

Ham Radio T O D A Y

Mini handhelds

Alinco DJ-S41
and Standard AX400
reviewed

Yaesu FT-3000M
2m mobile reviewed



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NEXUS

Ham Radio T O D A Y

HAM RADIO TODAY VOLUME 14 NO.6 JUNE 1996

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Alinco DJ-S41 mini-rig reviewed

AX-400 credit-card sized receiver reviewed

CQ

from G8IYA Editorial

Circulation up 10%!

Whenever you pay a visit to your local newsagent, you'll usually see plenty of magazines on the shelf, all clamouring for space, all trying to entice you, the visitor, to buy one or more of them. Specialist magazines, such as Ham Radio Today, often have a hard time here, because, given a choice, the typical newsagent will naturally only give shelf space to the titles he knows people will want to buy. I've read that more than 30% of homes in the UK have a personal computer, so it's little wonder that there are so many computer magazines - the choice on the shelf of these is usually bewildering! But how about hobby radio magazines - there's not many of these, are there?

Now, some 'doom and gloom' merchants may think that our hobby of amateur radio is dying, with less people becoming interested. More and more magazines are being published, each wanting shelf space. Which isn't usually good news for existing specialist magazines, the vast majority of which, from the figures I have here in front of me, are going down in circulation. Some rather dramatically. Despite some people saying that their membership, circulation, or whatever is showing a 'slight decline', I'm extremely pleased to say that Ham Radio Today circulation over the last twelve months has *increased*. To be precise, it's increased by a very healthy 10%. You don't need to just trust me not to be telling you 'porkies' by the way

- this increase is officially certified by the Audit Bureau of Circulation.

So, here's a big *thank you!* May you continue to enjoy reading Ham Radio Today, and please *do* keep telling your friends. If you or they don't see Ham Radio Today on the newsagent's shelf, then ask the newsagent *why!* It's available to *any* newstrade outlet, no excuses of "we can't get it", but if you still have problems then just give our subscriptions department a ring on 01858 435344, they'll be pleased to let you know what the latest subscriptions offer is. If your newsagent does say he can't get a copy, then please let our Magazine Sales Dept on 01442 66551 know, and they'll do something about it!

Does the monopoly end?

Many readers know that Ham Radio Today has been, and indeed still is, a 'pioneering' magazine in a number of fields. That's certainly true regarding many aspects of the Editorial content, as well as our 24 hour information and automatic fax-back service, Fidonet BBS group, Internet email facility and World-Wide Web information site, all for the benefit of readers and non-readers alike. But you'll usually find it isn't a 'campaigning' magazine, although some readers may mistakenly believe that printing factual information on amateur radio happenings, where in some other outlets it's reportedly tried to be 'hushed up', is

campaigning. A word to the wise - it's called not censoring information, or to use an alternative phrase, 'telling it like it is'.

Anyway, unless you've been a little out of touch (maybe reading the wrong journals?) then you'll probably have heard of the new national society that I'm told is being formed - the United Kingdom Radio Society, or UKRS for short. Memberships are reportedly being taken right now as I write this, with membership application forms even being available through 'modern' amateur radio methods such as the packet radio network, via an automatic BBS 'CLIVE' server. One amateur reports that he can't get into his local packet BBS because of all the 'CLIVE' traffic being sent and received on it!

I'm told that some amateurs believe it's a 'rival' to the RSGB. But then, how about other well-established and well-respected radio societies in the UK, such as the International Short Wave League? They also have an elected President, officers, and committees, who work together well with their members, they run an international QSL bureau, worldwide contests, several awards programmes with handsome certificates, publish a monthly magazine, even members' stationery. I wouldn't call them a rival, and I'm very pleased to publicise their, and any other amateur radio society's, activities. I'm sure we'll be hearing more in the future, as the UKRS's coordinator, Greg GOMAN, is

already putting 'press information' together.

Ham Radio Today at the London Show

If you came along to either of the Ham Radio Today lectures at this year's London Show, I do hope you enjoyed them. The attendance at the ex-PMR Conversion talk by Chris G4HCL exceeded 180 - with people having to wait outside the door or round the corner because the lecture room was so full! Chris was very pleasantly surprised, especially as a number of keen amateurs turned up 45 minutes before the talk just in order to get a good seat! I hoped you also liked the free giveaways - I only wish I'd managed to arrange more for the ex-PMR lecture as they ran out very quickly - even the 150 information bundles were gone 10 minutes before the 'start' time! I'll prepare more for next time!

See you this month in Yeovil?

If you're thinking of visiting the Yeovil QRP Convention taking place this month (or if you're undecided, why not come along anyway, you might enjoy it!) then do come and say 'hello' to the Editorial team. The Yeovil Club have granted me a great honour by asking for me to officially open the event, and there'll also be another Ham Radio Today talk, this time on QRP Equipment, at the Convention. Maybe I can organise some more 'giveaways'? See you there?

Yaesu FT-3000M

Chris Lorek G4HCL tests a rugged 2m mobile rig that's capable of 70W output

Are Yaesu going power crazy? Maybe, maybe not. We think nothing of running 100W HF mobile rigs, and with the availability of higher power VHF PA devices then why not the capability of high power, when needed, on 2m as well? Yaesu's FT-3000M can run either 10W, 25W, 50W or a very substantial 70W output power, just choose which you need at any time from the set's menu facility. Great for both in-city use in strong signal areas, or if you need to hit those distant repeaters whilst travelling through our green and pleasant land of valleys and radio 'blank spots'!

Besides the capability of high power 2m transceive, the set also has a wideband twin receive system built in, covering 110-180MHz, 300-520MHz, and 800-999MHz, including an automatic AM receive mode facility for the VHF airband range! This of course means that while you're listening on 2m you can also keep an ear open on 70cm, or if you use the rig on your pleasure boat, you can also tune into coastguard weather broadcasts when you're at sea (even if your 'main' marine rig is keeping a listen out on channel 16 or



whatever). You can use the FT-3000M either in single receive, or in 'dual receive' mode, the latter on either twin VHF, twin UHF, or VHF/UHF, with full-duplex transceive between bands if you wish.

Twin turbo cooling

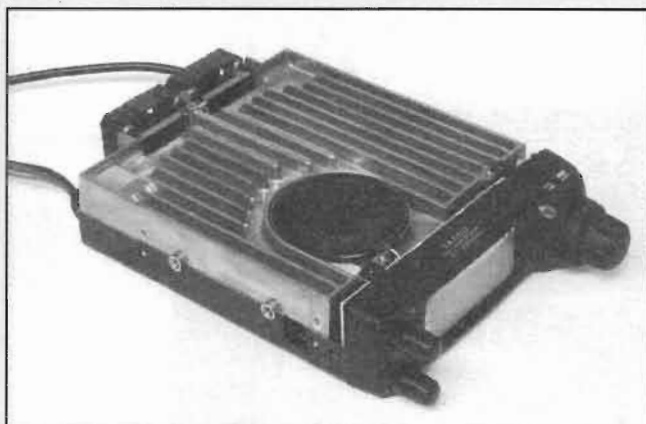
I must admit that my first thoughts on seeing the rig

were along the lines of "Where on Earth is the transmitter heatsink?". Surely all that power needs a decent 'lump of metal' to dissipate the generated heat from the PA? The answer is twofold. Firstly, there's not just the usual one, but twin cooling fans fitted to the rear of the set. These are used as extractor fans together with a very significant die-cast air duct system within the set -

indeed it extends the entire length and width of the set itself beneath the outer covers! The set measures 140mm (W) x 40mm (H) x 180mm (D) and weighs 1.25kg.

Controls and functions

Besides the high power and rugged build standard, to Mil Spec 810 for the technically



minded, the set has an impressive range of features, the range of front panel controls being kept relatively small and simple through a 'menu' system of selection. In fact, there's over 50 transceiver operational settings, and a scrolling alphanumeric display along the bottom section of the front panel LCD gives you 'real time' programming instructions! As well as the front panel controls, two function keys on the right hand side of the set can be programmed to control often-used functions, reverse repeater and transmit power level for example.

Just some of the set's many facilities are a 'spectrum scope' to let you see what's going on around either side of your centre frequency, and a 'smart search' can automatically program your memory channels for you with active frequencies the set's found, sorting these in either frequency or signal strength order. There are 81 memory channels altogether, divided into 70 'normal' channels arranged in seven banks of 10 channels each, five pairs of upper/lower search range frequencies, and a quick-access 'home' channel. Each channel can, if you wish, have a short alphanumeric 'tag' instead of the frequency, for example your local club channel can be called "CLUB" in large letters instead of 144.725MHz or whatever.

The set also offers an automatic repeater shift, which, as its name suggests, automatically places a -600kHz transmit shift in for

you whenever you've tuned within the European 2m repeater allocation in VFO mode. As well as this, a time-out-timer, variable in one minute intervals, makes sure you don't 'time out' on the repeater, or indeed suffer from 'stuck mic' syndrome when mobile with a locking mobile mic PTT that you've forgot to release! To save you needing a jump start, an automatic 'power off' is also selectable, which switches the set into power-down mode if you've accidentally left it switched on in your car and gone away.

For add-on data terminal use, the set sports a dedicated packet radio port on its rear

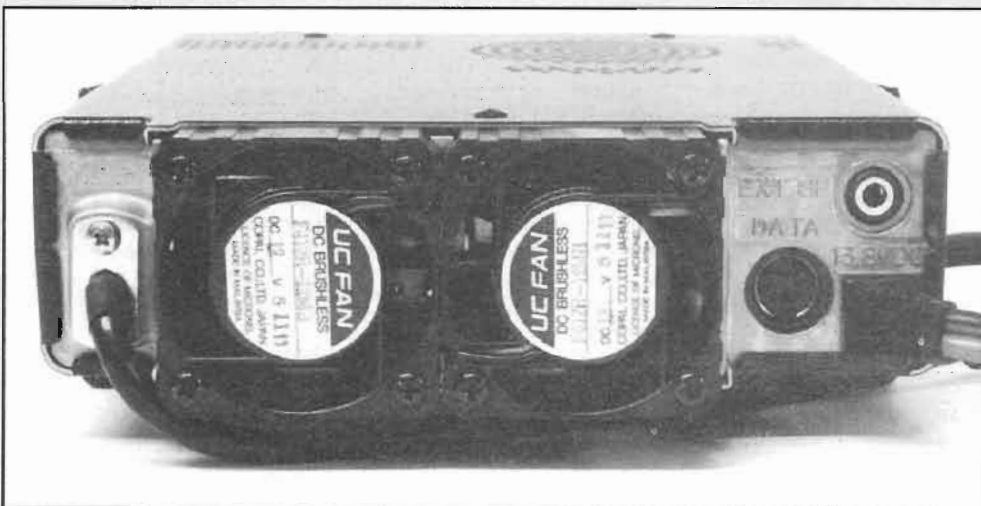
is known to many commercial radio users but relatively new in the amateur radio field, and is best described as a 'digital' form of CTCSS, with a different format but with a large number of available codes. An 'Automatic Range Transpond System' can be used with the set's DCS facility, between it and other similarly equipped sets with ARTS, to let you keep track of the stations in your 'fleet' who are in radio communication range at any time on a selected channel. 'Normal' CTCSS, which of course is used in our hobby especially for repeater access and monitoring, is also built in for encode use, the addition of CTCSS decode being available as a plug-in option.

DTMF 'touch tone' paging is built-in, using the common 3-digit standard used by several amateur radio manufacturers in their transceivers, with an automatic acknowledgement transpond where allowed under licensing conditions. A variable length paging 'ringer' tone lets you know you've been called. There's even a

facilities, then if you fit an optional DVS-4 digital speech board inside the FT-3000M, it gains a digital speech recording facility, of a message up to 16 seconds or two messages of up to 8 seconds each. Combined with the DTMF paging facility, this can also be used as a 'voice mail' facility where allowed under licensing conditions - just like a digital 'on-air' answerphone! Whatever next, the mind boggles!

On the air

Warned that I might melt my aerial (indeed one of my mobile whips, a glass-mount 2m/70cm dual band type, is only rated for 25W!), I connected the set up and started to have a good 'play' on the air. I quickly got used to the menu system of control, using the inner and outer concentric front panel knobs to select the various options - I soon had my memory channels filled this way. Of course, I could have taken the option of letting the set scan around, automatically filling them for me, but I



panel, and you can use the menu system to select the set's internal audio response for either 1200 baud or 9600 baud packet use.

Selective signalling

The set has DCS, Digital Coded Squelch, built in. This

DTMF remote control capability, either using an optional DTMF keypad mic or even from off-air received commands.

Voice mail

If all the above isn't enough for you in terms of

thought I'd start off the 'manual' (simple?) way first!

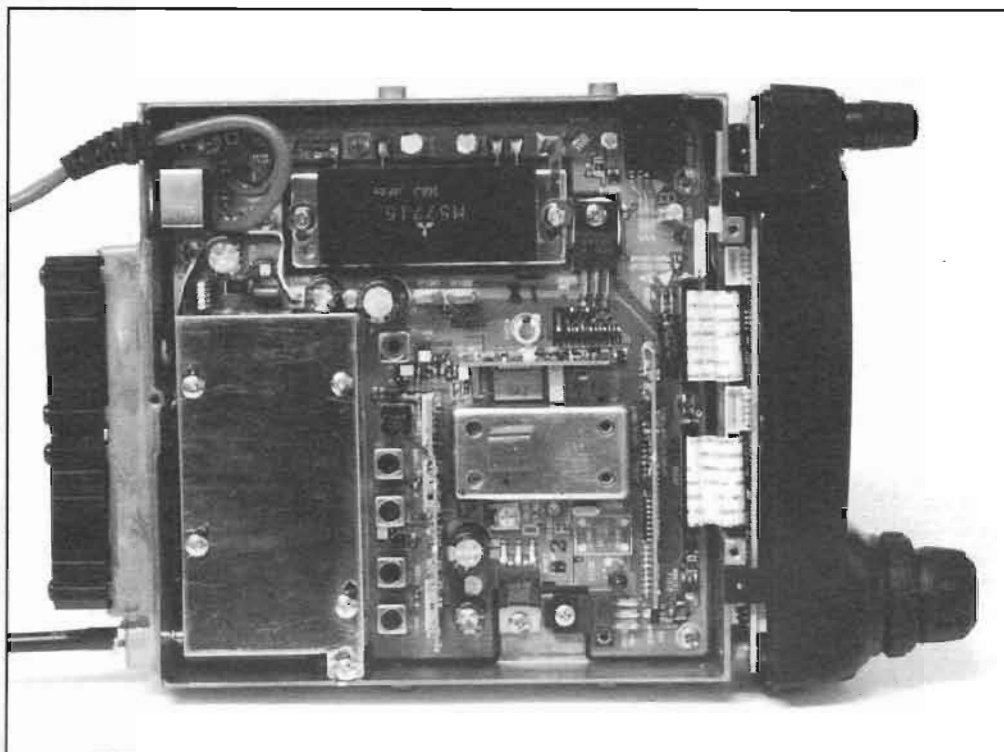
Determined to see how hot the rig became, my first QSO using the set was on high power with a friend of mine, who was mobile between my location near Southampton and his 'works QTH' in Portsmouth, for his entire journey. Clever people might

work out this lasted at least half an hour, with around 50% transmit and 50% receive duty cycle for both of us. The FT-3000M stayed very cool to the touch - indeed so cool that after my extended contact I quickly checked the output into a power meter just in case I'd set it incorrectly. No, there was a full 70W coming out. Yaesu must I feel be congratulated on their efforts here with heat dissipation - it certainly works!

Time to have a 'play' around the bands I thought. Coupled into a variety of aerials, including my rooftop colinear and tower-mounted 2m/70cm beams, I found the receiver quite sensitive, and very immune indeed from strong signal breakthrough. The built-in 'secondary' receiver I found to be less sensitive than the 'main', on 70cm my 'usual' 2m/70cm rig's receiver was rather more sensitive, but I suppose that's to be expected. Even so, the second receiver still had very good immunity to unwanted signals, right across its range which I did appreciate, living as I do in a rather 'busy' RF area.

Reports on my transmit quality weren't just OK, I was actually complimented on the good audio, (anyone who's heard my voice 'live' with its fairly broad accent will know that's an on-air rarity!), including once by an amateur who works as an amateur radio shop salesperson in a nearby city. I suppose I couldn't get a much more critical opinion!

Despite the set's flexibility, I found operation on the move quite easy. The low profile of the transceiver allowed it to be placed on top of the car's dashboard, but lower than the windscreen 'visible area' to thus give minimum eye-travel distance between the set's controls and display and the road ahead. A multi-level display dimmer helped prevent any glare or distraction at night from the set's large back-lit LCD. I



also appreciated the handy mic-mounted controls, which besides the usual up/down buttons also had two programmable 'function' buttons, plus further buttons for VFO/memory switching and an 'Acc' to give a 1750Hz toneburst for repeater access. Depending upon my menu configuration, an extended press of the up or down buttons would initiate a memory channel scan of that memory bank only (e.g. in my case all the repeater channels plus S20 and a local natter channel), or all banks (i.e. everything I'd programmed, although skipping the channels I'd manually 'locked out' of scan mode).

At home in the shack, I usually tended to prefer using the front panel controls for tuning around. Here, the concentric controls coupled with the menu system (when I *could* look long and hard at the various scrolling displays instead of at the road ahead!) I used to good effect. A quick press of the main tuning control changed between the 'main' band and the alternative receive frequency, usually

displayed on the sub-menu section, which I also found quite handy.

Although the set had a 'spectrum scan' facility, I found this to be more of a gimmick than anything useful, as in this mode the set couldn't receive anything on the 'scanned' band whilst it was displaying the activity it had found. I had to go into the menu again to switch the spectrum scan off before reception was restored, and in the end I just didn't bother using it. In my opinion this would be even more useless in operation on the move.

Lab tests

My measured lab results showed the set had a healthy level of transmitter power output, with very well suppressed harmonics - we wouldn't want to cause EMC problems, would we? On receive, the set had excellent intermodulation rejection - very important for operation in many areas of the UK today, but this was also coupled with a nicely sensitive main receiver to match the available high

transmit output power. The adjacent channel rejection was particularly good, the good 12.5kHz rejection also being useful if we go over to this spacing in the future. A quick check of the secondary receiver showed wasn't up to the sensitivity of a typical amateur rig, as I found on air, but then it is a 'secondary' receiver.

Conclusions

It's rugged, it's got a very high level of available transmit power, and even so it's reasonably small and it stays cool in use. The technical performance is extremely good, there's even a wideband secondary receiver built in to keep you occupied if 2m gets quiet anytime on your journey - although with the high transmit power you'll certainly get to make your QSOs last that bit longer. So, if you're after a 2m rig and you've around £479 in your pocket for one, it could certainly be worth more than a second look!

My thanks go to Yaesu UK for the loan of the review set.

LABORATORY RESULTS:

All measurements taken on 145.000MHz FM, high power TX, using stabilized 13.8V DC power supply and supplied DC lead, high power TX, otherwise stated.

RECEIVER

Squelch Sensitivity;

Threshold; 0.10µV pd (5dB SINAD)
Maximum; 0.56µV pd (27dB SINAD)

Adjacent Channel Selectivity;

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

+12.5kHz; 47.9dB
-12.5kHz; 41.9dB
+25kHz; 73.3dB
-25kHz; 73.8dB

Maximum Audio Output;

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

2.25W RMS

Blocking;

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

+100kHz; 86.8dB
+1MHz; 96.2dB
+10MHz; 95.0dB

Sensitivity;

Input level required to give 12dB SINAD;

144MHz; 0.14µV pd
145MHz; 0.14µV pd
146MHz; 0.14µV pd
430MHz; 0.25µV pd
435MHz; 0.24µV pd
440MHz; 0.24µV pd

Image Rejection;

Increase in level of signal at 1st (45.05MHz) and 2nd (455kHz) IF image frequencies, and 'half 1st IF' over level of on-channel signal, to give identical 12dB SINAD signal;

Half 1st IF >100dB (145MHz), 69.7dB (435MHz)
1st Image 85.7dB (145MHz), 23.7dB (435MHz)
2nd Image 99.6dB (145MHz), >100dB (435MHz)

Intermodulation Rejection;

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

25/50kHz spacing; 73.6dB
50/100kHz spacing; 72.6dB

S-Meter Linearity;

	Sig. Level	Rel. Level
S1	0.55µV pd	-16.8dB
S3	0.89µV pd	-12.7dB
S5	1.49µV pd	-8.2dB
S7	2.44µV pd	-4.0dB
S9	3.85µV pd	0dB ref.
S9+	6.34µV pd	+4.4dB
S9++	10.3µV pd	+8.5dB



TRANSMITTER

TX Power and Current Consumption;

Freq.	Power	10.8V Supply	13.8V Supply	15.6V Supply
144MHz	High	50.3W/10.65A	69.4W/11.90A	69.7W/11.75A
	Low 1	48.5W/10.5A	48.7W/9.70A	49.0W/9.80A
	Low 2	24.3W/6.70A	24.3W/6.50A	24.7W/6.70A
	Low 3	10.4W/4.35A	10.3W/4.35A	10.6W/4.55A
145MHz	High	49.0W/10.45A	69.6W/11.55A	70.0W/11.45A
	Low 1	48.5W/10.35A	49.0W/9.40A	49.3W/9.50A
	Low 2	24.5W/6.50A	24.4W/6.40A	24.7W/6.35A
	Low 3	10.5W/4.25A	10.4W/4.20A	10.6W/4.20A
146MHz	High	48.5W/10.1A	69.8W/11.1A	70.1W/11.0A
	Low 1	47.5W/10.0A	49.0W/9.10A	49.3W/9.0A
	Low 2	24.7W/6.25A	24.5W/6.10A	24.7W/6.05A
	Low 3	10.6W/4.05A	10.4W/4.05A	10.6W/4.05A

Harmonics;

2nd Harmonic; -82dBc
3rd Harmonic; -83dBc
4th Harmonic; <-90dBc
5th Harmonic; <-90dBc
6th Harmonic; <-90dBc
7th Harmonic; <-90dBc

Peak Deviation

5.19kHz

Toneburst Deviation

3.24kHz

Frequency Accuracy

-285Hz

Alinco DJ-S41 Mini-Rig

Our Consultant Technical Editor goes
roaming with a tiny 70cm handheld

Seen for the first time at this year's London Show, was Alinco's small 70cm transceiver, the DJ-S41. With a hinged flip-up aerial and a power output of around a third of a watt, it could be just the thing for local 70cm repeater operation whilst walking out and about.

You'll see from the photos the rig is quite small, and with a planned selling price of around £150 it shouldn't hurt your pocket too much either in the monetary sense! The controls have been kept to a minimum to give simple operation, indeed I didn't even need to look at the instruction book in order to get the set on the air, or even to get the memory channels programmed up.

It covers the usual 430-440MHz band on FM, and 20 memory channels are fitted - ten of which can store repeater channels and the remainder simplex channels, together with a further quick-access 'call' channel.

CTCSS encode is fitted for repeater access, and a 1750Hz toneburst is planned for UK models (although this wasn't fitted in the 'one-off' review



sample I tested). A 'bell' function can be switched in, which alerts you with a telephone-type ring for a few seconds if the receiver squelch raises. In this mode a 'bell' icon remains flashing on the LCD, which also lets you know if there's been a signal received on the set in your absence.

Controls

You change frequency and memory channel by using the front panel up/down buttons, in 'VFO' mode these change the operating frequency in your programmed steps - or in 1MHz steps with a prior push of the side-mounted 'Function' button. An LCD backlight button lets you see what the set's tuned to at night, this also having a 'double function' of enabling an auto-power off facility, which switches the set into low-current standby mode if you haven't used it for a while.

The rig uses an internally pre-set squelch, and a side-mounted 'mon' button lets you defeat this if needed for weak signal listening. Apart

from that, about the only remaining control (probably the most important one!) is the top panel rotary on/off/volume knob.

The set measures 100mm (H) x 54mm (W) x 27mm (D), and it's powered from three AA sized batteries which you fit into the rear of the set. A top panel power socket lets you plug in an external 5.5V DC supply, and adjacent 3.5mm speaker and 2.5mm mic jack sockets are fitted for either an external speaker mic, or other accessories such as a packet TNC.

On the air

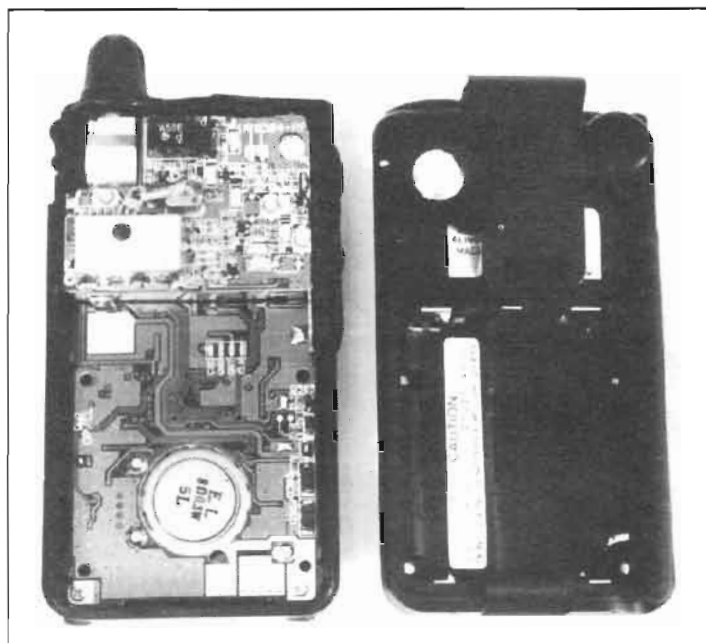
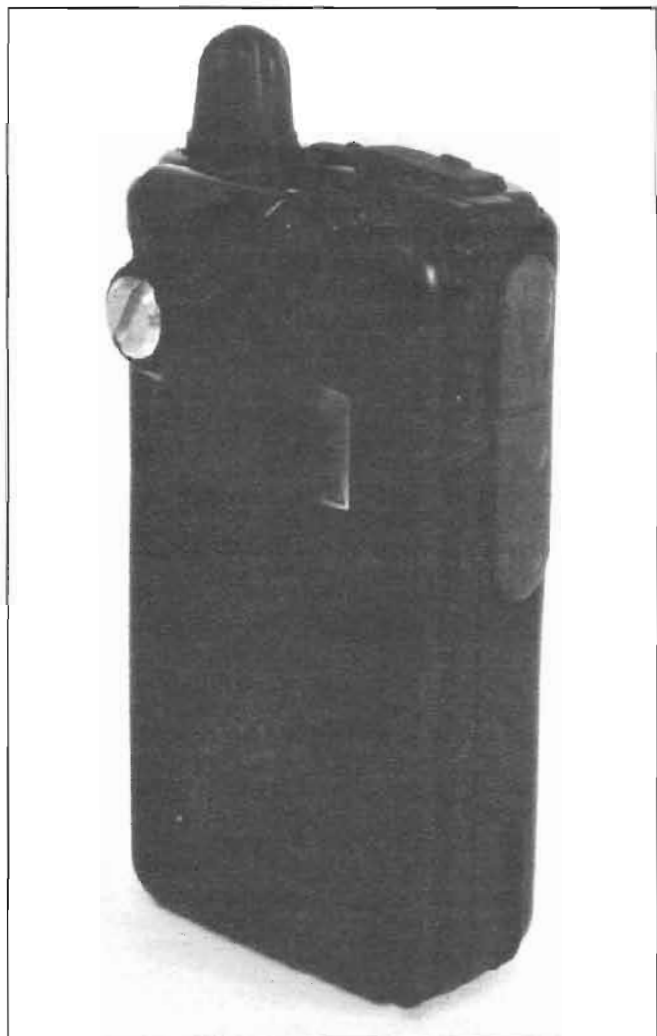
The review period nicely coincided with a period of coverage tests for a new 70cm repeater in my area, so I was pleased to be able to use the set to good effect here, comparing its performance to my 'usual' 70cm rigs.

As already noted, I found the set's controls very easy to use, but what did surprise me was the good audio quality on receive from the set's small speaker - it certainly wasn't 'tinny' or distorted as I was expecting.



The set's equally small flip-up aerial also worked surprisingly well in its upright position, both handheld and with the set in

my pocket or clipped onto my belt using the supplied plastic belt clip. I was often tempted to hinge the aerial down for top-pocket use,



but I found this reduced signal strength remarkably. Using the aerial in this position on transmit also (naturally!) reduced the ERP considerably - after all my hand was then wrapped round the aerial.

Audio reports on my transmission were quite complimentary, and I found that, at least for the local use I tested the set under, the transmitter power output was reasonably adequate. I did however often wish that I could connect an external aerial for home use - there was no facility for this on the set, and I feel the set would otherwise have been useful for local packet use as well, or operating through neighbouring 70cm repeaters which I couldn't get to in 'handheld mode'.

Lab tests

To perform the RF measurements, I opened the set up and temporarily connected a 50ohm coax lead in place of the set-top aerial (I found there was a handy two-pin aerial/earth connector inside the set for this very purpose). The tests showed the receiver to be quite sensitive, verifying the good on-air results, with it also having quite reasonable

strong-signal handling performance.

On transmit, using a regulated 4.5V DC source connected to the battery terminals, the set gave 280mW output, with reasonably suppressed harmonic levels and accurately set deviation and frequency parameters.

Conclusions

I found the DJ-S41 a handy little transceiver, ideal for use within, for example, the local coverage area of a 70cm repeater. It was light, small, easy to carry around, the flip-up aerial being quite a novel feature for an amateur rig. It also performed quite well, although the quarter watt output and lack of external aerial connection does limit the set to such 'local portable' use.

A useful feature was that CTCSS encode is fitted as standard - as used on a number of 70cm repeaters in the UK. If your 'local box' however needs a 1750Hz toneburst, this is planned to be fitted in future UK sets - I'd advise checking with your supplier.

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

LABORATORY RESULTS:

All measurements taken with set powered from internal batteries, on 435MHz, unless otherwise stated.

RECEIVER

Sensitivity;	
<i>Input level required to give 12dB SINAD;</i>	
430MHz;	0.17µV pd
435MHz;	0.17µV pd
440MHz;	0.18µV pd

Squelch Sensitivity;	
<i>Threshold;</i>	
0.11µV pd (4dB SINAD)	

Image Rejection;	
<i>Increase in level of signal at 1st (23.05MHz) and 2nd (450kHz) IF image frequencies, and 'half 1st IF' over level of on-channel signal, to give identical 12dB SINAD signal;</i>	
<i>Half 1st IF</i>	52.4dB
<i>1st Image</i>	45.4dB
<i>2nd Image</i>	57.3dB

Adjacent Channel Selectivity;	
<i>Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;</i>	
+12.5kHz;	43.6dB
-12.5kHz;	14.9dB
+25kHz;	58.1dB
-25kHz;	56.7dB

S-Meter Linearity;		
	Sig. Level	Rel. Level
1	0.54µV pd	0dB ref.
2	0.81µV pd	+3.4dB
3	1.05µV pd	+5.8dB
4	1.38µV pd	+7.9dB

Current Consumption;	
Standby, no sig;	63mA
Receive, mid vol;	76mA
Receive, max vol;	127mA

Maximum Audio Output;
<i>Measured at 1kHz on the onset of clipping (10% distortion), 8 ohm load;</i>
93mW RMS

Blocking;	
<i>Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;</i>	
+100kHz;	68.0dB
+1MHz;	70.6dB
+10MHz;	70.9dB

Intermodulation Rejection;	
<i>Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;</i>	
25/50kHz spacing;	57.8dB
50/100kHz spacing;	57.5dB



TRANSMITTER

TX Power and Current Consumption;		
Powered from stabilised 4.5V DC source		
<i>Freq.</i>	<i>Power</i>	<i>Current</i>
430MHz;	280mW	249mA
435MHz;	280mW	240mA
440MHz;	280mW	234mA

Harmonics;	
2nd Harmonic;	-70dBc
3rd Harmonic;	-76dBc
4th Harmonic;	<-90dBc

Peak Deviation;
4.53kHz

Frequency Accuracy;
-345Hz

AX-400 Wideband Scanner

Chris Lorek G4HCL goes portable
with a credit-card sized scanner

At this year's London Show, I saw many of the traders marvelling at a tiny handheld on show. This was the AX-400 scanner, with a 'footprint' of about the size of a credit card and just 21mm thick. It covers an incredible 500kHz to 1300MHz, with modes of AM, NFM and WFM, and with 400 memory channels and 10 'search' ranges to play with. Manufactured by Standard in Japan, it's due to be marketed in the UK under the 'Welz' name as the WS 1000, at a price of around £349. I was extremely pleased to come away from the show with the (only!) sample, for review in Ham Radio Today.

Controls and features

The receiver is powered from just two AA sized batteries, which fit in the lower rear of the set's case, either dry batteries or nicads can be used. On the front panel, 12 push-buttons, plus a further recessed power on/off button, control the various functions together with a rotary click-step knob on the top panel. Concentric to this is a rotary volume control, and a fingertip squelch control is located on the right side panel. Not to be outdone, the left side panel of the set has a rubberised 'function' button to 'double up' most of the front



panel controls, together with a small 'monitor' button to act as a momentary squelch defeat control.

You can use the keypad for direct frequency entry, and the rotary knob on the top panel acts as a tuning control, stepping through in selectable 1, 5, 6.25, 9, 10, 12.5, 15, 20, 25, 30 or 50kHz increments. A

handy facility is that you can assign various steps and modes to given frequency ranges to suit your preferences, a 'default set' being stored in the scanner as supplied. The 400 memory channels can contain the usual mode and frequency, plus channel skip status, delay, etc. Ten programmable

lower/upper frequency 'search' ranges, in additional memory channels of 400-419, also let you search for new active frequencies.

In normal operation, the set's scan or search halts when the squelch raises, and as an alternative to the usual 'noise squelch' (i.e. which raises when the FM noise reduces), an 'RF squelch' is also available. You can set this to raise on any one of 8 pre-set signal levels, useful when you only wish to hear signals exceeding a given strength. A switchable attenuator is also fitted, to offer protection from possible unwanted strong signal overload.

A BNC aerial socket is fitted, which allows connection of an external aerial besides the supplied wideband set-top whip, and a 3.5mm jack socket is fitted for connection of an external speaker or earphone as an alternative to the built-in front panel speaker.

On the air

It didn't take me long to try the set out on the air - indeed I started using it with my car-mounted wideband scanner aerial on the way home from the show, giving me my first 'taste' of using the set. Several more journeys, plus many hours and days of portable and shack use, followed.

Despite its small size and



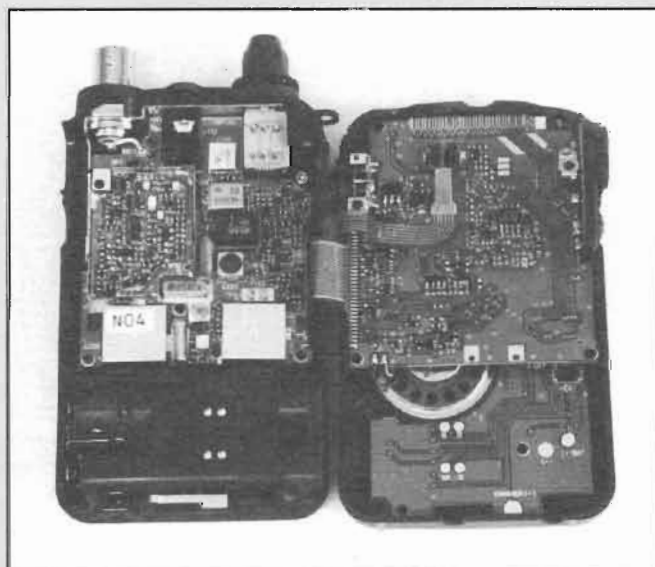
the tiny push-button controls. I found the receiver quite easy to use on the air. About the only thing I would have liked was an easily switchable backlight for the LCD, plus a one-touch 'lock' function for the buttons, which I sometimes found were accidentally pressed when carrying the set in my pocket. These were however available as a 'second function' (on the '2' and '1' buttons respectively) so I mustn't grumble too much!

In normal use, switching the set on always retained the last-used mode, which I found very useful. For example, if the set had been in 'memory scan' mode (which I usually used each time when portable outdoors) it powered up in that mode until changed - this again usually being a second-function control. Various facilities could also be controlled using the receiver's 'set' mode, such as scan delay, memory swap, priority channel monitor, automatic mode on/off, keypad beep and so on. The set also has a switchable auto-power-off

facility to help save the batteries if the set was accidentally left switched on after use.

Throughout the review period, I used the receiver with a variety of aerials, from its set-top whip to my rooftop VHF/UHF vertical and outdoor HF dipoles, as well as my mobile 2m/70cm whip and separate wideband mobile scanner aerial. Overall I found the receiver to be very

sensitive, indeed quite similar to that of a modern 2m amateur transceiver, as well as being fairly resistive to the effects of strong signal interference from signals on adjacent bands. On the HF broadcast bands, the receiver did tend to overload when coupled to a large outdoor aerial system, which I suppose is to be expected. But switching in the attenuator here helped to reduce the



resultant 'mush' somewhat.

The audio level from the built-in speaker was quite adequate for home and most portable use, as well as in the car at low speeds - although motorway driving certainly benefited from an extension speaker being plugged in. I found the set, when fitted with a pair of fully-charged 700mAh nicads, gave me around 8-10 hours worth of normal listening before it warned me with a large 'Batt' indication on its LCD that a recharge was needed.

Second opinion

After showing the scanner to a friend of mine, a 2E1 amateur who's also a very keen scanner user, I was persuaded to 'let him loose' on air with it in his station for a while. His comments after a few hours of listening were simply "Fantastic, I want to buy one, how much do they sell for?"

Lab tests

The measured results do indeed show the set to be rather impressive, RF wise, for its size, I found no great problems whatsoever. It was sensitive, with quite reasonable strong-signal handling performance. In all, it gave the level of performance I'd expect from physically larger scanners. Indeed the AX400 actually had better adjacent channel and close-in blocking performance than I'd found on a couple of other (larger) wideband HF/UHF/UHF handheld scanners I'd tested in the past!

Conclusions

A lovely little set, I enjoyed using it immensely on the air. It's small, light, and very easy to carry around, with no performance compromises being made due to its small size. I just wished I had smaller fingers!

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

LABORATORY RESULTS:

All measurements taken at 145MHz, NFM, unless stated.

Sensitivity;

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

Freq.	Level
0.5MHz	1.01 (AM)
1MHz	0.58 (AM)
2MHz	0.42 (AM)
5MHz	0.81 (AM)
10MHz	0.47 (AM)
20MHz	0.34 (AM)
30MHz	0.16 (AM)
40MHz	0.15
50MHz	0.14
60MHz	0.14
70MHz	0.14
80MHz	0.15
100MHz	0.27 (WFM)
120MHz	0.34 (AM)
145MHz	0.15
165MHz	0.27
200MHz	0.34
250MHz	0.87 (AM)
300MHz	0.45 (AM)
400MHz	0.20
435MHz	0.24
450MHz	0.24
500MHz	0.25
600MHz	0.52 (WFM)
700MHz	0.99 (WFM)
800MHz	0.83 (WFM)
900MHz	0.23
934MHz	0.15
1000MHz	0.21
1296MHz	0.83
1300MHz	0.78

Squelch Sensitivity;

Level of signal required to raise receiver squelch

Threshold; 0.10 μV pd (6dB SINAD)
Maximum; 0.55 μV pd (27dB SINAD)

Adjacent Channel Selectivity;

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

+12.5kHz; 31.2dB
-12.5kHz; 24.8dB
+25kHz; 55.9dB
-25kHz; 54.1dB

Blocking;

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

+100kHz; 54.0dB
+1MHz; 83.2dB
+10MHz; 94.0dB

Attenuator Level;

10MHz; 19.6dB
145MHz; 21.1dB
435MHz; 14.1dB

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; 52.6dB
50/100kHz spacing; 55.8dB

Image Rejection;

Difference in level between unwanted and wanted signal levels, each giving 12dB SINAD on-channel 145MHz FM signals;

1st Image (+21.4MHz); 65.7dB
2nd Image (+910kHz); 52.4dB

Maximum Audio Output;

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

55mW RMS

Current consumption;

Scanning, no sig; 58mA
Receive, mid vol; 77mA
Receive, max vol; 110mA

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W9GR DSP Filter

G4HCL gets his soldering iron out and ends up with a superb transceiver add-on

On the front cover of the 1996 ARRL handbook is a Digital Signal Processor (DSP) unit, designed by DSP 'guru' Dave Hershberger W9GR. If you're not familiar with the concept of DSP, then just take a look through a few of the recent 'upmarket' HF rig reviews in Ham Radio Today, and you'll see the often amazing difference it can make to reception under difficult conditions.

There are a number of commercial 'black box' DSP units available as add-ons for your amateur rig, but the thought of building one myself seemed rather attractive. Although all details, including circuit diagram etc. are given in the ARRL handbook, I found that SEM on the Isle of Man could supply complete kits of parts, including a smart metal case together with full assembly information, for £159.50. Knowing that many other Ham Radio Today magazine readers are of the same mind, I was on the phone to them the same day!

Kit and ready built

The unit arrived in the post very quickly, complete with very comprehensive instructions on building the unit. I'll say it now, you need to be a competent constructor to build the unit. It uses several static-sensitive ICs, and you'll need to know how to identify resistor colour codes etc. - it's not a 'raw beginner's project'. Having said that, IC sockets are



The W9GR filter, available as a kit or ready-built

provided, and clear 'step by step' assembly and test instructions make sure you don't make expensive mistakes! However, if you're unsure of your soldering skills (over 95% of problems are caused by poor soldering I'm told) you can also obtain a ready-built unit from SEM for an additional £40.00.

Overall it took me just over a hour and a half to build the unit, which surprised me as I quite believed it would have taken a lot longer. Testing the board, following the clear instructions, took just a few minutes, after which I plugged the ICs in, fitted the board inside the supplied metal case, and connected the unit up to my receiver. I switched on with some trepidation. I'm pleased to say (phew!) that the unit worked perfectly, first time.

Connections

The unit connects between

your receiver's audio output and an extension speaker, an external 12V DC supply at 500mA being needed to power the unit. A total of 18 functions are selectable, using the front panel rotary switch together with a rear-panel 'BIO' (Binary '1' or '0') toggle switch. A 10 segment bargraph LED display is used on the front panel for indication, and in most of the operating modes this displays the peak audio level, each segment representing a 3dB level change.

Inside the unit, a 13 bit Analogue to Digital (A/D) conversion is used, this theoretically giving an 80dB dynamic range. As well as making this easy to set input levels, it also vastly improves CW filtering over a typical 8 bit conversion, as a wide dynamic range is needed to select a weak CW signal in the presence of strong QRM. In voice modes, the signal to noise ratio of a

relatively strong SSB signal is probably around 30dB, so there's 50dB of 'headroom' left.

Operation modes

The 16 position front panel switch selects;

- 1) *Combined automatic notch and noise reduction*; which automatically notches carriers and simultaneously reduces noise, useful for general HF SSB operation.
- 2) *Noise reduction*; which reduces noise with greater effectiveness than Mode 1, for weak signal SSB, VHF SSB and FM.
- 3) *Automatic notch*; automatically notches carriers with greater effectiveness than Mode 1 - for HF SSB where interfering carriers are a problem.
- 4) *Narrow (2.1kHz) Voice Filter*; a fixed 100th order narrowband filter intended for rejecting adjacent overlapping

SSB signals, with a passband of 300-2100Hz and out-of-passband rejection of 50-70dB.

5) *Narrow (1.8kHz) Voice Filter*; identical to the previous mode with the passband narrowed to 300-1800Hz.

6) *RTTY filter*; a 100th order linear phase bandpass filter, intended for 170Hz shift FSK signals such as Baudot and AMTOR. The rear panel BIO switch selects either North American (2125/2295Hz or European (1275/1445Hz) tones, the out of passband attenuation being greater than 60dB.

7) *HF Packet/SSTV filter*; a 100th order linear phase bandpass filter for 200Hz shift, 1200 baud HF packet or SSTV signals. The BIO switch selects HF packet (1600/1800Hz tones, with a passband of 1550-1850Hz) or SSTV (1200-

centre frequency when a filter is selected. The filters are centred at 1kHz, 750Hz, 600Hz and 400Hz, but the centre frequency of each can be changed to suit your personal preferences.

On the air

I used the filter with a couple of HF transceiver systems; an 'ageing' Trio JR599/TX599 combination and a modern Yaesu FT-990 (the latter having its own variable digital filter built-in). Transverters allowed testing on 6m-23cm as well, and the sets both have a number of crystal filters built-in, including narrow CW filters. Possibly not surprisingly, used with the JR599 (a very good receiver for



The kit of parts

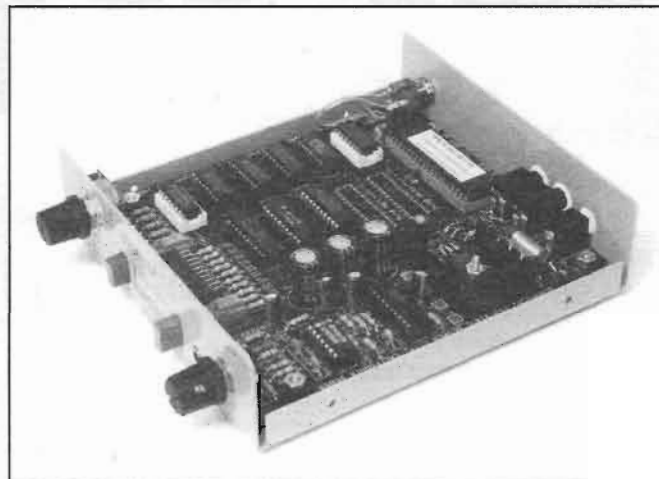
2300Hz). Attenuation out of the passband is greater than 60dB.

8) *DTMF decoder*; decodes DTMF signals, using the LED bargraph to indicate the decode tone pairs.

9) *CTCSS decoder and squelch*; which will decode any of the 38 subaudible tones used for repeater access, tone squelch and selective calling, but it'll only work if your receiver audio gives a low enough audio frequency response.

10-16) *CW filters*; bandpass filters with centre frequencies ranging from 400Hz to 1000Hz, and bandwidths of 50Hz to 200Hz. Out of band rejection is greater than 50dB for the 50Hz filters and greater than 60dB for the wider filters. A short 'dit' is sent at the filter

it's time but naturally having poorer shape-factor filters and poorer strong-signal performance compared with modern sets) the DSP filter made a world of a difference on HF. Suddenly, weak CW signals buried in QRM became remarkably readable - the difference really had to be heard to be believed. The only problem I found was in trying to keep signals correctly tuned in - a difference of just a few tens of Hz between two amateurs in QSO meant I had to retune the receiver slightly if the DSP filter was used in its narrowest (50Hz) bandwidth position - the filtering was that sharp! Many of us are used to the 'ringing' effect of a very narrow crystal filter. Now, this



Ready to go!

just doesn't happen with a DSP filter - and it could take many otherwise very experienced amateurs by surprise to hear such 'pure' signals!

Testing the unit on weak VHF/UHF beacon signals, i.e. CW and RTTY, in very noisy, weak, but otherwise interference-free conditions, also brought an immediate improvement in readability. I was most impressed. Being a 'data freak', I appreciated the packet and SSTV filters, switching the DSP unit in and out via its front panel switch usually made an instant difference to the visible data decoded on my KAM all-mode TNC on the typically very busy 20m band.

In day-to-day listening on SSB, usually on the rather 'noisy' 80m and 40m bands, I invariably used the DSP filter in the combined auto-notch and auto-noise reduction mode - it made reception significantly less tiring on my ears! I really did appreciate the automatic notch, it nicely got rid of the annoying 'tuner-uppers' as well as doing sterling service in reducing the effects of unwanted CW QRM. I often use the variable upper/lower cut-off DSP filter system in my FT-990 for such listening, but I must admit that I found W9GR filter, e.g. in its 2.1kHz and 1.8kHz bandwidths, to be better in terms of cut-off rejection and noise performance. A careful test in 50Hz bandwidth CW filtering mode showed the W9GR filter to be considerably better than my FT-990's built-in DSP filter!

Upgrades?

The performance of the filter is of course primarily software controlled. I'm told that the chip, as supplied by Quantics with the kit, includes the latest version of the software, but as more and more experience is gained with the software, changes are made in the program to incorporate improvements based on the experience of amateurs using the filter. If, as is the case with W9GR's earlier DSP filter, the source code is freely available on the Internet (or even as a purchased plug-in chip upgrade) this should allow the filter to be reasonably 'future proof'.

Conclusions

It may sound rather enthusiastic, but I really was taken aback by the performance of this DSP filter - and I'm no 'newcomer' to DSP. All I can say is that, even owning a modern 'top of the range' HF set with its own variable DSP filtering, the W9GR filter I built and tested didn't go back to SEM. It stayed in my shack, with a cheque being returned instead. This is only the second time this has ever happened over the past ten years of my reviews (ironically the last was an SEM 'QRM Eliminator'!). Can I give any higher recommendation?

My thanks go to SEM for the provision of the DSP filter kit for review.

SCANNERS

Bill Robertson gives advice on getting rid of paging interference

A number of readers who use handheld scanners on an external aerial seem to have the same problem on VHF airband - that of strong signal breakthrough from VHF paging transmitters. This isn't always a 'fault' on the receiver, but rather a limitation in its strong signal handling capability. 160MHz paging signals also fall in the 'image' of sets with a 21.4MHz 1st Intermediate frequency (e.g. this being 42.8MHz above the wanted, i.e. 120MHz, signal). Also, paging transmitters on 139MHz often cause blocking through strong signal overload into a receiver tuned to within the adjacent VHF airband range. The receiver circuits of handheld scanners are naturally optimised for use with their set-top helical aerials, and connecting a large outdoor type, particularly an amplified aerial, can cause a lot of problems!

A message from Simon in East Yorkshire, who lives just around 200 metres from such a paging transmitter site, tells of the paging signals breaking through on several frequencies on his AOR2700 scanner, even when using just a set-top telescopic aerial, although he says his PRO2006 (a base scanner, with it's better filtering) rejects the unwanted interference a lot better. Mark Brickley has similar problems, and is thinking of investing in an AR3000A scanner. News from Paul Jones is that his AR3000A doesn't suffer at all from this (it's also a superb rig all round in my opinion).

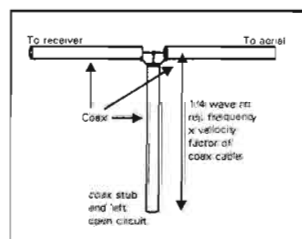
So, what's the 'answer'? In the case of VHF airband, you could try an in-line filter such as the AOR ABF125, available from AOR (UK). This is a purpose-

designed airband range 'bandpass' filter, which attenuates signals outside of it's range. Alternatively, a simple 'notch' using a coax stub can be used, although this will also give a notch at odd harmonics, i.e. if it's cut for 160MHz then it'll also notch out 480MHz (3 x 160MHz), 800MHz (5 x 160MHz) etc.

Coax stub filter

This uses just a short length of ordinary coax, connected in a 'tee' configuration to the coax feed between your aerial and your receiver. At the 'tee', the coax braids connect together, and the coax inner connects together (don't connect the coax inner to the braid!), and at the end of the stub the coax and braid should be left unconnected, i.e. open circuit.

The frequency you want to reject determines the length of the coax 'stub'. Use the formula of 750 divided by the frequency in MHz to give you the length in centimetres of a quarter wavelength in free space. Then, multiply that length by the



Simple coax stub filter

velocity factor of your coax, which will typically be 0.86 for UR76 (thin coax) or 0.66 for UR67 (thick coax) to give you the electrical quarter wavelength (i.e. the 'coax quarter wave'), which is the length you need to cut your coax stub to.

POCSAG reception

Many readers of course do want to receive and decode pager transmissions! Jason Petty in Stockton-on-Tees wrote to me saying that he's writing a pager decoding program for the Amiga 1200T. He's already written programs for Morse and RTTY decoding for this machine, so the pager one looks like it's not too far away! I'll keep readers posted through this column on its availability.

There's now a new version of the POCSAG PC software written by Peter Baston. It's version 2.00, which replaces the earlier version (V1.02), and now allows off-air decoding of numeric and alphanumeric paging signals at 2400 bits/sec as well as 512 and 1200 bits/sec, including a new 'auto detect' mode. The new version also adds a few other facilities, such as error detection and correction, and auto-logging of received messages. It uses the same simple one-IC interface - full information being given on the disk (it's available from the HRT Software Service - all requests for the POCSAG software now automatically receive V2.00 - Ed).

European air frequencies

Jannick Johnsson asks about UHF frequencies used by air forces in Europe. He's seen several 'frequency books' advertised, but wonders which is the best for European (not just British) frequencies. For this, one possibility is the "En-Route supplement, Northern Europe" which is available from the RAF Documents Unit at Northolt. It's priced at £7.50 and available to

the public from the documents unit, Tel. 0181 845 2300 ext. 7209 for an order form and book list (ask for a "flight information publication prospectus"). My thanks to Pat Martindale for the above information.

SWL and scanner control software

If you're a scanner or HF listener and yearn for PC control of your set, then Simon Collins, who's written plenty of such software including several programs for AOR scanners, now has an Internet web site. You'll find it at

<http://www.ibmpcug.co.uk/~g4sgil/> where you can download time-limited demo versions, as well as free fully working programs (such as PC Monitor which gives DOS control of the FRG-8800) and several free SWL working aids, such as a bandplan, language help, and several other programs.

If you don't have Internet access (or if you don't want the phone bill for downloading them!), remember that you can get Simon's AOR control programs by requesting the 'AOR disk' from the Ham Radio Today software service. I've also arranged with the Editor this month to have many of Simon's other programs from the web site (plus the V2.00 POCSAG software - Ed) available this month on 1.44Mb disk for the usual £1.00 to cover the cost of disk and p/p, see this month's 'Software Offer'.

Strange signals on 434MHz

A message from Andy Boyd says that, whilst he was

RA 169
RA 265
RA 255



Base station scanners offer better strong signal performance

scanning through the 70cm band one night, on 433.950MHz he stumbled across what sounded like a 'loop', saying "Car zone one, alarmed", which was repeated twice. Then came "Weee woow weee woow" and again "Car zone one, alarmed". He asks "what's this doing in the 70cm band?".

This to me sounds like a remote alarm device operating in the European low-power

allocation of 433.920MHz, although in the UK this frequency, according to the Radiocommunications Agency, is only supposed to be used for car key fobs (it doesn't seem to have stopped 'TrafficMate' using it - see last month's Editorial - Tech Ed). Here, you'll often hear low-powered data 'bursts', although with the relaxation of import controls no doubt some 'European units' have made it 'across the water'

into the UK, and are being used in this way. Maybe this frequency could prove to give a few other surprises in the near future!

Free information booklets and guides

If you'd like a free booklet on VHF/UHF frequency allocations in the UK, it's available from the Library and Information Service of the Radiocommunications Agency, your's for the asking. The "Table of Current Allocations and Users in the range 28-470MHz" (document RA255) has 18 pages worth of useful frequency tables together with their users, and for UHF addicts document RA265 is the "UK Table of Frequency Allocations Part 3" which covers 470-3600MHz. You can obtain these from the Library and Information Service, Radiocommunications Agency, PO Box 9711, South Key Three, 189 Marsh Wall, London E14 9DA. Tel. 0171 211 0502 or 0505. At the same time, why not ask for the RA's "Receive Only -

Scanners etc. Information Sheet", document RA169, which lets you know exactly what you can and can't listen to.

With that, my thanks go to readers for your letters, and I hope I've managed to answer a few queries here. Next month I plan to give information on how to build a simple circuit for an add-on 'S-meter' for your base scanner. If you've any topics you'd like me to cover in this column, please do drop me a line!

Bill Robertson is pleased to hear from readers and will answer queries through this column - address your letters to: Bill Robertson, c/o HRT Editor, Nexus, Nexus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or by fax or email to the Ham Radio Today direct Editorial contact points.

Please remember that reception of some frequencies or services may not be permitted without appropriate permission. The RA's information sheet on 'Scanners' has full information for the UK.



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A Simple Inexpensive Mast and Rotator

Many amateurs would like to have a good 9 metre or higher mast, but the expense usually puts off the idea until at least everything else has been bought. This idea by Glenn GOGBI is rather novel in that his system is mostly built from scrap parts that he culled from various sources at 'silly' prices.

I first met Glenn at a special event station that he had helped organise to celebrate the 'Battle of Britain'. A fellow who knows how to transform what he calls 'a sow's ear into a silk purse'. He puts his reasons for choosing this particular design as low cost, speed of rotation and reliability. Having looked closely at his ideas I have come around to his way of thinking too.

The main limitation with most commercial equipment, be it radios, aerials or masts, is

their initial cost. Much better to build your own if at all possible. His quoted increase in speed of operation may appear to be optimistic until you look at it closely. Reliability comes only after testing for a long time. Glenn's mast and rotator has been in operation for quite a few years. I would suggest to readers that this has proven the reliability of his ideas.

Obtaining the listed exact parts may be difficult, but like most homebrewers, don't follow the exact sizes, adapt the idea. Use this design to construct your own mast with the materials to hand, or those which can easily be obtained. Items like bolts will have to be bought new, but the old bike may be found on the local scrap heap, look carefully at the same time for the piping! The lengths

Dick Pascoe
GOBPS
describes a
simple
mast and
rotator for
you to
build at low
cost

given are intended only as a guide, and can be adjusted to suit your own particular situation.

Construction

Construction is relatively simple, the only difficult part of the whole job for some may be the welding. But many local garages will be happy to oblige for a nominal fee if the metal is cut to size and the drawings supplied. Some may even be happy to do the whole job, again the exact

design may have to be altered to fit.

Fig.1 gives the layout and shape of the two brackets, the more astute will immediately realise that no dimensions have been given. Calculations will have to be made to ensure that the brackets hold the mast far enough away from the house to clear the roof and guttering, and also be sound enough to carry the weight of the aerials.

Fig.2 shows the construction of the mast, the length has been shortened for clarity. The length of the remaining box section is used to support the 25mm galvanised water pipe in which the actual rotatable mast turns.

The 25mm inside diameter section of pipe is cut into short lengths of about 15cm each. These are then slipped over the longer section of the 25mm pipe and the whole laid along the box section. The length of 25mm square section is cut into the same lengths and laid out alongside the same pipe lengths (see Fig.3).

These short sections of pipe are then slid along the 25mm pipe, so that they are at equal intervals. They are then welded into place to act

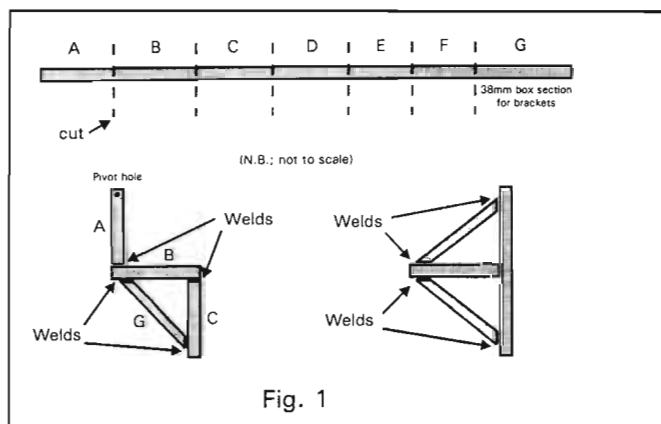


Fig. 1

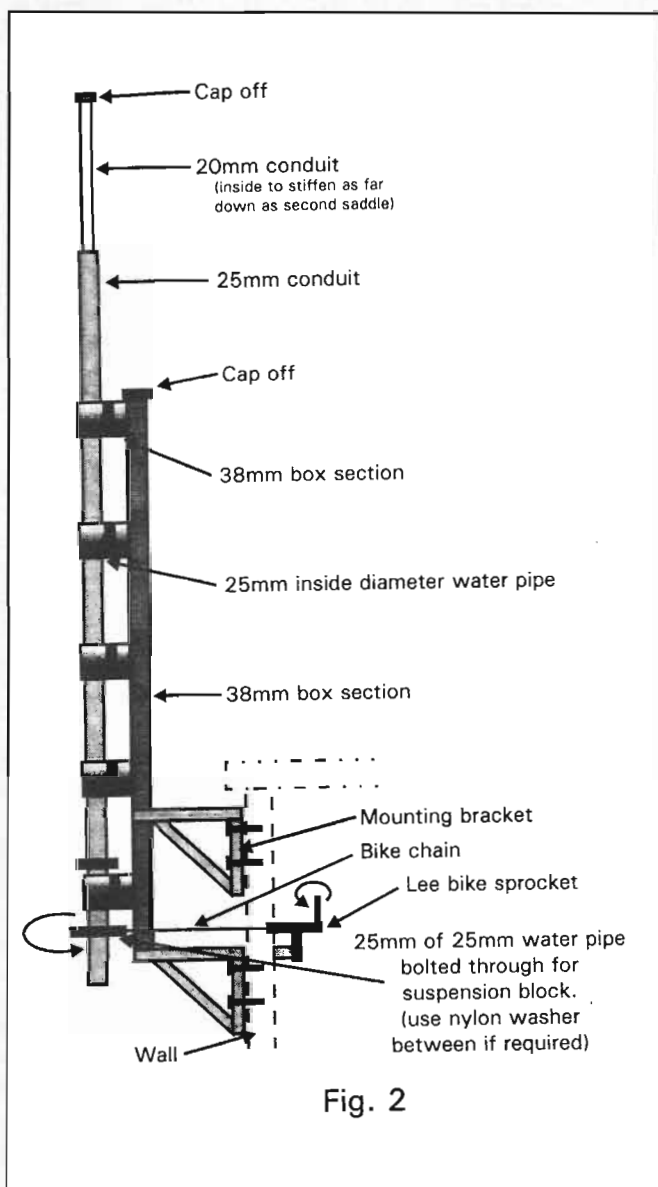


Fig. 2

as supports for the 25mm pipe when in the vertical position. Be sure to do this with the 25mm tube in place to ensure that the final job will not bind in use. A couple of millimetres out now will cause the whole lot to jam in the future.

Bicycle power returns

The idea of using a bicycle to turn the aerial may not be new, but Glenn's reasoning may be so. If we refer to Fig.4, using the lower part of a simple bicycle frame, a simple winch can be made. The efficiency of this when coupled to the rear sprocket

of the bike, welded (more welding!) onto the base of the mast is rather good!

Consider a rider trying to cycle uphill, lots of effort from the legs, but little turn on the back wheel. The cyclist however has the choice of gears to use. Using a large wheel on the inside and a wheel on the outside that has a quarter of the number of teeth, will ensure that the mast will turn four times, for one turn on the main handle. If we reverse this, then the mast will turn once for four turns on the handle.

"How do I use a bicycle?" I hear you say. "Easily" I reply. Grab your bike from the scrap

heap and check the sprockets and the chain. If they are OK, you're in business. Remove the rear sprocket from the rear wheel and cut the frame of the bike about half way up above the pedal unit, to form the mounting bracket as in Fig.4. The small sprocket is welded to the bottom of the mast, directly outside the shack wall.

Drill two holes through the wall to carry the chain of the bicycle from the outside sprocket, to the cut-down frame of the bike on the inside of the wall. The gearing may prove to be difficult, but the normal ratio found on the average bike should suffice. The main difficulty will be the turning circle of the inner, large sprocket, fitted to the inner wall.

This problem has been overcome by 'nature'. The limited turning circle of the

'pedal' when the frame is bolted to the wall has ensured that the mast will turn about 400 degrees. This is somewhat over the normal 360 degrees, but is rather good if you are into working DX, especially if it happens to be just past the aerial stop at full turn! Experience will show that it can be turned at quite a rate too.

Fitting the mast to the brackets isn't critical either, it can be bolted to either the face or the side of the brackets. For those with a flat roof, the face fitting will be great. For those with normal size houses, the side fitting will be required.

Glenn is presently using a vertical 2m aerial, a 5 element 2m beam and a 9 element 70cm beam with this system. It has all withstood the ravages of nature over the years, including two hurricanes. If you're worried

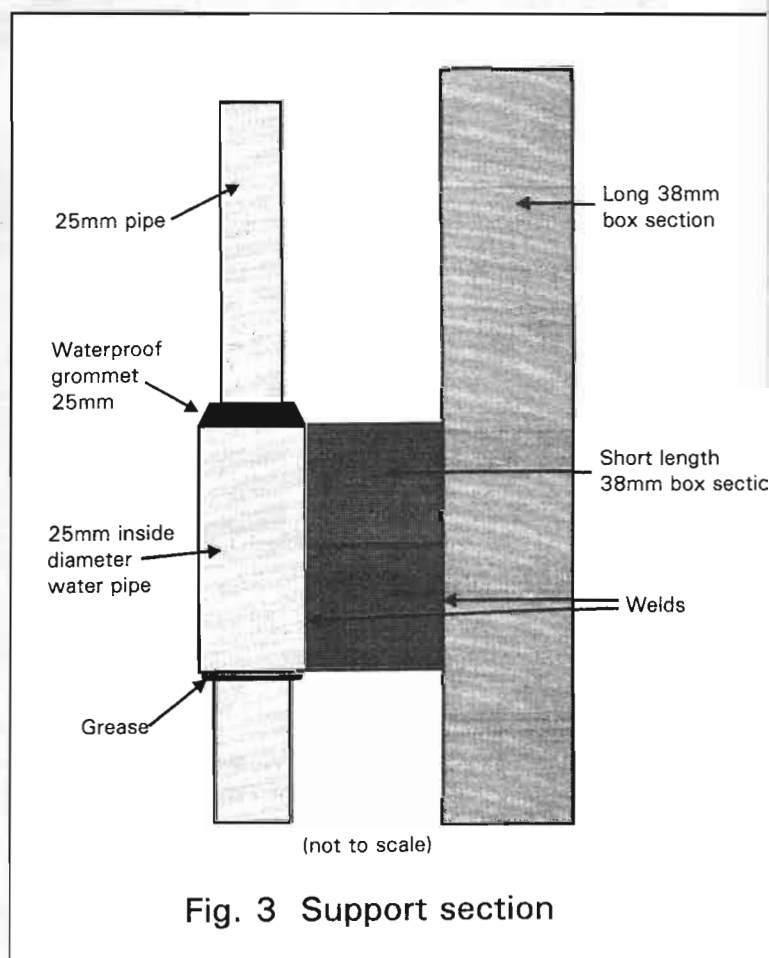
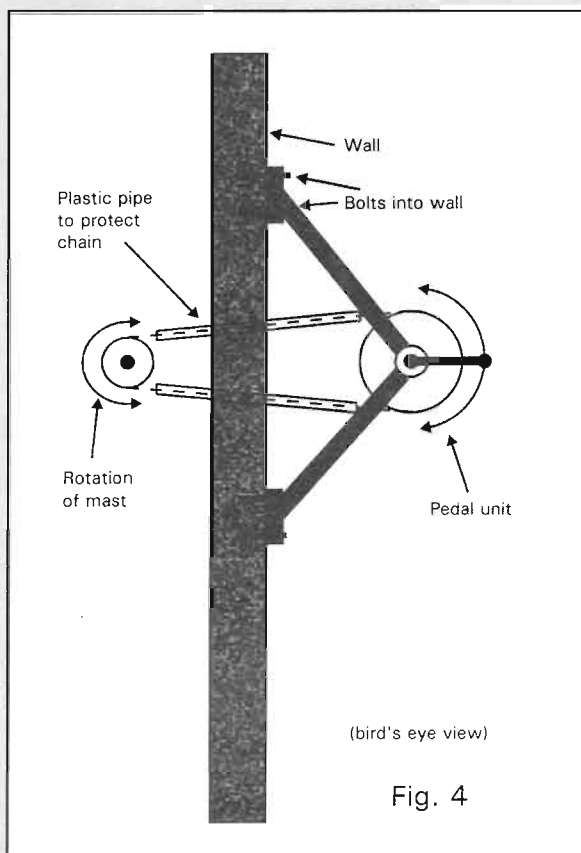


Fig. 3 Support section



about stability, guy wires can be added at any point where the welds are made on the box section, just by welding a loop or two to the frame.

This system is not the only answer to building a mast, but it may be a good guide to what you may achieve using similar equipment from a scrapyard. Happy building!

If you have any queries regarding this project, please

address them to the author, Dick Pascoe G0BPS, Seaview House, Crete Road East, Folkestone, Kent CT18 7EG, enclosing an SAE if a reply is required, or via packet to GB7RMS, or email to: dick@kanga.demon.co.uk

Any reported updates will be available for at least the next 12 months on the Ham Radio Today 24hr info line, 01703 263429

Parts list;

- 1 x 6m (20ft) section of 38mm (1.5") box section iron
- 1 x 3m (10ft) section of above for brackets
- 3 x 4m (13ft) of 25mm galvanised conduit
- 1 x 4m (13ft) of 20mm galvanised conduit
- 1 x 79cm (2ft 6") of 25mm (1") inside diameter steel water pipe
- 1 x 60cm (2ft) of 25mm x 25mm metal box section
- 1 x old bicycle
- 4 x 50mm x 6mm (2" x 1/4") steel bolts
- 2 x 100mm x 12mm (4" x 1/2") steel bolts
- 6 x rawbolts
- 4 x 25mm (1") rubber grommets

Note; these dimensions are intended only as a guide, adjust to suit your own situation (see text)

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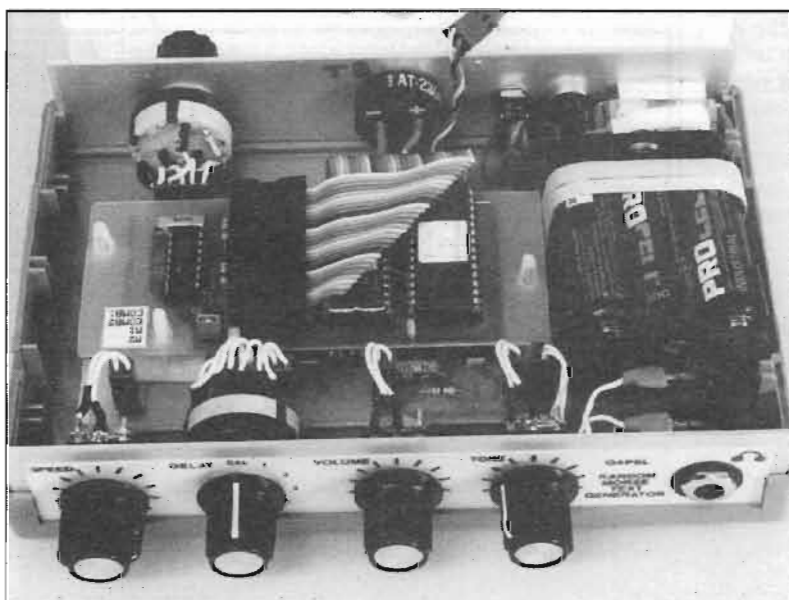
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Random Morse Text Generator Expansion Board

Terry Grice G4PSL describes a memory expansion board for the RMTG project featured in the September and October '91 issues of Ham Radio Today



The Random Morse Text Generator project published in the September and October 1991 editions of Ham Radio Today will sequentially generate one of 256 Morse words at random. This includes amateur abbreviations and common text. An add-on speed meter circuit was provided in the June 1993 edition of HRT (*If you missed these articles photocopies are normally available from the Nexus Photocopy Service, see the rear of the magazine for*

ordering details - Ed). The expansion board shown here allows the memory capacity to be doubled providing a total of 512 Morse words.

Circuit Description

The expansion board circuit diagram is given in Fig.1. The original EPROM is relocated to the expansion board but retains its original IC3 designation and is referred to as M1. The additional EPROM, IC7, stores a further

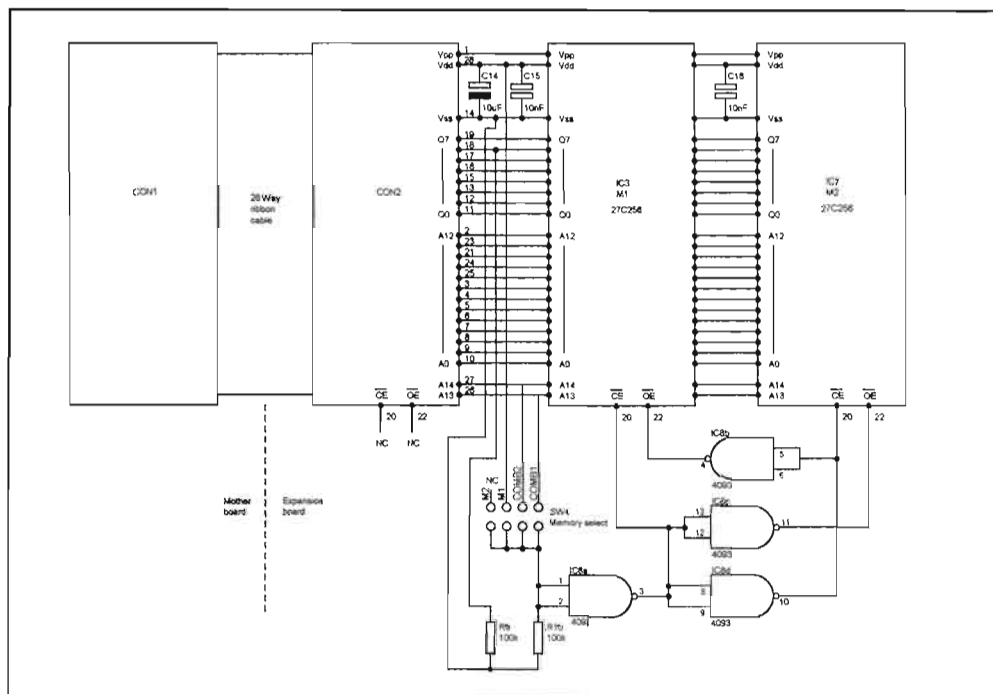
256 Morse words and is labelled M2. The vacated 28-way IC socket on the motherboard accepts the 28-way header, CON1 (connector 1), and a length of 28-way ribbon cable provides a pin-to-pin link with a second header CON2 (connector 2) situated on the expansion board. This arrangement connects the 5V DC supply and the address and data bus to the expansion board.

The addressing and subsequent production of a Morse word remains unchanged to that of the original design. The CE (chip enable) and OE (output enable) lines must be controlled to facilitate memory selection. To select a particular memory i.e. the M1 or M2 EPROM both lines must be held at 0V. IC8, a quad two i/p NAND gate configured as four separate inverters achieves this. SW4, Memory Select, is a PCB mounted jumper-link connection and with this

placed in the M1 position the following events occur.

Pins 1 and 2 of IC8a are held firmly at +V (Vdd) producing a 0V (Vss) o/p level on pin 3. This holds the CE, pin 20, of IC3 at 0V along with i/p pins 12 and 13 of IC8c and i/p pins 8 and 9 of IC8d. The o/p, pin 11 of IC8c is at +V and keeps the OE, pin 22, of IC7 at this level. The o/p, pin 10, of IC8d is also at +V and holds the CE, pin 20 of IC7 at the same potential. EPROM M2 is therefore deselected. The i/p pins 5 and 6 of IC8b sit at +V and the o/p, pin 4, takes the OE, pin 22, of IC3 to 0V thus selecting this IC, M1. Placing the jumper-link in position M2 of SW4 will cause R10 to hold i/p pins 1 and 2 of IC8a at 0V. This reverses the polarities generated for the M1 option and selects M2.

The Comb1 and Comb2 settings for SW4 monitor the voltage levels on the respective address bus lines A13 AND A14. Using either option allows Morse words from M1 and M2 to be intermixed, in a variety of permutations. SW1, Memory Select, on the original circuit should be set to the Mix position when using the



dimensions to the first, compress the whole connector in a vice. This is best done with the vice clamps removed. The wires can be soldered to the individual header pins but the end result is not as neat. When both headers are attached, test the continuity of each wire with an ohmmeter for a pin-to-pin connection between connectors, and ensure that there are no shorts between pins. Form the cable as shown in Fig. 6b.

The extension board sits above the motherboard and may be installed as follows. Insert a 10mm high plastic self-adhesive spacer into all three PCB fixing holes but do not remove the adhesive backing. Situate the PCB

Fig. 1 Circuit diagram

Comb options.

Capacitor C14 provides power supply line smoothing. C15 and C16 are transient decoupling capacitors.

Construction

With regard to PCB assembly, the procedures and guidelines given in the original design construction notes should be followed. IC holders are recommended for reception of all three ICs and CON2. Drill the three large PCB fixing hole pads 4mm diameter.

The interconnecting cable is assembled as shown in Fig. 6a. The ribbon cable should be cut to length at 115mm, sharp scissors being ideal. The headers used for CON1 and CON2 are of the IDC (insulation displacement connector) type. Connection is made by lying the ribbon cable over the pins of the header base and fixing the top cap in place. It is now necessary to compress the assembly to cause the insulation of each wire to be ruptured and provide a connection to the header pin. A compression tool can be manufactured by using some scrap material such as metal strip of 5mm or greater

thickness and drilling 28 holes to accommodate the header base. A 1.5mm drill will ensure a close but not too tight fit for the header pins. A small piece of Vero-board may be used as a jig to spot the holes. Insert the header base and position the ribbon cable checking for good alignment.

Attach the top cap using finger pressure, and with a second piece of scrap material of similar

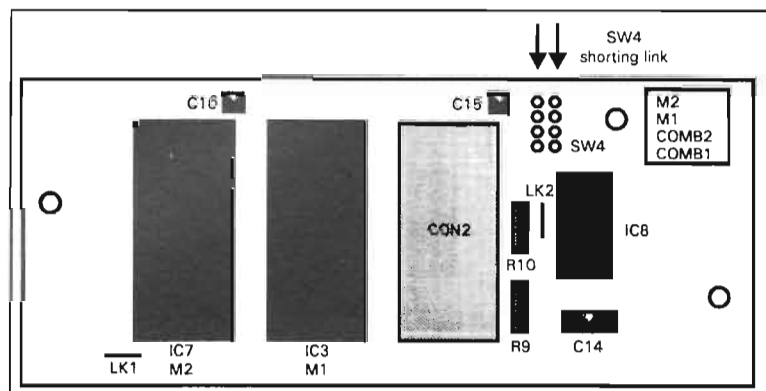


Fig. 2 Components Layout



BLOCK SELECT	COMB1	BLOCK SELECT	COMB2
1 3	M2 : BLOCK 1 AND 3	1 2	M2 : BLOCK 1 AND 2
2 4	M1 : BLOCK 2 AND 4	3 4	M1 : BLOCK 3 AND 4
MIX	M1 : BLOCK 2 AND 4 M2 : BLOCK 1 AND 3	MIX	M2 : BLOCK 1 AND 2 M1 : BLOCK 3 AND 4

Fig.4 Block Permutations table

over the motherboard with SW4 towards the front of the case and note the required shape to which each spacer base must be adjusted. Remove the spacers from the board and trim to size using sturdy cutters. Replace the

The adhesive backing may now be removed from the spacers and the board carefully fixed in situ. Bring the ribbon cable over the top of the extension board and insert CON2 into its 28-way IC holder.

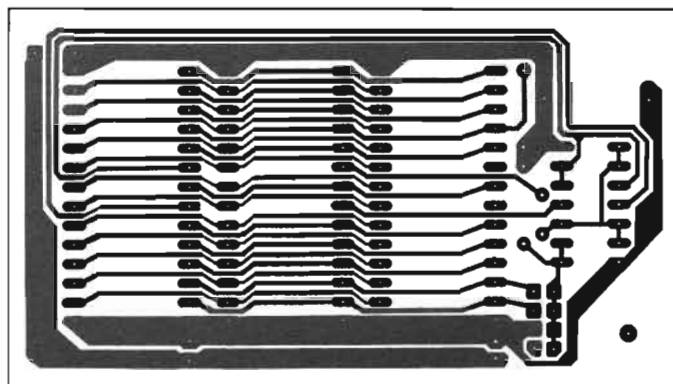


Fig.3 PCB pattern (shown full size)

to 256 Morse words stored in memory 1 in accordance with the block select switch setting,

setting. This ensures that full intermixing of selected blocks occurs. Some switch settings

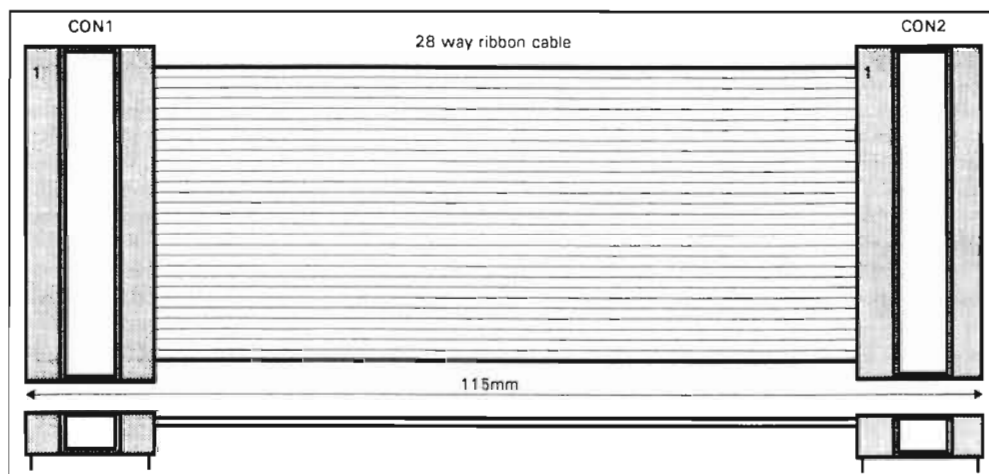


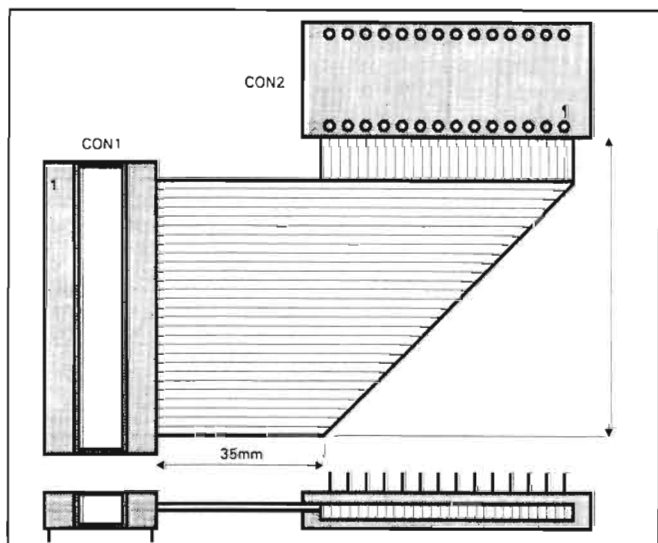
Fig.6a Cable detail

spacers and resite the board to test for a good fit. Plug CON1 into the empty 28-way IC holder on the motherboard. This should be oriented so that the ribbon cable comes away from the holder towards the rear of the board.

Fig.6b Cable form

Operation

With the SW4 Memory Select jumper-link set to the M1, the unit will randomly select and generate one of up



M2
M1
COMB2
COMB1

Fig.5 PCB Legend

offer the same combination and this has been left to avoid unnecessarily complicated switching arrangements. Six different permutations are available as detailed in fig.4. This table may be pasted to the inside of the case lid for easy reference.

All queries regarding this project must be addressed to the author enclosing an SAE if a reply is required. Write to; Terry Grice G4PSL, 11 Durham Street, Wallsend, Tyne and Wear NE28 7RZ.

If there are any reported updates to this article, the details will be available for the next 12 months on the Ham Radio Today voicebank information line, Tel. 01703 263429

this being the format of the original design. By selecting M2, memory 2 only is accessed. The Comb1 and Comb2 options both offer intermixing of blocks of Morse words between both memories. When using either Comb setting set the Memory Select switch, SW1, to the Mix

Components List

R9, R10	100k 0.25W 5%
C14	10µF 16V min radial
C15, C16	10nF Ceramic
IC7	M27C256B CMOS EPROM
IC8	CD4093BE
1m x 30-way ribbon cable (reduce to 28-way)	
2 x 28-way header	
1 x jumper-link	
1 x 0.1 inch pin strip	
1 x 14 pin IC holder	
2 x 28 pin IC holder	
3 x PCB pillar	

Letters

Letter of the month

Dear HRT,

I'm sure by now you have received more letters regarding the possible abolition of the Morse test than you have room to print in the forthcoming issues of HRT. I am sure also that this subject will continue to generate a substantial debate up to and beyond the point at which the final decision is made. However I feel that to some extent at least we are missing the point, while the opposing factions align themselves at either end of the spectrum we fail to realise that what we are actually debating is the form that our hobby, amateur radio, is going to take in the 21st century. It is worth drawing some conclusions from the Novice licensees as regards the way forward.

The Novices, although I think the term is inappropriate since the few I have spoken to have behaved impeccably on air and have a good knowledge of the technical aspects of radio. These people, who represent the new blood, are often younger than the average amateur. They are children of the digital age and it is apparent that very few of them have taken up the A licence,

not I suspect because they cannot learn Morse, or that lack the dedication to our hobby, but simply because they don't want to, seeing it as outmoded in today's technological arena. If we are to continue to hold the interest of these people and others yet to be licensed into the 21st century, we must remove this outdated obstacle to the HF bands.

Predictably, as a B class licensee, I would welcome the abolition of the Morse test. However, I recognise the concern expressed by A class licensees. I have discussed the test with people of both classes and although most agree that the test is outmoded it is widely accepted that it provides a form of 'filter' (something not dissimilar to a low pass filter I suspect!). Many A class licensees fear that the HF bands will become overrun if the Morse test is removed as a barrier. Personally I doubt this to be true, I have often read in the past about congestion on 2 metres, for example, yet my personal experience is that the repeaters and simplex channels remain idle for significant periods of the day, and I suspect that the same is true of the HF bands until it's contest

day. However if the concern is overcrowding, the obvious way to avoid it is to reduce permissible power levels.

In some respects I believe that A class licensees think that the B classes want something for nothing. Perhaps then we could be taken more seriously if we were prepared to give up some of our privileges in return for access to the HF bands. We would be more readily accepted, since under these circumstances the A class licensees would still have some privileges over and above the B class.

The present situation is that upon passing the RAE I can operate up to 400W on most amateur bands above 30MHz, sufficient on the higher frequencies with a high gain dish to microwave next door's cat should I be so inclined, and yet I cannot emit a milliwatt below 30MHz. This is somewhat akin to passing one's driving test and being told you can drive a Ferrari around town but can't drive a 2CV on a motorway until you can explain the operation of a carburettor. We could relinquish our high power privileges and limit our selves to, say, 100W on all bands

including HF, whilst those who specifically want high power above 30MHz for EME or other activities could easily be granted a variation under an R&D exemption. A class licensees would of course retain their full power privileges on HF and above. Lower power means less interference to each other, less TVI and more people in the same space. I have not chosen 100W for any technical reason other than it seems to be a level easily obtainable from today's commercial equipment.

In future, were this recommendation to be adopted, progression from B to A class would require proof of operation on HF without interference over a stipulated time period, say 1 year, and some other form of examination which could be oral, or require a presentation to show that the prospective A class licensee has a good understanding of the dangers of higher power and how to avoid interference.

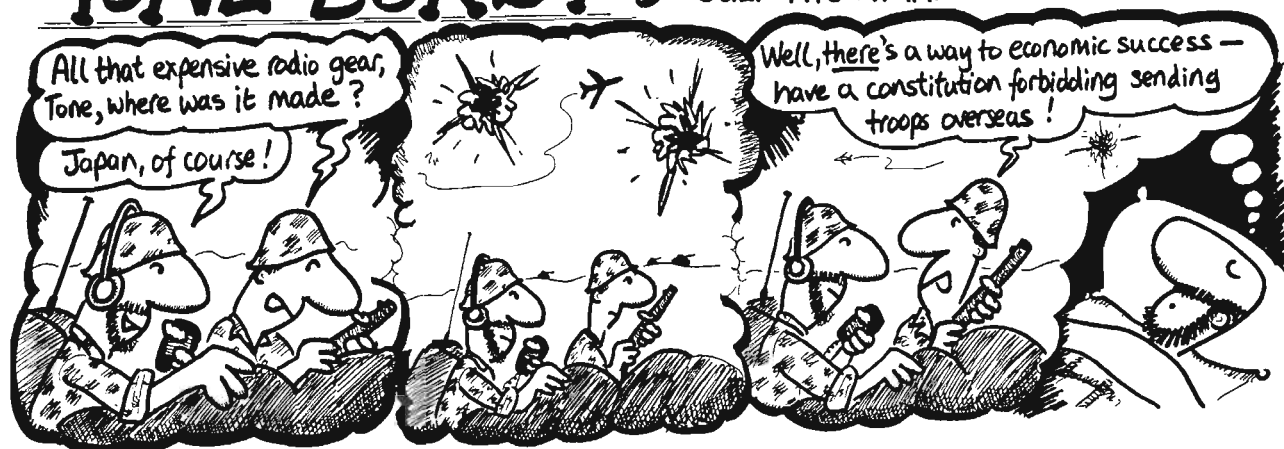
Well that's got all that off my chest, I thoroughly enjoy your magazine and can only implore you to keep up the good work.

Andy Jenner, G7KNA

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'TONE' BURST's GULF NIGHTMARE. DRAWN BY GEMENIX



Dear HRT,

Once more into the breach, on the Morse question and incentive exams for extended privileges. First let me say, there is a type of class system in the above, but no more than between, A and B class, G3's G4's and G0's. Simply because man will always try to elevate himself. As one tramp said to another, "My side of the park is much better than yours".

Having started my involvement in Ham Radio in the incentive system of the USA, I am all for it, the more you study, the more you pass, a bigger slice of the bands you get. There would be nothing wrong in the present RAE allowing certain privileges on HF, then another exam to gain full use of the bands.

Whilst I enjoy Morse, I am a thinker and cannot still my mind long enough to follow anything above a certain speed, even my wife talking. I am sure that these guys with a BSc. in electronic engineering know what I am talking about. The Morse code doesn't make you a better operator, I know people who are natural at the code and could not pass the RAE.

Finally, on what authority do we now maintain Morse code, is it by order of the ITU, if not, is it international law? If not then do we only keep it to satisfy the "I did it, so must you" crowd.

Dennis Barber G0UFS/KB8GCF

Communicators or amateurs?

Dear HRT,

I have been following the correspondence in HRT regarding the state of Amateur Radio, and the letter from Ray Howes G4OWY (Dec 95) has prompted me to pick up my pen. Ray says that it is the 'communicators' that have kept our hobby from 'slipping into irrelevance'. Sure, without the black box operators there would be only a fraction of the amateurs on the air today, but let us not confuse quantity with quality - would the fact that there would be, say, only 10,000 of us be such a bad thing in itself?

Traditionally, the Armed Forces have chosen, in times of war, to take their radio engineers from the ranks of the Radio Amateurs, as they know (or used to) that these people

would be at least technically competent. Could they do this today, when nine out of ten amateurs not only know nothing of the workings of their oriental wonder boxes, but openly admit that they have no intention of finding out?

In the eleven years of my licence, I have found it almost impossible to have a satisfying technical chinwag with ninety percent of the people I meet on the air. Conversation seems to be limited to QTH, model number of black box, quick moan about the weather and good/bye. What good does either of us get from that? The 'communicators' might have kept the Japanese in work for the last thirty years, but have they brought anything useful to the hobby?

Regards,
Andrew Howlett, G1HBE

One exam is enough

Dear HRT,

I would like to put my point of view regarding the Morse Test for the 'A' licence. Passing the RAE is to give proof that you are competent in the running of an Amateur Radio station. The Morse test has no significant bearing on your ability to run your station. It is comparable with a car driver who has just passed his driving test and is told that he is not

allowed to drive on the road until he has swum the Channel or something just as daft. I do not hold any licenses in radio at the present time, but I am taking night classes for an 'A' licence. I am 65 years of age and one examination is quite hard enough. The pleasure that it would give me in speaking to others throughout the world is immense, so why make it so hard to make the world a better place through friendship.

Yours respectfully,
Brian. A. C. Moran.

Does money maketh an amateur?

Dear HRT,

No doubt this is one of thousands of responses to the arrant nonsense promulgated in G. P Hamblin G4VBB's letter of February '96, here is my contribution to the debate.

Mr Hamblin seeks to convince us that the amount spent on the hobby should be the sole measure of 'commitment'. I disagree, believing that commitment be viewed as some function of efforts to promote amateur radio, maintain access to the airwaves, encourage new participants in the hobby and use the airwaves.

If you can afford a bucket of money, bully for you, most of us can't. Under Mr Hamblin's scheme of things only the wealthy would enjoy access to the hobby. In my

own case with three licensees in a family of three living on state benefits, there would be three less Hams on the air. Great way to reduce the QRM isn't it? Perhaps this is what he wants to achieve? What I struggle with is why any licensed Amateur would advocate a measure calculated to decimate the ranks of the Amateur population. When we all drop out of the system the bands will be free, in fact so free they could be sold off to the highest commercial bidder. Great for government strategy, not so great for the rest of us.

If you really think the government needs more ideas to raise tax, why not suggest the MoD install meters in surplus gas masks and oblige us to wear them at all times? We can then be charged for using and polluting the government's air!

Yours sincerely,
William F. A. Steele, G7VDL

more letters
next month

From my notebook

I find that going round amateur radio shows and mobile rallies can be rewarding and frustrating in more or less equal measures. If you are interested in computing hardware and software, then there's a fair chance you will find what you are looking for, as that's the direction that most shows seem to be heading.

The organisers of one show, twisting the arm of a reluctant radio trader recently, protested that it was totally untrue to say that their event was likely to be 80 percent computing and just 20 percent radio. He was finally persuaded to attend, and had to admit they were quite right - it was more like 95 percent computing!

That said, not all the shows are that bad, and there are still some interesting bits and pieces of radio equipment to be found at some of them. Where those items are manufacturer's surplus or redundant professional equipment, it is not always obvious what the units are, what they do, and whether they are of any real use to radio hobbyists in general and licensed amateurs in particular.

One type which I'm often asked about, usually by people who know of my marine radio background, are ex-shipboard rejector and preselector units, intended to be fitted into the aerial feed to a receiver. These were produced by firms such as International Marine Radio (IMR - part of the ITT group), Marconi Marine and Racal, and used on both merchant and naval ships. Their basic purpose was to allow reception of signals in the vicinity of powerful

Geoff Arnold G3GSR with some rally bargain-hunting advice on aerial selector and rejector units

transmitters, usually in the medium and high frequency bands (300kHz - 3MHz and 3 - 30MHz).

Rejectors

Rather in the same way that amateur VHF and UHF repeaters use different frequencies for transmission and reception, so too do marine radiotelephone services. Repeaters operate in what is known as 'two-frequency simplex' mode, but radiotelephone calls are normally handled in duplex mode - in other words providing simultaneous transmission and reception, so allowing a normal exchange of speech, without the need to say 'over' at the end of each transmission.

To do that successfully requires that the minimum possible amount of the ship's own transmitted signal must appear at the aerial input of its receiver. With transmitting and receiving aerials which may be spaced by as little as 10 metres on a small ship, and the transmitters and receivers themselves both placed within arm's reach of the operator, that's quite a problem, and this is where the rejector unit comes in. It notches out as much as possible of the transmitter energy, allowing the receiver to operate (hopefully) without blocking, cross-modulation, or even damage to the front-end tuned circuits.

In the MF R/T band, certain frequencies are assigned to ship transmitters for making telephone calls, and the coast station transmitters have other assigned frequencies, with a typical separation of around 700kHz between the two. The MF frequencies are not 'paired', as such, as each coast station within an area will be assigned different transmitting frequencies, obviously necessary to avoid mutual interference. Ship frequencies vary according to allocation, nationality, etc. The choice of a particular duo of frequencies is by mutual agreement between the ship and coast station operators.

In each of the HF bands allocated to marine use, at 4, 8, 12, 16 and 22MHz, specific sub-bands are allocated to telephony, one at the bottom end of each band for the ship transmitters and another at the top end for the coast station transmitters. These sub-bands are strictly channelised, and specific pairs of frequencies are used at all times. The separation between transmit and receive frequencies on board the ship varies from band to band, but on 8MHz for example it is around 700kHz.

Rejector units for HF are passband tuned on each band. A typical example, the Marconi Marine 2361 series, has a single 'L'-section filter network for each of the lower bands, selected by means of a

switch. Depending on the particular model, this switch may be manually controlled, or it may be turned by a Ledex stepping-motor, controlled by the bandswitch of the associated transmitter. The stepping motor will usually be of 24-volt rating, designed to work from the radio room emergency DC supply, not very suitable for the average amateur shack. However, in the 2361, it is a simple job to remove the Ledex and replace it with a shaft coupling and extension plus a knob, to take mechanical control to the outside world. The necessary hole for the shaft is already punched in the case, and covered with a blanking plate. (Other models may not be so easy to modify, so you would need to check them out.)

Each 'L' filter-section comprises a series-tuned circuit (an 'acceptor circuit') connected across the signal path, and a parallel-tuned circuit (a 'rejector circuit') connected in series with the signal path. On the higher bands, where the difference between transmit and receive frequencies is a smaller percentage of the operating frequency and it is therefore harder to achieve good rejection, two 'L'-sections are used in cascade.

Exactly how much rejection is required in order to achieve a satisfactory duplex call obviously depends largely on transmitter power and aerial separation - incidentally, the

problem does not arise at the coast station end, where transmitting and receiving aerial sites will be located some miles apart. In my seagoing days I found that when using a 10W transmitter, duplex could be worked without any rejector at all. What the RF voltage might have been at the receiver input I do not know, as I had no means of measuring it. On larger ships, having transmitters running to 400W or a kilowatt, things were rather different, and installation designers tried to site the receiving aerials as remotely as possible, feeding the signal back to the radio office via double-screened coaxial cables, usually enclosed in steel conduit for good measure.

The safe limit for shipboard receiver front ends was usually reckoned to be around 30 volts of RF. Above that, wax coating on coils would begin to drip, the solder on safety resistors would soften and the resistors drop off, or contacts in protection relays would weld themselves together. Altogether not very healthy!

Except as a source of RF coils, rejectors are not terribly useful to the hobbyist, as most models are spot tuned to the working frequencies or bands used by ships for making radiotelephone calls. It would be possible to retune the filter circuits to a certain extent, but whether it would be possible to get them onto a frequency of use to the hobbyist is impossible to say. Adjustment is generally by means of dust-iron cores. I know of only one marine rejector in which the notch was continuously tuneable over a range of about 1.6 to 3.5MHz.

Preselectors

As you will have gathered, rejectors can protect a receiver from a single adjacent transmitter, which is all very well for small merchant ships. However, for

naval vessels or large passenger ships with multiple transmitters, you need to be able to reject several transmitters operating on different frequencies at the same time. You could do this by means of an array of series-connected rejectors at the input of each receiver, but each one would introduce some attenuation at the received frequency too, which is not helpful.

Instead, the opposite approach is adopted, with a preselector or acceptor unit, which attenuates everything except the signal you tune it to. One example, produced by Racal, is their MA.197 HF Receiver Preselector and Protection Unit. This was widely used on naval vessels, but quite a number have appeared on the surplus market in recent years.

The MA.197 has a rather poor reputation among radio amateurs and short-wave listeners who have tried them, generally considering it to be merely an extremely efficient attenuator. Discussing the problem with several hobbyist users over the years, I find that generally they are not aware of what it is intended to do, and just how sharp its selectivity is.

Over its tuning range of 2 and 24MHz, the MA.197 will provide 85 to 100dB attenuation of signals just 5 percent off-tune. The 'nose' bandwidth is not given in the unit's specifications, but obviously some fairly careful tuning is required if you are not to unfairly condemn the unit as 'deaf'. It uses three double-tuned circuits coupled by cascade amplifiers, giving a nominal overall gain of 6dB. It will protect receivers against RF up to 40V EMF.

Incidentally, the input and output impedances of the MA.197 are 75 ohms rather than the usual present-day standard of 50 ohms. An alternative input of 92 ohms is provided for use with common aerial distribution systems.

In general, preselectors are useful add-ons for any HF

receiving station, but make sure that the unit actually tunes to the frequencies you are interested in. The MA.197, for example, has range-switch positions for 1.5 - 2 and 24 - 30MHz, but operates 'straight-through' on those bands, providing no preselection.

The Odd-balls

Occasionally you will come across rejector or preselector units designed to do particular jobs which are of no use whatever for anything else, other than as a source of components.

One example would be a little filter unit which I was responsible for developing some 25 years back, intended for use on Trinity House light-vessels. These carried a radio-beacon operating around 300kHz, which totally wiped out communications on the on-board R/T set operating in the 2 - 3MHz band each time it transmitted. The prototype filter did its job well enough when tested on a light-vessel in Harwich, but I don't know if any more were made and installed, as I made the move from industry to journalism very shortly afterwards.

Other filters might be of naval origin, used to connect a number of HF transmitters simultaneously to a single broad-band aerial. Each filter would have a band-pass characteristic, tuned to block energy from the other transmitters feeding back into the tank circuits of its associated transmitter, but at the same time allowing energy from that transmitter to pass to the aerial.

Siting is important

Any receiving rejector or preselector needs to be sited as close as possible to the receiver aerial input, and connected to it by the shortest possible length of coaxial cable. After all, there

is no point in getting rid of all the unwanted signals in one unit, only to let them sneak back in by stray pick-up on the lead to the next one!

Exactly how short you can make that lead depends on the design of each of the units. When the Marconi Marine 2361 rejector I spoke of earlier is secured to the fixings provided in the side of the same company's 'Atalanta' receiver, the link is only about 50mm long. A good example of efficient, thoughtful design.

Another vital thing is to efficiently earth the metal casework of any rejector or preselector, to ensure good screening of the tuned circuits.

Receiver protection units

Incidentally, do not confuse acceptors and rejectors with little boxes of marine or military origin which you may come across called 'receiver protection units' or some such. These contain one or more high-speed relays which disconnect the aerial from the receiver to prevent damage when an associated transmitter is radiating. They may either be controlled by a Morse key or telephone handset pressel switch (operating in simplex mode), or else incorporate a germanium bridge rectifier circuit which operates a relay when the RF from the aerial exceeds a given level.

In Conclusion

If you have any ideas on topics that I might tackle in future Notebooks, I'd like to hear from you. Your suggestions, please, to Geoff Arnold, either via the Editor by letter, fax or email, or direct to me at 9 Wetherby Close, Broadstone, Dorset BH18 8JB. Alternatively come and have a chat with me on the Radio Bygones stand at a radio rally.

QRP

corner

Peter, PE1MHO called in to see me recently, and during a long chat about construction techniques he offered me a good idea which he suggested I share. When building units, most of us tend to build the PCB, and then fix it to the box or case by using a bolt at each corner. The bolt heads are then seen at the base of the box. Some, including myself have always marked out the place for the holes and then put the bolt in and clamped the bolt in place with one nut. The PCB is then placed and a second nut clamped tight to keep the PCB in place.

Peter's idea was to use a piece of perspex. Drill the holes in the perspex to match the PCB. The holes should then be countersunk to ensure that the bolt heads are within the surface line of the perspex. A nut is fitted on the other side and then the PCB as above. We now have a PCB bolted to a piece of perspex which may now be fitted into the box by using some silicone glue. The 'bottom line' is that the box will remain clear without the bolt heads showing on the bottom.

I wrote some time ago about grinding crystals, I know that some amateurs regularly do this to change the frequency of the crystal. It appears that when grinding, the frequency can only go up. There are other difficulties too. The modern microprocessor crystals and the newer sealed crystals have gold plating and will be destroyed when they are opened to be got at.

I am told that other problems include chirp, the crystal dying, drift and even

spurs. My informant tells me "I'm not saying you shouldn't do it, just be careful". I will attempt to get some information from a grinder and report back with more information later.

Having ground your crystals to the exact frequency you need some form of mount. Of course there are commercial crystal sockets available, but there is also a cheap alternative. If you look at a standard IC socket you will find that the spacing of the holes is just 1/10th of an inch. Check the pins on a standard HC25 crystal and it will be seen that they are 3/10th of an inch apart.

If you now cut the IC socket so that you have only the three holes left, you can cut out the middle leg and solder this to the board. You're left with a simple, cheap crystal socket that will let you change crystals easily and quickly.

QRP Plus

The QRP Plus was designed as a superb CW QRP man's transceiver. It succeeded, and it's been a huge success throughout the world. Ten Tec tried with the Scout 555 and the Argo 556, but in my opinion didn't quite make it. The QRP Plus did.

I have been told that it became so popular that the manufacturers, Index Labs had decided to produce a better, modified version. Apparently a newsletter appeared recently showing the following information, the figures in brackets are those of the older version of this rig; "3rd order Intercept at 20kHz + 16dBm (+5), minimum discernable signal -126dBm (-132dBm), sensitivity for 10dB S+N/N 0.24µV @2400HzBW (0.45µV)".

"The new QRP Plus has a dynamic range of 100dB, the new AGC will not overload with

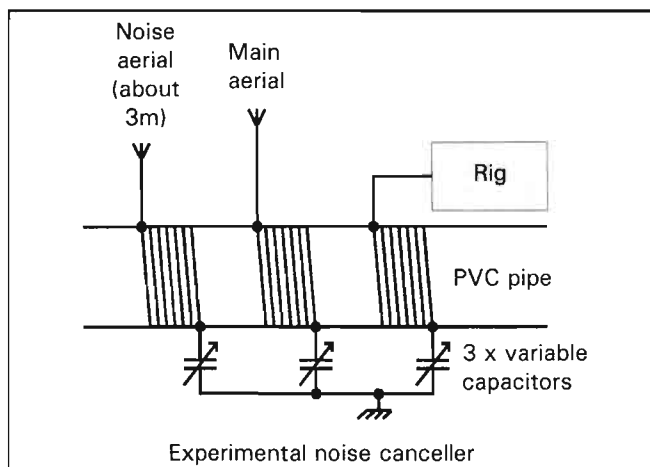
the onset of strong signals", also "RF speech processing has been added for significantly higher effective power on SSB". I hear also that a VOGAD circuit has been added to automatically adjust mic gain, and the CW QSK recovery time has been shortened to 15mS. Many improvements have been made to the keyer circuits / software too.

I was very disappointed not to be able to test one of these in the early days of their time in the UK, they were very sought after though and I can understand that it was better to supply the buyer rather than me! Perhaps I will be able to get one of these new ones in my sticky little hands soon. I shall report on the results as and when they arrive.

QRN

Like many amateurs, I get a lot of noise on my HF rig from power lines near the house. In my case I'm surrounded on three sides by these lines to and from the neighbours. I have tried the SEM QRM eliminator, but like many homebrewers it is better to try your own at some time or another. I recently saw the circuit shown here, and it quite appealed to me. I haven't tried it yet, but hope to do so when the weather improves and the temperature in my shack gets above freezing!

The circuit looks as if it would be ideal for a receiver only and single band too. I'm told that it cancels electrical



noise of 15dB over S9. The number of turns wound on the PVC pipe is adjusted for maximum noise in the receiver with the capacitors set at mid range. The wires should be close coupled on the pipe and insulated of course.

Play with the capacitors until a null in the noise is apparent. This will be very sharp, so spend a little time trying to find it. As I was told, the noise from the small aerial is 180 degrees out of phase with the noise from the main aerial and thus cancels it out. Since the noise aerial is small it will not affect the signal as much. It is also a passive circuit so should not effect the signal strength at all. Give it a try, I shall as soon as my heaters take effect.

Warm rain

It must be summer, the rain is warm! Of course as you read this it will be sunny, approaching summer with that time to get new aerial systems up and running. But one part that we all seem to gloss over

is the earth system. Although I plan on getting a full size loop on top band up during the summer, I also plan on improving my earth system. Many amateurs just rely on the house earth or a single rod into the ground. One of the best QRP DXers I know is Chris G4BUE, he seems to spend more time on his earth mat than any other part of the system.

I have seen his in the bottom of the garden. He has a criss-cross mat of wire under the mast and his 40m verticals. He must have miles of wire each painstakingly connected to each other as they pass.

One way to start this is to measure out the area you require and drive into to ground a series of small stakes around the perimeter. These should be as close together as you can make it, but remember the closer they get the more wire you will need.

Start at one stake and run your wire over the ground to the opposite side and back again. This time to the stake next to the original. Continue

until you have a ladder-like mat over the area. Now is the time to start over again, but this time going in the opposite direction, giving this criss-cross pattern.

You may wonder how it will look, and how the 'other half' will accept it. Believe me, if it is trodden down well into the grass it will vanish in a week or so as the worms shed their casts and the grass grows.

For those who have the spare cash, then alloy or copper sheeting will be easier to use, but will not last so long. If you have access to a metal scrap yard, try to get hold of scrap copper cylinders, several of these electrically connected and buried in the garden will be of benefit. They should be beaten flat of course, (I know of one amateur that buried a Mini to get a good ground!)

I'm currently packing my bits and pieces for my trip to Dayton Ohio as usual. I will be there again with George G3RJV. This year the QRP ARCI have arranged a special

treat for all QRPers attending the Hamfest. We have a hospitality suite in the hotel and this year they have arranged a complete day of talks, symposiums and interactive events on QRP. Many of the 'big names' will be giving talks including George. It would appear that this will be a great day for all those involved in the hobby. I will report back in detail later. The Friday Banquet is also a must and great fun too.

Finally a reminder; Don't forget international QRP day on the 17th June. I hope to see you on the bands with my latest acquisition, an HW9 with WARC and narrow filter, and of course the VHF QRP contest where I will again have a bunch of mad Dutchmen and Germans here wrecking the shack (we are all members of the select Dragonslayers QRP group).

That's it for this month, news and views to me via the Editor, via packet to GB7RMS, direct to Seaview, Crete Road East, Folkestone, or Email; Dick@kanga.demon.co.uk

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VHF / UHF

message

Geoff Brown GJ4ICD goes rally-hunting for VHF components

Late June sees a very special VHF expedition. This will be to Sable Island off the coast of Canada and will be a new country for all Europeans on 50MHz. Here is the news so far, direct from Ken, WA8JOC;

Everything is still a 'go' for the upcoming June CY0AA DXpedition. Ken says "We are 95% there". The group have obtained the licence and landing permission, but still need help in funding (about \$5000-6000). Besides Ken, other operators include VE9AA and W90EH. The team will install a 6 metre beacon on the island and concentrate on 30-6 metres, but they will have wire aerials for 40, 80

Mike VE9AA, who will be active as CY0AA in June

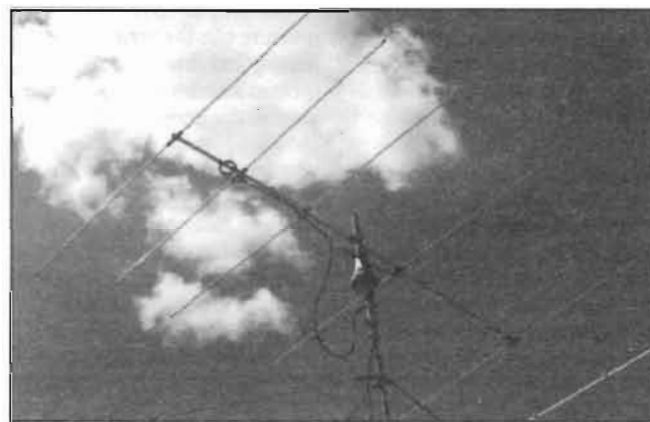
and 160 metres. Japanese amateurs have so far donated \$1000 to help offset the costs of the expedition.

Other rare countries that will be active on 50MHz next month include JX, HZ, OD5, 4K6 and D44, good luck to you all.

1996 VHF Convention

The RSGB VHF convention took place once again at Sandown Park, Esher, Surrey on the 18th February. One major change was that the lecture programs were moved to an earlier time slot, by doing this it was hoped that the later lectures would be

better attended. As usual the weather was cold and miserable, but the company was really fine. Overseas visitors were in attendance and included Ralph 4X11F, Enno PA0ERA, Frank PA3BFM and, well known for his 50MHz square hopping expeditions, Angelo I2ADN. News and views were exchanged over lunch at the Bear Public house in Esher with Enno, Frank and Angelo. Enno told us of his experiences last year on the XROY expedition, whilst Angelo told us of his plans for more rare squares around Italy on 50MHz. Also included in the lunch session was Brian G3SYC and Nick G3KOX.



'Pointed to UK', split 18.09 1995, Renny 9A3FT

Judging by the activity on the component stands, it looks like 'homebrewing' may be on it's way back. I saw several people picking up bargains like variable capacitors (low values!), relays and the like. I personally

spent a few (very fruitful!) hours looking for components for the Ham Radio Today winter project. Unfortunately I had no time to visit the lectures, but enjoyed bumping into many old and new friends. See you all there next year?

Beacon news

Here's some news from Hal ZS6WB on the Marion Island beacon. Hal received a phone call from David on Marion Island with the news that the 1C-551 had died. So the beacon is off the air, probably permanently. The keyer and other circuitry is OK, but there is no RF coming out of the radio. He has the service manual and will have the technician take a look at it, but no spares are available. So it's suspected that nothing can be done until a replacement is sent down



with the new crew in late May.

JW7SIX information: Stefan LAOBY plans to move JW7SIX into another location from April this year. The new location will be the radio club JW5E in Longyearbyen, locator JQ78TF. The take-off towards Europe is not as good as from JQ88AD, the horizon is perhaps at 5 degrees elevation. In the sector 315-345 degrees the horizon is almost at 0 degrees.

Sardinian Beacon operational: ISOAGY reports that ISO5IX is operational on 50.162MHz from JM49. The Vatican City HV3SJ beacon update, starting February 11, 1996 the HV3SJ Beacon (JN61FV) will be active for the TEP period with the 5 element aerial beaming to the south (before it was beaming at 315 degrees). The FSK beacon message is as follows; "HV3SJ HV3SJ JN61FV HV3SJ HV3SJ JN61FV VATICAN CITY LAUDETUR IESUS CHRISTUS". At around the end of March, the aerial will be changed to an omnidirectional type.

A new beacon at Pietersburg in South Africa is on air. This has the callsign ZS6TWB/B and is located in KG46RD, frequency 50.044MHz, mode A1A. It transmits 'VVV ZS6TWB/B KG46RD' followed by a 30 second carrier. It runs 30W to a 6 element at 15 m beaming north. Reports by packet to ZS6PJS@ZS0DL. A full updated list of 50MHz beacons will appear next month.

DX news

Jan Mayen News: LA7DFA will be active from Jan Mayen from April - October 1996, 50MHz operation will use 10W and a ground plane. The operation from IQ51 ('a virgin square') will be limited to a few weekends due to the distance from the normal QTH.

JX7DFA Cycle news from G0JHC; "Those of us waiting for cycle 23 to start should continue with other plans



50MHz legal limit amplifier, including power supply and 500W low pass filter, there's a full construction article on the way this winter for Ham Radio Today!

until next year I guess". The latest information from the Space Environment Laboratory at Boulder, Colorado, is that they have updated the forecast for the sunspot minimum. It is not now expected to occur in early 1997, with a smoothed sunspot number of 8.

Current up-to-date news can now be found on the Internet if you have access to it. Try <http://user.itl.net/~equinox> (there's a one-touch link to this from the Ham Radio Today Internet site - Ed), then head for the VHF or 50MHz sections.

QSL information

Chris PA3GML reports that he has received his QSL card for 4K6D via UA9AB. The address from UA9AB; QSL service, P/O Box 17, Troitsk 457100, Chelyabinskoy, Russia.

EME news

Doug G3HUL is now using eight 24 element yagis and has 600W from an ageing pair of 4CX250s. He was active during the recent contest and picked up two initials, DL3WG and K5GW, both (559/559), despite a very low activity level. Doug's totals now stand at initial #104 and 30 DXCC. He is not sure about his US states standing.

Peter G3LTF sends good news; "I got permission for the dish to go up. It will be just under 6m diameter based on the one I used previously, and thus about 0.38 F/D. I have to do some fairly serious excavation for the base, and so I can't give a date yet for my return to the moon, but it will start as soon as the weather allows. I also have got agreement for the building changes to start the shack construction. I was in

Wow, just think what his electric bill is like! My thanks to Allen K2UYH for the above information.

F5FHI plans to be active from 9U/F5FHI later this year. He will be in 9U land for eight days, and will try satellite first, and then 70cm EME with four yagis. CX9BT is inactive because of work and political problems. HP3XUG will be inactive for about a month to refurbish his aerials.

Late news

Jan Mayen News; JX7DFA information: Per will go to JX on April 13. The station on 50MHz will now be an IC-706 (100W) and a five element yagi donated by PA3BFM. In April and May he will still use the old FT-767 (10W). Per hopes to run some MS skeds from Jan Mayen throughout the year and will be on the VHF net from time to time (14.345MHz).

Chris SP4TKK reports from Poland; SP1's and SP2's are on the air, there are some licences issued for SP1 and SP2 stations. The main news

IARU Region 1 50MHz records

Tropo	ZS2FM	KF26TA	ZS6PJS	KG46RC	SSB	95-03-27	1178
Aurora	G4IFX	IO94FM	ES5MC	KO38JJ	CW	94-02-06	1786
Spor-E	JY7SIX	KM71WX	WD4KPD	FM15	CW	94-06-09	9779
Meteor	GJ4ICD	IN89WF	OH3MF	KP20LC	SSB	90-04-22	2102
F2	ZS6LN	KG46RC	KH6IAA	BK29LA	SSB	79-04-15	19305
TEP	G0JHC	IO83PR	LU8YYO	FF50	SSB/CW	89-08-24	1212

Phoenix, AZ recently and was delighted to see Charlie, W7GBI and XYL Veda. I spent an hour or so looking at the shack and those big boxes that make his signal so loud! Now I know why I can hear him so well on 2304".

SM2CEW is now active on 70 and 23cm with two feeds. Peter worked DD1XF on 23cm. G4RGK's aerials are not operational, and it will be about a month before he gets back on EME. DL8YHR will be active on 70cm with a 38 element M2 yagi and 200W from 3V8BB. LX1DB has 2000W on 70cm, on 23cm he has 60W input and 1500W output from a YD1304, and on 2304 250W.

is that type approval for 6m transceivers is no longer needed in Poland, which makes the procedure for 6m permits easy to handle. I know some SP2's from JO94 who are quite active such as SP2IQW.

That's it for this month, please send your news/views and especially photos to Geoff Brown, GJ4ICD, Tv Shop, Belmont Rd, St Helier, JE2 4SA, Jersey, or Via Email equinox@itl.net, and my packet address is GJ4HXJ@GB7GUR or GJ4ICD@WD5B - now I'm sure the last address puzzles you! You can also fax your information to 01534 877067 anytime.

DATA connection

Chris Lorek G4HCL looks at two packet radio guides, and gives a view of the future of data-based amateur radio communications

Following my comments on Spread Spectrum for future voice communication on the amateur bands, James G1PVZ @ GB7TJF.#45.GBR.EU tells me that he's been experimenting with Direct Sequence Spread Spectrum on 70cm for a few years. He had to get special permission from the UK Radiocommunications Agency to experiment with SS under the terms of the UK licence. James has constructed a number of DSS systems, the first being based on the Practical Direct-Sequence Spread Spectrum UHF Link (published by Andre Kestelloot in QST May 89) and republished in the ARRL Spread Spectrum handbook. This was followed by James' own design for a digital voice 32 kbit/s direct sequence transmitter with a companion delay-locked loop receiver, which was published in Electronics and Wireless World (Voice Link over Spread Spectrum Radio, James Vincent, Sept and Oct 1993).

After the initial euphoria of getting the system to work, the inability to communicate with anybody else in this mode (as no-one else was experimenting with SS in the UK) led to the system being put away in a drawer. However, James is thinking of re-visiting the design and simplifying it, and hopefully improving its performance. He says if there's sufficient interest he might even consider modifying it for packet!

Have any other readers experience with Spread Spectrum communication,

particularly on the amateur bands? I'll be pleased to publicise the work, and maybe thus get the ball rolling on what could very well be a new mode in the UK licence. You might even be seeing a construction feature on building your own SS rig in these pages - I'm certainly having a go myself.

Program problems

I've read a number of messages from amateurs who are having problems with Windows-based problems, such as "The trouble is that every time the program connects to the BBS the mouse locks up!". This usually (if not always) is not a problem with the program, but with the set-up of Windows. If you use Windows 'Terminal' with your TNC and with the same COM port settings, you'll probably find exactly the same

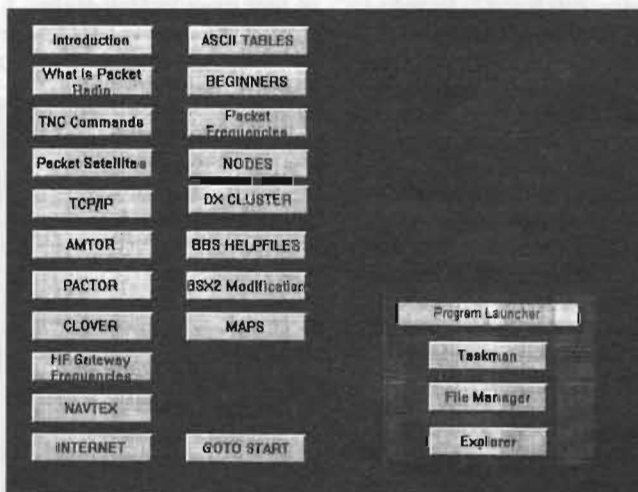
thing happens! The most likely cause is trying to 'share' an IRQ, i.e. COM1 and COM3 (IRQ4), or COM2 and COM4 (IRQ3). If your I/O card supports it, you can change the interrupt for COM3 and 4 to an unused IRQ, i.e. IRQ5 (which will normally be free unless you have two LPT parallel ports). Then use the Windows Control Panel to update your port setting. My thanks to Roger G4IDE for the above information.

A vision of the future

Peter G4CRY @ GB7CYM.#19.GBR.EU sent me a message to say that he'd just bought the last copy of Ham Radio Today that WHS had (yes, I know they go *fast* Peter!). He suggests a few ideas for the column, which I'll be pleased to expand on. Peter first asks "Please explain PacTOR 2 and why is it so expensive, and is it

better than GTOR, PacTOR, AMTOR etc. Is it better even than Clover and will it catch on?". I've given an introduction, and the result of my initial tests with a PTC PacTOR III controller, in past columns, but basically PacTOR II uses DSP techniques to give even better data throughput. It'll also get through in even weaker conditions than the standard 'PacTOR', which itself will get error-free data through in -20dB S/N, (that's the data being 100 times *weaker* than band noise/interference etc., i.e. inaudible to the human ear). At the present time, DSP chips are relatively expensive, and the PTC PacTOR II controller as an example works out at around twice the price of a standard PacTOR controller. But, as with most things that digitally process, the price will inevitably fall (witness the cost of PC processors over the past few years). Right now, by the number of amateurs already using PacTOR II, (and of course PacTOR, which PacTOR II is fully 'backward compatible' with), in my opinion it *has* caught on, in a very big way.

Secondly, Peter asks "I have not been on packet very long, about a month, and initially used a converted PMR on 2m. I soon found this was too busy and adapted my handheld, my only 70cm radio till I get another PMR radio to work on 70cm. Even 70cm seems very busy at times, so will the future of packet be 9600bd? The local SysOp at GB7CYM says he will go to 9600 when he gets enough requests". My answer to this is that undoubtedly the immediate future of packet is higher speeds, 9600 baud being the next logical step. But the real, i.e. longer-term future, is full multimedia communication. By that I mean speech and moving images, even 3-D virtual reality for our QSOs, not



just text. We've witnessed the tremendous explosion in multimedia over the past couple of years, and I can see a time, in the not too distant future, when instead of tapping away at a keyboard we'll be having audio-visual QSOs between ourselves, using advanced data compression and DSP techniques under what would otherwise be 'impossible' communication conditions. And I'm talking here of world-wide, not just local, communication.

In appreciation

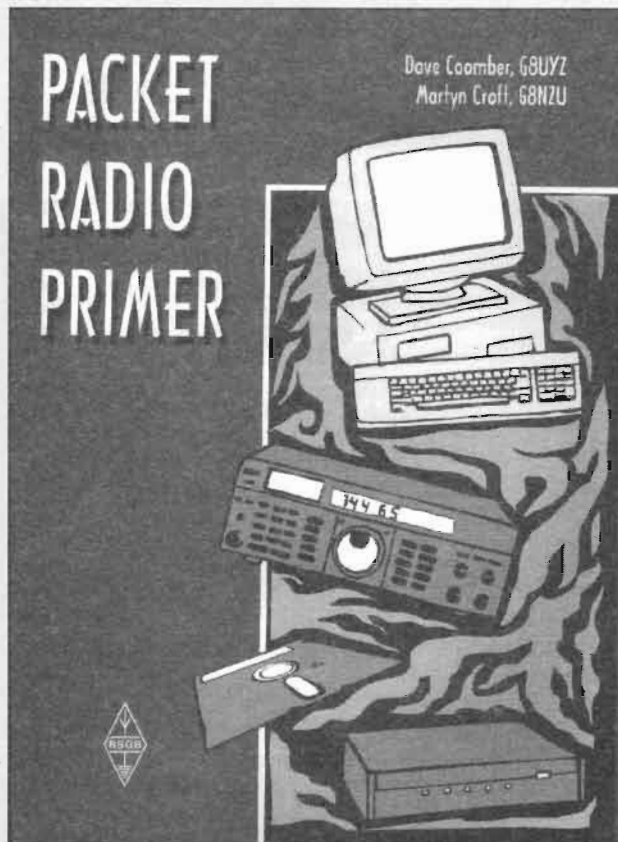
We all like to have QSOs about things of common interest on the airwaves, and of course this isn't just limited to chats on FM, SSB or CW. With this in mind, James G7MCK @ GB7OAR.#16.GBR.EU sent me a message in appreciation of one particular amateur, a 'thank you', to say; "A few of us may have noticed the number of 'FOOTY' bulls accumulating on packet. The topic is football and the field attracts many views, jokes, contradictions and arguments on any chosen soccer issues. However, despite any differences displayed between various contributors, they are all united at the end of the week, due to one man and his highly appreciated service. Justin, GOVBV, provides a weekly 'football prediction' competition, called the 'PacPrem' (Packet Premiership), for any willing station to enter. It proves to be great fun for all the participants and they would like to thank Justin and acknowledge his time and effort put into providing such a pleasing service. Here's to season #2!". This goes to show that general discussion and debates on packet *aren't* just limited to (rightly or wrongly) 'knocking' various people and societies!

Packet guide on disk

I've often recommended the 'Practical Guide to Packet Operation in the UK' written by Mike Mansfield G6AWD, this coming in a comb-bound A4

format book. It offers a comprehensive guide to getting onto packet, with special emphasis and information to the UK-based network. Now, as well as updating the guide, Mike has launched it on PC disk! It runs under Windows V3.1, 3.11 or 95, and comes supplied on three 1.44Mb disks - it expands greatly (there's a *lot* in there!) and you'll need around 13Mb of free hard disk space for the guide. During installation you'll also need access to a telephone to call the author for a serial number based upon a screen-given PIN number during the program set-up. As with Mike's printed volume, the guide is well thought-out, and it's up to date, very necessary in today's ever-changing packet field. For example, the many node maps, which cover several areas of the UK, are just a few months old, and of course the disk-based supply makes updates very easy as time goes by. As well as text-based information and maps, colour diagrams are also used, although these require you to change between screens to view them. The 'power of the PC' however is used to good effect with a Windows-based 'Index' being available, so you can easily find the information you need, i.e. nodes and BBSs in a given town by entering 'Southampton', or 'Manchester', or whatever.

For PC 'gadget freaks' the guide is quite novel - Mike says that it can run alongside your favourite packet program. On my system however I found it could only run in the foreground, i.e. it didn't have a 'minimise' button, so I had to either go back to the 'contents' of the guide and then run the task-bar option to switch to another program, or use the 'ALT-TAB' option on the keyboard to switch between programs, rather than have multiple windows open. I also found that I needed a fast PC, a bare minimum of a 486DX2/66 with 8Mb memory to run the guide sensibly, if a little slowly. A 100MHz Pentium with 32Mb memory gave fully acceptable performance, running it under Windows 3.11 on a 386SX33 with 8Mb memory was intolerably slow, the guide



taking over a minute just to 'boot up' and ten seconds or so to change between 'pages' (Mike does recommend a minimum of a 486 for the guide).

The guide, priced at £8.50 plus p/p, is available from Siskin Electronics in Southampton (Tel. 01703 243400) to whom my thanks go for the supply of the evaluation guide.

Packet Radio Primer

If you're looking for a paper-based guide to packet radio, then *Packet Radio Primer* by Dave Coomber G8UYZ and Martyn Croft G8NZU is certainly worth a good look, and a good read. I say that because it's presented in a very 'easy-to-read' format, it isn't just a deeply-technical 'reference book' or whatever. The occasional relevant cartoon by Paul G6MEN (of Ham Radio Today's 'Tone Burst' fame) also adds a bit of light-hearted relief throughout the book. But if you're also after deep-rooted technical and protocol information, you'll find it here as well. Indeed the latter half of the book is devoted to appendix information, covering TNC commands, the bulletin board, cables and ports, PC packet software, a glossary, operating guidelines, PC operation, protocols, the ASCII set, OSI,

BBS, DX Cluster and node lists, and the CLIVE help file. I found the book extremely informative, with up-to-date information on hardware and systems, although the lists of nodes etc. were rather out of date, even though these were taken from the RSGB's 1996 callbook. But the vast amount of information, e.g. on BBS commands such as REQDIR and REQFIL command formats (which I always forget!) make it worth the cost alone in my opinion. Softbound, 183mm x 244mm with 266 pages, ISBN 1 872309 31 3, it's priced at £8.50 plus p/p, and is available from amateur radio dealers and book shops or direct from the publishers, the RSGB (contact details follow 'club news' in each issue), to whom my thanks go to for the review volume.

CTRL-Z, end of message

That's it for this month. As always, please *do* let me know what you're up to in the ham radio data communication side of things, or indeed what your local group are doing. Likewise if you'd like a specific topic covered in this column, or a question you'd like to ask, just get in touch and I'll try and help. You can contact me either direct via packet, or via post, fax or email c/o the Ham Radio Today Editor. Until next month, 73 from Chris G4HCL @ GB7XJZ.#48.GBR.EU

Satellite rendezvous

A series of Qualification Shock Tests have just been successfully completed for the Phase 3-D Specific Bearing Structure (SBS). The SBS is the structure that will be used to carry the Phase 3-D spacecraft to orbit during launch. The tests exposed the structure to the shock environment that is expected to be encountered on the Ariane 5 vehicle during launch. Following the shock exposure tests the performance of the spacecraft's separation system (in full-up, flight configuration) was also demonstrated. The success of both of these tests has confirmed that the Phase 3-D SBS design will withstand both the launch environment as well as to ensure the P3-D spacecraft will separate cleanly from the SBS after launch.

We are expecting that P3-D will be operational for general usage not later than three months after launch; the 'optimum' orbit will be reached about 1 year after the launch, but this only affects coverage and a few other criteria. There are no firm plans and schedules yet, but we expect that the first burn will happen within the first few weeks. If we fly with ARIANE-502, then we are not under pressure because the perigee will be higher compared to ARIANE-4 where we have to do the first burn within a few days. But it may

Richard Limebear G3RWL with the latest on the Phase 3-D satellite in this month's AMSAT-UK news collation

still take a few months (we expect about 3 months) before we will arrive the 'near' final orbit.

Amsat-UK were pleased to cause a £75,000 donation to the P3-D effort, but the DARC (who are the German equivalent of our RSGB) have put in almost a million Deutschmarks (US\$ 600,000) to the project since 1991, following an agreement with Amsat-DL to contribute DM 150,000 per year over a period of six years. DARC membership is about 60,000; so the contribution works out to about US\$10 per member.

Oscar 13

The Engineering Beacon (EB), on 145.985MHz, is *on* from MA 0 to MA 40. This beacon is about 6dB stronger than the general beacon (which is *off*), so facilitating telemetry collection at perigee when the omnidirectional aerals are in use. The EB is PSK only; it does not transmit CW or RTTY.

Oscar 10

It's operational again in Mode-B. It's currently available when in view but please do not attempt to use it if you hear the beacon or the transponder signals FMing.

Russian satellites

In addition to Mode-K (21MHz uplink with 29 MHz downlink), RS-12 has the 145MHz transmitter on giving a second downlink. Signals on both downlinks are very strong, with lots of activity. The passbands are:
Uplink; 21.210 to 21.250MHz
Downlink; 29.411 to 29.451 and 145.910 to 145.950MHz

The *Robor* is operating in Mode 'KT', 21.130MHz uplink, 29.454 plus 145.959MHz downlink simultaneously, complete with auto speed adaptation.

The new *Mir* crew, Yuriy Onufrienko and Yuriy

Usachyov should be up there by now.

Microsats

Dove is still in MBL mode while controllers sort out what's wrong with the satellite. The packets being seen in the 145.825MHz downlink are short telemetry frames sent at more or less random intervals from a few seconds to several minutes; the primary purpose of this mode is to allow software to be loaded. As controllers continue the process of troubleshooting the satellite, other 'strange' downlink packets will continue. Has anyone heard anything about 10-26 in the past six months?

WISP software update

WISP users may care to note that Chris has uploaded a new Windows 3.1 version of MsgMaker (V1.14) to the Amsat ftp site. ([ftp.amsat.org](ftp://ftp.amsat.org)) and found in the `/amsat/software/windows/wisp` directory. The update fixes a couple of minor things, the main one being that the TO/TITLE/KEYWORDS can now take the full allowable 255 characters.

New launch

A press report says that Russia's military authorities

Specified P3-D Frequencies

<i>Uplink</i>	<i>Digital</i>	<i>Analogue Passband</i>
15m	none	21.210 - 21.250MHz
2m	145.800 - 145.840MHz	145.840 - 145.990MHz
70cm	435.300 - 435.550MHz	435.550 - 435.800MHz
23cm(1)	1269.000 - 1269.250MHz	1269.250 - 1269.500MHz
23cm(2)	1268.075 - 1268.325MHz	1268.325 - 1268.575MHz
13cm(1)	2400.100 - 2400.350MHz	2400.350 - 2400.600MHz
13cm(2)	2446.200 - 2446.450MHz	2446.450 - 2446.700MHz
6cm	5668.300 - 5668.550MHz	5668.550 - 5668.800MHz
<i>Downlink</i>	<i>Digital</i>	<i>Analogue Passband</i>
10m	29.330MHz (+/- 5kHz)	%
2m	145.955 - 145.990MHz	145.805 - 145.955MHz
70cm	435.900 - 436.200MHz	435.475 - 435.725MHz
13cm	2400.650 - 2400.950MHz	2400.225 - 2400.475MHz
3cm	10451.450 - 10451.750MHz	10451.025 - 10451.275MHz
1.5cm	24048.450 - 24048.750MHz	24048.025 - 24048.275MHz

IHU Telemetry Beacons

<i>Dwn</i>	<i>Beacon-1</i>	<i>Beacon-2</i>
2m	none	none
70cm	435.450MHz	435.850MHz
13cm	2400.200MHz	2400.600MHz
3cm	10451.000MHz	10451.400 MHz
1.5cm	24048.000MHz	24048.400 MHz

Notes:

- 1) All receivers are inverting!
- 2) Beacon-1 (former GB) and Beacon-2 (former EB) are for command purposes and can be modulated in 400 Bit/s BPSK and possibly other modes.
- 3) Due to unavoidable technical constraints imposed by the IF matrix system and the limited bandwidth on 2m, there are no Beacons on the 2m-Downlink.

may launch a small British satellite in December from the Svobodny facility in Eastern Siberia near the Chinese border, in an effort to re-introduce Svobodny as a spaceport. Some Russian military officials have been pushing Svobodny as an alternative to the Baikonur Cosmodrome in Kazakhstan, a former Soviet republic. The 300 kilogram Minisat, built and owned by Surrey Satellite Technology Ltd., will be launched board a Rocket vehicle from a missile silo. If Svobodny is not selected, the launch will occur either from Baikonur or the Plesetsk site in northern Russia, according to Surrey officials.

WOCY

Jim McKim, WOCY, became a Silent Key on 14th February.

Jim was born in 1915 and first licensed in 1933. He had been involved in satellites since the launch of Sputnik I in 1957.

Your chance in Surrey

The University of Surrey have a vacancy for a Senior Lecturer/Reader In Satellite Engineering. This new post will provide a senior academic deputy to the Professor of Satellite Engineering (Martin). Applicants should possess a PhD and substantial research experience relevant to satellite engineering in one of the above fields.

Colloquium '96

The 11th AMSAT-UK Colloquium will be held at Surrey University, Guildford,

Surrey, U.K., from Thursday 25th to Sunday 28th July 1996. Current intentions are to devote the Thursday to international and IARU matters, and to structure other subjects across the following three days. There will be a barbecue on the Friday night.

Amsat-UK invite authors to submit papers, about amateur radio space and associated activities, for this event; we normally prefer authors to present the papers themselves rather than having someone else read them in the authors' absence. Abstracts of Papers for presentation should be submitted by 15th May and the full submissions should be received by 15th June in order that the Proceedings document be available to participants. Submissions should be sent to: Chris

Jackson, G7UPN via Internet at: G7UPN@amsat.org or direct on UO-22.

AMSAT-UK also invite anyone with requests for program topics to submit them as soon as possible to G7UPN as above, or to G3RWL or G6ZRU (both available @amsat.org and on digital satellites). Colloquium information is available via Internet; the URL is: <http://www.ee.surrey.ac.uk/EE/CSER/UOSAT/new/amateur/colloquium.html>. All other enquiries about colloquium'96 should be addressed to the AMSAT-UK office.

The Monday and Wednesday evening nets (7.00pm 3.780MHz plus/minus QRM) are in danger of being dropped - join in or lose.

For further information about AMSAT-UK contact: AMSAT-UK, c/o Ron Broadbent MBE, G3AAJ. 94 Herongate Rd., London, E12 5EQ. A large SAE gets you membership info. SWL's are welcome. All new joiners get the USAT-P tracking program on 5 1/4in disk. G3RWL can be reached via Internet as g3rwl@amsat.org.

Latest Keplers

AMSAT-UK Keplers are put out on packet fortnightly, sent to KEPLER @ GBR. The latest satellite Keplers as supplied by AMSAT-UK are also available by automatic fax retrieval from the 24hr Ham Radio Today fax-back line, 01703 263429 (use with a personal DTMF, i.e. 'touch-tone', phone/fax keypad - follow the voice menu), request fax document 41 from the satellite menu for this month's. You can also get a copy in the post by sending an SAE together with the corner flash from this page to the Ham Radio Today Editor, marking your envelope 'Keplers' and stating whether you want *all amateur* satellites (one A4 page) or *all* satellites (10-15 A4 pages - you'll need an A5 or A4 sized SAE with postage for 100g for this).