, including the WARC bands. A watch was also kept on 6m for some of the time, but propagation was unfavourable and no QSOs resulted.

Recent Activity

After the good band conditions earlier in the year, propagation during May was a real disappointment although few DXpeditions were active. ZL1AMO showed early in the month as FW0BX, and KB5LRO/KH9 made a determined effort to work Europe, mainly on 10m. There were occasional openings, but always when I was at work, so I'm still chasing that one! Propagation did start to pick up again mid-month, my log recording, for example, 12m QSOs with V73BN (Marshall Islands) and H44SX (see below).

The Solomon Islands must now be one of the most visited DXpedition destinations. DL1VU was very active as

Don, WB2DND, made it back to the United Arab Emirates for a further operation from the QTH of A61AD for whom Don acts as QSL manager. Don was very active, especially on CW and on the WARC bands, and was happy to give me an RTTY contact on request.

XQ0X finally left San Felix in mid-May after a wonderful effort on all bands, I was very pleased to catch this rare one on both 17m and 12m. The good news is that he expects to go back in October, and is planning to take RTTY and satellite gear as well this time. I heard CE3ESS, his QSL manager, bemoaning having a backlog of literally thousands of QSL cards to deal with — the penalty of being volunteered as manager for an active DX station!

Forthcoming DXpeditions

Carlo, I4ALU, who has operated from a number of the Italian islands and from the Maldives, is due to show up from the Pacific during July and August (he leaves Italy on 14th July and flies home on 1st September). His itinerary includes Fiji, Tonga and the South Cook Islands (sounds great!), and he hopes to visit some of the outer islands of these groups for the benefit of IOTA chasers. All operation will be on CW, running 100W. Check 5kHz above the lower band edges.

Fastnet Rock

Sometime during July (9th to 19th, weather permitting) a group of Irish amateurs (EI2BB, EI2GS, EI3GU, EI4GK, EI5CZB and EI9FK) will operate as EJ7FRL from the infamous Fastnet Rock. The reasons for mounting this expedition (which will be the first operation from this remote and windswept spot) are that July 1991 marks the 125th anniversary of the successful linking of Western Europe to North America by submarine cable, and to recognise the unique role played by the Fastnet light since 1854.

The July DXpedition will be sponsored by Telecom Eireann, plus the Irish Tourist Board, and Switzer, a local caterer. The group plan to operate on 3.775, 7.075, 14.140, 14.240, 21.275 and 28.450MHz, as well as 160m and the WARC bands. An interesting history surrounds this site, and no doubt they will be sending out a suitable commemorative QSL card after the event (EI2BB will handle cards, either direct or via the bureau).

As if all that wasn't enough, another group of Irish amateurs is planning to put the Blasket Islands on the air between 20th and 27th July. This group call them-

selves the Island Hoppers DX Group, and they will use the following frequencies: 1.985, 3.785, 7.085, 14.285, 21.385, 28.585 and 50.150MHz. EI3BA will handle the QSLs, and they ask for cards to be sent direct rather than via the bureau.

DXCC News

The ARRL is now accepting cards for both SV2ASP/A and DJ6SI/SY for DXCC credit (these operations were both from Mt. Athos). As of 21st April the ARRL were processing new applications received 11th April (not bad!), but had only caught up with endorsements as far as mail received on 18th October 1990.

Congratulations to Ian G4GIR, yet another UK amateur to make it on to the DXCC Honour Roll. I finally made it myself, too, after all these years.

Ron G6LX told me that he recently lost about 600 QSLs en route to the DXCC desk, the packaging eventually being found minus the cards. Makes you wonder whether registration is such a good idea, especially as all Ron was offered in compensation was \$15, a trifle compared with what it will cost to replace the cards.

IOTA Directory

IOTA director Roger G3KMA has finally completed the mammoth revision of the directory. The new directory lists all current and potential island groups so that there need be no argument in future as to what might or might not count. The IOTA directory is available from G3KMA at £5 to European stations, £6 outside Europe.

Talking about IOTA, I had a fascinating chat with Hans DF5UG at the RSGB's NEC Convention back in April (*I fondly remember my Indian curry session with Hans during the evening — Tech Ed!*). Hans had only recently returned from his 9M2QQ IOTA DXpedition and was telling me a little about it. The Malayan tourist office produces very detailed information on all their offshore islands, including details of how to get there, cost of chartering boats, and so on. Hans has clearly fallen in love with Malaysia, and intends to keep returning for his annual vacation. HRT's Technical Editor had also been twisting his arm, so hopefully we will be able to feature some photos in a month or two.

The QSL equivalent of a Russian doll? A QSL within a QSL within ...



G4JVG — Papua New Guinea

Steve, G4JVG, my predecessor on this column, is now active as P29DX. Roger G3LQP has taken on the role of Steve's QSL manager. As I write this, Steve is still living in a hotel and is only able to be active for about one hour a day, between 0200 and 0300 GMT, from his work QTH. Hopefully by the time this appears in print, Steve and his xyl Eva will have moved into permanent accommodation with space for aials.

August Contests

The YO-DX Contest is on 3/4th August (20 hours, CW/SSB) and the Worked All Europe CW Contest a week later (36 hours from 1200 on the Saturday). In this latter contest, European stations can gain extra points by taking QTC traffic from non-European stations, QTC traffic consists of details of earlier QSOs made by the station concerned. This adds an extra aspect to contest strategy, as you try to strike a balance between running the pile-up and handling QTC traffic. Worth a try if you want to improve your CW under competitive conditions!

The SEANET (South East Asia) SSB Contest is on 17/18th August and the All Asia CW Contest a week later.

All in all, then, plenty of contesting opportunities, especially for CW enthusiasts.

DX Achievement

Although I tend to write largely about DX, many people also happily spend their time on HF ragchewing with friends around the World, learning a new language (I heard a group of amateurs working each other in Esperanto the other day!), or getting comparative reports on aials. On the other hand, if you want to chase DX, don't be put off if you have limited space or equipment. Just the other day I received a letter from Clive G3NKQ, a fellow member of the Chiltern DX Club who, in the past 12 months, has worked over 200 countries on the 18MHz band. 'So what?' you may ask. Well, Clive has achieved this running just 90W to an indoor dipole, and without any help from PacketCluster or spotting nets. As Clive says, it has been just like the old times. And a very fine achievement too, Clive, if I may say so.

Have a good summer, and do take advantage of the summer weather to get your aerial system ready for the autumn. The pundits are saying that the sunspots will start to dive after the autumn of 1992, so there isn't too long to work all that HF DX. After that it could be the next century before the new peak arrives (now there's a thought to conjure with!). 73.

VHF/UHF Message

Cycle 22 has continued to provide excellent DX conditions on 6m recently. If previous cycles are to be a pointer for the future, we may expect similar conditions for some time to come, before the fall-off in conditions as we approach the trough between cycles 22/23. Those of us who were active on 6m during cycle 21 will remember that the peak of the cycle, November 1979, was followed by good conditions during 1980/81 and the best conditions were during the autumn of 1982. With the main interest over the last three years being F2 propagation, other modes of propagation have tended to attract less attention. This month, mainly for newcomers to 6m I shall deal mainly with modes of propagation that are with us during the whole of a sunspot cycle, and not influenced by the vagaries of monthly, annual and eleven year cycles.

23/13cm Parabolic Aerial

This month's photograph shows in the foreground the large 23/13cm aerial used by the Crawley club at G3GRO/P during VHF NFD. It is a 4.3m by 2.4m rectangular parabolic reflector, fed by dual waveguide horns on 23cm and 13cm, with GasFet amplifiers at the horns. The aerial is put together on site and is based on 5 horizontal pre-fabricated ribs, clamped to a 50mm diameter scaffold pole support. Vertical aluminium tubes 12.5mm diameter are laid over the ribs and held with tie-wraps. Finally wire mesh strips are laid over the tubes and held again with tie-wraps. The gain of the aerial is around 32dB on 23cm and 34dB on 13cm, the rectangular cross section is used to maintain a reasonable horizontal beamwidth but with high gain, although the whole of the aperture is not used on 13cm. The aerials in the background are a 120 element yagi stack for 23cm, and 0.9m dish for 13cm.

Meteor Scatter

As mentioned last month, HRT plans to contain a comprehensive

Ken Ellis G5KW provides a collection of thoughts on Meteor Scatter, Sporadic E, and Aurora

appreciation on meteor scatter (MS), which is with us all the time, written by one of Europe's most successful operators Paul Turner G4IJE of Bishops Stortford, Herts. In a letter confirming that his feature is in the pipeline Paul refers to correspondence he has had with SM7FJE over the MS contest during August. Bo says the SM7s will stick to the standard IARU rules regarding which period to transmit on. This means that the period will vary, depending on which direction they are beaming. He says they have deliberately chosen well spread out frequencies to make it possible for one of them to be using the even minutes, whilst a neighbour uses odd minutes. I personally think it is a bad idea, but I think we can live with it. There has always been a problem when trying to work Scandinavia from the UK, as it is usual for G and SM/LA etc. to use the second period (odd minutes). There is no easy way out of this problem.

As there is unlikely to be any other MS activity near the frequencies used by the SM7s, it would be quite acceptable for UK stations wanting to work them to use whichever period is necessary at the time. The obvious solution is to listen first to see which period is being used before calling. Bo says that he does not support the idea of 50.350MHz as an MS calling frequency. He seems to think that something like 50.175MHz should be used, although he says no particular frequency is recommended for use during the MS contest. He says that use of a single calling frequency would cause chaos, something I disagree with completely! I believe there is nothing fundamentally wrong with 50.350MHz as an SSB MS frequency, and it is after all an

IARU recommended frequency and not an RSGB one. It is not perfect, but it does not make sense to me to try to bunch all the 6m activity right at the bottom of the band, I believe we should try to promote 50.350MHz as the SSB MS frequency. I have used that frequency for years and have a great deal of success there. Perhaps I could remind people that 50.350MHz is an IARU region 1 MS frequency, and as such it should be used throughout Europe. It is unfortunate that Bo has excluded it from his contest, but I think it would be wrong to discard it because of the preferences of one station.

Sporadic E (Es) Season 1991

The RSGB is running its Sporadic E hotline again this year. This is an experimental service to help operators make the most of potential Es openings. It's run by Jim Bacon G3YLA, the IARU Region 1 Sporadic E co-ordinator, who will update the information when new data becomes available. This usually means on a random basis whilst Jim is otherwise at work as Anglia TV's weatherman. The hotline will include details of possible Es locations for that day (based on past years studies), any known Es event and the Boulder K index when available. Please note these will not be forecasts, merely indications of where new logs are needed to resolve some of the many remaining mysteries of Es formation.

RSGB Sporadic E Hotline 0426 952211

This is a local rate call in the UK, and if you do work anything, let Jim have your logs. Remember to include all the usual details, date, band, time, callsign, QTH locator, report and beam headings for both stations. The best times to check for Es are typically late morning (10.30-12.30 UTC) and particularly late afternoon (16.00-18.00 UTC). The prime months for Es on 2m are May to August, so now is the time to sample this exciting mode of VHF communication. You don't require high power or large aerials to work Es but you need to be brief with the overs, a QSO may only last a few minutes before the path fades. Further details can be found in the excellent articles by Jim in RadCom May-August 1989.

It is hoped to issue bulletins on packet and, of course, receive any data or messages. Contact G3YLA @ GB7TLH.

Finally Jim is establishing a data

Ted Collins G4UPS (right) was recently presented with the Harold Rose Trophy for his 6m work



base for Es logs which will enable any interested researcher to participate in this active area of propagation work. The aim is to be able to provide data for any given day on request, probably via floppy disk in a PC compatible format. Your logs will help to ensure that this data base is as comprehensive as possible, an announcement will be made when the data base is ready.

From the Mailbag

Steve Wimborne tells us he has not been very active lately due to business and other activities, but the aurora on 24th/25th of March was quite a large event extending well down to the Dorset coast. Generally we coast-dwellers don't do as well in auroras as stations even 50 miles inland, and activity on the 2m SSB section was almost non-existent. My radio neighbour (and very good friend) fellow DX chaser Jim Smith did somewhat better in the 2m CW section, 24/3/91 19.34 to 23.30, CW aurora GM0CLN, G0CUZ, DJ1EAP, PA3EQK, GM0NXP, GI4OWA, GM0CDW. Heard but not worked were SP2AOZ, SP4MPB and SP5CZA.

Alex L Dick (Sandy GM0IRZ) writes;

"It has not been my habit to bother anyone with reports because nothing outstanding ever happens at this rather restricted QTH, but it has just occurred to me that this very circumstance may make the following event of some interest. Since the first release of 50MHz to Bs my IC-551D has scanned away pretty

regularly between 50.240 and 50.100 and, up to this month had found nothing workable not attributable to sporadic E, except two east coast reports on 11/12/89 received at S2 only. Shortly before 10.30 GMT on 2/4/91 ZS6WB, Hal in Pretoria, popped up on 50.125 at S9 working Europe on SSB. I contacted him at the third shot only at 10.34, genuine 5&9 reports were exchanged. South Africa is more or less 'end on' to my dipole slung between the chimney and the roof ridge. It seemed this was some sort of TEP without any assistance from anything like extra 'E' hop as no other stations were heard".

Eric Jamieson VK5LP South Australia;

After a long absence I have received a long letter and report from Eric (VHF/UHF columnist 'An Expanding World, Amateur Radio Australia'). "Generally speaking, it seems the Northern hemisphere stations do have more opportunities of working long haul DX to more countries than we do. It seems that so many of our contacts have to be made over vast distances and we find it particularly difficult to work South Africa and South America. It is easier to work across the equator than due east or west. Some of the contacts to places like Senegal and Namibia in Africa have been made with aerials pointing over Canada!"

Derek Atter G3GRO reports;

"In recent months VHF/UHF activity and also conditions seem to have been at a low ebb. No doubt the excellent HF band conditions account for some of the drop in activity on VHF/UHF but it seems ages since we had any decent tropo 'lifts'!

I took part as one of the operators at the Crawley club station G3WSC during the March 1991 70MHz fixed contest, the first contest from our new club house,

The G3GRO/P
23cm/13cm
station

conditions were very quiet with only 36 QSOs in 6 hours! G4KUX from Barnard Castle in 1094 was consistently a good signal down in Sussex.

I also spent a little time on 23cm from the home QTH during the May 4/5th UHF contest. Conditions seemed flat with drizzle and windy weather. Activity level was low with G3CKR/P up in IO93AD being the best UK contact. However, a search to the east brought DF0HS/P in JO31AA out of the noise on CW, who could still be heard 30 minutes after I first worked him. The QTH is only 200ft ASL and badly obstructed to the east. It shows that it is worth looking to EU even under unpromising conditions."

Ray Cracknell G2AHU, co-ordinator 50MHz reporting club RSGB, says 'What of the future?'

"It is our task to report on what has been achieved rather than to forecast the future. Nevertheless the sunspot maximum of cycle 22 has certainly passed and the decline of the magnetic cycle, which often tends to follow somewhat in retard, will certainly follow. F-layer propagation from latitudes well away from the tropics will become less frequent, but the rate of decline should be slower than the rapid rise which characterised the present cycle. If as we might expect, disturbances decrease, there may be a partial recovery during the next F-layer season. On paths that run more or less north and south towards the equator, conditions will hold up longer. Transequatorial propagation at 50MHz will persist right through the sunspot minimum but will become progressively confined to optimum areas as solar activity declines. This means that openings using TEP plus Es into northern Europe will be occasionally possible at times when the TEP and the sporadic E seasons overlap.

Auroral openings, although more frequent at the peak of the magnetic cycle, are by no means confined to it, nor it seems are they likely to be weaker in extent or maximum usable frequency. This point is one awaiting careful research, as does auroral-E which, when there is no possibility of winter F2 openings will become an interesting proposition."

Due to dealing this month mainly with propagation during the period between cycles 22 and 23, reports from some of our regular contributors have regrettably been held over, but I extend a welcome to the new reporters. Please continue to send your reports, particularly about the neglected bands, to me Ken Ellis, 18 Joyes Road, Folkestone, Kent. CT19 6NX — thanks.



Packet Radio

Roundup



Packet messages from the Mir Space Station, G4HCL reports

ful nowadays. It's advertised each month in HRT. Maybe, one day, more amateurs will find this out.

From comments heard on the network as well as on voice modes, many amateurs are now realising the benefits of running a single-channel, low cost 'second' rig for packet, rather than tying up their 'prime' 2m shack or mobile rig, this often being a synthesised and sometimes even multimode affair! But what to look for in a 'second rig'?

Low Cost rigs for Packet

The first thing to investigate is what packet frequencies are in use in your area, and possibly more importantly what frequencies are in use in use, with node links to BBSs and other nodes, but doesn't get used very often. A typical

case here is that of 6m, 4m and 70cm, in some areas one or more of these are heavily used, in others they're virtually 'dead' except for the odd 'lone user'. With dedicated inter-node links using higher and dedicated frequencies, bands such as 4m literally 'open up' to allow fast communication, leaving often very busy frequencies such as 144.650MHz for the intended purpose of local BBS access. In my area, there are interlinked nodes on 6m, 4m, 2m, 70cm and 23cm, yet the 2m and 70cm frequencies are often so congested that things grind to a halt due to some adjacent areas not having 23cm nodes in operation. But the interlinked 4m node (with it's vertical end-fed dipole on a 20m high mast near to a couple of large cities) sees maybe three or four stations a day (no prizes for guessing who one of the stations is!).

Ex-PMR gear ready for 4m use or for conversion to 6m is so cheap and plenti-

Low Cost 23cm Inter-Node Links

So you think 23cm gear for your local packet node, to get inter-node forwarding off busy frequencies, is prohibitively expensive? **Wrong.** Just like packet users on a single channel, you don't need commercially made synthesised transceivers. In fact, transceivers are often useless for a dedicated duplex 23cm link, you'll need two of them for this, doubling the cost and probably suffering from synthesiser noise problems with duplex operation.

So what's the secret? Right then, here goes. You get a 2m ex-PMR rig (like the M-band Pye Europa in this month's issue — no need to convert the TX side) and knock up a Cirkit 23cm-2m converter kit to place onto the receiver. Then get a 70cm ex-PMR rig, and build up a simple varactor tripler and filter (see the RSGB's 'VHF/UHF Handbook' for a simple low-cost design) to add on the end. Total cost, probably less than £60, and you've got a full-duplex high performance 23cm link TX/RX. For the aerial, look at the details in my article in the Nov 1986 issue of HRT for the late G4XHM's modified TV aerial, giving high gain and very wide bandwidth (necessary for wide duplex splits), together with a low-cost PCB splitter for multi-aerial use if needed. So what's the excuse for not getting nodes onto 23cm now?

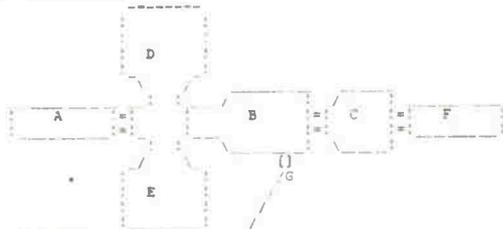
Packet from Mir

As many amateurs know, Musa U2MIR has been active on packet from the USSR space station Mir, using the Pac-Comm Handipacket TNC on board. In a message to 'ALL' in his personal mailbox, he tells us that "U2MIR have to be replaced — maybe soon!" adding that the new team will be Sergey Krikalev U5MIR and Anatoly Archebarski U7MIR. Musa recently sent a novel packet 'sketch' of his space station home together with a few details of what he'd been up to. By the time you read this, Musa (who was once in space aboard Mir for over a year non-stop) should be firmly back on the ground, for a while at least, but you now know the call signs of

From Musa U2MIR and Victor U9MIR on Soviet Space Station Mir:

The closer our landing, the more work there is. We are now changing blocks of apparatus new ones in my "radio shack", so now the room is a shocking mess. I have almost stopped working ham radio. My ham radio gear is installed in the "Kvant" module -- the astrophysical one. Here is a sketch of our space station:

OUR SPACE STATION:



- A -CARGO SHIP
- B -MAIN MODULE (MAIN CONTROLS, MAIN LIFE SPACE-COOKING, EXERCISES, VICTOR'S SLEEPING PLACE)
- C -MODULE "KVANT" (MY RIG IS HERE)
- D -MODULE KVANT-2 (LIFE SYSTEMS, EXIT FOR EVA)
- E -MODULE "KRISTALL" (OVENS FOR TECHNOLOGY-SEMICONDUCTORS, ETC; MY SLEEPING PLACE)
- F -OUR SPACE SHIP (VERY GOOD INDEED)

This month we have to go out twice on spacewalks (EVA). Our task is to transfer two drives for the solar batteries from module E to module C. The last time we went out we installed special bearings (supports) on module C. The work is rather difficult. For transferring the drives we use a special cargo (load). Shaft G. It is telescopic like some antennas.

Now, about a few rumours:

--We always have a stock of food to last several months, so hunger never threatened us. (And I have remained stout and handsome).

-- If the Progress cargo ship had not arrived, there would not be new equipment for subsequent experiments. However, there is still enough food, water, O2, forks and knives.

--About a possible collision: Progress lost radio contact with the station and missed the docking unit. But for these events, we have some automatic control in the Progress on-board computer to put the cargo ship right back. In addition, at the moment of docking the crew must be inside the space ship with the hatch closed.

You see, it was not so dangerous.

We succeeded only in exchanging call signs with STS-37. They had a damaged antenna.

73 Musa U2MIR

Packet message from Musa U2MIR and Victor U9MIR on Soviet Space Station Mir

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the new stations to connect to. Word has it that operation on 432.675MHz packet may commence also, we'll have to wait and see. I wonder if we'd be able to use this for BBS mail forwarding?

Kantronics Host Mode

Phil Anderson of Kantronics was recently kind enough to send me an evaluation copy of the new 'Host Mode' program for Kantronics TNCs, and what a great system it is, especially when used with my KAM. The program, which is available for PC compatibles and the Commodore 64/128, is called 'Hostmaster II' and makes multi-mode, multi-connect with a single keyboard a reality. Used with a KAM fitted with the latest V4.0 software, the program allows operation of packet on VHF/UHF together with simultaneous HF transceive operation of Packet, AMTOR, RTTY, CW, or NAVTEX receive. You can toggle back and forth between, with multiple 'channels' in use for each port each with their own memory buffers. Hence, if you're operating on HF AMTOR and you're monitoring your local packet BBS or DX Cluster, you can quickly go back and forth between ports by hitting either the 'F1' or 'F2' buttons. If you've missed something that's gone off-screen, you can simply scroll it back down with a

single button.

I found when operating packet on a single port, that a very useful facility of the program was that even when connected I could, if I wished, monitor all on-air packets in one 'window', monitor the packet information to my 'connected' station(s) in another, and see my outgoing text in another — very useful to check what else is around whilst operating! Operating in a 'Window' environment with pull-down menus, I'm now a dedicated user of this with my KAM.

You can purchase this from your local Kantronics dealer, on delivery you can 'register' your copy which then allows you to perform an instant sign-on rather than the devious encryption used by Kantronics which asks you a simple question from the official manual to make sure you aren't using a 'pirate' copy!

DSP Controllers

Revealed at the NEC this year was the new DSP multi-mode data controller from AEA. Coming in two versions, the DSP-1232 (two switchable ports) and the DSP-2232 (two simultaneous ports), the units claim to have the hardware for all available modes built in, for now and the future. Hence with the one unit which houses the TNC as well as the DSP mod-

ems, linked to a suitable transceiver you can operate on modes including those for Pacsats, Oscar-13, Oscar-15, reception of high resolution multi-level WEFAX and SSTV, as well as transceive operation of 1200 and 2400 baud packet together with compatibility for transceive with G3RUH 9600 baud modem users. AEA's 'SIAM' signal recognition ('best guess') mode recognition is built in also, and AEA tell us that every known frequency pair for FSK has already been programmed in. With all that, the only other thing I can say is that it isn't cheap by 'normal' multi-mode TNC standards! You can get further details from ICS Electronics in the UK, or of course your local AEA dealer.

CTRL-Z, End of Message

That's it for another month, do keep your packet messages coming to keep me in touch with what you're doing. This weekend we're having the inaugural formal group meeting of SUNPAC, the Southern Users Packet group, round at my QTH. Seeing as we've been running it for a couple of years with several BBSs and a couple of dozen nodes in operation as well as having a stand at the local rally, we thought we'd better formalise ourselves! See you next month. 73 de Chris G4HCL @ GB7XJZ

Club News

Acton, Brentford & Chiswick ARC meet at 7.30pm on the 3rd Tuesday of each month at the Chiswick Town Hall, Turnham Green, Chiswick, London W4. A date for your diary;
Jul. 16th 'My favorite Key', discussion and demonstration.
Further details from Paul Truitt G4WQO, Tel. 071 938 2561

Braintree and District ARC meet at the Community Centre, Victoria Street, Braintree at 8pm on the 1st and 3rd Mondays of each month (except bank holidays). Club events;
Jul. 1st Quiz evening.
Jul. 15th Tools and techniques — David G3PEN.
Aug. 5th Travel talk, USA and Australia — David G0KQV.
Details from M. J. Andrews, 22 Arnhem Grove, Braintree, Essex CM7 5UQ. Tel. 0376 27431

Bromley and District ARC meet on the 3rd Tuesday of each month, 7.30 for 8.00pm at the Victory Social Club, Kechill Gardens, Hayes, Kent. Club events include;
Jul. 16th Short talks.
Aug. 20th Operating evening and barbecue.
Further details from Mr. Geoffrey Milne G3UML, 142 Hayes Lane, Hayes, Kent BR2 9EL Tel. 081 462 2689.

Bromsgrove ARS meets at 8pm on the 2nd and 4th Tuesday of each month at the Lickey End Working Mens Club, Alcester Rd, Lickey End, Bromsgrove. Club events include;
Jul. 9th Aerial construction tests and prizes.
Jul. 23rd 145MHz direction finding contest.
Aug. 13th Eric Danks G8BKL ceramics.
Aug. 27th Night on the air.
Further details from Mr. D.J. Edwards G4ZWR, Tel. 0527 546075



South Bristol ARC meets every Wednesday at the Whitechurch Folkhouse Association, Bridge Farm House, East Dundry Road, Whitechurch, Bristol, Avon. BS14 0LN. Forthcoming events include;
Jul. 3rd The hobby of the space age.
Jul. 6/7th VHF National Field Day.
Jul. 10th Invitation to a slide show.
Jul. 17th Homebrew for Terry Dunsford trophy.
Jul. 24th CW activity evening.
Jul. 31st Fox hunt preparations.
Events and dates often change, so for more information Tel. Whitechurch 832222 on a Wednesday evening.

Coulsdon ATS meet on the second Monday in each month 7.45 for 8.00pm at St Swithun's Church Hall, Grovelands Road, Purley, Surrey. Programme of events;
Jul. 8th 2m fox hunt.
Aug. 12th RSGB video evening with cheese and wine.
Further details can be obtained from Andy Briers G0KZT Tel. 01 668 7004 or Alan Bartle Tel. 01 684 0610

Dorking and District RS meet on the 2nd and 4th Tuesdays at 7.45pm. Dates for your diary;
Jul. 9th Informal — at Parrot forest green.
Jul. 23rd Portable activity night — venue Devils Dyke at 7pm.
Aug. 11th D/F trial — venue TBA.
Aug. 13th Informal — Abinger Hatch.
Further details from John Greenwell G3AEZ Tel. 0306 77236

Edgware & District RS meet at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak. Events include;
Jul. 6/7th VHF field day — Hatfield.
Jul. 11th Air navigation, G4GLM.
Jul. 25th 'Kites', Roy G4UNL
Aug. 22nd SSR field day briefing.
Further details from Hank Kay G0FAB Tel. 081 205 1023 or Howard Drury G4HMD Tel. 09274 22776

Exeter Amateur Radio Society meet on the 2nd and 3rd Monday of each month at the Community Centre, St Davids Hill, Exeter at 7.30pm. Every 3rd Monday is a social gathering in the bar, other club events include;

Jul. 8th Construction contest.
Aug. 12th Free and easy.
Sep. 9th Frequency measurements.
Further details can be obtained from Ray Donno G3YBK Tel. 0392 78710

North Ferriby United ARS meet at North Ferriby Football Club Social room, Church Road, North Ferriby at 8pm. Meeting details as follows;

Jul. 5th HF linears, G3ZRS.
Jul. 12th Extra-ordinary meeting.
Jul. 19th A trace of flutter, G4TGE.
Jul. 26th Night on the air.
Aug. 2nd Latest QSLs of interest — members.
Aug. 9th Night on the air.
Aug. 16th Field night.
Aug. 23rd Night on the air.
Aug. 30th Portability my way — Frank G3YCC.
Further details from F. W. Lee G3YCC, Tel. 0482 650410

Grafton RS meet every Friday at Holy Trinity Church Hall, Stapleton Hall Road, London N4 from 8pm. Dates to remember;
Jul. 5th Detection equipment.
Jul. 19th WW2 radio interception.
other dates are informal. For further details contact Rodney Harrigan G0JUJ, Tel. 081 368 8154

Horndean and District ARC meet at the Horndean Community School at 7.30pm, Barton Cross, Horndean, Hants. Their activities include;
Jul. 4th Coast guard systems.
Aug. 1st Aerials — the beginnings.
Further details from S. W. Swain, Tel. 0705 472846

Horsham ARC meet at the Guide Hall, Denne Road, Horsham, W. Sussex on the first thursday of each month at 8pm. Events include;
Jul. 4th HF aerials and things.
Aug. 1st Photo quiz.
For further details contact Peter Stevens G8SUI, 11 Nutwood Ave, Brockham, Betchworth, Surrey RH3 7LT Tel. 073784 2150

South East Kent (YMCA) ARC meet at the Dover YMCA, Godwynhurst, Leyburne Road, Dover, Kent. The club have 3 novice instructors and are running a novice class currently with 12 students from age 11 to 60+. The demand for the class has been so great that they already have several students for the next class which will start in July/August. Other club activities include;
Jul. 10th Optical fibres, by G8ZYZ
Jul. 17th Natter night
Jul. 24th Bring your rigs for checking against spec.
Specialist equipment and help at hand by G0DOV
(Someone's been reading the June 91 HRT! — Ed)
Aug. 7th Nor-landing cruise, 7pm departure.
For further details about novice classes and the club contact Eileen Berridge G7HXJ Tel. 0304 372656

Keighley ARS meet at the Cricket Club, Ingrow, near Keighley every Thursday at 8.00pm. Most club meetings are 'Natter nights' other events include;
Jul. 18th Packet radio on the air.
Jul. 25th Construction Project, G3TDZ.
Aug. 8th Quiz.
Aug. 29th America's first 25 years in space — G4ZVD.
Further details from Kathy Conlon G1IGH on 0274 496222

Maidenhead and District ARC meet at the Red Cross Hall, The Crescent, Maidenhead. Meetings start at 7.30pm.
Jul. 6/7th VHF field day at John Hampden School, High Wycombe.
Jul. 16th Planning permission for aerials — G3WYK.
Jul. 21st McMichael rally.
Aug. 1st 2m fox hunt.
Aug. 20th Quiz against Bracknell ARC (at home).
For more information contact Neil G8XYN, Tel Maidenhead (0628) 25952

Norfolk ARS meet at 'The Norfolk Dumpling', The Livestock Market, Harford, Norwich every Wednesday at 7.30 for 8pm start.

Dates to remember;

Jul. 3rd Evening at Happisburgh.
Jul. 10th Mobile DF hunt.
Jul. 17th Informal and committee meeting.
Jul. 24th Keeping the trains running.
Jul. 31st Quiz with a difference.
Aug. 4th Club outing to Woburn rally.
Aug. 7th HF SSB NFD / town and country show briefing.
Aug. 14th 'Real Radio' evening.
Aug. 21st QRP activity week — hints and advice.
Aug. 28th 'Science for all' - Arnold Tomalin G3PTB.
Aug. 31st HF SSB NFD at East Tuddenham site.
For further details contact Jack Simpson G3NJQ Tel. 0603 747992

Northern Heights ARES meet on the first and third Wednesdays each month at the Bradshaw Tavern, N. Queensbury, Bradford, W. Yorkshire at 8.15pm.

Jul. 3rd RSGB evening, video, discussion.
Jul. 17th Treasure hunt.
Aug. 7th DF foxhunt.
Aug. 21st Access control — Geoff G8NWK.
For details contact Stan Catton G0IYR on 0274 673116



Nottingham ARC meet every Thursday at 7.30pm at the Sherwood Community Centre, Mansfield Road, Nottingham. Forthcoming events include;

Jul. 4th Forum.
Jul. 6th Special event station at St Peters School, Ruddington.
Jul. 11th Ambulance communications, by Alan G8SSL.
Jul. 13th Special event station at Gedling Comprehensive School.
Jul. 18th 2m foxhunt and activity on the air.
Jul. 25th Demo of mast and aerial erection, Martin G6ABU.
Aug. 1st AMTOR, by Alan G3XOF
Aug. 8th Forum.
For further details contact Rex G1LRI Tel. 0602 733740

Porthmadoc and District ARS meet at the Harbor Cafe, The Ffestiniog Railway, Porthmadoc. Meeting details as follows;

Jul. 18th General discussion night.
Aug. 15th Video evening arranged by GW6IMS.
Further details from Ralph Taylor GW2HCJ, Tel 0766 770637

Reading and District ARC meet at the Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading on 2nd and 4th Thursdays at 8pm. Forthcoming events include;

Jul. 11th Electronic warfare, by Peter Chadwick, G3RZP.
Jul. 25th Project Year evening.
Aug. 22nd Power amplifiers, by Roy Church G3KJC.
Aug. 31st Special event station for Guide Dogs For The Blind.
Further details from Vin Robinson G4JTR, Tel. 0734 476873

Rhyl and District ARC meets on the first and third Tuesdays each month at the Scout Hut, Vale Road, Rhyl. Their forthcoming programme of events include;

Jul. 1st Homebrew construction.
Jul. 15th Electrical regulations, in-house lecture.
Aug. 5th Annual fox hunt.
Aug. 19th Home brew construction.
For further details contact Mr. David Bevan GW4DMR (Chairman) Tel. 0745 345078, or Mr. Edward Shipton GW0DSJ (Secretary) Tel. 0745 336939, or Mr George Greenhalgh GW0MOH (Treasurer) Tel. 0745 350896.

Salisbury ARES meet at Govesnor House, Churchfields Road, Salisbury. Club meeting dates are;

Jul. 2nd Weather satellites.
Jul. 9th Committee meeting.
Jul. 23rd Video about aeriels.
Further details from David Kennedy Tel. 0256 342289 daytime and 0722 330971 evenings and weekends.

Stratford upon Avon & District RS meet at the Baptist Church, Payton Street, Stratford upon Avon, at 7.30pm. Club dates include;

Jul. 8th Fox hunt.
Jul. 22nd Construction contest.
Details from A. Beasley G0CXJ, Tel. 060 882 495.



Stourbridge and District ARS meet on the first and third Mondays of each month at the Robin Woods Community Centre, Scotts Road, Stourbridge. Their programme of events;

Jul. 1st On air and natter night.
Jul. 15th Demo of Jandek kits by G3ZOM.
Further details from their Hon. Secretary D. Body G0HTJ, 53 Grove Rd, Wollescote, Stourbridge, W. Midlands DY9 9AE

Mid Sussex ARS meet every Thursday in term time at 7.45pm, at Marle Place Further Education Centre, Leylands Rd, Burgess Hill, West Sussex. Dates for your diary;

Jul. 6/7th VHF National Field Day.
Jul. 14th Brighton Rally.
Further details from John Fuller G0OIO or Len G0APZ Tel. 0273 844951

Sutton and Cheam RS meet on the 3rd Thursdays each month, 7.30 for 8pm at Downs Lawn Tennis Club, Holland Ave, Cheam, Surrey. Natter nights are on the 1st Monday each month in the Downs Bar. Dates for your diary;

Jul. 6/7th VHF National Field Day at Leek, Staffs.
Jul. 18th Video evening.
Aug. 4th Woburn rally.
Aug. 15th Barbecue (tentative).
For further details, Tel. 081 644 9945

Three Counties RC meets every other Wednesday at the Railway Hotel, Liphook, Hampshire at 7.30 for 8.00pm. Club events include;

Jul. 3rd UoSAT and OSCAR satellites.
Jul. 17th Telecommunications in the North Sea.
Jul. 31st Computer night.
Aug. 14th RSGB video and other activities.
Aug. 28th Junk sale.
For further details contact Dave G4VKC.

Verulam ARC meet at the RAF Association Headquarters, New Kent Road, St. Albans at 7.30 for 8pm on the 2nd and 4th tuesdays of each month. On the 2nd Tuesday they have an activity evening and on the 4th Tuesday a main meeting. Main meeting event;

Jul. 23rd 'What's on 80m' by J. Allen G4PDP
For further details contact Walter Craine G3PMF, Tel. 0923 262180

Wakefield and District RS meet every Tuesday at 8pm on the first floor rooms, Ossett Community Centre, Prospect Road, Ossett. Club events include;

Jul. 9th HF operating procedures, G4JMT.
Jul. 16th Car treasure hunt, G0FLX.
Jul. 23rd Morse operating, G0BQB.
Jul. 30th On the air (CW!).
Aug. 6th Visit rally site (Rodillian School).
Aug. 13th RSGB video.
Aug. 20th ATU/aerial principles, G3WWF.
Further details about the club from John G0MVA Tel. 0924 220048

Wimbledon and District ARS meet on the 2nd and last Friday of each month in St. Andrews Church Hall, Herbert Road, Wimbledon, London SW19. Dates for your diary;

Jul. 12th Weather satellite update, Dave Young G8VXB.
Jul. 26th Pre-camp briefing.
Aug. 3-11th Annual camp, Barwell Estate, Chessington, Surrey.
Aug. 30th General activity evening.
Further details from Chris Frost G0KEB, Tel. 081 397 0427

Yeovil ARS meets every Thursday 7.30pm at The British Red Cross Society, 72 Grove Avenue, Yeovil. Each week they have a programme of lectures, videos or discussions and have an RAE course currently running. A Date for your diary;

Jul. 4th A peak reading RF voltmeter, by G3MYM.
Further details from the Secretary David Baily G0NMM or John Howard G4EVI Tel. 0935 75920

National and International

G-QRP Club publish a quarterly magazine devoted to low power communication, and hold regular get-togethers. Their secretary is Rev. G. Dobbs, St. Aiden's Vicarage, 498 Manchester Road, Rochdale. Lancs. OL11 3HE. Tel. 0706 31812.

Free Readers Ads!

FOR SALE

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

Transceivers, Yaesu FT-747GX, new in box, £495. FT-101B very clean, £269. FT-101V matching external VFO, £59. Mobile 45ft crank-up tiltover tower, ideal for field days or clubs, £495 buyer to collect. Contact L. Lloyd (Lancaster), 0524 823277

Kenwood TS-770 2m and 70cms transceiver, SSB/CW/FM, 10W output, excellent condition. Dual VFO, six memory channels, base station 240V, Kenwood's original dual band multimode, reluctant sale, £585, buyer to arrange collection. Contact Bob G4MWR (York), Tel. 0904 425619 evenings. Free to good home, Muirhead fax machine, working, can be used for weather fax etc. Uses standard wet Muirhead paper still available. Contact Mr. W. Rabbitt (Warrington) Tel. 0925 815705

FT-980 transceiver, Ham and Gen memory and CAT system, mint condition with operating manual and technical supplement, £850 ono. Contact T. Hartshorn (Chesterfield), Tel. 0246 236496

FT-101 plus manual, £200. KLM amp 144, 160W out 10W in, £100. BC-221 power pack charts, £30. Atlas solid state SSB TX/RX, mic, manual, mobile/fix, £250. Contact R. Richardson (Glensford, Suffolk), Tel. 0787 280259

Station close down. RN transverter 28MHz in 50MHz out, £110. Transverter 28MHz in 70MHz out, £75. Transverter, 28MHz in, 144MHz out, £120 with 600kHz repeater use. Uniden 28-30MHz transceiver, £150. SEM ATUs 50MHz and 144MHz, £15 each. AKD WAZ wavemeter (144MHz), £10. All hardly used. Contact Mr. M. Williams (Hove, E.Sussex), Tel. 081 871 1395

Trio R1000 receiver, 30kHz/30MHz continuous, AM/USB/LSB, boxed and in very good condition, £215. Contact Jeff Graham (Harrow), Tel. 081 907 0140

Linear amplifier, Zetagi B300P, GWO, 6 stage output up to 250W FM, £40. Contact Stewart Noble (Leighton Buzzard), Tel. 0296 661452

Dragon 32 needs attention, £20. Avo 8, leather case, £85. Teletext

adaptor Acorn, £85. Dragon 32 232 PCB, £35. Printer control switch, £18. Manuals, 9500, 2500, 3500, 120V, £5 each. Dragon bits and pieces, RS232 I/O interface Dragon, £45 carriage extra. Contact G8SBU (Exmouth), Tel. 0395 265059

Halllicrafter Super Skyrider receiver model SX28, 55kHz to 43MHz with manual. Good clean working condition, BFO and band spread plus crystal filter, ideal set for SWL or collector, £75. Contact M. Donington (Mkt Harborough), Tel. 0858 462775

Lowe HF-125 receiver in excellent condition, boxed with manual, £275. This receiver was used to handle the pile-ups at 7Q7CMI Contact Dr. Colin Morgan 7Q7CM/GW3RYR (Mid Glam), Tel. 0685 723426

Yaesu FT-290R complete and like new, £230. Contact J. Court (Woking), Tel. 04867 87896 evenings.

Rig 136-138MHz synthesised weather sat receiver module, LCD frequency readout, scanning etc. £110. Kantronics KPC4 dual port TNC, latest V3.06 Eprom available, £200. Contact Paul Chamberlain (Crawley, Sussex), Tel. 0293 515201 evenings.

Trio TS-930S, very good condition with original packing, £850. HY-Gain T2X 'Tailtwister' aerial rotator, the really powerful one, unused and boxed, £350. Palomar engineers R-X aerial noise bridge, new, £35. All plus carriage. Contact R. Ratcliffe (Near Worcester), Tel. 0584 79372

Icom IC-735, mint condition, 30A PSU, Capco ATU, auto SWR, complete station, rig etc. under guarantee, cost new £1500+, sell for £1095 ono, will consider splitting, sale due to house purchase. Also Datong Morse tutor, £40. Contact Glen Charman (Taunton, Somerset), daytime Tel. No.- 0225 310256 ext.2032 ask for Glen.

Jaybeam TB2 2 ele beam, good condition, £120. Contact A. Turford (Chesterfield), Tel. 0246 824972 evenings.

Eddystone 940 receiver, overhauled with manual, spares if required, offers. Contact W. Billington (Forest Hill), Tel. 081 699 4413 after 6pm.

Amiga A500 latest 1.3 workbench expanded to one megabyte, second disk drive, includes all books, disks etc., boxed as new, includes amateur radio programs and boxed games, bargain at £325 ono or exchange WHY. Contact N. Parr (Nottingham), Tel. 0602 452242

FT-209RH, FNB-3 charger boxed, £130. Tokyo Hy-Power HT120, 20m SSB/CW 25W, as new, £230. Racal-Dana lab 120MHz frequency counter, £80. Telequipment D34 portable scope 15MHz dual trace, £80. Contact Bob Ralph (Solihull), Tel. 021 705 1089

Yaesu FRG7, mint condition, no mods, £150. Contact Brian G1WTI (Sheffield), Tel. 0742 887052 anytime.

TS-680S superb condition, £700 cash. Datong audio filter FL1, £45. MM 70cm converter, £20. Apollo 28MHz 50W linear, £35. MM 50MHz converter 6m/10m, new, £30. AEC SWR power meter, £20. Cobra 148GTL-DX converted 10m certificate, £75. Contact W. Badcock (Hemel Hempstead), Tel. 0442 256170

PF2UB (UHF) handset, helical, working 450MHz (two), five nicads and a charger, £70 the lot. Used QY5/3000A valve with ceramic chimney, offers. Contact J. A. Share (Wirral) Tel. 051 632 5534 evenings.

Packet TNC (clone) TX/RX VHF/UHF, £40 p.paid. ZX Spectrum 48K keyboard, £25 p.paid. ZX printer with 2 rolls paper, £60 p.paid. Silver Rod 18ft still in box, £15 collected. 70MHz base aerial, £15 collected. RSGB Radcoms Jan 1986 to Dec 1989, £20 collected. Contact Mr. Marsden (Ormskirk, Lancs), Tel. 0704 892088

Yaesu FT-757GX HF transceiver plus fully automatic ATU 757FC, also heavy duty power supply FR-757HD, £850. Will not split. Contact Mr. L. Colwell (Chestnut, Herts), Tel. 0992 29639

National Panasonic World band receiver RF8000, SSB/FM/MW/LW up to 10m cal, narrow/wide filter, cost £2000 bargain at £450, heavy 50lbs buyer inspects and collects. Also Sony World zone CRF 230 excellent performance, powerful VHF MW/LW up to 10m, cost £500 sell for £225. Contact Mr. Rai (West London), Tel. 081 571 5759

Yaesu FT-101 HF transceiver, VGC, fan, manual, £200. Two pairs Pye PF1 RX/TX, £10 per pair, spares £5. 'Connexions' satellite RX LNB, horn polariser, £150. Six valve radio spares, £10. Contact Mr. O. Rogers (Bodmin), Tel. 0637 880404

FT-290, £205. Microwave Modules 50MHz transverter, £175. ERA BP34 filter, £65. Howes 3.5MHz transverter, £50. Spectrum 28MHz preamp, £25. Spec-

trum 144MHz preamp, £30. Cirkit 144MHz linear, £40. Europa on R7, £35. Contact Mike Thorogood (Banchory, Scotland), Tel. 03302 3324

American PK232, £150. Maplin satellite RX, £50. Dragon 32k BMK Amtr/RTTY cartridge, £40. BBC B PK232 Eprom cassette joy stick, £120. 12in mono monitor, £35. Contact Peter Haughey G3JXR (Bletchley), Tel. 0908 642398

Yaesu FRG-7700 receiver, 150kHz to 30MHz AM/SSB/CW/FM in mint condition with hand-book, £195 ono. Contact Mr. Pettit (Locks Heath, Southampton), Tel. 0489 577686

AOR 2002 VHF/UHF scanner, mint, £325. Kenwood AT-130 ATU, mint, £75. BNOS 144MHz linear amp, 144/3/100 mint, £150. Also Tristar 747 10m converted multimode 28 to 29.7MHz DTI approved, £125. Katsumi E121 electronic key plus keyer, £25. All mint condition. Contact Mr. B. West (Pontypool) 0495 757221

Yaesu FT-290R MkII, immaculate, unmarked and boxed, £325. Nicads £12. Tokyo transverter HX-240, boxed as new, £210. Capco ATU for above, 3 weeks old, £80. Kenwood TS-440S fitted 500Hz CW and 1.8kHz SSB filters boxed as new 9 months old £950. Contact Mr. D. Kay (Bolton, Lancs) Tel. 0204 852410

HF-225, speaker, keypad and FM board, cost £555 sell for £250. Sony PRO-80, cost £335 sell for £150. Code scanner Microcraft, cost £199 sell for £90. Palmor pre-amplifier, cost £119 sell for £60. Realistic PRO-2022 scanner, cost £235 sell for £100. All radio gear 4 months old. C64 Commodore, disk drive, monitor, printer and amateur radio programs on disk, £175. Write to John Lyons, 66 The Birches, Three Bridges, Crawley, Sussex RH10 1RZ

Digital multimeter small AVO, £40. Fluke multimeter, £50. HV probe, £12. Tacho probe, £25. Contact S. Patell (London area), Tel. 081 554 2913 6-9pm.

Ten-Tec Corsair HF transceiver model 560, excellent worker, £600. Also Yaesu FP-707 power supply, £70 nearest. Contact E. Williams (Llanelli, Dyfed), Tel. 0269 861221

Trio TS-940S with auto ATU, 500kHz CW filter and SP940 speaker with audio filters, mint condition and boxed with all manuals and hand mic, £1400. Icom 725 tcvr complete station all mode with AM/FM/CW filter

(500), 40A HD PSU, complete with accessories box (matches rig) containing AMT-3, RTTY and AMTOR modem with serial interface cable, EL-keyer and side tone unit, all interconnecting cables to IC-725. Plus Samsung (IBM/PC/XT) twin 5.25" drives, full KBD, 14in amber CGA/Hercules monitor and deluxe Citizen LSP 100 printer. Complete station with all manuals boxed and in mint condition, £1000. Contact A. Smith G3XNE, 62 Agnes Close, Bude, Cornwall EX23 8SB

Eddystone EA12 receiver, VGC, prestige S/N 00002, manual and spare valves, offers around £260. Contact Mr. R. James G7FGU (York), Tel. 0904 799043

Icom 290D 2m SSB/CW/FM, 1/25W untouched, manuals, mobile mount, boxed as new plus MM GasFET pre-amp, £325 ono. FT-211RH 2m FM 5/45W, TNC connections, quick release mobile mount, boxed as new plus quarter wave mag mount, £180 ono. Contact Dennis Tacy G7CHY (Liverpool) Tel. 051 220 1275

Yaesu FT-290RH hand held complete with two carrying cases, nicad charger, FNB-4 12V pack, FBA-5 empty AA pack, mobile mount, helical aerial, excellent condition and boxed, £145. Also Samson ETM-IC electronic Morse keyer, £20. Contact Steven Goodier (Stockport), Tel. 061 427 5931

KW2000B transceiver, LS/PSU, E-Zee match, SWR meter, LP filter, mic, GWO £250. Spectrum RX/TX programs, RTTY, SSTV, CW, complete with interface etc, £20. Contact Stan G3XON (Guildford), Tel. 0483 36953

Yaesu FT-101ZD MkIII, FM board, narrow CW filter, extra pre-mix crystal board, also spare 10m crystal. New pre-mix board fitted covering all WARC bands, includes workshop manual, must sell as going abroad, any reasonable offer. Contact G. Adams (Burlington-on-trent), Tel. 0283 221870

BBC Master compact plus green monitor, £240. RN Electronics 50/144MHz transverter plus HB9CV, £145 ono. Contact Phil Gabel (Towcester, Northants), Tel. 0604 864249 5-8pm.

Sangean ATS-803 receiver, immaculate condition, boxed, £55. Also Sony ICF-2001 receiver, slight fault hence £30. Contact M. Jones (Sheffield), Tel. 0742 685740

Yaesu FT-102 with FM board, CW and SSB filters with spare PA valves and handbook, good condition, £490 ono buyer collects and inspects. Contact Clive G4OMG (Bath), Tel. 0761 72431 after 7pm or anytime at weekends.

Yaesu FL-101 TX and FTV-650B

transverter, £280. Contact Paul Postle, Tel. Norwich 745734
Shack clearout: CDE AR40 rotator, £40. Yaesu YE-7A fist mic, £10. Vacuum variable capacitors 1000pF and 2000pF 3kV, £35 each. Contact Ian Poole (Staines), Tel. 0784 450947

2m hand held, digital, 4/0.5W, program steps etc, nicads, charger, boxed, £79. Maplin Gamma radiation meter, £38. Wanted AR1000 scanner. Contact M. Worvill (Margate), Tel. 0843 294446

Sommerkamp FT-290MkI with muTek front end, up/down mic and manual, £300. Realistic PRO-2002 50 channel AM/FM 12V or mains powered, scanner coverage 68-88, 108-174, 410-512, boxed and fitted with automatic memory battery charger, £120. Contact R. Trussler (Hamilton, Strathclyde), Tel. 0698 286078 after 6pm.

Kenwood R5000 receiver, CW VC20 VHF converter, VGC and perfect working order with manual, £700. Tel. 0934 635313

Lake DTR7 QRP transceiver for 7MHz, 2.5W output, £75. Contact C. Beynon GW3WSU (Barry, S.Glam), Tel. 0446 781261

Datong RFC1 speech processor, £25. Memory keyer, £30. Service manual TS830S/M, £8.50. YD844A desk mic, £22. Oscilloscope, Cossor 1039M, £15. ZX81, 16k RAM, additional keyboard, £20. Printer (serial), daisywheel type, £20. R1155 receiver, offers? (collector's item). John, Sandy Beds. Tel. 0767 680058

AR2002 Scanner, condition as new, original packing, power pack, frequency books etc. Terry (Sheffield), Tel. 0742 582137

Uniden 2830 mint condition, £260. (Wolverhampton), Tel. 0902 735832

Realistic PRO2022, perfect with discone, £200. Sony ICF7006DS with PSU, £100. Grundig Sat 400 International, £125 ono. Alf (Bristol), Tel. 0272 828586, 43 Atwood Drive, Bristol. BS11 0SR

Atari 520STFM, 1040 spec megafile 30 hard disk drive, Citizen 120D printer, external 3.5in drive, Atari SM124 high resolution monitor, all boxed, as new, hardly used condition, complete with loads of software, £575 ovno. Contact Paul G0AFF (Portsmouth), Tel. 0705 258698 evenings, answerphone during daytime.

FT-290R multimode with HX240 transverter, £390. Standard handheld, five channels, nicads and charger, £45. KW Atlanta transceiver, 10-80m, 350W, £240. LCL 10m FM mobile transceiver, £40. Contact J. Tylee (Thornton Heath, Surrey), Tel. 081 653 0386

Icom IC-2E 2m handheld,

charger and case, £95. Pac-Comm Tiny 2 VHF TNC, £85. Contact Steve Mitchell (Whitchurch, Shropshire), Tel. 0948 6016

FT-101, WARC, 12, 17 and 30m, G3LLL's double balanced mixer mod fitted also sidetone mods. FV-101B external VFO, both in good condition and full working order with manuals, £365 ovno. Prefer buyer to collect and inspect. Contact David Agar (Chigwell, Essex), Tel. 081 504 8187 after 6pm.

FT-902DM, headphones, microphones, good condition, £560. CTE-1600 2m transceiver with matching BS25 linear, plus charger, £145. Realistic PRO-2005 scanner with Diamond active aerial, 20dB gain, £225. All mint condition, carriage included. Contact John G4YDM (Washington), Tel. 091 416 2606

EXCHANGE

Yaesu FT-4700RH VHF/UHF mobile dual band transceiver, 50W on VHF, 45W on UHF, for HF rig TS530, TS830, FT101ZD or similar HF rig. Bob G0DOK (Havant), Tel. 0705 473323

For **Yaesu FT757GX**, I have for exchange a Sharp VC750E video camera, 12X zoom, complete with case and extras, BBC video and course book, only few months old. Tony Davidson, 7 West Drive, Castlefields, Tattershall, Lincs. LN4 4ND

Swap for good 2m SSB rig or 2m/70cm handheld, my Pentax IC1000 camera complete with 70-210mm zoom lens and flash, all good condition, worth £200. Lee (Northampton), Tel. 0604 582551 after 7pm only please.

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

WANTED

Yaesu MH12A2B speaker/mic or YH2 headset/mic. Don (Axminster), Tel. 0297 35131

Operating Manual for my Atlanta transceiver, photocopy or original, also service sheets for same. All costs/postage paid, this is urgent, also KW109 supermatch, new amateur hoping to be on 40m soon. Mervyn McPeake, 85 Orkney Drive, Ballymena, Co. Antrim, BT42 4EE, N. Ireland, all replies appreciated.

Kenwood TS-440S with ATU, must be in immaculate condition and sensibly priced. G7JFL (Saltburn, Cleveland County), Tel. 0287 652822 evenings or weekends.

Motorola MC Micro mobile transceivers (FM), suitable for 2m, 4m or 70cm conversion/operation. Please contact Peter Murdoch G7ALE (Wolverhampton), Tel. 0902 374423 evenings, or via. packet at GB7MAX.

To buy or borrow for copying, manual for Eddystone 770R receiver. (Nottingham). Tel. 0602 819549.

Burndep information and paperwork for the PMR Burndep VHF/UHF handheld range, photocopies etc. Information on Pye P5012 UHF PMR and paperwork etc., photocopies, tech info. Storno 800 manual, photocopies, VHF/UHF PMR sets. (Paddington, London). Martin, Tel. 071 625 7554 6pm-9pm.

Eddystone 940 unmodified, will travel Midlands/North. Contact Mr. G. Leese (Barnsley) Tel. 0226 288718

Beginner needs extensive help in connecting a packet radio to an Amiga 500 computer. Information on radios, hardware and software needed, plus any other relevant information, much appreciated. Write to Chris Jackman, 3 Albion Terrace, Ixham Road, Utcham, Kings Lynn, Norfolk PE32 2QQ

WHOOOPS!

In last month's receiver project, the pattern for the PCB track layout was printed back to front. Please bear this in mind when making your board. We apologise for this error, and for any inconvenience this may have caused.

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