HRT

HAM RADIO TODAY

Incorporating SCANNER INTERNATIONAL

AUGUST 1992 £1.70

DLA-80H 2M/70CM LINEAR AMPLIFIER REVIEWED

PACKET RADIO beginners guide to getting on the air

USING EX-PMR RIGS FOR VHF AND UHF – a low cost start

AN ARGUS SPECIALIST PUBLICATION

NOVICE • PACKET • REVIEWS • PROJECTS • SATELLITES

HRT HAM RADIO TODAY

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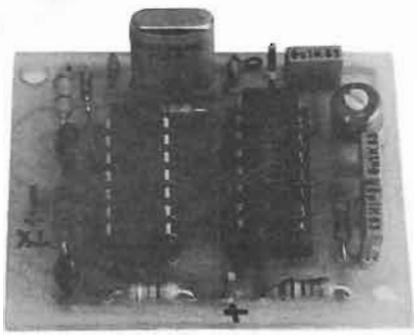

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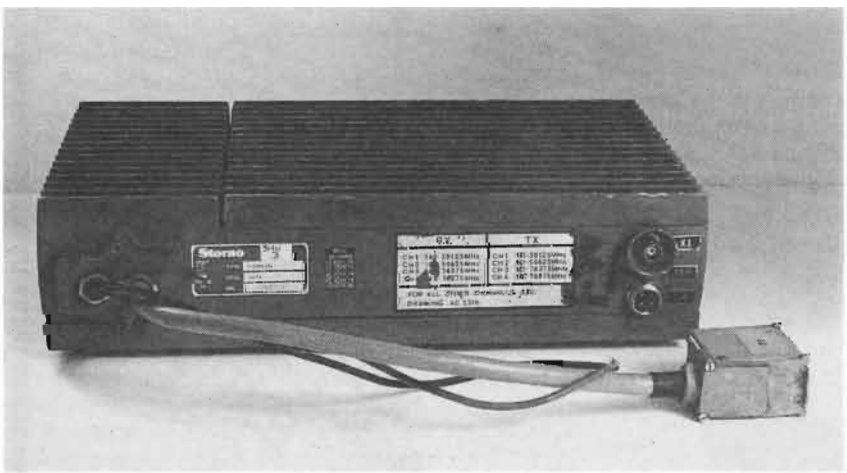


AR 1500 Reviewed in Scanners International this month

CQ de G8IYA

Recycle that Radio!

What's this? Is Ham Radio Today suddenly jumping on the bandwagon and 'going green' by talking of recycling? No, radio amateurs have been doing this for years. 'What!' you say? Well the great radio club tradition of the 'junk sale' is a typical example, and what about the radio rally with loads of surplus 'junk' and secondhand 'good stuff' weighing down the bring-and-buy trestle tables!

You may say the days of 'real junk' at rallies, especially the larger ones, has gone. But at a significant Midlands rally last year, one trader, who had an *entire* marquee to himself, was selling *only* surplus equipment. I fondly remember the wondrous time we had inside there, surrounded by goodies galore. Chris G4HCL came away with a pile of ex-PMR gear to convert for packet, plus a genuine tested Avometer to align the sets with, from the pile of 200-plus Avos all going at £10 each. Outside the marquee was a special rally offer, three Firestreak missiles stood for sale. The sign next to these said 'Normal price £xxx, special rally price £xxx, Access/Barclaycard accepted, give us your coordinates and we'll deliver by airmail, sorry no export orders!' We understand at least one was sold on the day, I bet that would have looked good atop an azi/ele rotator system. Could this have been an alternative method of preventing TVI complaints?

Seriously though, ex-professional gear continues to be available in great profusion, the sources of radio gear seem to be never-ending as PMR users constantly upgrade their radio systems to keep in tune with current regulatory requirements. This equipment often reaches the amateur market for, literally, scrap prices, as many professional radio users simply can't utilise the gear for anything else. If you have 'friends in the right places' you can often get it for free. My OM once was asked how much he'd charge to take away a load of working gear suitable for 2m, as the PMR dealer in question would otherwise have to pay for a skip to dispose of it, coupled with the labour cost of piling it all in the skip!

Dealers sometimes 'see the light' and either take out a stall at a rally, or arrange for someone to do this for them. Their only interest is 'getting rid of the lot' for whatever price the market stands. With 'typical' amateurs at a radio rally, you can bet that isn't very high, but as long as it pays the wages and transport involved, they've saved themselves the cost of alternative disposal.

Knowing what gear to look for is either down to individual experience, or of course to looking through your back copies of HRTs before you go, noting down the various identifications of the rigs you're interested in. Add a couple of crystals and/or a plug-in IC, and one of these sets can often be put onto 4m, 2m or 70cm at very low cost indeed.

What was that, a *plug-in IC?* Yes, as time goes by, replacing crystals to change frequency on these rigs is likely to become a thing of the past. I already have a UHF PFX in front of me, a 99 channel synthesised 70cm handheld, together with its accompanying conversion article just waiting to go into HRT. Another one sat here is the MX294, a car radio sized synthesised 25W VHF FM mobile. The last one which my OM bought from a PMR dealer cost him £25, working, (he runs it at 45W output). Either of these sets just need a replacement IC (readily available from HRT sources), and about ten or fifteen minutes of tuning (the record is two minutes), to give you an instant amateur band rig.

Has this aroused your interest? The details are coming, in HRT.

Ham Helplines

The Editorial staff often receive queries from readers, and I know that my contributors are sometimes 'snowed under' with requests for specialist technical help. We're very pleased to offer assistance if we can, and I know that G4HCL has photocopied numerous PMR circuits for readers. As well as requests for help, there's also a lot of other amateurs out there who'd be pleased to give help in line with their knowledge and interests. Our readers who've taken advantage of our *Free Reader's Ads* in asking for help, circuit information, or whatever, can testify to this! From next month's issue, you'll see an additional panel linked to our Free Readers Ads section, that of 'Helplines'. If you need help, just write your needs down. Maybe you need local assistance in getting that ex-PMR rig going (we've lost count the number of times we've been asked this!), or to repair your AR88. Also, if you have time on your hands and you'd like to *offer* help, either your time or maybe you have some old gear or even radio books and magazines going spare that you'd like to offer 'free to a good home' rather than throw away, then be our guest! Perhaps your local PMR dealer friend might like you to publicise the fact that he'll give away that heavy pile of ex-PMR gear lying at the back of his store, as a 'job lot'. Let us know! Let's keep the 'recycling' tradition going!

HRT 'Amateur of the Year' 1992/93

The inaugural 'HRT Amateur of the Year' award was a resounding success, and many readers will agree it was won by a very deserving person. It's an annual award, and the time will soon come again for *you* to think who *you* would like it to be won by next. You'll be seeing an entry form in a future issue of HRT, and we'll be having them on our stands at the major radio exhibitions we attend. Maybe your friend down the road who's been so helpful could be a worthy contender? The award is granted for voluntary work in the amateur radio field, and we're again planning a significant radio prize for the winner along with our inscribed shield, to be awarded early next year. The first proposer of the award winner will also receive a 'token' gesture. The only people who aren't eligible for the award are direct employees of Argus Specialist Publications, i.e., us. Get your thinking caps ready!

LETTERS

Letter of the Month

Dear HRT,

I keep hearing that dealers are having a hard time in the current recession, so how come the prices of transceivers have increased by about double inflation, and why do all dealers seem to sell at the same list prices? Where is the price competition needed to attract business?

Incidentally, us class Bs have had 50MHz for some while now. Why then is there still only one base transceiver that covers all the class B frequencies? I refer to the Yaesu FT736. Every new 50MHz unit seems to be linked to 28MHz. Since very few of us can afford £1400, it seems about time a new basic all mode design was produced.

S. G. Mitchell, G1WBN.

Editorial comment;

We live in a competitive world, if you don't like the price, you can vote with your feet! However, if you examine the relative cost of transceivers, compared to sets many years ago, I'm sure you'll find the relative price has actually come down, taking inflation into account. Lower-cost production is called progress! But talking of progress, I'm sure that somewhere along the way, other equipment manufacturer's have also seen the need for a VHF/UHF multi-band transceiver. 50MHz is often linked to 28MHz in 'up market' sets as cross-band operation between these two bands is very common, but there are lower-cost 50MHz-only all-mode rigs such as the FT-690 and IC-505 around. Maybe we'll be seeing more transverters on the market soon!

Dear HRT,

We were absolutely delighted with the write-up of the League plus photographs in HRT. We cannot thank you enough in taking the interest and time to do this for us. I have had a lot of enquiries following this article and hope to enrol some more new members. I have also heard from a member who was in the league 37 years ago and eager to re-join us, and another ex-member who was one of the founder members whose membership number is G-52. Your article has certainly served as a reminder to the 'old codgers' Hi.

Evelyn May, G-17197/G0OZI,
Hon. Secretary, International Short Wave League.

Editorial comment;

It's great to see that interest has been aroused in the ISWL. As members ourselves, we've found the ISWL to be a very friendly organisation, and the quick receipt of two large bundles of QSLs via the ISWL QSL bureau (many with friendly welcoming notes) from ISWL members, both licensed and SWLs, after calling into an ISWL net for the first time shows that an almost 'family feeling' is there amongst the members. As readers know, we actively try to promote groups and clubs in HRT, at least those who are doing something! We'll keep on trying!

Dear HRT,

With reference to Mr. Leeming's letter in the June 92 issue of HRT....I agree, except his premise regarding Incentive Licensing.

Does he really consider this proposal valid? Is he aware of the catastrophe it caused when introduced in the USA? Introduced back in the early 60s, not only did it decimate the American amateur radio industry, it almost killed their amateur radio stone dead. They're still recovering from the after shock.

Some might say that a Novice licence is nothing more then 'incentive licensing' through the back door...and they might be right. Still, if we all wish to save amateur radio from the jaws of extinction, it's probably a brilliant idea...right?

Although not totally relevant to Mr. Leeming's letter, one last thought. A few years ago a very prestigious amateur radio publication stated in its editorial pages, that valves would remain the de facto device for amateur radio applications, period. Transistors were merely a passing fad. Thank goodness that such entrenched views are slowly becoming relics of the past. Don't become complacent though, the 'dinosaurs' hate change.

Ray Howes, G4OWY.

Editorial comment;

The USA recently introduced another 'step' in incentive licensing, the 'no-code' licence (i.e., no CW test requirement). The resultant increase in licences issued there has surpassed all recent records. People learn, and fortunately they sometimes move with the times. Apparently incentive licensing hasn't always 'killed' amateur radio there, maybe as you say people's entrenched views really are becoming 'relics of the past'!

Dear HRT,

Having read your article 'Changes to the UK licensing? It's up to you!', I have sent my views to Karen Everett, Secretary of the Novice Licence Review Group.

One of the main problems with the Novice Licence, is that not everyone has the opportunity to sit for this licence due to; (1) living out far and beyond a training centre, and (2) not every town with radio amateurs within it, are willing to give their time, pity but that's the way of life. Let's just not think of the younger generation, but consider the middle aged class, the disabled, and those without means of transport,

£10 for the Letter of the Month

Do you have something constructive to say on the state of amateur radio today? Perhaps you'd like to put your viewpoint to the readers, get some discussion going, or give an answer to one of the issues raised? We'll pay £10 for the best letter we publish each month. So write in with your views, to Letters Column, P.O. Box 73, Eastleigh, Hants SP5 5WG.

which can include the younger generation.

My proposal to the RA is that a postal course should be considered, let the RSGB run the course if they so wish (I'm not against private enterprise). After having completed the postal training course, then one could make the effort to sit the examination at the nearest centre.

At this moment in time, I am sitting for the class B amateur licence in May this year at my local adult evening class training centre. Unfortunately as yet, they do not do the Novice course. I am registered disabled and hoping that I pass first time. Including night class and studying at home, I have put in an average of 1000 hours since last September to the end of April this year. Yes, I have learned a lot and do not regret it, after being a SWL for the past 30 years.

If I (dare I say it) fail, then I would seriously consider a Novice course, that is if there is one locally. My nearest is 10 to 15 miles away, there and back is roughly 30 miles, that is if there is a place available. It could entail bad weather during the winter months, which is enough to put anybody off who doesn't live locally, and who is not on a bus route after the hours of darkness. Should we not consider those who have failed, or dropped out due to finding it hard to study, and including the perhaps failed Novice.

Whether it be a Class B or Novice B, let us first pass one thing at a time, when we have had time to relax, then no doubt the CW will follow. In my case I would not consider HF other than perhaps QRP, but having said that, I would still like to pass the Morse test, as it would be there should I ever need to use it.

One last word, if I am successful in passing the class B, and my health doesn't worsen, and having under gone the 12 months as a licensed amateur, I would very seriously consider taking a class of Novices within my local area. Yes, they are there waiting for the opportunity, why not pass one's free advice to the young and old.

M. B. Marsden

Editorial comment;

The Novice licence system is under review, and we've found on many occasions in the past that prospective Novices do often find it difficult to attend a course. It's up to amateurs to provide this course, at the moment, and unfortunately some either just can't be bothered or don't wish to do this.

Dear HRT,

Two problems, relating to our hobby. The inability to attract young people and deliberate interference, both of which are by the day commented upon, need to be addressed with urgency. I believe the problems are interrelated.

I am not suggesting for one moment that Novices or any particular class is responsible for interference, only that in my opinion, the easier you make it to obtain the full licence, the less merit it has. We need to return to the self-respect, the tolerance, the sense of achievement, the privilege and trust, that went with being a Radio Amateur. Pleasure and reward is, almost always, directly proportional to the work and dedication you put into the activity. If it's worth having, it's worth striving for. We need Quality and Quantity without compromising one for the other. It can be done, it must be done. It follows therefore that incentive licensing, skillfully formulated, must go, at least some of the way to attain these objectives.

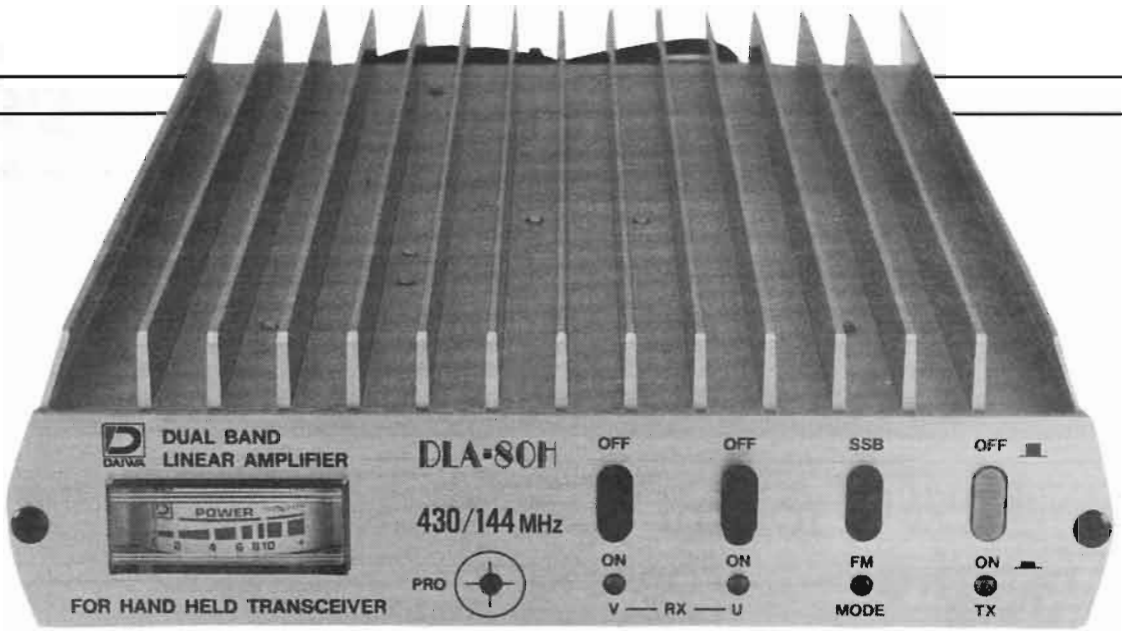
Sorry but I disagree with G3LLL's comments regarding the advisability and need, of having within our hobby, (linear?) amplifiers. I am though, very much in tune with his thinking on incentives. As Harry well knows, 400W from a badly driven or incorrectly loaded amplifier, may well be S9 splatter at some DX point. It would still be S8 splatter at the same point, when radiated from an incorrectly adjusted 100W TX, and S6 from a 10W one. No, a 10W limit would not cure the problem, only relieve some of the symptoms. If you don't believe me, just listen to an overdeviated 5W packet signal on 2m. To effect a cure you must combat the root cause. Whilst modern rigs are exceptionally clever, they aren't yet idiot-proof. Have you ever tried telling someone, that the signal from his £3000 black box is not quite right? Whow! Yes knowledge, the incentive to progress, a pride in, and recognition of achievement is essential if this hobby is to regain it's deserved status.

If you do not agree with the premise that the licence is too easy to acquire, is it not then perhaps too difficult to forfeit?

Bill Ricalton G4ADD.

Editorial comment;

Lot's of thought, what do our reader's think? The RA are considering a revision in the licence, let's have your views!



Easy-to-use front controls

Daiwa DLA-80H Review

G4HCL reviews a high power dual band linear to match your dual band portable

Dual band portables seem all the rage nowadays. Not without reason, as the ability to operate on both 2m and 70cm, listening out for calls on both band simultaneously, lets you 'get in' on both the local and the area-wide activity in many places. But when you 'go mobile', the urge to increase your output power somewhat tempts the use of a dedicated high-power mobile. You *could* use your dual band portable with an in-line amplifier, but for 'automatic use' this often restricts you to using just one band unless you add an extra pair of diplexers. Once you've gone to that length, then maybe another amplifier (for the other band) could come useful, then maybe a preamp to boost receive signals, then maybe.....where does it stop?

Daiwa seem to have been looking at these (typical?) amateurs, and have come up with a nice looking box housing a 2m 80W linear, a 70cm 60W linear, individually switchable GAsFET preamps for each band, and auto-band sensing and full-duplex (i.e., simultaneous TX/RX) to boot! It looked *very* interesting, and a phone call quickly brought a review sample.

Table 1

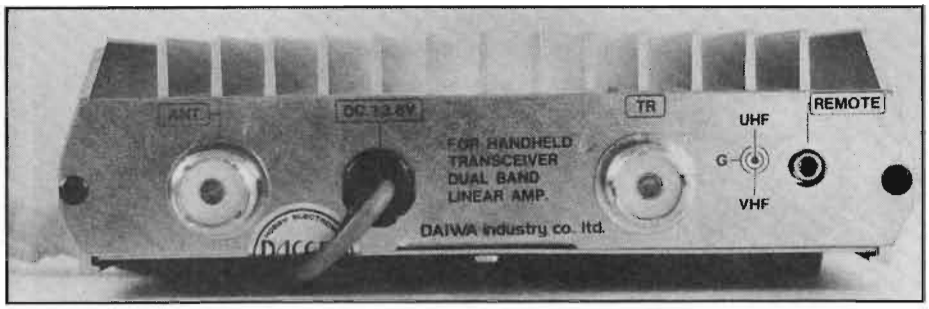
Typical Input/Output Power (manufacturer's figures)

Attenuation Range	Input Power	VHF Output	UHF Output
1 (0.5W-6W)	0.5W	25W	20W
	2.0W	60W	45W
	5.0W	80W	60W
2 (6W-12W)	7.0W	70W	55W
	10W	80W	60W
3 (12W-25W)	15W	70W	55W
	20W	80W	60W
	25W	83W	62W

Features

The DLA-80H comes in a smart gold-anodised box (see this month's front cover inset photo) measuring 160mm (W) x 45mm (H) x 238mm (D). Connecting it up couldn't be simpler; use the supplied terminated coax lead to connect your portable's aerial connector to the amplifier, connect your mobile/base aerial lead to the SO- 239 socket on the back of the amplifier, and the red and black DC cables to your battery or power supply. Switch it on, and that's it.

Depending whether you're transmitting on 2m or 70cm, the appropriate linear amplifier circuitry is automatically used. It even adjusts itself to the power level you're transmitting into it, switching in one of three TX attenuators at its input. Either, both, or neither of the separate 2m/70cm preamps may be used on receive, with the appropriate receive preamp staying in circuit when you're transmitting on the other band.



The rear panel

Power Output

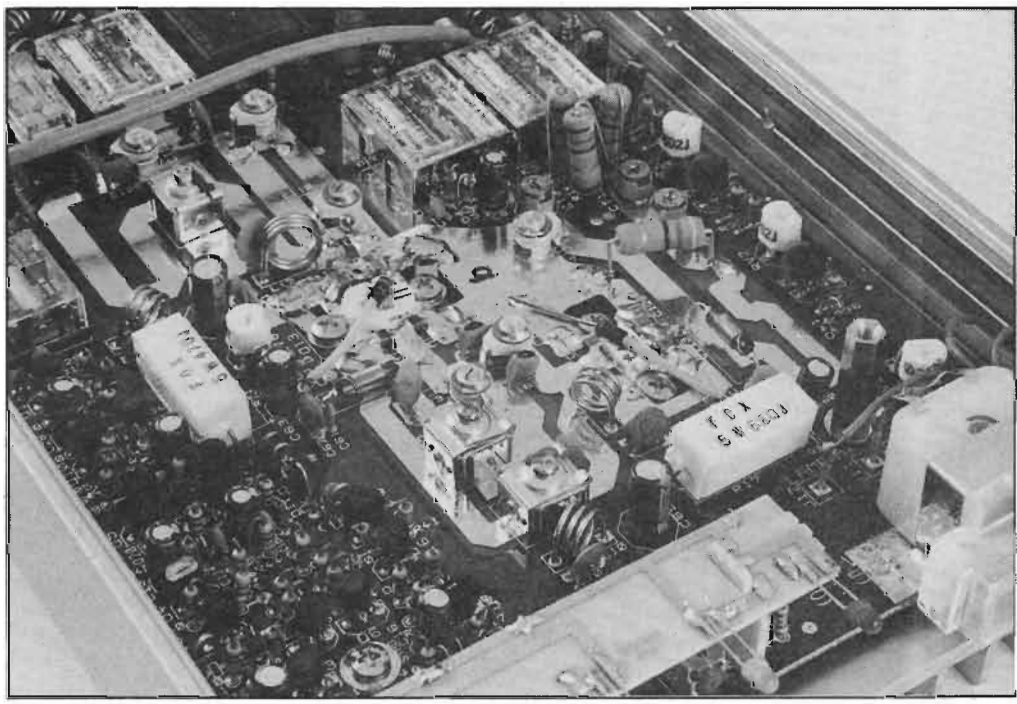
The amplifier accepts anywhere between 0.5W and 25W of drive power, giving up to 80W output on 2m and up to 60W output on 70cm, depending on which internal attenuator has been automatically selected together with the actual power level you're using. Hence you can use the amplifier with your portable on either high or low power settings, as well as with a 10W or 25W dual-band mobile rig to gain that bit more output. A typical input/output table, as provided by the manufacturer, is shown in Table 1.

Together with FM use, the amplifier, being linear, is also capable of being used on SSB. The auto-attenuator compensates for this incidentally, selecting the peak power level for the attenuator setting. An 'SSB/FM' switch on the front selects a 'hang time' of around a second before the amplifier circuitry goes back to receive, and you can also use 'hard' PTT switching to save the relays chattering and the loss of parts of the first syllable during pauses in speech on SSB. A three-terminal 3.5mm jack socket is provided on the amplifier's rear panel for independent 2m/70cm TX switching.

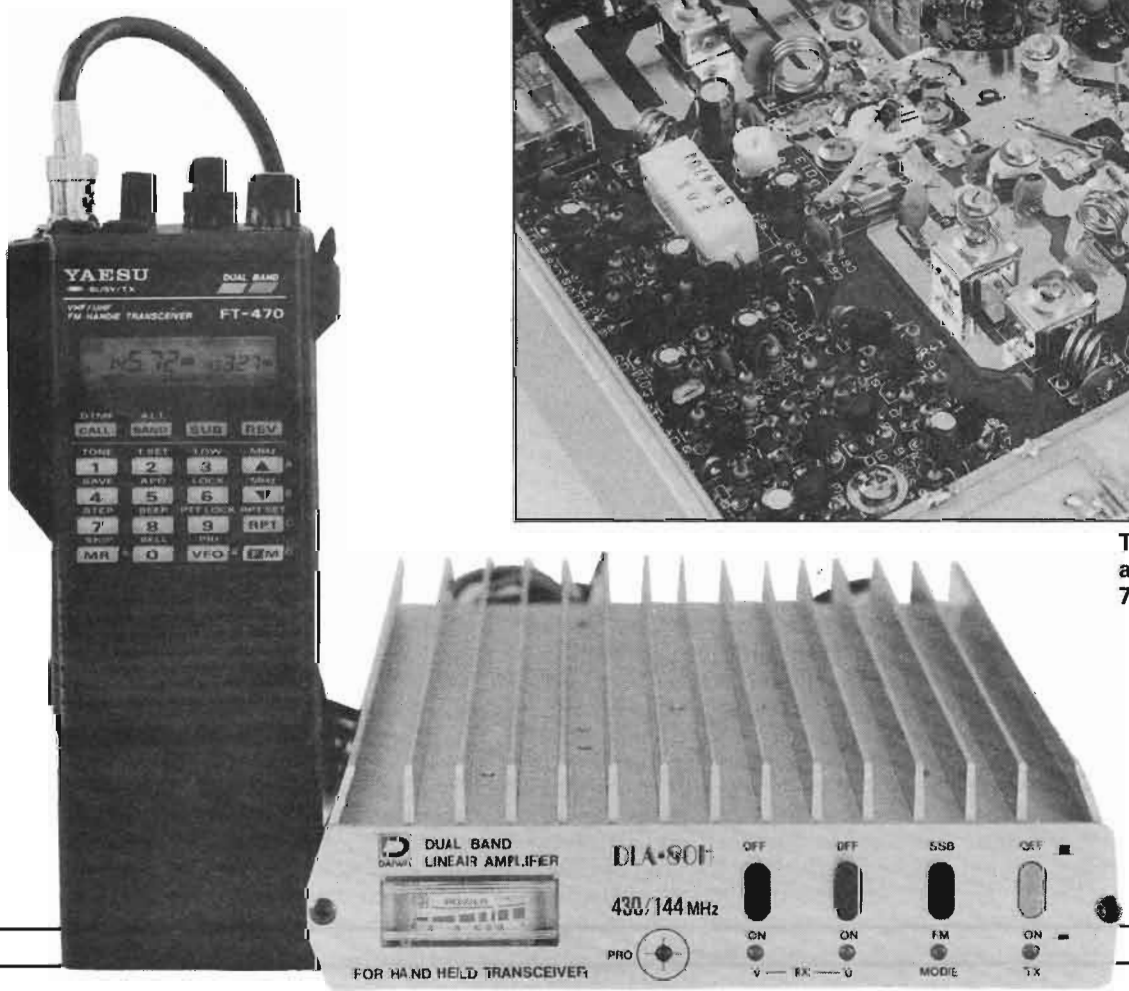
On the Air

I tested the amplifier in conjunction with an FT-470 2m/70cm portable, giving a typical use. Although it took me less than 5 minutes to get on air from home after taking the amplifier out of its box, I was a little dismayed to find the power lead was rather short, less than 60cm in fact, which would certainly have caused me problems in a mobile installation unless I had a supply of additional cables and connectors. That aside, following my first evening's 'on air' test, I was rather amazed at the 'new' 70cm repeaters I could suddenly work through, with good signals. I suppose that's what comes of otherwise running a measly 2W!

I found the 70cm preamp in my setup made only a very slight improvement to readability. The 2m preamp normally gave no discernible improvement, and often even caused me problems due to receiver overload from strong out-of-band signals when I was operating in 'RF congested' areas. This, of course, was no doubt due to the very good sensitivity, but limited strong-signal handling performance (as it was designed for portable use with it's set-top aerial), of the portable receiver I was using. 'Older' sets would of course



The power transistors are used on both 2m and 70cm



gain a greater benefit from the very low noise figure of the GAsFET preamps. Occasionally I found that when I transmitted on the lower part of 2m I had some receiver desensitisation on 70cm when listening to a weak signal with the preamp switched in, this was probably caused at the receiver end because of third harmonic noise sidebands. In the end I normally ran with the preamps switched out, this always superb twin-band operation.

The transmit amplifiers performed very well on both 2m and 70cm, boosting my signals as I'd have expected. In 'normal' use, for example having the odd QSO or two rather than an extended 'ragchew', the heatsink kept quite cool (i.e., it didn't start to burn my hands when I touched it!) even though the review period coincided with a bout of rather hot weather in my location. Long overs did (of course) cause it to become rather hot, so I had to make sure it was well ventilated, and out of accidental reach of passenger's fingers, whilst keeping the front panel buttons within my grasp.

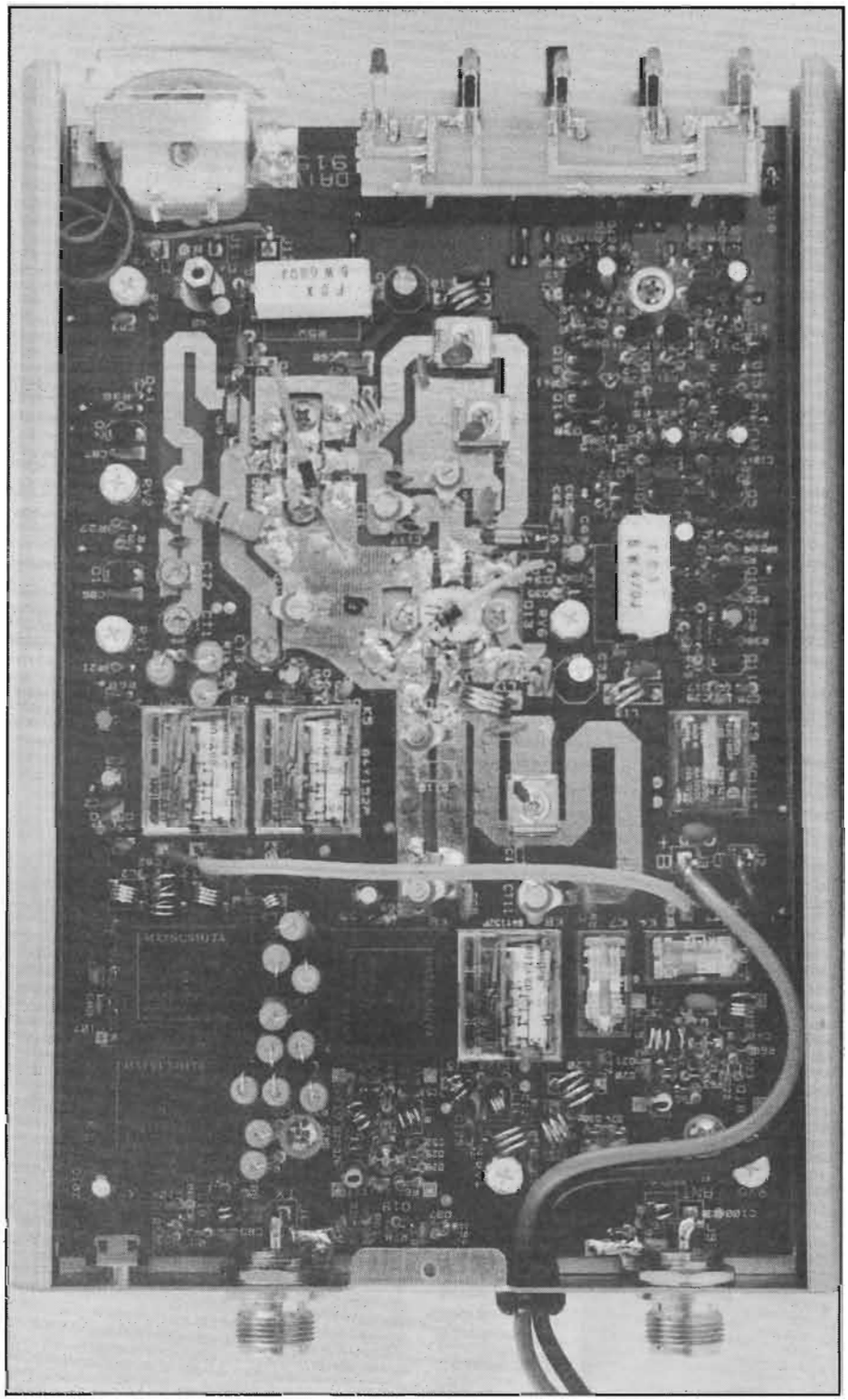
Each of the front panel buttons had LED indicators which I found were easy to use on the move. A relative power output meter is fitted next to these, and is backlit when the TX amplifier is switched in. A minor 'quirk' I found was that, with the mode button switched to FM mode, and when all the RX/TX amplifier facilities were switched off the adjacent LED *still* remained lit, meaning one more button to press to extinguish this.

Insides

A glance inside the case shows the large amount of circuitry contained, little wonder with so much going on inside! The transmitter amplifier uses the same driver and PA transistor for amplification on each band, separate tuned circuits being used on the input, output, and in parallel between the two, a novel approach! Integral 2m/70cm diplexers are used on both the input and output to separate the signals, with several relays used for TX/RX, preamp, and attenuator switching. A reverse power level detector prevents damage to the amplifier due to high VSWR, and an overvoltage cutout similarly protects the devices should your power supply or battery voltage go too high.

Laboratory Tests

I tested the amplifier with drive levels of both 2W and 5W, to represent typical power levels in dual band portables found on the market nowadays. Slowly increasing the drive level above 5W caused to output to steadily increase to around 90W on 2m and 70W on 70cm, until the input attenuator then correctly switched levels to reduce the input. The overvoltage protection tripped in at just above 16.0V. A quick IMD test with a two-tone 3W PEP source on 2m and 70cm (a 25W dual band transceiver turned down in power to give good linearity) showed the output to be reasonably 'clean', comparing this to previously measured two-tone IMDs from typical 3W all-mode 'transportable' rigs showed it would normally be the transceiver, not the amplifier, to be the limiting factor.



Inside the box

Conclusions

The Daiwa DLA-80H should find itself popular with owners of dual-band portables who'd like to 'extend their horizons' somewhat, especially whilst mobile to equal, and often better, the

HRT PHOTOCOPIES

HRT has been publishing a great many interesting and valuable reviews, projects, and features for 10 years now. Although back numbers are available for the past twelve months, ASP can supply photocopies of individual articles. The cost per article, regardless of their length, is £1.50. Please note that projects published over several issues must be ordered as a series of individual articles, each for £1.50

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LABORATORY RESULTS

2.0W Drive power;

Output power and DC current drawn, measured with amplifier output terminated with a 50 ohm dummy load.

Freq MHz	10.8V supply	13.8V supply	15.6V supply
144	28.0W/7.2A	54.0W/10.3A	77.0W/12.0A
145	25.5WQ/6.5A	49.0W/9.5A	72.5W/11.1A
146	23.0W/6.0A	45.5W/8.8A	68.0W/10.4A
430	26.5W/7.4A	46.0W/10.3A	59.0W/12.0A
435	25.5W/7.7A	44.5W/10.8A	57.0W/12.7A
440	22.5W/7.7A	41.0W/10.9A	52.5W/12.7A

5.0W Drive power;

Output power and DC current drawn, measured with amplifier output terminated with a 50 ohm dummy load.

Freq MHz	10.8V supply	13.8V supply	15.6V supply
144	51.0W/9.7A	79.5W/13.1A	110.5W/14.9A
145	47.5W/8.9A	74.0W/12.7A	106.5W/13.9A
146	44.5W/8.4A	70.0W/11.7A	99.0W/13.1A
430	39.5W/10.3A	58.0W/12.9A	63.5W/13.5A
435	36.0W/10.3A	59.0W/13.8A	64.0W/13.5A
440	34.5W/10.3A	63.0W/14.4A	64.5W/14.4A

RX Preamp	Gain
145MHz;	17.4dB
435MHz;	13.4dB

Harmonics

Measured with 5.0W drive and 13.8V DC supply voltage

	145MHz	435MHz
2nd	-57dBc	-64dBc
3rd	-65dBc	-66dBc
4th	-80dBc	-68dBc
5th	-78dBc	-
6th	-79dBc	-
7th	<-90dBc	-

power output and receive sensitivity of the 'best' dual-band mobiles now available. At a current selling price of £339, a few sums show that you almost get a 'free' handheld if you're in the market for a high power dual band rig, and you don't mind using a handheld (with its often poorer receive strong-signal handling performance) and speaker-mic, instead of a dedicated mobile rig whilst on the move or at home. The unit can, of course, also be used as a 'performance upgrade' for older dual band mobiles and/or base stations, although I feel the price may start to become significant here.

My thanks go to South Midlands Communications Ltd. for the loan of the review equipment.

Low Cost Rigs for VHF and UHF FM

Chris Lorek G4HCL shows how using ex-PMR equipment can give you a low-cost rig for VHF or UHF

What type of rig do you need for VHF/UHF voice or packet? Like many amateurs do you think an all-singing, all-dancing synthesised (and subsequently rather expensive) set is the only answer?

Voice

You may use your 2m or 70cm portable rig on just one or two channels, i.e., a local repeater and a 'chat channel', indeed many amateurs just use their local repeater, particularly on 70cm. For country-wide travellers, a multi-channel scanning set is of course a great advantage, but a low cost crystalled 'stick it in and leave it' rig can often prove useful to supplement an expensive 'do everything' rig.

Packet

As a packet rig need not have its frequency changed, nor its volume or squelch altered, and if you're a confirmed 'round the clock' operator (i.e. you also leave you station running as a packet digipeater or node for others to use, or stay logged into a DX PacketCluster) it needn't even be switched off. You may now have guessed, you hence don't need to have it within reach or even within sight, unless of course you want to.

So instead of tying up one of the latest Japanese 'wonder-boxes', you may find you can easily use an ex-PMR (Private Mobile Radio) transceiver, this can cost you just a few pounds. Use the money to then buy yourself a multimode 'wonder-box' and work some DX on SSB, or use your 'main' rig at home and stick an ex-PMR rig in the car or have an extra rig in your pocket - it all boosts activity.

But I hear the cries right now - 'I can't convert one', or 'I don't know what to look for', or 'I never see them on sale' and so on. Well this brief article can't give you *all* the information you need, this would fill a book (indeed it has done, the *Surplus 2-Way Radio Conversion Handbook* published by HRT's sister company Argus Books), but I hope to at least provide some information to 'whet your appetite'.

Types of Rigs

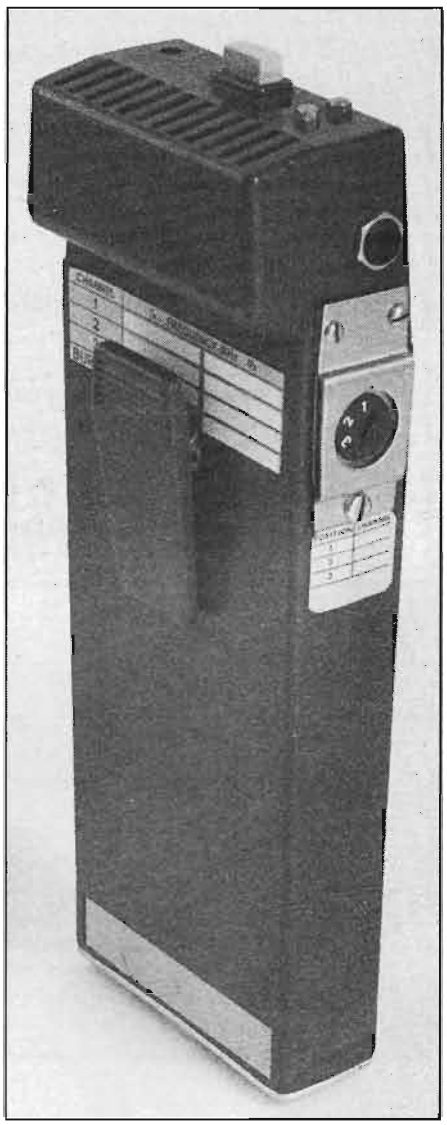
As PMR sets become redundant through changes in mandatory Radiocommunications Agency specifications (either frequency range or technical parameters), many sets can't be economically re-used. The result is that they're often sold for 'scrap value' only. PMR technical specifications *do* change, such as the move from 25kHz to 12.5kHz channel spacing on UHF PMR, and rather than modify already-old sets the opportunity is sometimes taken by the user to replace the sets instead. Other users have found their national frequency allocations have changed, a typical case being the recent move from 107MHz as a 'Public Utility' band in the UK to that of FM broadcasting, the old sets then being useless for any commercial application. This is where we amateurs come in!

Types of Sets

The vast majority of ex-PMR rigs on sale nowadays are those from the early company of Pye Telecommunications (now owned by Philips). There have also been a smaller number of others available on the surplus market, such as those from Motorola/Storno and Burndept, and this percentage is starting to rise (PMR dealers may now be finding they have an alternative use rather than the rubbish skip!). There are mobile sets, portable sets, base station sets, crystalled and synthesised, covering a wide variety of uses. Rumour has it that a large number of synthesised UHF portable sets may become available in the near future - guess what we're featuring as a HRT conversion project soon!

Identification

Each set is often part of a 'range' of equipments of the same name, so don't be tempted to think that, for example, an 'Olympic' you see on the rally stand which looks identical to your friend's 70cm rig will be OK for your local 70cm packet or repeater channel. It may easily be an 85MHz AM rig! How can you tell the difference? Look at the metal serial



number plate which is fitted on every set, if it hasn't got one then don't waste your money. For example on mobile rigs, you'll often see an 'equipment type' panel, Table 1 gives an example of Pye mobiles found on the surplus market.

Avoid the AM sets if you want one for packet or the FM 2m/70cm channels of course, however any of the others will often be capable of use on one of the amateur bands. It simply isn't worthwhile, in my opinion, attempting to convert an AM set to FM as quite often the extra cost of components in-

Table 1

Typical mobile transceiver identification codes

		VHF AM	VHF FM	UHF FM
Westminster	(Dash)	W15AMD	W15FMD	
series	(Boot)	W15AMB	W15FMB	W15U
Europa series			MF5FM (8W)	MF5U
			MF25FM (25W)	
Olympic series		M201	M202	M212
M290 series		M293	M294	M296

volved can outweigh the cost of an FM set in the first place. Also, make sure you have the information needed to 'convert' it, either from a published article or from details supplied with the rig. Unless you're an expert in these matters, you can waste a lot of time and money in trying to convert an 'unknown' set!

But which one to choose, and will it even *need* 'converting'? Some sets are made to operate on bands closely adjacent to, or even including, the amateur bands. These will only need a couple of crystals and a re-tune to get going, nothing else. To identify the band, on any set (mobile, portable, or base), take a look at the frequency or 'code' section of the serial number plate. An example, again of mobile Pye rigs seen on sale, is shown in Table 2.

Details on re-tuning most Pye A, B, E, T and U band sets found on sale are given in the 'Surplus 2-Way Radio Conversion Handbook' and many have been published in back issues of HRT (photocopies available). Conversion details for the M and P band Westminsters and Europas, together with 'Mid Band' Storno transceivers, have been published in recent issues of HRT, together with the odd conversion article for 6m use. Conversion details for Burndept, and other Storno, sets have also been published, and we're continuing with the M290 and MX290 series of mobiles, and the PFX series of portables, in future issues of HRT.

What to Look For

For packet, probably the 'best' rig would be an 'E' band set to get going on one of the three 4m packet frequencies, or converted onto 6m, say 50.650MHz, providing you have a local BBS/Node access port on these bands of course, away from the congestion of 2m and, in many areas (such as mine), 70cm. If you get a boot-mount mobile (many others are dash-mount, i.e. self-contained) then make sure you obtain the necessary control lead and control box to go with it before you part with your money, unless you have the information to hand and you wish to 'convert' this to a self-contained unit. Again, don't be tempted to buy an AM set hoping to convert it to FM, in either case with the sets being so cheap (a few pounds) in the first place it's sometimes false economy to do things the 'hard' way.

Where to find the bargains

The best bargains are normally to be found at radio rallies, which is good news as we're now in the right season for them! As a guide, at the last Drayton

Above; The Pye Olympic

Table 2

Typical frequency band codes

A (148-174MHz) - OK for 2m
B (132-156MHz) - OK for 2m
E (68-88MHz) - OK for 4m
T (405-440MHz) - OK for 70cm
U (450-470MHz) - OK for 70cm

You may also see the following;

M (140MHz RX,107MHz TX) - can convert to 2m
P (75MHz TX,100MHz RX) - can convert to 4m

Manor rally I visited, 25W Pye Europas for 4m went for £5 each complete with all accessories, the last Elvaston Castle rally I visited saw piles of Westminsters for 2m (A band sets) go for £2 each, and 70cm (U band) units for £5 each. One bargain I saw at the last Peterborough rally I visited was Olympics for 2m going at two for £1 towards the end, when the trader simply wanted to get rid of the lot to save taking them back! He still had plenty left at the end - makes you wonder doesn't it? The fitted SO-239 aerial socket alone was worth 50p.

You can of course obtain sets by mail order, although these will naturally be at a higher price due to carriage, storage, logistics and other overheads borne by the trader. Even so, you can still get a set for less than around £20-30 this way.

Conversion

No, you don't need signal generators, spectrum analysers or whatever! It does of course help if you have these, but you can easily get away with using just a multimeter and a diode probe, together with help from off-air received signals. The multiplier stages in ex-PMR rigs are normally a 'tune for maximum voltage on such-and-such' test point affair, followed by transmitter alignment for maximum power as indicated on your home-made diode probe (consisting of just four components) connected to your multimeter or your absorption wavemeter (which you may already have to comply with your licence conditions).

The receiver front end you can tune either from an off-air received signal, or in the case of a 70cm rig using the weak off-air 3rd harmonic from your 2m rig tuned to one third of your receive frequency. The local oscillator from a scanner receiver also makes a good weak signal, just tap in the required frequency plus or minus your scanner's IF.

When tuning the set's adjustment cores, what you *must* remember is to never, ever, be tempted use a metallic tool such as a jeweller's screwdriver on the fragile ferrite cores in the set. You'll very easily break them and thus jam the cores, thus causing a considerable amount of heartbreak! As well as this, you'll find that a metal implement will change their tuning point during adjustment, so when you remove this the tuning point will shift. On transmitter strips you may find you'll be adjusting the 'hot' RF side of a PA capacitor, which won't like the addition of an additional metal 'aerial', especially when it's connected to your fingers! If you don't have the correct adjustment tools to hand (they make a useful club purchase) then use a filed-down plastic knitting needle, or even a matchstick, anything as long as it isn't metallic!

It's beyond the scope of this brief introduction to provide specific conversion and alignment details for sets. Tuning details for many varieties of ex-PMR rigs have been published in HRT, and a large collection for Pye rigs may be found in the book already mentioned. Hence details are readily available to radio amateurs. Back issues of HRT are of course available from the 'Back Numbers' department, and the conversion book is stocked by several equipment and component dealers including Anchor Surplus, Cirkit, Maplin, Poole Logic, and many others.

Crystals

A final point about crystals - the things you have to plug into the sets to put them on the channel of your choice (not much point paying a lot more for an expensive synthesised 'black box' for when you only want to operate on one or two channels). Do remember to state the *crystal* frequency you need, *and* the holder size, when you order. As an example, the crystal size for a 6 channel Europa is different to that for a 3-channel Europa, even for the same band. Personally I have always had excellent service from a certain firm often seen at rallies and exhibitions, they know what they're talking about and do at least take the trouble to visit rallies with drawers full of ready-made crystals on popular channels. One other crystal supplier some time ago had the cheek to tell me the reason his firm's crystals didn't work with Pye rigs was that Pye had designed their transceivers incorrectly and hence they didn't suit his crystals! It takes all sorts I suppose!

The Pye PFX

The PF85 with add on speaker/mic

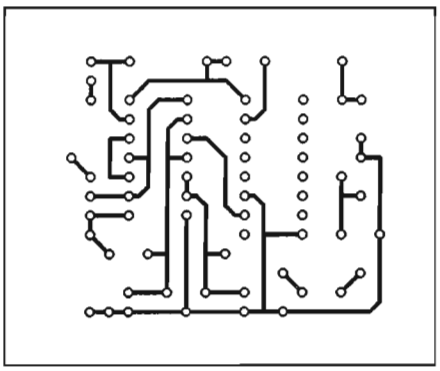
Project

Crystal Controlled Tone Burst

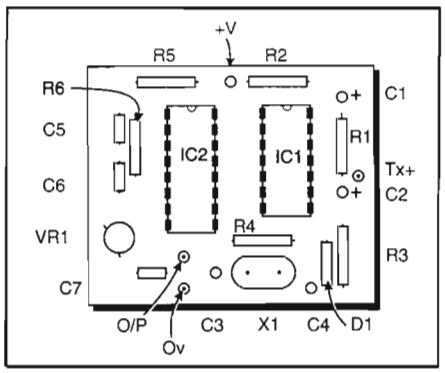
Mike Rowe G8JVE describes a tone burst for your converted PMR radio.

Having converted a VHF or UHF PMR transceiver, the amateur now possesses a cheap alternative to the usual Japanese black box. Unfortunately one feature of the typical Japanese Kenyaicom range which is missing, is the repeater access tone generator. This small unit remedies this, together with ease of operation especially for mobile operation.

I chose crystal control because there is no need for frequency adjustment, and the additional cost of the readily-available crystal (an NTSC colour type, very cheap) and IC2, is only marginally higher than that of a quality multi-turn cermet trimmer, which is required with an RC oscillator. I've designed this circuit also so that if a tone is required to open a repeater, a double PTT press, i.e., on-off-on' will give a tone. For simplex operation, or when a repeater is already open, a simple 'on' of the PTT with a continual press will give no tone.



PCB layout



Components layout

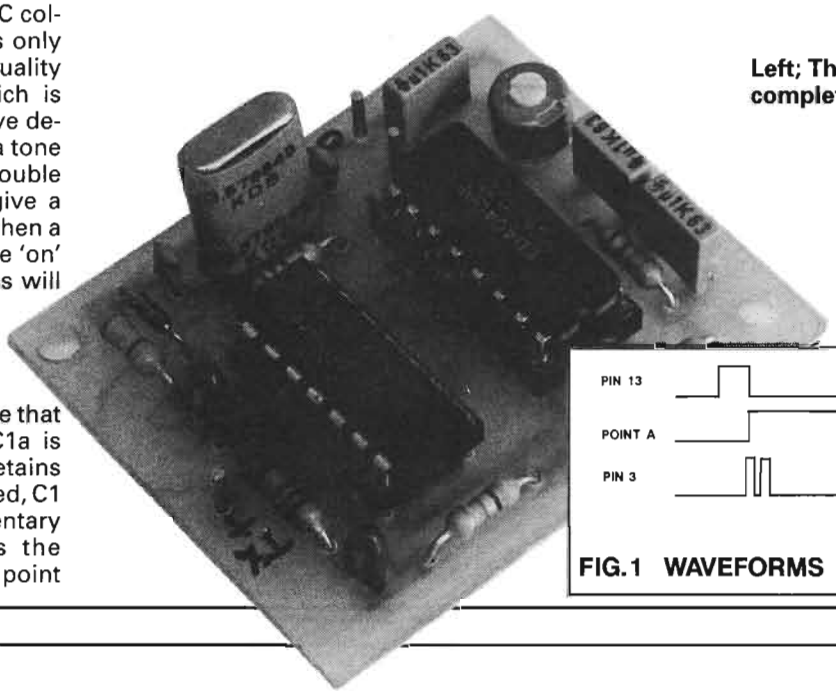
Components list		
R1	1k	0.25W
R2	47k	0.25W
R3	470k	0.25W
R4	1M	0.25W
R5, 6	10k	0.25W
VR1	10k	0.25W
C1, 2	2.2uF	Tantalum bead
C3, 4	22pF	Min plate ceramic
C5,6,7	100n	63V min poly
D1	1N4148	
IC1	4011	
IC2	4040	
X1	3.5794MHz	

Circuit description

Looking at Fig. 2, let's assume that a tone is required. Pin 13 of IC1a is normally high, pressing the PTT retains this state. When the PTT is released, C1 discharges via R1, giving a momentary low on pin 13 which causes the monostable to change state, with point A going high. The time period of the monostable is set by the time constant of C2 and R3, after which point A goes low again.

IC1c oscillates at the crystal frequency with the output connected to one input of IC1d. The other input of this gate is connected to point A. This gate is enabled during the time that point A goes high and passes the oscillator output of the binary counter IC2. This divides the output of the crystal by 211 (2048) to give an output of 1748Hz, which is well within the tolerance of amateur repeaters.

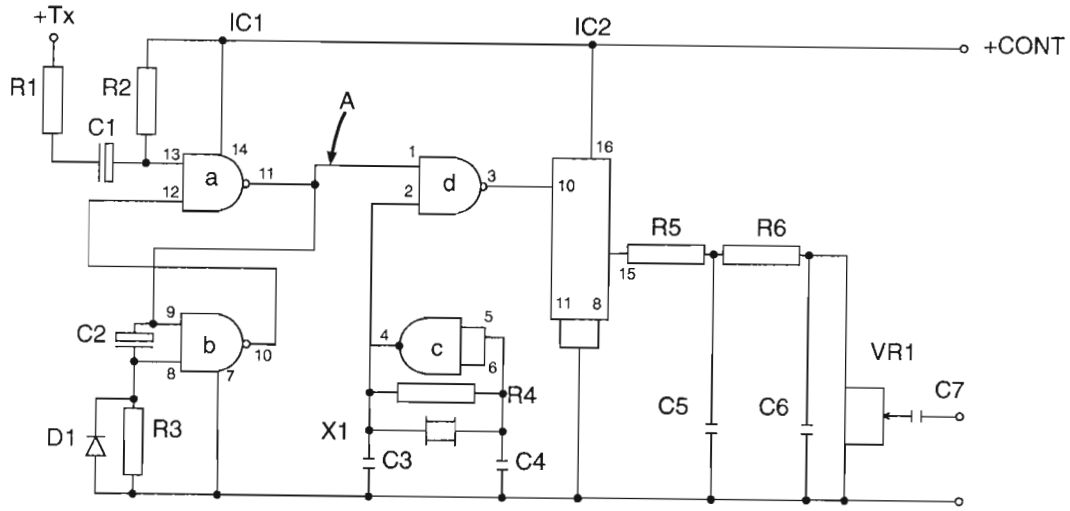
The square wave output from IC2 is filtered by R5, R6, C5, and C6 before the output level control VR1. This filtering together with the shaping within the host transceiver will ensure a sine wave output. If no tone is required, pin 13 does not change state, point A stays low and no tone is generated. Fig. 1 gives waveforms associated with IC1 for checking in case of problems.



Left; The completed PCB.

FIG.1 WAVEFORMS AROUND IC1

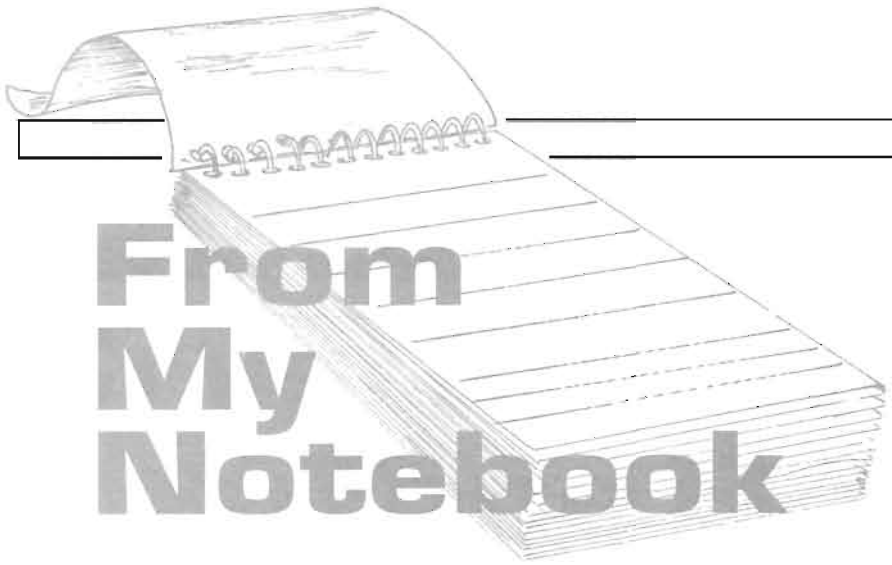
FIG.2



Construction

The circuit is constructed on a single sided PCB. Mount all the components, taking care with the orientation of IC1, IC2, C1, C2 and D1, all of which are polarity conscious. When soldering the crystal X1 into the circuit, do not use too much heat or you may damage it.

Connect the continuous positive voltage supply to a point on the rig which remains positive on both transmit and receive. The transmit positive is connected to a point in the rig which is available on transmit only. These two voltages should be roughly equal to each other. In many of the Pye range, the PTT switches stabilised 10V to the transmit stages, the continuous positive can be connected to the 10V line, and the transmit positive to the switched transmit stages. The output can be connected directly to the microphone circuitry and the tone level set by VR1. As the unit is crystal controlled there is no frequency adjustment needed.



Geoff Arnold G3GSR looks at 'full break-in', and duplex circuitry in surplus commercial rigs

Engineering a radio station, consisting of a transmitter and receiver located immediately alongside one another, is not one of the easiest things to do if you aim to have a slick, conversational style of contact. This is true no matter whether you are communicating by speech or by any of the telegraphy modes.

For speech, a discussion such as you might have with a friend, either face to face or over a conventional telephone, can be achieved only by using a full duplex two-way link. On such a link, you can hear a comment or an interruption not just between your words but even in the midst of a syllable.

Usually, in amateur radio communications, we have to make do with some sort of voice-operated switching (or key-operated switching for telegraphy) between transmit and receive. You can still hear when the person at the far end is trying to interrupt, but only in pauses in your speech or between characters if sending Morse. Many of today's rigs offer so-called 'full break-in', where the switching time is so short as to be almost unnoticeable to the human ear.

If you're planning to marry together a separate transmitter and receiver into your radio station, then the engineering of the changeover arrangements is up to you. In the following, I've assumed for the sake of simplicity that it's a Morse telegraphy system using a simple hand key that you're interested in – the same sort of problems apply to speech and to automatic telegraphy (one more so!).

Protection

There are three main problems to be considered in operating a receiver and transmitter in close proximity. First, if you are not to damage the front-end (input stages) of your receiver, you must reduce the leakage of RF energy from your transmitter into the receiver to a fairly low level.

That 'leakage' may be across the changeover contacts of a relay if you are using a single aerial for transmission and reception (the most common arrangement for amateur stations), or it may be pick-up on the receiver aerial if that is a separate piece of wire or whatever. Either way, if the voltage at the receiver aerial socket is too great, you may overheat or burn out a coil, or 'blow' an RF amplifier transistor. That was one advantage of receivers using valves; they were far more robust.

Some of the earliest transistorised communications receivers with gang-tuned front end circuits would blow input-stage devices with monotonous regularity if sat alongside a transmitter. Later designs with fixed-tune bandpass front end circuits seemed more forgiving, presumably because of their lower 'Q'.

If you are choosing a relay to switch an aerial between transmitter and receiver, there are three requirements. It must operate and release rapidly, have contacts large enough to carry the transmitter power comfortably, and have the lowest possible capacitance across the 'open' set of contacts. That capacitance is what allows transmitter RF output to leak into the receiver input (Fig. 1).

Those three requirements don't really go very well together. If the contacts are large, they need to be widely spaced to reduce capacitance between them when they are open. A relay with large, wide-spaced contacts is not a fast relay! A partial solution is to use a 2-pole relay (or two separate relays), arranged to put two open pairs of contacts in series with the line between the aerial and the receiver input when the station is in the 'transmit' condition. The second changeover can be connected as shown in Fig. 2, so that as well as inserting an extra gap in the circuit between transmitter and receiver, it earths the receiver input during transmissions, providing further isolation. This still doesn't get over the speed problem though, except for low transmitter powers.

Reed relays may be useful here as they are extremely fast in operation and have a very low capacitance across their open contacts. Power handling capacity is limited, however, being a maximum of 25W for the beefiest type of single-pole, normally-open (called Form A), or as little as 3W to 10W for smaller types. Reed switches with single-pole changeover contacts (called Form C) have lower power ratings than single-pole, normally-open types. The contact area in a reed relay is very small, and if you try to switch or pass too much power through it, the contacts will very rapidly overheat and weld themselves together.

It is not unknown for this to happen in systems where a reed relay is used simply to provide isolation at the input of a receiver fed from a separate receiving aerial. The arrangement shown in Fig. 3(a) works well, but that in Fig. 3(b) is fatal to the reed switch, and should be avoided at all costs!

Specialised coaxial RF relays, designed to give the best compromise on all these conflicting requirements, are of course available. Unfortunately, they are expensive unless you can pick one up secondhand at a rally or club sale.

If there's any likelihood of a significant amount of RF energy appearing at the receiver input, both the passive and active components used must be rated to cope with it. Sub-miniature coils wound with wire not much thicker than a human hair are not going to survive very long. Diodes shunted back to back across the receiver input is one protective device commonly used, but they need to be of a type chosen for low junction capacitance if they are not to degrade normal operation of the receiver.

Desense

The second problem to be taken care of is what happens to mixer and IF amplifier stages, and the detector and AGC circuits, when they are presented with a signal many tens of dB over 'S9'. If they are pushed into an operating condition that the designer never anticipated, there's no telling what spurious signals they may produce, or what state they may reach. The AGC voltage may increase to such a level that it could take several seconds for the cir-

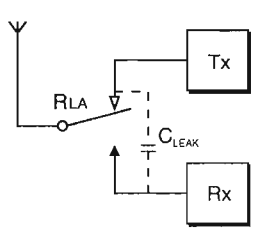


Fig.1

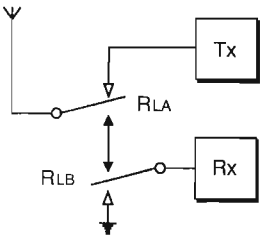
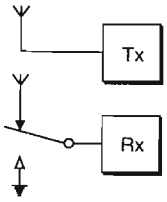
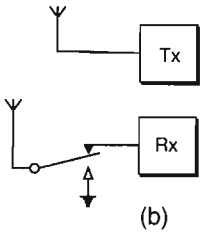


Fig.2



(a)



(b)

Fig.3

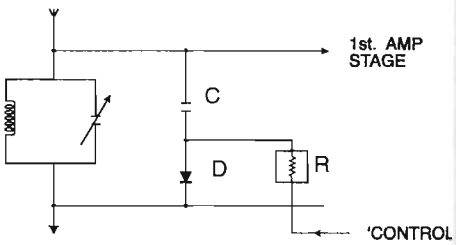


Fig.4

cuit to recover after the overload signal is removed at 'key-up'. Not very helpful for 'break-in' operation!

Of course, you could totally switch off the early stages of the receiver during transmission, but it can be more difficult to achieve the required quick recovery to full receive sensitivity afterwards if you do so. More often, it is arranged instead that the gain of the early stages of the receiver is reduced during 'key-down'. Because the receiver is made less sensitive, this process is called 'desensitising', or 'desense' for short.

In the days of valved receivers, desensitising was usually achieved by increasing the bias applied to one or more of the early amplifier stages, typically by adding a resistor in the end of a potential-divider chain or between the bottom end of a cathode bias resistor and the chassis line, during key-down periods. If a receiver incorporating this arrangement is used without an associated transmitter, it is necessary to add a permanent link across the 'desense' terminals, otherwise it will be very deaf.

Transistorised RF amplifiers are not always so amenable to having their gain varied by changing the applied bias, and variable attenuators, shunted across the signal path, can be used instead. The basic principle is shown in Fig. 4. With no bias applied on the 'Control' line, the diode *D* is non-conducting, and the full signal from the aerial is passed to the first amplifying stage. If an increasing positive voltage is applied on 'Control', the diode conducts more and more heavily, shunting signals from the aerial via capacitor *C* to earth and reducing the effective gain of the first stage. The high-value resistor *R* isolates the RF signals from the Control line. Although you might think that the diode would be either 'on' or 'off', so that the attenuation it controls would be either minimum or maximum, this sort of circuit can in fact provide a smooth variation in stage gain, and has been used in several solid-state communications receivers.

In practice, a more complicated arrangement is used, in order to reduce the intermodulation distortion which the single diode can cause. Capacitor *C* is replaced by a second diode, so that the positive bias from the Control line is applied simultaneously to the anodes of both diodes to turn them on, forming a conducting path for RF to earth.

Muting

The last of this trio of problems involved in close-quarters working is getting rid of any residual clicks, bangs and other bursts of noise which can issue from the loudspeaker (or more shattering still, the headphones) at each 'key-down' and 'key-up' of the transmitter. These noises will be a combination of any residual feed-through of the transmitter signal, plus resulting transients from the receiver AGC circuits. They are often quietened by superimposing a sample of the keyed 'desense' line signal onto the AGC voltage being fed to the IF amplifier stages. Alternatively, the gain of the audio amplifier following the detector may be reduced in a similar way. In modern solid-state equipment, a voltage-controlled attenuator IC may be used to do this job.

Carefully chosen delays are introduced into the drives to protect, desensitise and mute a receiver, so that they are all applied and removed in the correct order for optimum operation. The term 'receiver protection' is often used to describe the whole collection of methods and circuits used to protect, desense and mute the receiver.

External Protection

All the circuits mentioned so far are usually built into the receiver, although some of the lines that control them obviously have to brought into the outside world. If you dabble in surplus commercial equipment, you may come across various sorts of external units which can interconnect and control several transmitters and receivers making up a station. These may be designed for use on telegraphy or telephony systems only, or on both.

Other external boxes you may come across include rejector or acceptor units, which fit into the feeder from the aerial to the receiver. These are intended to keep signals from local transmitters out of the receivers, either when working duplex (a full two-way radio circuit, transmitting and receiving telephony signals at the same time) or when several transmitters are in use simultaneously at one site.

The rejector unit obviously operates at RF, and for the HF bands may be a variable-tuned notch filter or a fixed-tuned band-stop filter. In either case, it is made up of a number of shunt and series LC sections to achieve the required 'Q'. A rejector unit gibes you protection against interference from just one transmitter at a time. Moving up to VHF, a very efficient notch filter can be made from a 'stub', a short length of twin or coaxial feeder 'Tee-d' off the side of the feeder connecting the aerial to the receiver, and trimmed to the appropriate length. You will find further details in most books on VHF aerials. At UHF and above, resonant cavities will do the same job.

An acceptor (pre-selector) again operates at RF, and is almost always variable-tuned, so that you can set it to favour the signal you want to receive, whilst attenuating all others. An acceptor gives you protection against any number of transmitters on frequencies different to the one you are listening on. Because of this, it is often used in its guise of a pre-selector to improve the performance of a receiver operating on its own. It can reduce both second-channel (image) interference and IF break-through problems on a 'budget' receiver, at the expense of the operation inconvenience of having to adjust two tuning controls instead of one.

For use with a receiver that's operating alongside a transmitter, the components in a rejector or acceptor must be capable of safely withstanding the sort of RF voltages that will be picked up by the receiver aerial. The Racal MA197 pre-selector, which was used in the Royal Navy with the well-known RA17 receiver, offered protection from aerial EMFs of up to 40V.

For another typical application, in HF radio installations on board merchant ships, 30V has been a fairly standard maximum rating. On installations likely to exceed that, additional protection could be provided by a little box containing a diode bridge driving a high-speed relay. When the RF on the receiver aerial feeder reached 30V, the DC output from the bridge was sufficient to operate the relay, which disconnected the aerial from the receiver. If the RF on the aerial exceeded 100V, the diodes in the bridge tended to burn out!

SCANNERS INTERNATIONAL

AR-1500 Multimode Scanner Review

In the 'New Products' feature of last month's Scanners International we promised you'd soon see a full review of this impressively-featured scanner! Do we ever let you down? The review team couldn't wait to get their hands on this one, did it live up to expectations? Let's find out.....

Some handheld scanners, well, the upmarket ones at least, now add coverage of HF ('High Frequency', or shortwave to the uninitiated) to match the 'traditional' VHF and UHF coverage they offer. This is great if you'd like some alternative listening such as international AM broadcast stations like the BBC World Service, Radio Moscow, or whatever. But as many listeners know, much of the 'interesting stuff' on HF uses single sideband (SSB), such as intercontinental aircraft and marine communication and radio amateurs. But tuning into SSB with an AM-only receiver gives a good replication of Donald Duck with a sore throat! What you need is a Beat Frequency Oscillator (BFO) and a fine tuning control to resolve these. So guess what AOR have come up with on their latest handheld scanner?

Features

The set covers the range of 500kHz up to 1300MHz, with reception modes selectable from the front panel buttons and memories of AM, FM (Narrow), and FM (Wide). All the 'usual' facilities of scanning, searching and the like are of course fitted. Together with direct keypad entry and click-step rotary tuning, 1000 memory channels arranged into 10 blocks of 100 channels each let you store frequencies for later recall and for scanning, and 10 'search' banks are fitted for lower/upper limit frequency searching.

A small button on the top panel switches in a tunable BFO which, when used with the set in AM mode, lets you resolve USB, LSB and CW signals. The set's minimum frequency step size is 5kHz, and a small knob concentric with the outer squelch control is used for BFO tuning, this having a range of around +6kHz and -4kHz.

The scanner comes with a British originated manual, in contrast to the 'Japanese translations' which you occasionally see. At the possible risk of being considered 'lengthy' by the experts amongst us, this gives clear and comprehensive operating instructions, right down to including a few 'sample frequencies' of commercial and professional radio services to be heard around the UK, for you to key in if you so wish.

'What's this?' you ask. Well all the scanner's memories are stored in EEPROM (Electrically Erasable Programmable Read Only Memory) rather than a battery-back memory circuit, so you don't lose all your memory frequencies should your internal backup battery die a death. To reset the unit, inside the nicad battery compartment at the end of a pair of wires, there's a small switch which sole purpose is to act as an 'EEPROM reset'. Flicking this from one position to the other, then switching the set on, erases all the memories, and then necessitates a re-program of the frequency ranges and internal IF offsets before the scanner correctly functions again. Could this have a use for covert agents operating 'behind enemy lines'?

Accessories

With some sets you seem to have to buy loads of accessories as optional extras. Not with this one. As well as a fitted internal nicad pack and plug-in AC mains charger, the AR-1500 comes with a battery holder for 4 AAA size batteries, a 12V DC car cigar lighter plug lead, a 5m long wire aerial to use for better performance on HF in place of the wideband whip supplied for VHF/UHF, a belt clip, soft carrying case, and an earphone. The 12V DC lead can also act as a charging lead, for an overnight 'top up' of your nicads when out and about, and the battery case lets you fit a spare set of dry cells to use in place of the nicad pack should the need arise. Yes, spare nicad packs are available as an option!

Auto-Memory Input

1000 memory channels to program up should be enough for even the most dedicated scanner listener, but it can take a good deal of listening, and keyboard-tapping, to enter active frequencies you've found within a given band. A useful feature of the AR-1500 is that you can select an 'Auto-memory input' where the set fills up the 100 memory channels in Bank 9 with active frequencies it's found in search mode. Just leave it on all day and the set does all the work for you! Very useful if, say, you're out on the water and you want to find all the local marine channels in use. Another example would be for monitoring civil or military airband in countries where this is allowed, where the wide frequency 'search' range could cause you to otherwise miss signals. Another useful feature of the search mode is that you can lockout up to 1000 frequencies (10 banks of 100 frequencies each), to stop those computer and internally-generated carriers from halting the search.

In Use

The AR-1500 comes out of the box ready-programmed with the following search banks;
1) Shortwave; 2-30MHz, AM, 5kHz steps,
2) VHF FM; 88-108MHz, WFM, 50kHz steps,
3) VHF Air; 108-138MHz, AM, 25kHz steps,
4) UHF Air; 225-400MHz, AM, 50kHz steps,
5) VHF Amateur; 144-146MHz, NFM, 12.5kHz steps,

6) UHF Amateur; 433-435MHz, NFM, 25kHz steps,
7) VHF Marine; 156-163MHz, NFM, 25kHz,
8) VHF PMR; 165-174MHz, NFM, 12.5kHz steps,
9) 'C-Mobile'; 890-905MHz, NFM, 12.5kHz steps, and
0) 'C-Base'; 935-950MHz, NFM, 12.5kHz steps.

After a nicad charge, switching the set on, in my case, started the set searching away across these search banks. A press of any of the numeric keys, 0-9, re-started the set searching that bank, a useful 'starter' mode. It must of course be noted that, depending on your county's laws, you may not be allowed to legally listen to some of the services using the above, the 'C- Base' (cellular) for example in the UK is a no-no. This is also true (technically) of the air bands although in this case there seem to be many people around who publicly break the law in this respect!

Any or all of the search banks can be re-programmed to suit your needs, for example I programmed a bank around 70MHz to replace the HF search bank which I felt wasn't of great use for my needs.

I could write chapters about the interesting time I had with the scanner on AM and FM, but suffice to say the scanner worked reasonably well. It seemed to decline in sensitivity around the 435MHz amateur band, and particularly so above 900MHz (although signals here were often so strong I could receive them without an aerial plugged in), yet it pulled a good signal in from my semi- local 1296MHz amateur beacon. Even on VHF with the set coupled to my rooftop wideband aerial it didn't suffer excessively from the many strong off-channel signals in my area. I did however find, in search mode, the set would often lock onto a strong signal 12.5kHz away from the actual signal frequency, the resulting distortion indicating that I had to do a few button-pushing operations to restore normality.

The 'unique' feature of the set was, of course, its built-in BFO. I had hours of fun

Maximum Audio Output
Measured at 1kHz audio at the onset of clipping, 8 ohm resistive load;
168mW RMS

Current Consumption	
Scanning, no signal;	74mA
Receive, mid volume;	98mA
Receive, max volume;	124mA

Attenuator
Signal attenuation level, measured on 15MHz, provided by set-top control;
23.5dB

Compact top panel controls

with this, sitting in my back garden over the recent spell of good weather, using the AR-1500 with its 5m wire aerial plugged in. Tuning around the HF amateur bands was great, and although the set can't in my opinion be termed a dedicated SSB receiver (the tiny BFO knob needed similarly tiny fingers to operate!) it resolved both strong and weak signals very well. The filters, which were designed for AM use, were of course on the 'wide' side for SSB and CW, but nevertheless it was amazing the signals the set pulled in from around the world in the absence of stronger closely spaced signals. Commercial services normally use such channels, as opposed to amateurs who often 'squeeze themselves in'! Listening around 'crowded' amateur bands such as 7MHz was rather on the 'noisy' side due to the general level of all signals coupled with adjacent strong broadcast signals, and I found I needed to switch the attenuator in when I replaced the short wire with a dedicated HF outdoor aerial to prevent the set collapsing in a 'mush' of noise.

The memories could only store frequency to the nearest 5kHz, so memorising the channels of commercial SSB services was often a case of remembering where to set the BFO knob for each channel as well as recalling the channel, however this was the only major limitation I found. The set appeared to generate a fair degree of internal noise as it approached its lower frequency limit on HF, which reduced its sensitivity somewhat, but above around 1MHz this died away - but who wants to listen to medium wave on such a set anyway?

As a final test, I couldn't resist trying the small 'killer switch'. Yes, it worked, all the memories and my programmed search banks were dumped into oblivion, and I returned the scanner with a clear conscience!

Conclusions

AOR (UK) agree with me that the scanner can't of course be classed as a purpose-designed SSB receiver, but with it retailing at only a little more than an AM/FM scanner of this calibre the SSB 'addition' is very worthwhile in my opinion. The measured technical results confirmed the good sensitivity of the set across its lower frequency ranges, and the strong-signal handling was reasonable for a set of this type. I had great fun with the AR-1500, to be able to listen to all modes, across such a wide bandwidth on a set this size, caused more than the odd stare amongst my friends!

The AR-1500 is currently priced at £279, and my thanks go to AOR (UK) for the loan of the review sample.

LABORATORY RESULTS:

Sensitivity;

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

Freq.	AMF	MNF	MW
500kHz	3.20	286	-
1MHz	3.39	7.93	-
2MHz	0.73	0.49	-
4MHz	0.41	0.32	-
6MHz	0.29	0.13	-
10MHz	0.19	0.13	-
20MHz	0.18	0.12	0.49
30MHz	0.18	0.12	0.47
50MHz	0.19	0.13	0.51
100MHz	0.19	0.13	0.65
145MHz	0.22	0.13	0.71
250MHz	0.28	0.18	0.97
435MHz	0.45	0.38	1.63
700MHz	2.92	3.07	8.64
1300MHz	-	0.67	1.77

Intermodulation Rejection;

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

25/50kHz spacing;	45.0dB
50/100kHz spacing;	48.0dB

Blocking;

Measured on 145MHz NFM 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;	48.0dB
+1MHz;	75.0dB
+10MHz;	97.0dB

Adjacent Channel Selectivity;

Measured on 145MHz NFM 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;	34.5dB
-12.5kHz;	33.5dB
+25kHz;	53.5dB
-25kHz;	53.5dB

QRP CORNER

Your scribe

Dick Pascoe G0BPS looks at 'what's new' in the aerial line for QRP

Lighthouses and Marconi

The heart of any station, be it QRO or a 'barefoot' transceiver, is the aerial. No matter how many times you may change the rig or the feeder, it is the aerial that gets the RF out into the atmosphere. With this in mind, I'd heard reports about the Cushcraft R5 and the later R7, but I'd only recently managed to acquire one at a reasonable cost. I understand many amateurs are moving over to this aerial because of its good performance, and I find I've consistently received better reports from the R5 over my loop. The advantage over similar vertical aerials is that the R5 or the R7 can be mounted at height without the need for ground radials, and this is one topic that is well worth investigating further.

Truly International

It seems very strange that the majority of comments I receive are not from British readers. One regular is from Holland, far out on the borders with Germany. Peter PE1MHO spends most of his operating time on 50MHz, QRP of course and he has just received his Worked All Continents award from the American Radio Club International. This organisation is the equivalent of our very own G-QRP club. A little larger, but even with the 'international' in the heading the UK club has more of an international flavour to its membership.

The certificate awarded to Peter was for WAC QRP, quite an achievement, especially on a single VHF band. The certificate is quite tastefully done in black and gold, and Pete is waiting for just one last QSL card for his WAC Two-Way QRP, even more of an achievement.

Another regular writer is Byron WU2J. Byron spends a lot of the summer in France, he has been building a small CW transmitter for 20m, this having an output of 2.8W. He explains that he has used a direct conversion unit as the receiver, but comments "first CW unit in 26 years and *never* again!.. it might be OK in Europe but not in the US".

I've recently been operating from one of the few permanent Special Event stations to be found. The Lighthouse at South Foreland near Dover is no longer used by Trinity House, and has been taken over by the National Trust. One of the truly amazing things about this, and many others of the same type, is that the whole of the rotating light, weighing in at a massive 2.5 tons 'floats' on a ring of mercury. One slight push with one hand and off it goes. Amazing to see so much steel move with so little effort!

In 1898 Marconi used the lighthouse to carry out some experiments with radio. He managed to contact one of his other stations on the Goodwin Sands, and later establish contact with another base over in Wimereaux near Calais in France. Because of this connection with Marconi, the Dover Radio club were asked to establish a station in the lighthouse. Quite a rare thing it is too.

What has this to do with QRP you may ask? Well the special callsign GB2SFL may only be used when the holder is present, as he was absent on the day it was my turn to operate I chose to use my own club's callsign GX0ROO (The Kanga Gang), QRP of course! The first contact was with Martin G4ZXN up in Coventry on 40m, he was running just 8W compared to my 6W. Yes, I know that QRP levels are 5W maximum, but we were on SSB! Here we can use up to 10W PEP.

Digital readouts

A message from the George G3RJV arrived to say that he had obtained a number of digital readouts from the States. These were used in the Dentron radios, but are now appearing on the surplus market. He has coupled one up to his Argonaut 515, another to his homebrew CSP transceiver. I understand that the G-QRP Club has obtained a number of these and they are available to members. More details from George. These seem to be ideal little units, more details later.

New Book

I feel I must congratulate three of the G-QRP club members, Peter Linsley G3PDL, Ty Nicholson GM0LNQ (KA9WRI) and FC McNiel G3FCK for their outstanding work in producing the latest offering from the club.

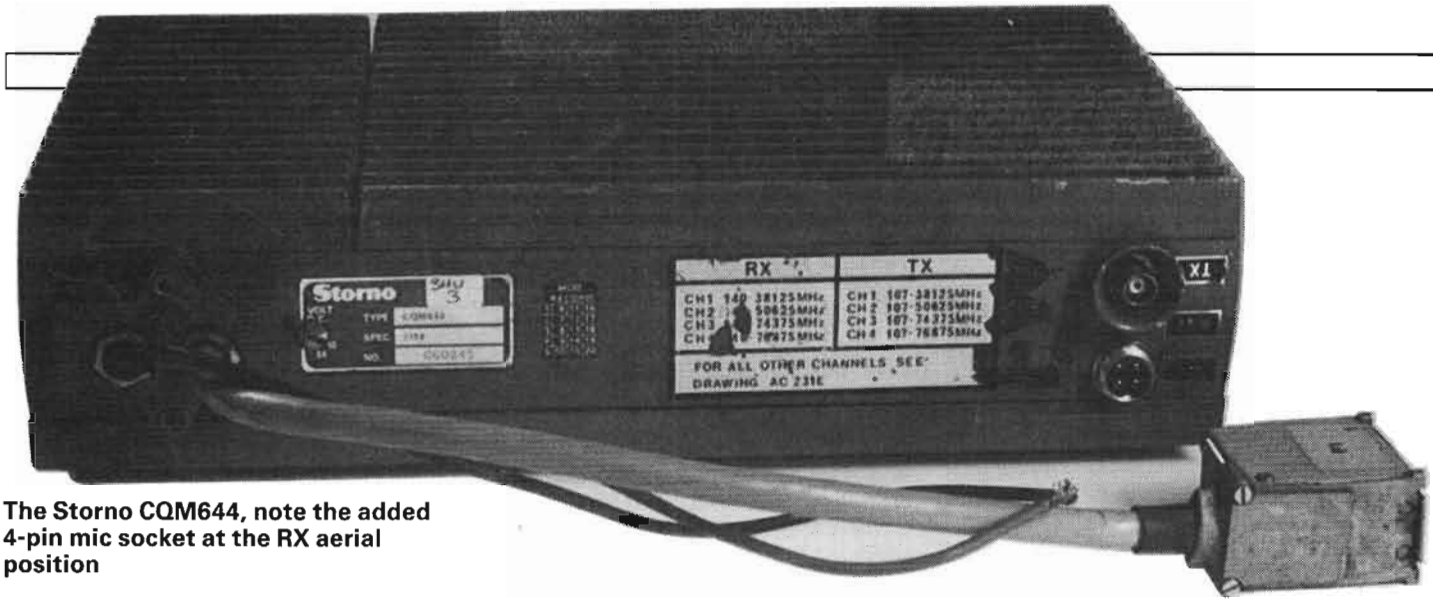
The *G-QRP Club Antenna Handbook* is a 'compilation of aerial, matching units and associated articles' from *SPRAT*, the journal of the G-QRP club. Many members had requested this book over a long period, it is just a assortment of ideas and articles that have appeared over the many years that SPRAT has been in exist ence. Various authors appear in the book, such famous names as Ha-Jo Brandt DJ1ZB, George Burt GM3OXX, CF Rocky W9SCH and of course Peter Dodd G3LDO. Too many more to mention also appear, but suffice to say that the book will, I'm sure, be a huge success.

Some of the articles show their age a little and will be read from a point of interest only, but so many will still be very pertinent to today's operator. Such gems as the *Simple Antenna Tuner to match Random Wires to Transmitters* will always be of interest, together with others such as *The QRP simple SWR Indicator,* the *Double 'D' Beam* and many more. The book follows the tradition of SPRAT and has an almost equal amount of drawings and words, this makes construction of the units so much easier. I am of the opinion that this an essential book for the enthusiast QRP operator, and also for many others. The aerial and constructional theory will benefit all builders.

I have several copies of this great book and they are available from me at the address below. The price to G-QRP Club members is £5.50 (quote your membership number), non-members is £6.00, both inclusive of postage and packing.

That's it for this month. Reports and ideas to me please either via HRT Editorial (P. O. Box 73, Eastleigh SO5 5WG), on packet via GB7SEK, or to 3 Limes Road, Folkestone CT19 4AU.

The certificate awarded to Peter Halpin PE1MHO for Worked All Continents (WAC) QRP.



The Storno CQM644, note the added 4-pin mic socket at the RX aerial position

Storno CQM 644 Conversion

Tony Hardman G6SHU Converts the synthesised Mid-Band CQM664 to 2m

This article is based on the conversion of the synthesised version of these sets (of which I understand several thousand are in existence), and much of the conversion should be the same for the crystalled sets. The Storno CQM 644,7514 is a synthesised, 10W set operating around 107 MHz TX and 140 MHz RX. The units are used with a green-grey control head, housing a speaker, a couple of LEDs, a L-M-H volume switch, and a 12 way channel switch. It is painted a green-grey colour.

Identification

The Storno 600 series covered several bands. Look for the 644 model number with a specification code 7514 for the synthesised chassis. If in any doubt, remove the larger of the two cover plates and look for a board with two 28 pin DIL chips fitted, with IDs of LA1234/LA1234 or HEF 4750/HEF 4751. If instead you see a row of crystal oscillator modules, you will have to buy a pair of crystals for each channel that you require, each fitting into its own oscillator module.

Two BNC sockets marked ANT are fitted, the TX aerial BNC is painted red with 'TX' marked, the RX BNC is plain and has RX marked next to it. These BNCs are useful in making it easy to identify the separate transmit and receive sides of the chassis.

Conversion Outline

The TX synthesiser operates around 13 MHz and is multiplied by 8 to obtain 107 MHz, the RX synthesiser operates around 50 MHz and is multiplied by 3 to give 151 MHz, which with a 10.7 MHz IF gives receive at 140 MHz. We need to reprogram the synthesisers, make the transmitter multiply by 12, convert the PA from 107 to 145 MHz, and retune the receiver.

The synthesisers use an EPROM to supply 7 sets of codes for each channel, and both the transmit and receive synthesisers being programmed separately. They are programmed in BCD, bit-parallel, digit-serial format, a table at the end of this article provides a good selection of channels. With additional toggle switches, you could have 24 channels, full reverse repeater etc.

12V Operation

These sets originally operated on 24V. For 12V operation, first turn the screw near to the power cables to the 12 volt position. Now remove both top and bottom covers and turn the radio so that the transmitter side is upwards. Where the power cables enter, you will see the foil side of the 10cm x 30cm PSU PCB, this supply is then used to power an inverter circuit, which in turn generates -24V DC, and +15 volts DC. The -24 DC is used to power the traditional radio circuits, but the +15 volts DC is used to power the frequency synthesiser circuits.

Position the chassis so that the PSU is on the right, and the power cables enter at the bottom. Near where these power cable attach you'll see a relay, and looking from the foil side below the left-hand relay connectors you will see a small island of foil. On the component side of the board you should see a piece of wire, possibly red, with black markings. Solder a short piece of wire from the island to the point on the PCB where the RED DC power cable connects. The set will now operate on 12V, and I'd strongly recommended you fit a 5A fuse in line with your DC cable. There is no on-off switch on this set, if you wish to fit one then connect it in series with this link.

Initial Checks

On switching on, you should see the red LED marked 'P' light on the control head, and hear a 2kHz whistle coming from the inverter. The squelch control is a preset pot, located on the receive side of the chassis on the board labelled AA600. With the ANT connector uppermost, the uppermost of the two presets to the left of the audio IC is the squelch. Turn it fully anti-clockwise to open the squelch. The lower of the two pots is one of two audio level pots. The other one is found on the SQ602 board, which is now the nearest board to you at the ANT end of the case.

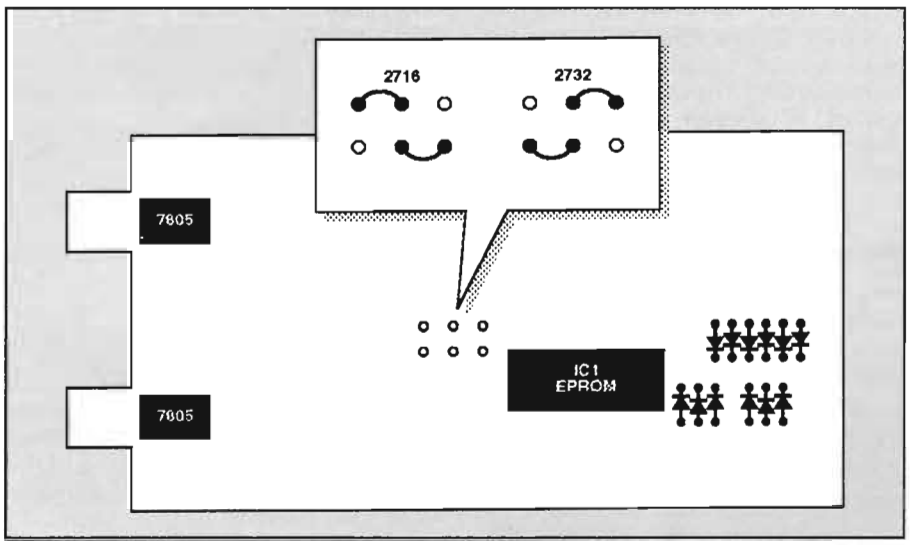
If you have suitable test equipment, you can check the set operates correctly on its original frequencies. The TX can be keyed by linking the pair of red-yellow wires on the black cable from the control head, when you should be able to hear the inverter come under load and see

your power meter indicate somewhere in the region of 10W. The pair of blue-green wires are the balanced TX audio input from the microphone.

EPROM Fitment

Locate board FC600, fitted upside down on the TX side of the radio. Remove the screws, and turn the board over. Gently remove the existing 24 pin EPROM (IC1) from its socket.

For 12 channels, to the right of the EPROM socket you will need to have a total of 12 diodes fitted as shown in Fig. 1.



Note that some of these may already be present. Wire the adjacent jumpers as shown depending upon whether you are fitting a 2716 or a 2732 EPROM. Fit your replacement EPROM, ensuring the correct orientation.

For expansion to 24 channels, isolate Pin 19 on the Eprom, using a sharp knife. Fit a 47k resistor between this pin and the track going to pin 24. Connect a switch between Pin 19 and 0V. When pin 19 of the Eprom is grounded, you will be using the lower half of the Eprom (Bank A), and with the switch open, you will be using the upper half of the Eprom (Bank B).

If you look at the board below the FC600, you will see a board marked FS600. On it, you will see a multi-way connector at one end. About 3 cm into the board from this connector, you will see two pins sticking up. Solder a wire strap to link these pins together. Turn the set over and you will see another FS600 board. Again you will see a pair of pins near to a multi-connector. As before, fit a wire link to the pins.

VCO Alignment

For the RX VCO, with your set switched to a mid-range channel measure the voltage on pin 4 of IC3 (LN1232 or HEF 4750). Using an insulated, non-inductive trimming tool, adjust the core of the VCO oscillator (metal can at end opposite to connector), until the voltage drops to 0V. If you have a frequency counter, you may like to monitor pin 1 of this IC looking for a 12.5 kHz signal. Measure the volts to the VCO at pin 6 of IC2, (CA 3140), and adjust the VCO core until a reading of 4.0V is obtained. Check this is within 2.5-5.5V at the extremes of your channels, and that pin 4 is always low after changing channel.

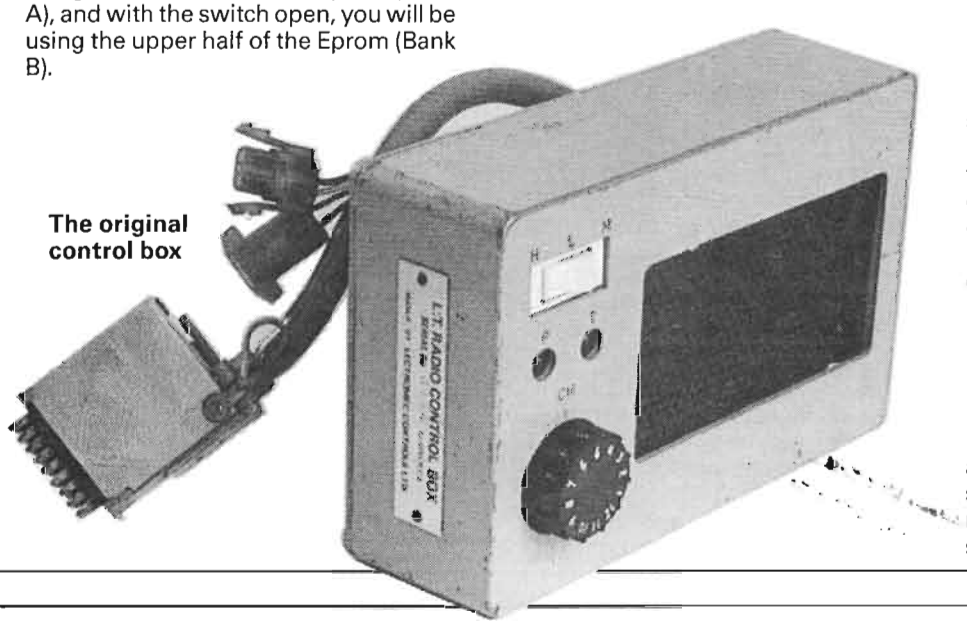
For the TX VCO adjust the VCO as before, but aim to set the volts at pin 6 of IC2 at 5.5V, you will find this hardly varies across the band. Now fit a short wire from the screen of the cable that connects the VCO output to the exciter board, and ground it to the PCB. This cable is easy to spot, it is right next to a ferrite transformer, this modification will prevent the TX operating when the synthesiser is out of lock. If you don't do this, you may find yourself sweeping across the band as you switch to transmit.

Transmitter Modifications

We'll first disable the 2 minute TX timer. This is fitted on the SU600 board, the timer circuit being at the position of the IC at one end. Starting here, you will see a brown wire (tag 1), a yellow wire (tag 2), and a thin brown wire (tag 3). Follow the track from the yellow wire to a BC307 transistor, remove this. Unsolder the brown wire from tag 3 and solder it to the yellow wire (tag 2).

Now we'll modify the Exciter board (EX611) to 2m. Hinge up this board by removing the heatsink bolted to the PA screen and unsoldering the screened cable from the synthesiser board and the orange wire. Now remove the screening coils from L10 and L11, held in place by lugs bent and soldered beneath the board, and replace the 47pf capacitors fitted inside the cans with 22pf values. Refit the cans. Replace C35 (150pf) with a 56pf capacitor. Unsolder one end of L15, and cut about 3 turns out off the end. Refit L15. Remove the cans from L12, L13 and L14. Remove the 10pf capacitor from L12, and replace it with a 6p8 capacitor. Remove the 8p2 capacitor fitted to L13, and replace it with a 5p6 capacitor. Remove the 12pf capacitor from L14, and replace it with the 8p2 taken from L13. Remove C47, (47pf) and replace it by a 27pf capacitor.

Refit the exciter board and the heatsink on the output transistor. If you examine the 'spare' pin at the input to the PA board, you will see a 47R resistor connected to it. This is provided as a dummy load for the exciter whilst tuning up. Unsolder the centre of the coax that connects the exciter to the PA, and solder it to this point instead.



The original control box

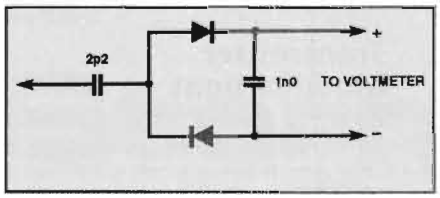
Exciter Board Alignment

The expected voltages I've quoted are from the manual. The figures in square brackets, are actual measurements taken using a diode probe as shown, connected to a digital

multimeter. Remember *never* to use a metallic adjuster when tuning the cores, which easily break.

You need to fit shorting links to various positions, during the exciter tuning. You will find a pair of convenient links in the PA section. These are normally in the DC supply in the PA, so removing them will also ensure the PA is not running.

Connect the output of the diode probe to the multimeter on a low DC range. Link the PTT to turn the transmitter on. If you have moved the output from the exciter to the dummy load as instructed, you won't need a dummy load on the PA.



With the probe on test point 30, Adjust L1, L2 and L6 for maximum reading, expect this to rise to about 0.5V. Link points G together. Do not apply modulation. Put a link on point A and adjust L3 for maximum reading on the meter via the diode probe. Expect about 0.5V [0.45V]. Move the link to point B, and adjust L4 for minimum meter reading, expect about 0.05V [0.054V]. Move the link to point C and adjust L5 for minimum meter reading, expect about 0.05V [0.06V]. Repeat the last three adjustments for absolute maximum.

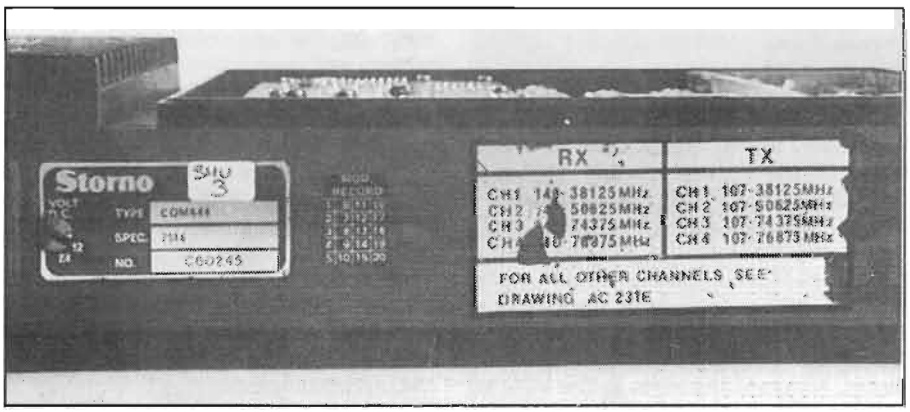
Remove the link from G, and re-tune L2 and L6 for maximum, expect about 0.5V [0.45V]. Move the probe to test point 32 and adjust L7 for maximum, expect about 1V [0.55V]. Move the probe to test point 33 and adjust L8 and L9 for maximum reading. Alternate between L8 and L9 until no more can be achieved, expect about 4V [1.81V]. Move the probe to test point 34 and adjust L10 and L11 for maximum reading. Alternate between L10 and L11 until no more can be achieved, expect about 4V [1.8V]. Move the probe to test point 35 and adjust L12, L13 and C37 for maximum reading. Cycle between L12, L13 and C37 until no more can be achieved, expect about 2V [1.5V]. Move the probe to the dummy load in the PA section. Adjust L14, C42, L16 and C48 for maximum output into the dummy load, cycle between these adjusters until no more can be achieved. Peak up L12 and L13 for maximum reading, [0.09V]. If you removed the links from the PA, don't forget to refit them.

PA Board Modification

Locate L11 on the PA board (PA 641), and snip 3 turns from its length, and carefully solder the ends together again, spreading the turns slightly. Fit a 10 ohm resistor in parallel with R4 (180R). Remove C11 (27pf). Remove one turn from L6, and carefully spread the turns equal to a gap slightly thicker than the wire itself. You may have to adjust this gap when you tune the PA.

PA Alignment

Initially remove the bandpass filter. This is the small square board, with 4 cans on fitted to it, in line with the output from the PA board. Reconnect the aerial cable without the bandpass filter in place. Reconnect the exciter output from the dummy load resistor to the input to the PA, and connect a 15W dummy load via. a power meter to the output from the PA.



The side panel gives the set's identification

Turn the output level pot anti-clockwise to minimum power, then increase it about a third of a turn clockwise. While making the following adjustments, don't let the output power exceed 12W watts or the PSU inverter could be overloaded, and be permanently damaged. Key the TX PTT by linking the wires in the red connector coming from the control box. Adjust C1, C2, C9, C10, C17, and C18 for maximum power, repeating for absolute maximum. You may find altering the spacing between the turns of L6 and L11 will help.

Remove link 38, and connect an ammeter set to the 1A DC range in place of the link. Rotate the output level pot until a TX power of 10 watts is achieved, and ensure the current shown on the meter is less than 700mA. You will find that you will reach a power peak during adjustment. As you pass this peak, you will find that the current increases at the same time as the power output is decreases. If this cannot be achieved, try retuning the capacitors and varying the spacing on the coils. You need to get the best power for the lowest current. Replace link 38, and remove link 37, fit the ammeter in place of the link and perform the same adjustments, this time aiming to achieve less than 250 mA.

Repeat all the adjustments until you achieve the 10W output power, for the minimum currents, preferably below the 700/250 mA currents.

Aerial Filter Modifications

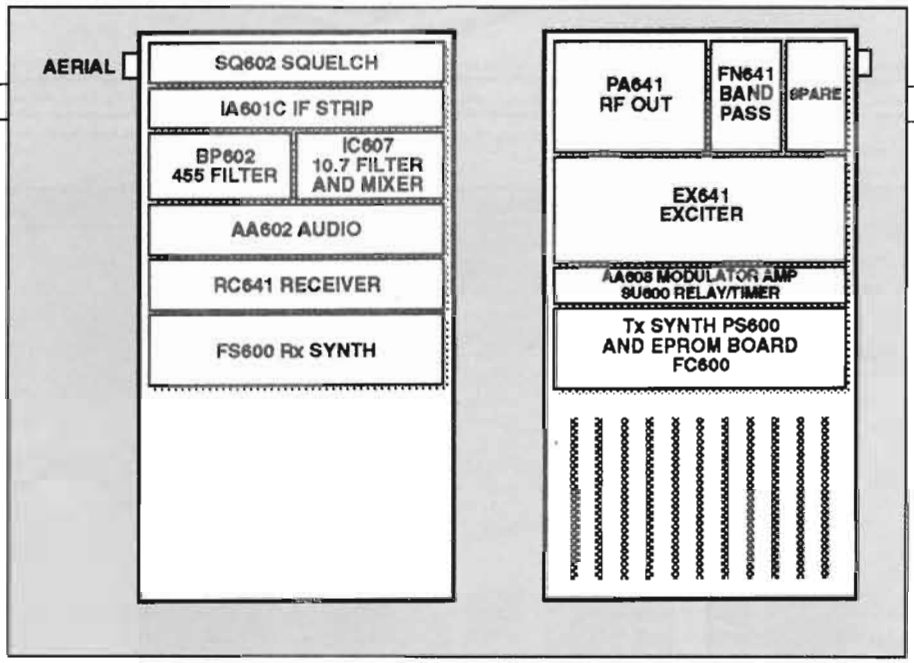
Two of the cores on this are sealed by a hard black compound, remove this with a hard, sharp tool. Scrape away at it carefully, until it is all removed. Then adjust the exposed slugs down by a couple of clockwise turns and remove any final sealant. Now gently adjust the slugs in the opposite direction until they are raised slightly above the top of the cans, once free you may lower them into the core again, to prevent damage.

Remove the bandpass filter from the chassis, and remove the four screening cans. You will see two coils with a single 27pf capacitor fitted, change these for 15pf capacitors. The other two coils have a pair of capacitors fitted. Remove the 27pf capacitor from one of these coils, on the other coil leave the 27pf capacitor in place. The other capacitors fitted on these coils are 39pf, replace these with 22pf capacitors. Refit the screening cans, refit the board, and connect the TX output to your dummy load/power meter. Key the PTT and adjust the slugs in the bandpass filter for maximum power. If you find the adjustment to be 'loose', set the slugs to be higher, rather than lower.

Fitting an Aerial Switching Relay

To operate using one common aerial, we need to fit an aerial switching relay. Ideally this should have a coil voltage of 24V, and should be suitable for VHF use. If you use a 12v relay with a resistor, make sure the relay is designed for RF and decouple the coil. Avoid supplying the relay from outside the PA section, because you may find RF being conducted on the relay wiring.

Connect the relay coil between the screen of the output from the board (0V) and the blue wire on the PA board (-24V),



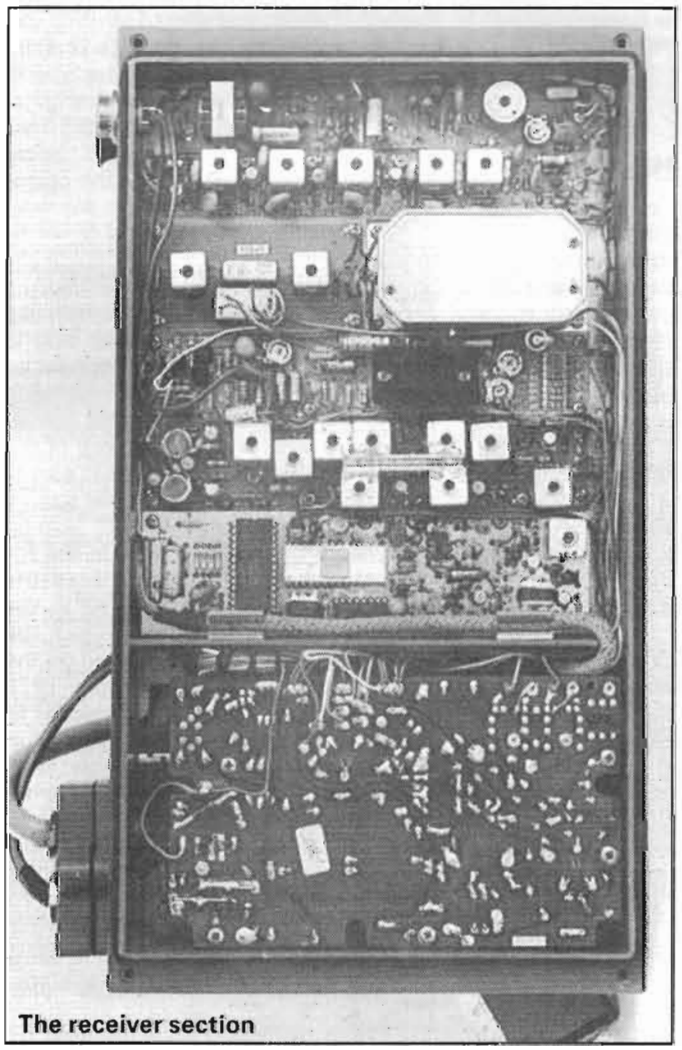
with a diode across the supply to the relay coil to prevent back-EMF (e.g. a 1N914/1N4148, banded end of the diode towards 0V). Wire the relay RF connections to correctly switch the aerial between the RX and TX aerial connections. After keying the PTT to check the relay is working correctly, repeat the tune-up for the output stage on the PA, and also for the bandpass filter, to account for any mismatch introduced by the relay.

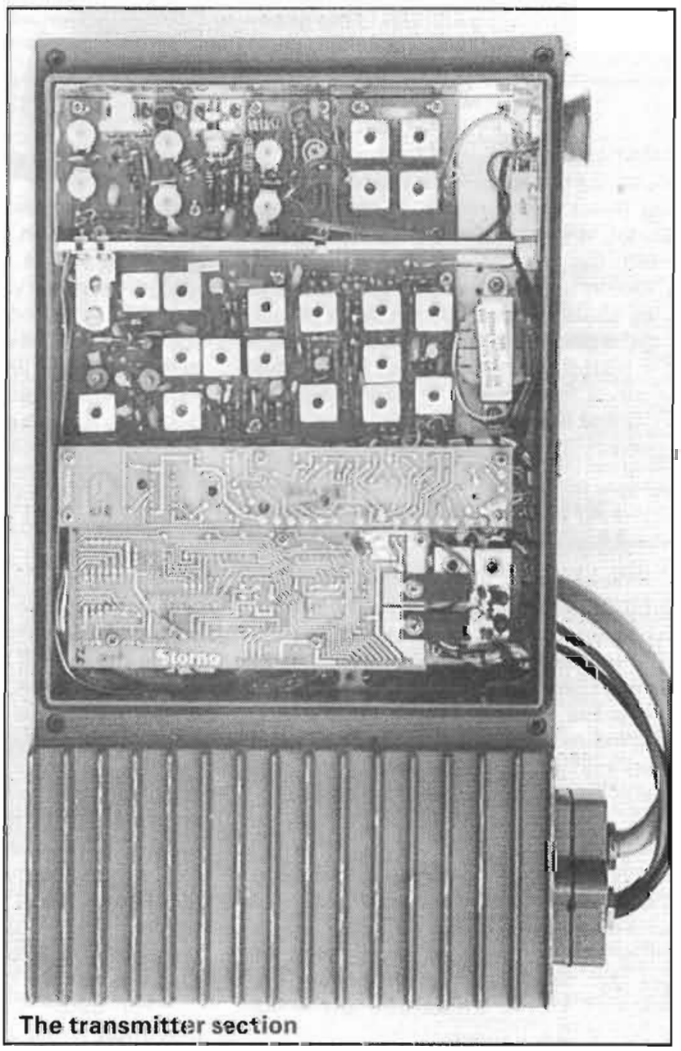
Receiver Alignment

There is no need for any front end modifications apart from realignment, but before doing this, we must disable the transmitter VCO. This is because it generates a harmonic directly on the receive frequency, which masks the signal we are trying to tune up on (although if you tune the receiver switched to a repeater channel, then you won't have this problem). Remove the strap on the transmit board, near to the multi-way connector, this will cause the transmitter to change frequency.

Also, it is important to check the set is operating on exactly the right frequency, as the receiver bandwidth is quite narrow. If needed this can be corrected by adjustment of the trimmer capacitor next to the 5MHz crystal on the receive synthesiser board (this also adjusts the TX frequency). You may also like to check the receive mixer oscillator inside the 'coffin' along with the 10.7MHz filter, adjusting the trimmer capacitor here for a frequency of 10.245MHz on the test point inside the filter.

If you look at the receiver board, you will see two large plastic cored coils, next to these coils you will see two threaded brass rods, fitted with plastic nuts. Adjust these for best reception of a strong received signal, reducing the signal level as needed. When you are satisfied that can't improve the adjustment


The receiver section


The transmitter section

APPENDIX

Parts required for conversion

Synthesiser;
1 x 2716/2732 Programmed Eprom.
12 x general purpose switching diodes (1N914 or 1N4148).
47K ohm resistor (only needed if 24 channels required)

Exciter;
2 x 22pf ceramic capacitors.
1 x 56pf ceramic capacitor.
1 x 6p8 ceramic capacitor.
1 x 5p6 ceramic capacitor.
1 x 8p2 ceramic capacitor.
1 x 27pf ceramic capacitor.

PA;
1 x 10 ohm resistor.

Bandpass filter;
2 x 22pf ceramic capacitors.
2 x 15pf ceramic capacitors. (Do not use any other value)

For packet use;
1 x 390R resistor.
2 x 1k resistors.
3 x 0.01uf capacitors.
1 x 10uf electrolytic capacitor.

2m EPROM Listing

EPROM REF: CQM10

Channel	Address	TX Output	RX Input	Label
A 1	$03F0	145.275	145.275	S 11
A 2	$03E8	145.325	145.325	S 13
A 3	$03D8	145.350	145.350	S 14
A 4	$03B8	145.375	145.375	S 15
A 5	$0378	145.400	145.400	S 16
A 6	$02F8	145.425	145.425	S 17
A 7	$01F0	145.450	145.450	S 18
A 8	$01E8	145.475	145.475	S 19
A 9	$01D8	145.500	145.500	S 20
A 10	$01B8	145.525	145.525	S 21
A 11	$0178	145.550	145.550	S 22
A 12	$00F8	145.575	145.575	S 23
B 1	$07F0	145.000	145.600	R 0
B 2	$07E8	145.025	145.625	R 1
B 3	$07D8	145.050	145.650	R 2
B 4	$07B8	145.075	145.675	R 3
B 5	$0778	145.100	145.700	R 4
B 6	$06F8	145.125	145.725	R 5
B 7	$05F0	145.150	145.750	R 6
B 8	$05E8	145.175	145.775	R 7
B 9	$05D8	144.500	144.500	-
B 10	$05B8	144.625	144.625	PACKET 3
B 11	$0578	144.650	144.650	PACKET 1
B 12	$04F8	144.675	144.675	PACKET 2

Replacement Eprom

Working out the program for the Eprom is beyond the scope of this article, data sheets are available for the HEF synthesiser chips. Each channel requires 7 bytes in the EPROM, the lower 4 bits of each byte are used to control the transmit synthesiser and the upper 4 bits of each byte control the receive synthesiser. A suggested replacement EPROM is given and as a service to readers I can supply EPROMs to this pattern for £10.00 each. I am willing to custom produce channel sets from £15.00 (Tony Hardman, 54 Hampton Drive, Newport, Shropshire TF10 7RE).

any more, turn your attention to the first aluminium 'can' in from the left. Try giving this a slight 'tweak' to improve the signal, you may also try the next two in from the left as well, although you shouldn't need to adjust the others as they should already be set. After adjusting the screened coils, go back and check the piston trimmers are set for the best settings. Refit the strap on the transmit VCO that we removed at the start of the receiver tune up.

TX/RX VCO Switching Modification

You'll need a further relay for this modification, which disables the TX VCO when you're on receive. A 47R resistor (R1) is fitted vertically on the transmit synthesiser, located next to the VCO coil, this is the +10V power feed to the VCO. Cut the resistor leg and connect a n/o relay contact in series with it, so as to break the circuit when the set is on receive. If you are not going to use the radio for packet, connect the relay to a convenient line which only has power at transmit time, a suitable point is the blue wire on the exciter board. Do *not* use the supply from the PA, otherwise you will get RF feedback on transmit, and remember to fit a back-EMF protection diode across the relay coil.

Packet Modifications

If you intend to use this set for packet operation, you will need to fit a 12V relay, with a pair of make contacts (n/o). Otherwise you may fit either a 24V or a 12V relay, with just a single make contact. A 12V relay is needed for packet to make the PTT line suitable for interfacing to a TNC, otherwise the PTT line has a negative voltage on it.

If you are going to use the radio for packet, you need to make the relay do a bit more work. Using a 12V relay, with a pair of make contacts as detailed before, connect one pair of contacts in line with the 47R resistor as above. The other pair of contacts will be used to regenerate the original PTT action.

If you look at the power supply, you will see one or more yellow wires going to the track side of the power supply board. Remove the yellow wire(s) from the PCB, and insulate them. Connect one side of the coil to the positive end of the large electrolytic (80-100uF) on either the receiver synthesiser board, or the transmit synthesiser board, whichever is most convenient. The other side of the coil will now become the new PTT line, remember to fit a back-EMF protection diode across the coil.

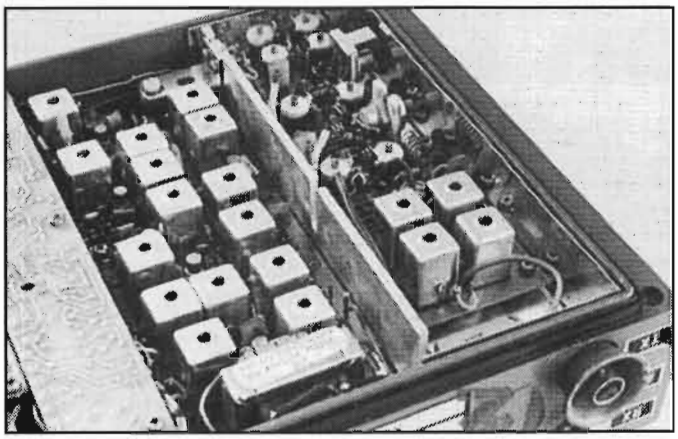
For better packet operation, you may modify the receiver audio HF roll-off as follows; Remove the screws from the SQ602 board, opposite to the aerial is a skeleton preset, and a metal screened coil. Adjacent to this coil is a 0.33uF (C12) capacitor which you should remove and replace with a 390R resistor. Fit a 1k resistor to the grey wire leaving the SQ602 board, at the end next to the original receive aerial, which can act as the TNC audio feed, the output level being adjusted by the preset pot at the opposite end of the board.

Fitting a Microphone

The set's original microphone had a differential output. i.e., neither side is connected to chassis. If you connect an 'ordinary' common-ground microphone across the original input wires (green and blues wires with coming out of the control box), you will find there is a lot of whine picked up from the power supply along with the audio.

Locate the AA600 board in the RX side of the chassis. It is the board with the large black heatsink on it, next to the 10.7MHz 'coffin' filter. Disconnect the wires from pins 20 & 21 (marked on the board). Attach the centre core of a screened cable via. a 10uF capacitor to pin 20 of this board, the positive side of the capacitor towards the cable, with cable screen to chassis. If you have not made any changes to the PTT, then you need to take the PTT from the slightly thinner brown wire connecting to the SU600 board, grounding this will give TX keying. You may like to add a four-pin microphone connector to the set, using the hole vacated by one of the aerial sockets.

(V)R16 on AA600 is the mic gain. On



Use a suitable non-metallic trimming tool for aligning the fragile cores

HEX DUMP OF PROM CONTENTS FOR 2m FREQUENCIES

Only the following addresses are used, all others are 'Don't Care';

Eprom Address																Band/switch	
0000F0	00	00	00	00	00	00	00	00-63	E9	6F	78	26	FF	FF	00	A	12
000170	00	00	00	00	00	00	00	00-63	7B	7F	78	26	FF	FF	00	A	11
0001B0	00	00	00	00	00	00	00	00-63	9D	7F	78	26	FF	FF	00	A	10
0001D0	00	00	00	00	00	00	00	00-63	BF	7F	78	26	FF	FF	00	A	9
0001E0	00	00	00	00	00	00	00	00-63	D5	76	79	26	FF	FF	00	A	8
0001F0	63	F7	76	79	26	FF	FF	00-00	00	00	00	00	00	00	00	A	7
0002F0	00	00	00	00	00	00	00	00-63	89	86	79	26	FF	FF	00	A	6
000370	00	00	00	00	00	00	00	00-63	AB	86	79	26	FF	FF	00	A	5
0003B0	00	00	00	00	00	00	00	00-63	CD	86	79	26	FF	FF	00	A	4
0003D0	00	00	00	00	00	00	00	00-63	EF	86	79	26	FF	FF	00	A	3
0003E0	00	00	00	00	00	00	00	00-63	75	97	79	26	FF	FF	00	A	2
0003F0	63	B9	97	79	26	FF	FF	00-00	00	00	00	00	00	00	00	A	1
0004F0	00	00	00	00	00	00	00	00-63	E9	EB	79	26	FF	FF	00	B	12
000570	00	00	00	00	00	00	00	00-63	7B	F8	79	26	FF	FF	00	B	11
0005B0	00	00	00	00	00	00	00	00-63	9D	F8	79	26	FF	FF	00	B	10
0005D0	00	00	00	00	00	00	00	00-63	AB	6C	89	26	FF	FF	00	B	9
0005E0	00	00	00	00	00	00	00	00-63	75	F8	69	26	FF	FF	00	B	8
0005F0	63	97	F8	69	26	FF	FF	00-00	00	00	00	00	00	00	00	B	7
0006F0	00	00	00	00	00	00	00	00-63	B9	F8	69	26	FF	FF	00	B	6
000770	00	00	00	00	00	00	00	00-63	DB	F8	69	26	FF	FF	00	B	5
0007B0	00	00	00	00	00	00	00	00-63	FD	F8	69	26	FF	FF	00	B	4
0007D0	00	00	00	00	00	00	00	00-63	8F	68	79	26	FF	FF	00	B	3
0007E0	00	00	00	00	00	00	00	00-63	A5	69	79	26	FF	FF	00	B	2
0007F0	63	C7	69	79	26	FF	FF	00-00	00	00	00	00	00	00	00	B	1

Cable Harness Connections;

Pin	Radio	Control Box Function	Connection in CQM
1	BN/W	W/BL CH 1	FC600
2	R/Y	GY CH 2	FC600
3	Y/W	BN/BK CH 3	FC600
4	GN/W	Y CH 4	FC600
5	Y/GN	GY/GN CH 5	FC600
6	GY/W	BL CH 6	FC600
7	Y/GY	T CH 7	FC600
8	W	BN CH 8	FC600
9	Y/BN	BL/OR CH 9	FC600
10	BK/Y	W/V CH 10	FC600
11	V	O/GN CH 11	FC600
12	O	Y/BN CH 12	FC600
13	S1	BK CH SWITCH COMMON	FC600
14	S1	W POWER LED	
15	BL h	GY/BN POWER LED	AA600 13
16	GN	BL/BK BL MIC	AA600 21
17	BN/GN	GY/BL GN MIC	AA600 20
18	S1	W/BN Y PTT	
19	GY/R	O VOL - M	AA600 15
20	GN/R	W/GN VOL - H	AA600 14
21	-		
22	GY/GN	-	Squelch nr pot, SQ602
23	-		
24	BL/BN h S2	Y/R SPKR-1	Large audio Tx nr
25	S2	Y/GN SPKR-1	PA Section
26	R/BN h S3	GN SPKR-2	„ „
27	S3	GN/BK SPKR-2	„ „
28	Y	-	Relay Squelch SQ602
29	GY/BN	-	
30	-		
31	BN	W/R PTT RED	
32	BK	R/B Tx LED	AA600 18
33	R h S1	V/BK Tx LED	
34	GY - S4	-	AA600 16
35	S4	P VOL - common	
36	BLANKED OFF	-	

KEY: BK : BLACK; BN : BROWN; GN : GREEN; GY : GREY; O : ORANGE; P : PINK; R : RED; T : TURQUOISE; Y : YELLOW; V : VIOLET; W : WHITE

h : Heavier wire.
S1 : STRAP 1
S2 : STRAP 2
S3 : STRAP 3
S4 : STRAP 4

the AA608 modulator board, looking from the square transformer, the first variable resistor is another microphone gain which should be set about ½ way. The third variable resistor is the deviation level, which will need adjustment to provide correct 5kHz peak from on-air tests.

There is a link to the side of the square transformer, to change between phase and frequency modulation. Set it to the pair nearest the transformer to provide frequency modulation for improved audio.

Volume/Squelch Mods

If you want to use the radio for both voice and packet, you may like to perform a modification to the volume level switch. Cut out R11 (22k) near connector 16, and fit a 1k resistor in parallel with R13 (4k7). Now 'Low' volume will be *no* volume, 'Medium' volume will be *low*, and 'High' volume will be *high*. Try adjusting preset R14 to obtain comfortable volume.

Preset R17 is squelch, which should be set as required. You may fit a switch on the squelch to force it open, wired in the control box using a spare wire (I used GN/R) which should be connected to pin 22 in the Plessey connector on the control box side, grounding this to open the squelch. As an alternative you may prefer to fit a 5k variable resistor and have continuous control.

Common Problems

These have been reported, which may be useful if you get stuck;

1) Shorted 27V Zener on the output from the -24V PSU.

2) A relay on the SU600 board can trip out if a PTT fault occurs. This needs to be reset by applying a voltage to it to trip it back in, or better strap it out. A ZN1034 timer chip is used on board to provide a time out timer.

3) Synthesiser faults include faulty reference crystals (5MHz), dry joints on the VCO. Sometimes the Philips Synthesiser chips can go faulty, but if you suspect this it is probably cheaper to buy another radio!

4) 27R resistor on SU600 board overheats, just completely remove this if found.

Conclusion

That's it. You now have a 12/24 channel synthesised transceiver working on 2m. Finally, I would like to thank all the people on packet radio, and those who have helped by supplying diagrams. Without the benefit of the packet radio network, mine and I suspect many other sets, would probably be still lying under the bench unmodified. In this regard, an ultimate thank-you should go to all the enthusiasts who provide and maintain the packet network in the UK.

Now What on Packet?

After his article 'Hooking up to Packet', Trip Neilser KC4KLS asks 'Now What?'

In the June 1991 issue of HRT I outlined my method of hooking up your hardware for VHF/UHF packet. I hope many of you have recently become hooked up to packet, an interesting and fun communications mode that's getting better all the time. Of those who have newly joined us on the packet frequencies, I'll bet many have already asked themselves, "Now what do I do?" ... or maybe, "Just what *is* all that strange looking stuff scrolling across my monitor?" Read on; with any luck I might have the answers to some of your questions.

First, you'll need to make sure you have everything hooked up properly and that there are no hardware problems in your packet station. That is, your TNC's sign-on message is clear, and when monitoring an active packet frequency you're receiving copyable packets from other stations and nodes. Even if all you're getting is gibberish, though, that doesn't necessarily indicate bad or failing hardware. Gibberish can appear when your TNC and computer's parameters conflict. Check that the TNC's parameters for TBAUD (data rate), AWLEN (data word length), PARITY, and number of start and stop bits are what the computer expects. You must set these parameters for the RS-232C port your TNC is using from within your communications software. Setting the TNC to other than its default parameters requires giving commands to the TNC from its 'cmd:' prompt after the communications program is running. It's best to initially set the RS-232C port to the TNC's defaults to avoid any confusing conflicts, consult your TNC's operating manual for these defaults. If you're still getting gibberish after correcting the parameters then you might have hardware trouble. You'll often small trouble-shooting sections in your TNC's operating manual, but my advice for dealing with a suspected hardware problem is to contact your dealer or the equipment's manufacturer.

What's Out There?

Okay. With your hardware checked out you're ready to try for your first packet connection. But who, or *what,* do you connect to? And *how?* It's not as hard as it looks, but you could want a little more explanation than that given in your operating manual. In most packet networks there are several kinds of stations transmitting packets. Firstly there are individual stations, like you and me. Then there are *Bulletin Board Systems* usually referred to as BBSs, which act as message systems between amateurs, and *DX Packet Clusters* for real-time DX communication. Finally there are *nodes* (sometimes called switches). A node is a specially configured TNC which functions differently from our home-based individual TNCs. Consisting of just a TNC and a transceiver/aerial combination, a node based on EPROM software such as TheNet needs no on-site computer once configured, (although in the UK popular use is made of *TheNode* by G8BPQ which runs on a PC — Tech Ed).

A node forwards incoming packets or connect requests somewhat like a repeater operating in simplex mode, and this is one very handy function of a node. Also, serving as a convenient point from which to connect to other nodes or stations, is another useful function of a node. That is, you connect to the node then issue a connect request to the node for a distant station.

A node can be easily identified by the regular transmission of its identification (ID) packet. Here in the States, nodes identify about every ten minutes with a packet that looks like this:

KB4NOZ-3*>ID:
TheNet 1.16 by NORD><LINK (ILMLAN:KB4NOZ-3)

This is the current ID of the Wilmington, North Carolina, local area network's node. ILMLAN is the alias for the node KB4NOZ-3, and either the alias or the call sign may be used for connection or digipeating purposes. An alias will often suggest a node's geographical location ('ILM' is the Wilmington airport's designation; 'LAN' is short for local area network), and many find an alias to be easier to remember than a call sign (KB4NOZ) plus a secondary station ID (-3), a term often abbreviated SSID. The '*' in the first line means that my TNC copied the ID directly, with no digipeating, indicating a local node, although your TNC may differ from this.

First Connection

Since a network node is nearly always on the air it's probably the simplest target for making that sometimes elusive first connection. So how do we connect to this node? With your TNC at the 'cmd:' prompt, type 'c ilmlan' ('c' is short for 'connect') or 'CONNECT ILMLAN' (typing all capitals, however, is *not* mandatory in packet operation), or 'connect kb4noz-3,' or 'C KB4NOZ-3,' then hit <enter>. Your TNC will immediately transmit a connect request that, if correctly copied by the node, will cause the node to complete the connection. Your computer's speaker might beep and you'll see a message from your TNC something like this:

This is what happens when you get hooked! (G4HCL's station).

*** CONNECTED TO ILMLAN

and your first connection is in the bag!

But what if you've followed the instructions so far, and although everything progressed as described there was no connection? Don't panic. Most likely all that went wrong was that the node couldn't copy your connect request. Often, fixing this kind of problem takes nothing more than a quick adjustment of your TNC's AFSK output level control. A procedure for setting the AFSK (audio-frequency shift keying) output level control was almost certainly part of the start up section in your operating manual. Even if you've already set the AFSK out-

put level control per your operating manual, sometimes another adjustment is necessary to adapt to others' local equipment or conditions. Of course you could have done what I did and decided to try out that shiny new TNC without first setting this control. You wouldn't do that, would you? I thought not.

Adjusting the AFSK output level control in my PK-88 means taking the cover off to get to the adjustable potentiometer. On some other TNC such as the Tiny-2 and the MFJ 1278 the adjustment can be done from the outside. Your operating manual will divulge the control's whereabouts on your particular unit.

After locating the control, adjust it all the way counterclockwise with a small screwdriver. Type in the same connect request that just didn't produce a connection and hit <Enter>. Check first to be sure you haven't made a typo, as typographical errors will *definitely* prevent a connection! Now, while your TNC transmits connect requests, *slowly* turn the control clockwise until you get a connection. If the TNC retries out before this happens, the number of tries can be increased to the maximum by entering 'RETRY 15' at the 'cmd:' prompt. This method can require several attempts, and some fine tuning may be necessary after the initial connection. I'd better add that you probably won't find anything like this in your operating manual, but it's fast, and it works.

Node Lists and Routes

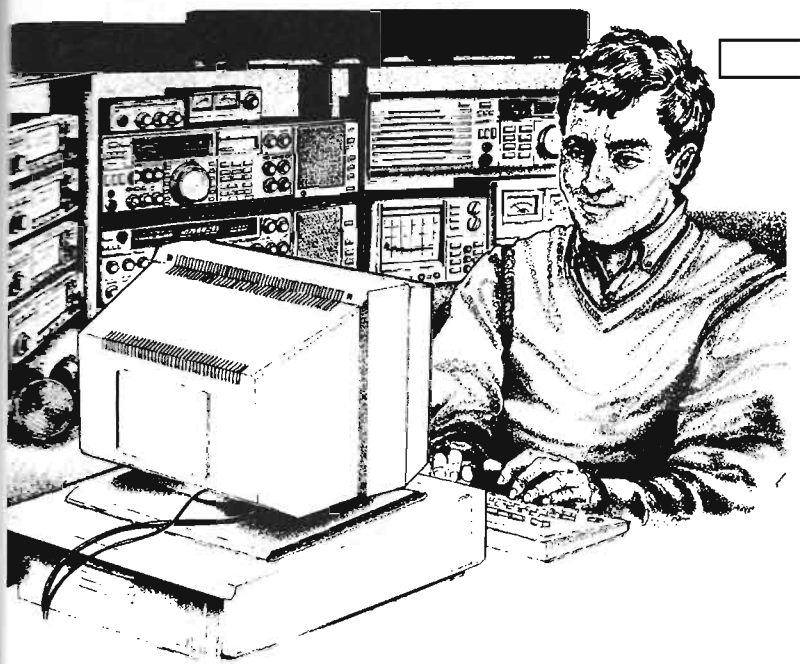
Now, what about the node you've just connected to? When you connected to the node, it started an internal timer that will be reset following each command you give the node. If you do nothing the timer will automatically request a disconnect after a specific period, often around 15 minutes. You can, of course, disconnect at any time. If you want to disconnect now to test this capability, hit <Ctrl><c>, or the <Break> key on some keyboards, to return your TNC to the 'cmd:' prompt, then enter 'd' for disconnect. Hitting <Ctrl><c> means that while holding down the <Ctrl> key you strike the 'c' key. You probably don't want to disconnect now because you want to find out what this node can do, right? So enter 'n' for 'nodes' and the node will respond with a list of nodes it's recently either heard or should be able to link to. Each node will be listed with an alias and a call sign, like: NCJAX:K6CIL-1, the Jacksonville, North Carolina, node, about a hundred and thirty kilometres north of my location. Most Bulletin Board Systems (BBSs) also will appear on the node list with an entry like: ILMBBS:N4CCK-2, the Wilmington, North Carolina, BBS. All the nodes on the list are theoretically within your node's range, and available for connects. In actual practice, though, for a variety of reasons including band conditions, this isn't always true. Node lists change during the day as different nodes are heard. A node list taken at noon may be very different from one taken at midnight, when VHF/UHF conditions are usually better. Trial and error is the best way to figure out which distant nodes are usable at any given time.

Another useful node command is 'r' for routes. This list shows which recently heard nodes have direct routes (or paths) to or from the node you're presently connected to. A connect request to one of these nodes in the routes listing will most likely produce a fast connection.

So now that you've made your first packet connection, I'll bet you can't wait to continue exploring the mode. Many enjoyable connections and experiences await you. You might find that you most prefer keyboard QSOs with other local amateurs, or maybe you'll enjoy reading the amazing variety of bulletins and messages on a nearby BBS, or perhaps you'd like to try sending messages to distant friends, even DX stations. Like me. My packet address is: KC4KLS @ N4CCK.ILMNC.NC.USA.NA.

See you on the monitor.

Packet Radio —Roundup—



Chris Lorek G4HCL looks at new software and hardware offerings for packet radio

This month, you may have noticed, is an ex-PMR 'special', and many readers will know that one of the common uses of an ex- PMR rigs is, of course, as a stand-alone single channel rig for packet. The two go hand-in-hand quite nicely, and the majority of 'nodes' I'm aware of use ex-PMR gear for their operation. It's good to have a low-cost supply of equipment, all we need now is a low cost supply of ex-service TNCs! The time will come, I'm sure, as users 'upgrade' their stations, possibly using computer-based methods of processing and/or DSP 'boxes' in future years.

Packet radio is the fastest growing mode in amateur radio, and it's been interesting to see the various discussions on the BBS network about what communication modes the future should be looking to in terms of regulation. As a Novice instructor, I've found my pupils can't wait to get their 70cm ex-PMR portable rigs (kindly donated to them by Anchor Surplus - thanks again Rob) coupled up for packet operation, even though it *did* mean buying another pair of crystals for their rigs in addition to their local 70cm 'chat channel'. Fortunately, going 'in' on 70cm to their local six-channel BPQ node system can then get them into their local BBS, DX PacketCluster and dedicated 23cm/10GHz inter-node links for 'DX' chats.

Packet however is often a 'connected' affair, where a transceiver is required for two-way 'Acks' and the like to receive information. But what about those who haven't got a licence yet, or indeed can't transmit on the frequencies used by their local system? Here's a software package that I recently came across;

DXC-MON

If you'd like to 'get in' on DX activity by receiving spots from your local DX PacketCluster, but you haven't got a transceiver for the band it operates on (4m or whatever), then all is not lost. Likewise you may like to monitor packet activity, for example bulletins from your local BBS, but without using a transceiver. If you have a receiver capable of simply monitoring the frequency, even a scanner receiver, then *DXC-MON*, from the computer of Doug Smith, W9WI/4, could prove useful. *DXC-MON* is a public domain (i.e. it may be freely copied) PC program for your PC which uses your TNC in receive-only 'monitor' mode, a transmitter isn't necessary. Doug tells us this can be handy for Novices (who aren't currently allowed to transmit on 2m in the UK), unlicensed SWLs who want to monitor DX amateur stations, and DXers who either don't have enough power on VHF to access their nearest node, or who'd rather not have a high-power VHF station transmitting during their DX sessions.

The program can ignore all packet data on a frequency except for DX spots. These spots will be displayed on the screen, with the DX callsign shown first, followed by the frequency on which the DX was heard, then the remaining data of time heard, reporting station, and any comments. If you wish, the program may be set to sound a 'bleep' from your computer with each DX spot received.

As an 'added bonus', the program can also log *all* incoming packet data, just DX spots, or both to disk (although you can't monitor all packet data on screen). If you're monitoring BBS activity, you can read messages read by the connected stations, eventually building up a nice 'log' of plenty of bulletins and the like throughout a day's worth of your system left on simply monitoring the channel.

For 'real time' DX spots, your receiver does of course need to be able to receive the DX PacketCluster frequency for your area, and it can only decode transmissions from a cluster node to end users. So you can't monitor a frequency used only for inter- node communications, and you can't monitor DX spots unless an end-user is connected (as many are, 24hrs a day).

After testing the program I was quite pleased with the results, DX spots coming up virtually just as if I'd connected into the DX PacketCluster. A test of the 'log everything' also worked well, with each packet line arranged nicely, not in the 'broken-up' fashion you normally see from your TNC in 'monitor' mode. I received my copy of *DXC-MON* from Venus Electronics, the public domain and shareware source who specialise in amateur radio software. It's their disk No. 3AM28 at £2.35, and you can find them at 26 Pevensey Way, Frimley Green, Camberley, Surrey GU16 5YJ, Tel. 0252 837860.

Paket Version 5

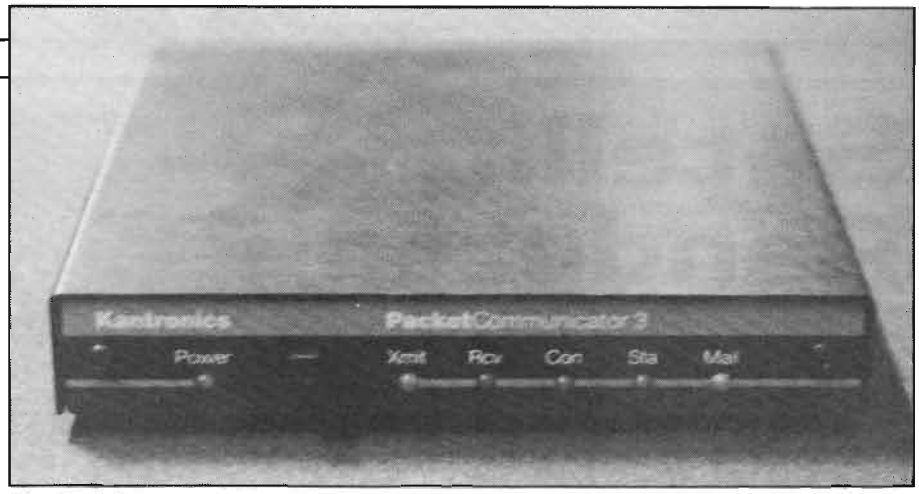
Hot on the tail of Paket 4 (featured in this column in the Sept 91 HRT) comes Paket 5, for the IBM PC and clones. This program, written by Tony Lonsdale VK2DHU, is now one of the best packet radio programs I've come across that isn't dedicated to a particular make or model of TNC. It's a 'shareware' program, i.e., 'try before you buy', with a registration fee of A$25 (Australian dollars). As well as providing the 'usual' multiple screens and type-ahead buffers, it has a useful 'flashback' mode where you can look at text which has scrolled up your screen. The new version includes a much larger manual (almost 200 pages worth on disk - I'm still reading it!). A useful 'screen saver' mode comes up when there's been no activity for a short while, thus saving your screen from 'burning in' (my packet terminal VDU is already beyond help here, having been constantly on for over a year!). There isn't room here to describe all the features, watch out for a full review of this soon in HRT. If you can't wait, then it's featured in the latest catalogue from the Public Domain and Shareware Library, Winscombe House, Beacon Road, Crowborough, Sussex. TN6 1UL. It's their disk No. H018 at £6.00, and it comes on either a 3.5in 720k or a 5.25in 1.2Mb disk, it won't fit onto a single 360k disk

Lan-Link Version 2

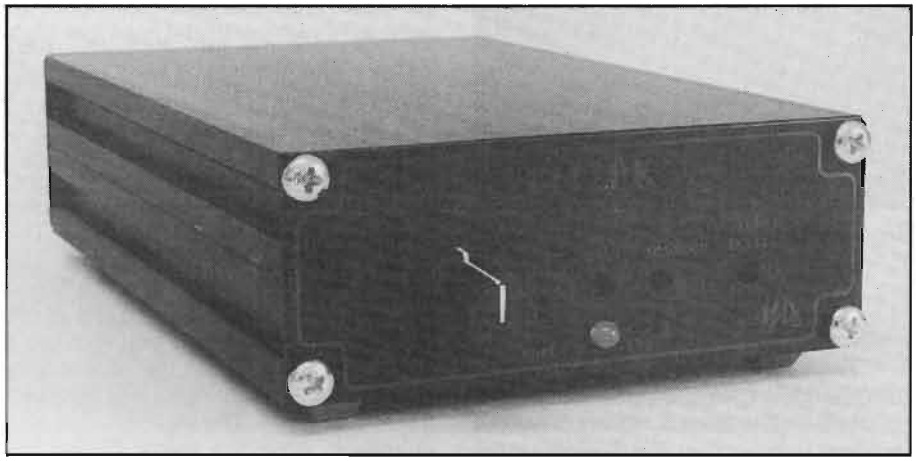
Peter G0GSZ has just received the long-awaited Lan-Link Version 2 update from Joe Kasser G3ZCZ/W3. Peter tells packet users that if anyone would like a copy to send him a formatted disk, return postage, and a self addressed disk mailer. He can handle all disk sizes, but if you use 360k disks the program needs two of these. Peter can be contacted with a message to G0GSZ @ GB7LDI.#35.GBR.EU, and by post at 2 Mayes Close, Norwich, Norfolk. NR5 9AR.

New Kantronics TNC

Kantronics have just launched their new TNC, a small sized (19mm x 102mm x 127mm), low power (less than 20mA at 6-25V DC with the LEDs off), 'fully featured' TNC, called the KPC-3. It has a novel dual-command set; the *NEWUSER* level gives the 20 commands most frequently used in basic packet operation, and the *EXPERT* level gives you complete access to the 120 plus commands the TNC has available. The KPC-3 provides the usual Kantronics PBBS features complete with reverse forwarding, the KA-Node,



The KPC-3



The Wood and Douglas packet rig.

remote SysOp access, and the TNC supports host mode for use with their superb HostMaster software (which I use here). If you use an alternative software from Kantronics, then you can even receive Weather Fax with the unit!

With it's low power consumption, the TNC has the facility to allow an internal 9V battery to be fitted for 'portable packet'. A software DCD also lets you run with your receiver squelch open, thus getting over one of the problems many users face with slow squelch 'rise times' in their receivers. Needless to say, there's a full review of the KPC-3 coming up soon in HRT!

Wood and Douglas 9600 baud 2m rig

Also on the hardware side, the UK firm of Wood and Douglas are getting together a low cost ready built 2m transceiver, capable of running 9600 baud packet. This provides an output power of 8W, and is expected to be priced at £230, they should be available sometime in the autumn. In my area there are a number of 9600 baud users on 144.625MHz, and I'm often getting my 'arm twisted' to put my earlier 2m 9600 baud node back on the air, linked to the 6m-10GHz multi-frequency node I run. All it needs is the equipment, maybe this will provide the opportunity!

CTRL-Z, End of Message

I'm off now to meet Johannes DG3RBU of *Baycom* fame this weekend (see HRT March 92 and June 92). Rumour has it that some Bavarian-style liquid consumption may become involved! Until next month, 73 de Chris G4HCL @ GB7XJZ (and via. mail/phone at P. O. Box 73, Eastleigh, Hants, SO5 5WG, Tel. 0703 262105, Fax 0703 263429.

DG3RBU and G4HCL indulge in a typical Bavarian pastime!

Satellite Rendezvous

Richard Limebear G3RWL with AMSAT-UK news

Dr. Junior de Castro, PY2BJO

Prestigious Award to Junior de Castro PY2BJO

Dr. Junior Torres de Castro (PY2BJO) who is the creator and owner of the DOVE microsat, will receive the highest honour that the Brazilian government can bestow upon one of it's citizens. The official title of this commendation is known as the *Order of Rio Branco*. Junior is being recognised for his efforts during the recent STS-45 SAREX operations where he invited Brazilian school children to come to his station and ask questions of the STS-45 astronauts. Through Junior's efforts, the SAREX program and amateur radio have received a great deal of positive publicity. Junior will receive a medal, a 'sash', and a certificate during a ceremony planned by the President of Brazil, Fernando Collor, in front of all of his Cabinet Ministers at President's house in Brasilia. AMSAT-UK congratulates Junior for this great honour, which is the Brazilian equivalent of a knighthood.

Oscar 13

Here's some info from the 1992 TAPR Annual Meeting held in March about AO-13's orbital decay;

The perigee height is starting to increase, as predicted; its currently 593km. The real data tracks the prediction pretty well. The prediction shows that AO-13 will be lost in 1996. The effect is *not* atmospheric drag. The gravity field of the Sun and the Moon are changing the shape of the orbit, making it more narrow and moving it toward apogee. When the eccentricity reaches 0.75, the perigee will intersect the atmosphere. The inclination is also changing. After the motor firings following launch it was 57.65 deg, then Dec 88 was 57.41; Dec 89 was 57.13; Dec 90 was 56.85; Dec 91 was 56.67 and now its 56.91. The eccentricity is currently 0.73.

The ZRO Memorial Technical Achievement Award Program, or just 'ZRO Test' re-started in May on OSCAR-13. This activity is a test of operating skill and equipment performance. The 'B' tests can be heard on 145.840MHz and the 'JL' test on 435.945MHz. N5EM will run the 'JL' tests while WA5ZIB will continue with 'B' runs. For times and dates, up to date information about AO-13 operations is always available on the beacons, 145.812 MHz or 435.658 MHz in CW, RTTY and 400 bps PSK.

Table 1.

RUDAK II – Test Schedule

(Downlink for all modes is 145.987MHz)

UTC (MINS. MOD 5)	BEACON MODE
0,1,2	FM DIGITAL SOUND GENERATION
3,4	PSK TELEMETRY, KLMNY-BLOCKS

Sample text;

```
L  TCMD-HISTORY (TEXT):                                  92-04-14 08:59:09
M  TCMD-HISTORY (BIN)              COUNT:                92-04-14 08:59:21
N  GENERAL TELEMETRY (BIN),        COUNT:                92-04-14 08:59:32

Y  HI, THIS IS AMSAT OSCAR 21 / RM1 / RS14               92-04-14 08:59:43

   VOLTAGES          RM1-TCMD-INTERFACE  LOCK     MEMORY ERRORS
   5V-R1 : 0.11 V    1-TX-ON :    ON     RX2 : *    SINGLE: 90
   5V-RTX: 5.16 V    2-RX12&48: OFF      RX3 : -    MULTI : 175
   5V-RAM: 0.09 V    3-RNG :      ON     AGC
   TOTAL CURRENT     4-SOFT: 14.0 V      RX3: 146 TEMPERATURE
   14V-I : 295 mA                        RX4: 209    22.7 deg C
```

AO-13 Satellite DXpedition

There's a satellite dxpedition from Svalbard/Spitzbergen JW) occurring in the month you read this, between 19th and 31st of July. The callsign will be JW/DL6DBN/P via the B-transponder. Unfortunately the whole equipment must be hand carried by one person, which means it is light weight at below 10kg. This means that operation times will be limited to a maximum of two hours each day, and will use an EIRP of less than 20 W, due to reduced accumulator-capacity. QSL-cards should be sent via DL6DBN, and these are appreciated via the bureau.

Russian Satellites

RUDAK-II on AO-21 is now running an automated test schedule. For three minute segments, digital sound will be transmitted, including the SPUTNIK-1 beacon, which can make listening to AO-21 a little bit easier especially for demonstrations and for those who can't decode the 400 Bit/s PSK Telemetry. Table 1 shows the schedule as provided by DG2CV.

Trakbox Satellite Tracker System

Again from the 1992 TAPR Annual Meeting held in March, some 'advance' information about the proposed autonomous aerial tracker. The unit is a stand-alone rotator controller, which this solves the problem of pointing the aerials at satellites, especially fast-moving satellites in low earth orbit, while also trying to do other tasks. The Kansas City Tracker has been available for a while now, but it requires an IBM PC, and takes up a slot, and requires the PC to be on during the pass. The Trakbox eliminates these limitations.

The Trakbox is based on an 8051 microcontroller with RAM and program memory, a realtime clock, and an LCD display. The user provides Keplerian elements through an RS-232 serial port, and then controls the operation of the Trakbox using the LCD display and front panel controls. The box interfaces directly to Kenpro rotators, and can be interfaced to other brands of rotator. The Trakbox can also control the receive frequency to compensate for Doppler shift, using either the computer interface or the up/down step buttons on Icom, Kenwood, or Yaesu radios.

A portion of the price of each kit sold is donated to the Phase III-D project.

If this has stirred your interest, please (for the time being) please *don't* ask Ron of AMSAT-UK about it, he *will* announce when its ready! At present, it's going out for beta testing, and when it's proved will the parts will be made available.

Delegates at last year's Colloquium

Phase III-D News.

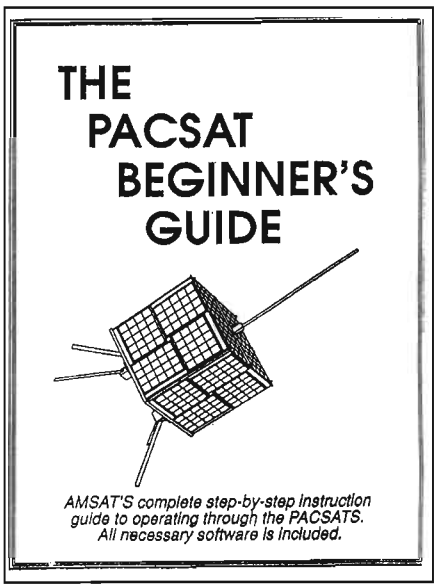
The Phase III-D mechanical design indicates a really big satellite. It's doughnut shaped, with two solar panel 'wings' with a 17-foot span. Users in urban areas are having more and more trouble installing large aerials, so the satellite will have 10 dB to 20 dB more performance on each link. The 10m downlink will be capable of several hundred watts, possibly using the long solar panel wings for an aerial. The gain aerials for 2m and 70cm consist of several elements mounted on the sides of the spacecraft, each with its own amplifier with controllable phase, giving many possible aerial patterns. The satellite will be 3-axis stabilised using momentum wheels, so the aerials will always be pointing straight down at the Earth.

AMSAT-UK Colloquium this month

The annual AMSAT-UK Colloquium is again to be held at the University of Surrey at Guildford, over the long weekend of 30th July to 2nd August. The Colloquium consists of a series of talks, lectures, and demonstrations right across the range of amateur satellite activity. It is arranged to provide delegates with a complete educational and fun weekend, for the beginner to the advanced technical person. In addition, delegates can talk to the very engineers who design, build, command, and launch our satellites. All delegates giving lectures are very willing and approachable to anyone who wishes to ask them questions, either at the lectures, or at the bar in the evening. Come along and test the water! It is *essential* to book in advance if you wish to attend, even just during the day. If you have a booking form already, then now's the time to send it off! Day-only bookings must be received by 15th July, and overnight bookings should have already been received (by 1st July), late overnight bookings (i.e. received after 10th July 1992) must carry a 20% surcharge, subject to accommodation availability. As a guide, day-only rates are £27.25 including lunch, £52.50 overnight including meals.

Items on the agenda include Phase III-D updates, KITSAT information, tours of the UoSat command stations, RUDAK system operation, Packet satellites, and much, much more.

The Colloquium dinner and Social will as usual take place on the Saturday evening. Dinner will be in the Chancellors Restaurant and Banqueting Suite (dress optional), and following this entertainment will be provided by the London Jazz Band. The usual 'junk sale' will of course be there, limited to 45 minutes. For those wishing just to socialise (or indeed to bring a guest for the dinner) there will be a ticket option for the Saturday evening only (i.e. no other Colloquium attendance). Send an SAE to Ron G3AAJ at AMSAT-UK for details and a booking form if you'd like to come along.



The latest PC Pacsat software comes with the Pacsat Beginner's Guide from AMSAT-UK

New stocks of the *Pacsat Beginner's Guide* are now available from AMSAT-UK, complete with the latest software on PC disk. For further information on AMSAT-UK contact: AMSAT-UK, c/o Ron Broadbent, G3AAJ, 94 Herongate Rd, London, E12 5EQ. Big SAE gets you membership info. SWLs as well as licensed amateurs are welcome.

Our Tech Ed made a TYPO in the June 92 issue; KITSAT will of course have an OSCAR 22, not OSCAR 20, transponder. AMSAT-UK have a well-deserved reputation of getting things correct, so we've cut off our Tech Ed's beer supply for the month as punishment!

KEPLERS

SAT:	OSCAR 10	UoSat 2	AO-13	PACSAT	DO-17	WO-18
EPOC:	92114.02636943	92115.05135742	92106.29935387	92100.74745699	92115.05209571	92111.72873409
INCL:	26.3660	97.8584	56.9068	98.6469	98.6454	98.6451
RAAN:	87.3437	153.0342	31.1164	183.6894	197.9900	194.7385
ECCN:	0.6055912	0.0011065	0.7295966	0.0012674	0.0011790	0.0012657
ARGP:	337.8024	260.3722	283.2827	19.5038	340.7167	350.3096
MA:	4.3528	99.6350	11.0887	340.6626	19.3570	9.7839
MM:	2.05883651	14.68492795	2.09724108	14.29674197	14.29808670	14.29799581
DECY:	-9.4E-07	1.522E-05	-2.63E-06	5.69E-06	4.61E-06	3.63E-06
REVN:	3864	43519	2941	11550	11755	11708

SAT:	L0-19	F0-20	INFORMTR-1	U0-22	RS-10/11	Mir
EPOC:	92115.04483884	92112.28957462	92114.67823211	92114.23196983	92114.33272320	92114.49282891
INCL:	98.6453	99.0707	82.9493	98.5083	82.9312	51.5988
RAAN:	198.1337	41.3971	3.2653	190.1487	188.9161	161.7573
ECCN:	0.0012641	0.0540857	0.0036665	0.0008712	0.0013344	0.0015249
ARGP:	340.7419	321.7473	109.2016	111.0868	45.6411	343.3121
MA:	19.3287	34.6385	251.3125	249.1251	314.5811	16.7578
MM:	14.29885907	12.83209890	13.74480011	14.36627871	13.72280839	15.60960271
DECY:	4.12E-06	3.4E-07	1.38E-06	7.12E-06	1.76E-06	4.3481E-04
REVN:	11756	10320	6181	4036	24226	35374

VHF/UHF Message

Geoff Brown, GJ4ICD boosts VHF DX operation by sending a unique form of 'food parcel'

This month I'll start by looking at something different. You may or may not have heard of Siggy YO2IS in Romania, Siggy has for many years been active on the VHF bands, all his equipment is home brewed due to the non-availability of commercial equipment in Romania. A couple of years ago Siggy received permission for 50MHz operation, this meant that he had to construct a transverter, which he did from old TV and radio parts, quite a challenge!

In March of this year I spoke to Siggy on 28MHz and asked him if he needed any parts to help with his construction projects, you can guess what the answer was! So, I managed to hunt around various friends in the hope of finding the type of components Siggy required. Within a few weeks there was a nice box full of items that I'm sure Siggy had never seen or heard of before. Then came the problem, how can I guarantee that the goodies will arrive in Romania? After a few days thought I took a gamble in sending the 'box' by letter post as a 'Food Parcel' and just kept my fingers crossed. Within seven days of posting, Siggy was calling me on 28.885MHz to say that it had arrived unopened, and he sounded very pleased indeed.

The word has now been spreading, in fact I have just received a donation from G8APZ that will be going out to Romania in the next 'Food Parcel'! So, if you have any surplus bits and pieces that you could offer free of charge to help such fellow amateurs in less fortunate situations than ourselves, please send them to me and I will make sure that they are shipped out to the relevant people. Finally, keep a good look out for Siggy YO2IS on 144MHz during the ES season.

50MHz Beacon List

50.000	GB3BUX	50.0551	ZS6DN	50.075	KB4AXD/2
50.005	ZS2SIX	50.0556	VE2TWO	50.0752-53	PY2AMI
50.005	H44HIR	50.057	TF3SIX	50.0753-65	K71HZ
50.0075	K0GUV	50.057	VK7RSB	50.0763	K5ZXE
50.0079-81	XE2HWB	50.0571-73	VK8VF	50.0764-67	W6SKC/7
50.0080	DX1HB	50.060	GB3RMK	50.077	N5JM
50.0087	HI0VHF	50.060	K4TQR	50.077	WB2CUS/3
50.0100	JA2IGY	50.060	W5VAS	50.0775	W6UR
50.012	OZ4VM	50.0600	PY1AA	50.0775	VK4BRG
50.0135	CU3URA	50.0600-02	PY2AA	50.0776-78	PT7BCN
50.015	SZ2DH	50.061	K1NFE	50.0783	N0LL
50.015	PJ4B	50.061	WB0RMO	50.0790	TI2NA
50.015	4N3SIX	50.0617-18	KH6HME	50.079	KF7VA
50.0169	JA6YBR	50.062	WA8R	50.080	WB4OOJ
50.0183	V51VHF	50.0625	GB3NGI	50.080	SK6SIX
50.0195	P29BPL	50.0628	KB6BKN	50.0804-41	HC8SIX
50.020	GB3SIX	50.063	W3VD	50.082	VE1MUF
50.020	CX1CCC	50.0630	KH3AF	50.0842	3D2FJ
50.021	OZ7IGY	50.0644	KH6HI	50.086	VE2STL
50.0215	FR5SIX	50.065	WO1JR/KA0CDN	50.086	VP2MO
50.0247-53	ZP5AA	50.0655	GB3IOJ	50.0865	LU1MA
50.025	6Y5RC	50.066	WA1OJB	50.090	TR8CA
50.025	OH1SIX	50.066	KB5KYB	50.091	9L1SL
50.0255	9H1SIX	50.066	AL7C	50.0919-21	HC2FG
50.0256	YV4AB	50.0661	VK6RPH	50.0958-62	PY5XX
50.0269	JA7ZMA	50.0661-4	WD7Z	50.0984	LU2MFO
50.027	ZS6PW	50.0664	KA5FYI	50.1020	V51E
50.030	CT0WW	50.067	KD4LP	50.280	PY responder
50.0318-21	ZD8VHF	50.0675	N7DB	50.314	FX4SIX
50.033	UL8—	50.0679	WZ8D	50.321	ZS5SIX
50.0338	LU8YYO	50.0683-87	W7US	50.480	JH8ZND
50.035	ZB2VHF	50.0685	W4RFR	50.4910	JG1ZGW
50.036	V73AT	50.0687-91	K6FV	50.4993	5B4CY
50.0386-87	FY7THF	50.069	W4HHK	50.904	ZS1STB
50.0399	SV1SIX	50.070	EA3VHF	51.0218-26	ZL1UHF
50.040	VO1ZA	50.070	KM4ME	51.0287	ZL2MHB
50.040	UB7I	50.070	KB4UPI	52.320	VK6RTT
50.042	GB3MCB	50.070	K0HTF	52.325	VK2RHV
50.043	YV5ZZ	50.070	N4LTA	52.330	VK3RGL
50.0430-35	ZL3MHF	50.070	WA7ECY	52.345	VK4ABP
50.0446-47	JR6YAG	50.070	K4AUG	52.370	VK7RST
50.0456	OX3VHF	50.0701	N6CW	52.420	VK2RSY
50.0459	JD1BFI	50.0703	W0VD	52.425	VK2RGB
50.046	VK8RAS	50.0704	KK4M/7	52.435	VK3RMV
50.0481	JA7YYL	50.0706	N4MW	52.4400-03	VK4RTL
50.050	GB3NHQ	50.0717-18	LU1DMA	52.4449-51	VK4RBM
50.050	VE7SIX	50.072	KW2T	52.4452-53	VK4RIK
50.050	ZS6DN	50.072	KS2T	52.450	VK5VF
50.050	LA7SIX	50.074	WB5DSH	52.460	VK6RPH
50.0500-01	FO5DR	50.0742-45	NN7K	52.465	VK6RTW
50.0513	ZL3MHF	50.0747-48	VS6SIX	52.470	VK7RNT
50.0537-38	VK3SIX	50.075	WB4OSN	52.510	ZL2MHF
50.0547-48	JA5FFJ	50.075	WB4WTC		

Massive Aurora

On 10th May there were in general very poor conditions, with 28MHz closed most of the day. But just as I started packing some equipment for ZB0T, a very large Aurora started on 50MHz and 144MHz. There was nothing on 432MHz down here, but I worked lots of UK stations plus GM, GI, GD, EI (IO51), PA0s, ONs, SM1LPU (JO97), SM7s, and lots of OZs, just under 100 QSOs. An ON reported working ZS6 during the Aurora, and UK stations reported QSOs with Italy, YU, HG etc. Quite an eventful day!

Beacons

Many readers write regarding beacon listings and certainly there seems to be a lack of them, so during the next few months I will endeavour to produce a short form beacon list of the VHF bands starting this month with 50MHz. See the accompanying table.

So what's been happening?

The VHF/UHF bands during April have been rather quiet, solar flux levels were up and down with the end of April dropping to under 130 units. The first major summer ES event took place on the 24th with a big 50MHz opening to DL, OE, SM, LA, OK, YU etc., this lasted for around four hours. The 12th brought 7P8SR into the UK, and the SMC gang from 8R1 had a small window into the southern half of the UK on Easter Monday.

Reports

Reports of activity for the early part of April were very poor. Ela G6HKM reports on aurora on 50MHz on the 3rd which netted EI2EFB, GI7CNO, GI8AYZ all in IO64, and GI4WVN, GD3AHV in IO74, GM1FNX (IO75), GM1IKQ (IO76) plus the northern counties of England.

On the 5th there was the RSGB contest, but there didn't seem to be too

QSL List

CE3GDN – *Don Long, M Guzman Maturana 1501, La Dehesa, Las Condes, Chile.*
CP6AK/CP6BY – *PO Box 2010, Santa Cruz, Bolivia.*
EI5FK – Charles Coughlan, 12 Forest Bridge Cres, Wilton, Cork, Eire.
ES5MC – *Arvo Pihl, PO Box 301, Tartu, EE 2400, Estonia.*
ES5PC – *Viljo Allik, via PO Box 301, Tartu, EE 2400, Estonia.*
ES6QB – *Tonu Taimsaar, PO Box 31, Voru, EE 2710, Estonia.*
FR5EL – *M. Hoarau, PO Box 87, Le-Tampon Cedex, F-97430, Reunion Is, via France.* FY3FV – *PO Box 999, F-97300, Cayenne, French Guiana.*
FY3FL – *Via FC1LOU, Box 305, Kourou, F-97379 Guyane, Francaise, France.*
G4SMC/8R1 – *See PP8ZCB.*
HC8K – *Via HC5K, PO Box DX, Guayaquil, Ecuador, South America.*
HK4BHA – *PO Box 50405, Medellin, Colombia.*
HL0LHS – *Lotte Hotel, 1 Sogong Dong, Chung-Ku, Seoul, Korea.*
JA4MBM – *Hideaki Yoshida, 3-1-8-401, Yoshizimanishi, Hiroshima, Japan.*
KG6DX – *Joel Chalmers, 93 Gardenia Ave, Latte Heights, Guam 96913.*
K4SYP/MM – *Robert Panknen, Golondrina 20, 30889 Calabardina, Murcia, Spain.*
KM1E/C6A – *Bill Wiseman, PO Box 120, Woolwich, ME 04579, USA.*
LU8EEM – *Ruben J. Allemanco, PO Box 150, Lincoln 6070, B.A. Argentina.*
LY2WR – *TV Transmitters RC, Box 927, 232044 Vilnius, Lithuania.*
OD5SK – *Via KB5RA, 809 Sweetwater Island Cir, Longwood, FL 32779, USA.*
OK2ZZ – *Rudolf Tuzin, Pricni 482/b, 59301 Bystrice nad Pernstejnem, Czechoslovakia.*
OK3LQ – *Palo Kosinoha, Febr. Vitazstva 24, 90101 Malacky, Czechoslovakia.*
OX3LX – *Via OZ1DJJ, Bergthorasgade 9-3, TH, DK-2300, Koebenhavn, S. Denmark.*
PJ2/OH1ZAA – *Via OH1NOA, KP7, SF-28760 Pori, Finland.*
PP8ZCB – *K.R. Diamond, c/o G4SMC Radio Club, School Close, Chandlers Ford Ind. Est., Eastleigh, Hants SO5 3BY UK.*
PT7CB – *Mauricio Moreira, PO Box 1329, 60001 Fortaleza, Ceara, Brazil.*
RA3TES – *Andy, PO Box 13-A, Arzamas 60722, Russia. SO1A – Via EA2JG, Arseli Bardeci, Las Vegas 69, 01479 Lyando, Alava, Spain.*
UL7GCC – *Mike Chirkov, PO Box 1, 480113 Alma Ata, Kazakh, Kazakhstan Rep.*
VK4FP – *T Roberts, 48 Malmrose Street, Wishart 4128, Queensland, Australia.*
VK4JH – *J.F. Hanran, 28 Macrossan Street, Townsville 4810, Queensland, Australia.*
VK6RO – *Graham Rogers, 22 Grace Street, Ferndale 6155, W.Australia.*
VK6HK – *D. Graham, 42 Purdon Road, Wembley Downs 6019, W.Australia.*
VP2MO – *Errol Martin, PO Box 113, Plymouth, Montserrat, West Indies.*
V85PB – *Peter Bacon, PO Box 715, Seria, Brunei*
XE3VV – *Alberto Ponce, PO Box 1198, Merida, Yucatan 97000, Mexico*
XE2HWB – *PO Box 674, La Paz, Baja California Sur, CP 23000, Mexico.*
YN5JAR – *Jose Antonio Roban, PO Box 112, Jinotepe, Nicaragua. Y*
S1AG – *Dr Andres Goens, PO Box 3061, San Salvador, E1 Salvador.*
YV4AB – *Via YV4UY, Ivan Aguirreche, Box 1717, Valencia, Venezuela.*
ZD8LII – *Steve Hodgson, PO Box 2, Ascension Island, South Atlantic Ocean.*
5B4YX – *Ian Osborne, Blakelow, Old Paphos Road, Episkopi Village, Limassol.*
5H3RA – *Via JA3PAU, M Gari Taguchi, Box 1052, Kobe 650-91, Japan.*
7P8SR – *Ray Shanweiler, PO Box 333, Maseru 100, Lesotho, via South Africa.*
7Q7CM – *Colin Morgan, PO Box 51491, Limbe, Malawi.*
7Q7XX – *Via JH3RRA, Box 21, Katano, Osaka 576, Japan.*

much activity, yours truly worked G4UJS/P in IO94 and a few other stations in the north. Ela heard ZS6XJ and V51/DL3ECK plus TU4DH on the same day but no contacts were made. Things then went dead for a week or so, until the TEP path opened up to South Africa. The 12th was probably the best day of the month; at 1430z with just a handheld receiver I heard ZS6WB working into the UK, so I knew that things were looking good. The 50MHz warning net was put into operation by a phone call to Chris G3WOS, Chris informed me that he had just worked Ray 7P8SR/KG30 for a new one. On checking the band out I found it full of ZS6s along with 7P8SR at S9+20, with many Italians also heard via backscatter operating in their segment of the band.

TEP continued to dominate the action on 50MHz for the next week or so, with reports of A22, V51, and the FR5 beacon into the UK. On Easter Monday Paul G4CCZ who was operating as G4SMC/8R1 was worked in southern England, but most people missed out on this one as the opening was very short.

On the 21st, UK stations reported a weak ES opening to YU, on the 22nd there was a better opening, the 23rd also brought an opening, but the 24th was the main and first substantial Sporadic E opening of the year. At 1300z that day YU was first reported into GM, PY5CC was also worked around most of the UK. ES continued throughout the afternoon with the following being worked, OK3LQ (JN88), OE5NEL, DF7RG, OK2PZW, and at 1400z Doug ZP6CW worked Alan GI0OTC and others in the north of England. More ES followed with OK1MAC (JN79), OK1IBL (JO60), GJ7DNI reporting the latter. As the ES moved it seemed to link up with TEP bringing in ZS4S, ZS9A, ZS6AXT and the V51 beacon very strong to the south coast of the UK. There was more ES on the 25th but it seemed that the peak had gone, this is often seen during the summer months when ES seems to build from day to day, then suddenly vanishes after reaching a peak or high MUF.

Other news

Eric TA/F1JKK has now arrived in Turkey and is operational, so keep an eye out on 50MHz and 144MHz during the next few months.

Poland have now got their act together, and Chris SP4TKK informs me that he will be QRV on 50MHz from the last week of May or the first week of June.

A new station on 50MHz from Africa has been heard in Malta and France, this was TY1ABE, no further info is at hand. ZD7CRC is now QRV on 50MHz from St. Helena, and it is thought that the 9L1 beacon is off the air.

Other bands

Propagation on the higher bands has also suffered despite the good start to the year. Dave G0DJA in Yorkshire informs me that he may have to go QRT for a while, until he can re-site his aerials due to wind noise at night. Yes Dave, I think many of us have had that problem!

Finally may I thank the UK Six Metre Group, KA3B, the 50MHz DX Bulletin, and KI6E, for their help in the 50MHz beacon listing and QSL info.

That's it for another month, please send any reports to; Geoff Brown GJ4ICD, TV Shop, Belmont Rd, St Helier, Jersey, Channel Islands, or you can phone me on 0534 77067 daytime (fax at night).