

Amateur

RADIO

For all two-way radio enthusiasts

Bits to Build
- Calibrator Kits

Secondhand
Computer Special

Build a two tone
Oscillator



On test: Icom IC575A
28/50MHz multimode transceiver

50MHz TRANSVERTER
REVIEW

Amateur RADIO



Editor:
Anita Ley
Deputy Editor:
Jane Berry
Assistant Editor:
Lisbeth Stedman
Editorial Assistant:
Nicola Woodford
Advertisement Manager:
Marian Vidler
Subscriptions:
01-760 0409
Accounts:
Clare Brinkman
Publisher:
Peter Williams
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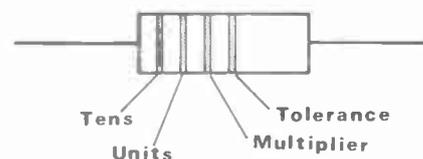
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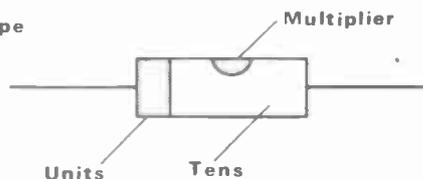
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ICOM

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Features:

- AC power supply
- Automatic antenna tuner
- Multi function CRT display
- Twin passband tuning
- Dual-watch
- 99 memories

Advanced engineering from ICOM has produced the most sophisticated Amateur HF transceiver on the market today, whether DX'ing, contesting or simply enjoying top performance the IC-781 is a top of the line performer. A unique multi-functional CRT displays frequencies, modes, memory contents, operating notes, RIT, two menu and seventeen optional screens. The soft orange display also serves as a display for DATA modes such as RTTY, AMTOR and PACKET.

The PAN display continuously indicates all signal activities and pile-ups with your operating frequency in the centre. Selectable frequency spans of 50kHz, 100kHz and 200kHz. Vertical range indicates relative signal strength. Twin passband tuning with separate controls for second and third IF stages increases selectivity and narrows bandwidth, independently varies low and high frequency response or functions as a IF shift.

Icom (UK) Ltd.

Dept AR, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

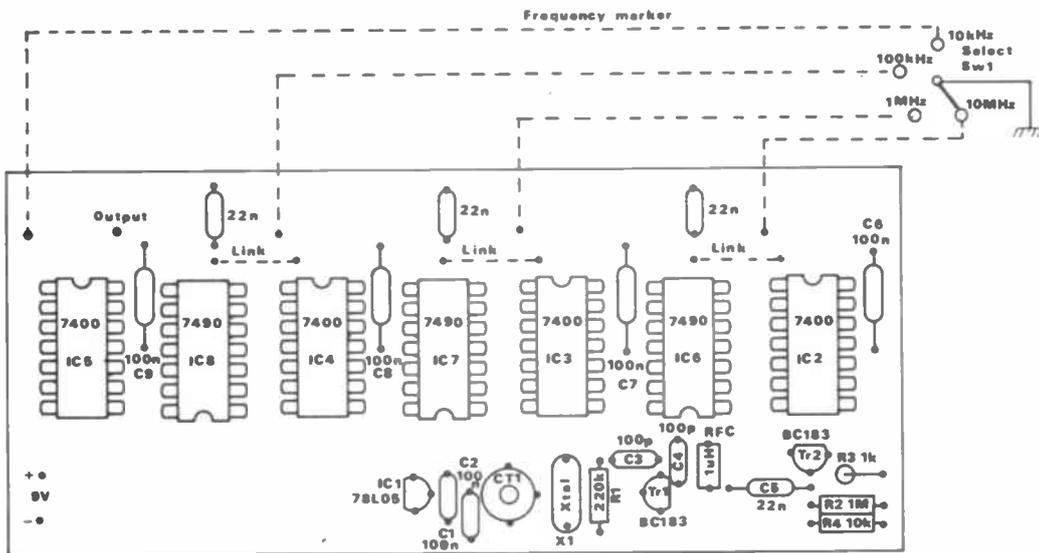


Fig 3 Layout of the 'Kanga' board

the TTL divider circuitry.

Rather than passing directly to a divider circuit, the signal runs to a 7400 quad NAND gate, IC2. When the ground is connected to the 'select' terminal it will pass the 10MHz signal to the output. If the 'select' terminal is left open circuit, the signal will feed to the first of the divider stages, IC6. The divider stage, IC6, is a decade divider based upon the 7490 and will produce a 1MHz signal at its output. This 1MHz signal passes to another 7400 quad NAND gate, IC3. Depending upon the state of the 'select' terminal of IC3, the 1MHz will go to the next divider, IC7, or appear on the output.

It is easy to see that if the 1MHz output is selected, by grounding the 'select' terminal, the second divider will not be in use: it has no input signal. The 1MHz signal appears on the output without the annoying 100kHz 'ghost' signals which could leak from IC7. Admittedly the circuit employs more ICs, but 7400 devices are so cheap that the convenience outweighs the extra stages.

The rest of the circuit contains yet another 7490 divider, IC8, to give 10kHz spaced signals and two further controlling quad NAND stages, IC4 and IC5. The final stage in the chain, IC5, works exactly the same as the other quad NAND stages, except that what would have been fed into the next decade divider is terminated at a pad on the printed circuit board. This output point is not required in the circuit, but it could be used to drive further dividers on another board, to divide down to whatever decades are required in other digital circuits.

Although the total circuit contains 8 integrated circuits and two transistors, because it uses 'LS' low power devices it draws less than 60mA from a small PP3 battery. The battery should last for several months in normal use. The output is a square wave, very rich in harmonics, and the marker points are audible on normal amateur radio equipment well above the 2 metre band.

Building the unit

The circuit is available in kit form from Kanga Products (see the footnote at the

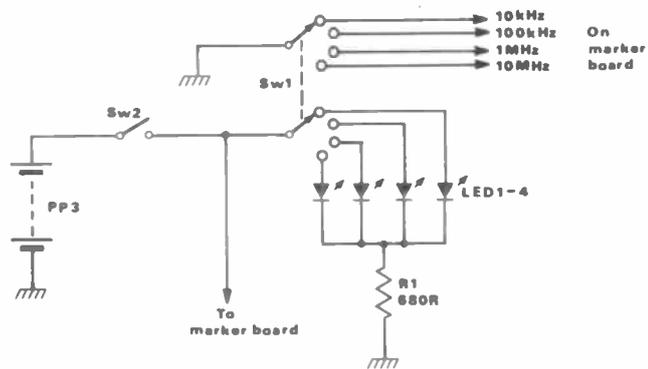


Fig 4 Frequency marker switching circuit

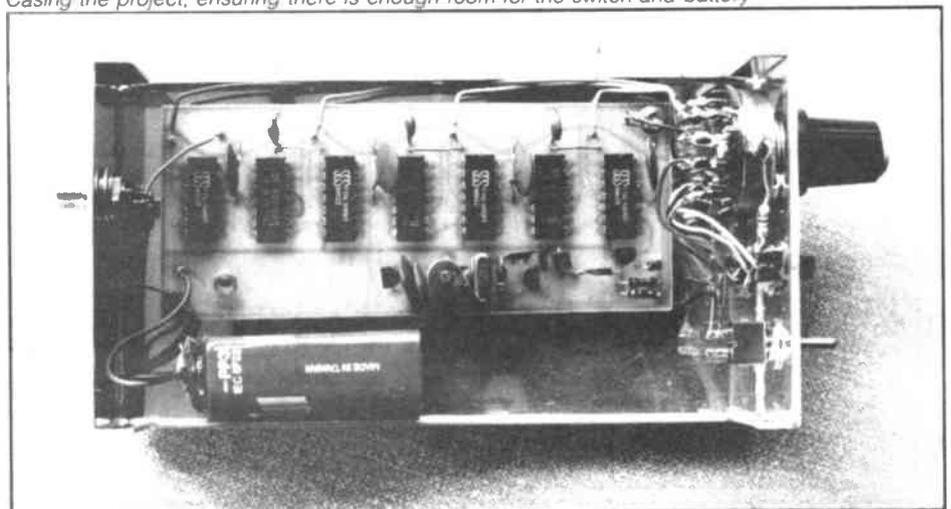
end of this article). The layout used in the Kanga version is shown in Figure 3. The decade divider and select control integrated circuits are arranged in a row, with the oscillator and driver transistor stages below.

The top of the board shows three capacitors, which are not included in the circuit of Figure 2. These are 0.022µF capacitors used to decouple the power supply lines to the divider ICs. These are important additions, as TTL dividers do send signals back along the power lines if not decoupled. I remember well building my first crystal calibrator, which

used old TTL devices to divide the frequency and did not include supply line decoupling. The calibrator worked very well, but it also produced patterns on the television set screen in the next room... so be warned.

I built the circuit using the Kanga kit and was pleased to have a well produced printed circuit board for the task. In the past, I have built such circuits on 'perfboard' with wirewrap connections and, at one time, with 5 amp fuse wire connecting from pin to pin. It is easy to go wrong - I know! These IC pins all look the same, and are so easy to mis-count when

Casing the project, ensuring there is enough room for the switch and battery



Count on us!

H HF TRANSCEIVER IC-781



The IC-781 has a dual-watch function which allows simultaneous receive of two frequencies in the same band. Balance controls adjust VFO A/B receive strength levels. This feature is especially useful on Dx-expeditions or contests to check band activity or to tune in your next contact. The newly developed ICOM DDS (Direct Signal Synthesizer) system is incorporated to provide a fast transceiver lock-up time. This is essential for data communication systems.

The IC-781 communication system includes a built-in 100% AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic, or full QSK CW break in to 60 wpm, audio peaking filter, RF speech processor, multi-scanning plus much more. Look into the future of Amateur communications, ICOM products will be setting the pace others try to follow. For more information on the IC-781 contact your local authorised ICOM dealer or phone ICOM (UK) Ltd direct.

- SSB, CW, FM, AM, RTTY
- 160-10m/general coverage receiver
- Direct keyboard entry
- 150 watt output
- QSK up to 60 wpm
- CI-V communications interface

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering ICOM equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

Datapost: Despatch on same day whenever possible.

Access & Barclaycard: Telephone orders taken by our mail order dept, instant credit & interest-free H.P.



STRAIGHT &

LEVEL



DIGITAL WATTMETER

A new addition to Electronic Broker's product range is the B4305 - a hand-held, battery-powered digital wattmeter from Siemens.

The B4305 has been specially designed to offer all commonly required power-line parameters on its 3½ digit display. It will measure ac voltage and current to an accuracy of 1%, plus active power up to 15kW and power factor.

The basic measurement of voltage is via auto-ranging scales of 0-200V and 0-750V, with a maximum resolution of 100mV. Current is covered by ranges of 2, 6 and 20A ac, with a maximum resolution of 1mA.

Power measurements are covered by ranges of 1-0.4/1.2/1.5/4/4.5/15kW with sign, maximum resolution 0.1W; and power factor span of 0.00 to 1.00 with display of capacitive or inductive loading. Input is 50 to 100% of $V \times I$.

The B4305's combination of ac, V, I, W and cos altogether in the one instrument make it the ideal choice for all power measurements on LT power circuits. It should be of particular interest to any plant or power engineer who needs to make measurements for power factor correction.

The B4305 is powered by 6 × 1.5V batteries, either alkaline/manganese type LR6 or zinc/carbon type R6 ones. It is offered with optional everyday carrying case, and test

leads with prods.

For further information please contact: *Electronic Brokers Limited, 140-146 Camden Street, London SW1 9PB. Tel: (0799) 26699.*

TIGER COLLINEAR

Following the success of the Tiger Collinear 145/3 and Collinear 145/3-2, Ant Products has introduced the very latest in antenna technology - the brand new Tiger dual band collinear antenna model 145/434.

This superb new antenna follows the same pattern as the monoband collinear, incorporating a similar fully sealed coil base and socket assembly. It is moulded into a solid fully machined aluminium housing, and supports a relatively large diameter tubular top section.

The active seventy centimetre sections are again fully sealed against the ravages of the British weather by total encapsulation in a tough plastic membrane.

In similar fashion to the two metre version, the lower part of the antenna is used in a number of ways simultaneously. First it combines the function of a rugged support mast and lower radiating section, with two sets of radial rods fitted to the outer of the tube by means of fully machined aluminium rings. One set of radial rods forms the choke for one band, and a set of rods fitted lower down forms the choke for the

other.

The support mast also contains the coaxial cable that feeds the antenna; in doing so the mast forms an infinite balun. This very effectively prevents feed line radiation, one of the most common causes of problems with vertical collinear antennas. Performing a balanced to unbalanced conversion, thus ensuring that the antenna is fed correctly, makes this antenna a balanced device.

Tests have shown that the VSWR characteristics are excellent for this antenna, with less than 1.25:1 on both bands and a bandwidth on seventy centimetres in excess of twenty megahertz. The radiation pattern is as to be expected on both bands for an antenna with a gain of 70dB on two metres and 90dB on seventy centimetres.

Altogether, for an antenna a little under 3 metres in length, this is a very creditable performance.

The new Tiger Collinear 145/434 comes complete with a full two years written guarantee, a guarantee registration card and full instructions. The cost is a very modest £48.50 plus £5.50 post and packing. The Tiger Antenna is only available from Ant Products and authorised dealers.

For further information please contact: *Ant Products, Foundry Works, Old Great North Road, Ferrybridge, West Yorkshire WF11 8NN. Tel: (0977) 85274.*

All the latest news, views, comment and developments on the amateur radio scene

LCD OSCILLOSCOPE

Thandar Electronics Ltd recently introduced a new combined battery portable digital storage oscilloscope and multimeter.

Designated the LCD100, the oscilloscope section incorporates a large 64 dot × 160 dot liquid crystal waveform display area. The vertical axis has a 6 bit (64 point) resolution and a sensitivity of 10mV/div to 20V/div over 11 ranges in a 1-2-5 sequence. The horizontal axis has a resolution of 8 bits (256 points) and a sweep speed of 5µs/div to 20µs/div. The sweep mode provides automatic sweep, trigger sweep, single sweep and pre-trigger operation.

Internal and external synchronization facilities are provided with positive and negative sweep.

Four memories are provided with 256 words per memory, of which three are non volatile. The multimeter section utilizes the LCD display to provide a large read-out of voltage, current and resistance. All modes are auto ranging.

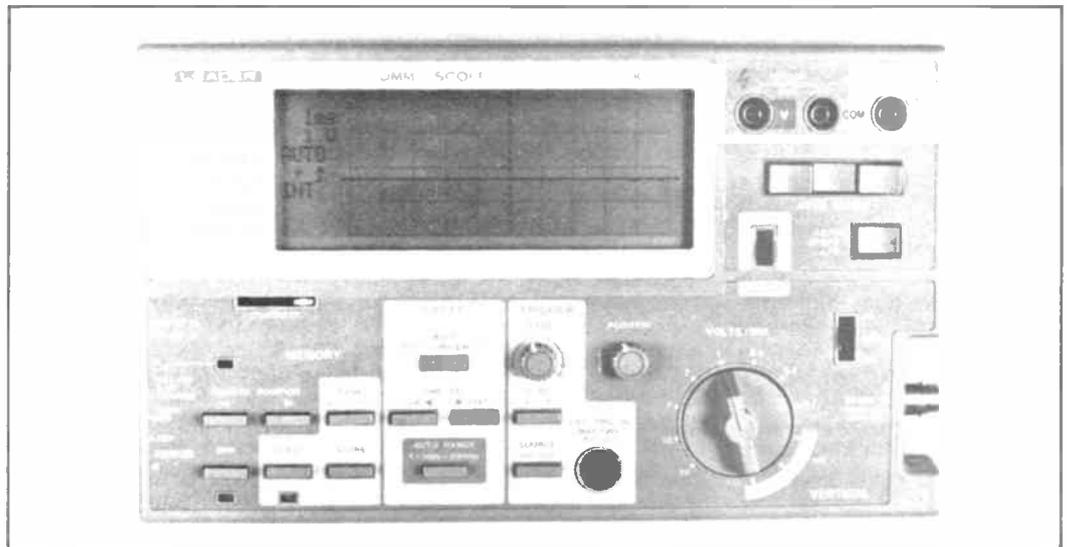
The LCD100 is compact in design with a size of 226(w) × 136(d) × 38(h). It comes complete with probes, a carrying strap and mains adaptor. At a price of only £595.00 + VAT, it offers an ideal solution to field service and general portable applications.

For further information, please contact: *Thandar Electronics Limited, London Road, St Ives, Huntingdon, Cambs PE18 4HJ. Tel: (0480) 64646.*

CONCERT BOY

Grundig have added the new Concert Boy 225 to their range of audio products – this brings their portable radio range up to four.

This compact four band radio – MW, LW, FM (with AFC and four pre-sets) and 2 × SW: the short wave coverage is 5.8 to 6.4MHz (49m band) and 6.8 to 18.5MHz (41m to 16m). Other features include slider volume and tone controls; large wideband loudspeaker;



1.5 watt music power output; 3.5mm headphone socket and mains or battery operation.

The Concert Boy 225 measures 31.5cm × 18.5cm × 7.2cm and weighs approximately 1.5 kilos. It is available in black, and the price is approximately £39.95.

For further information please contact: *Hammond and Deacon Ltd, 44 Earlham Street, Covent Garden, London WC2H 9LA. Tel: 01-379 7945.*

UNIVERSAL WORK CLAMP

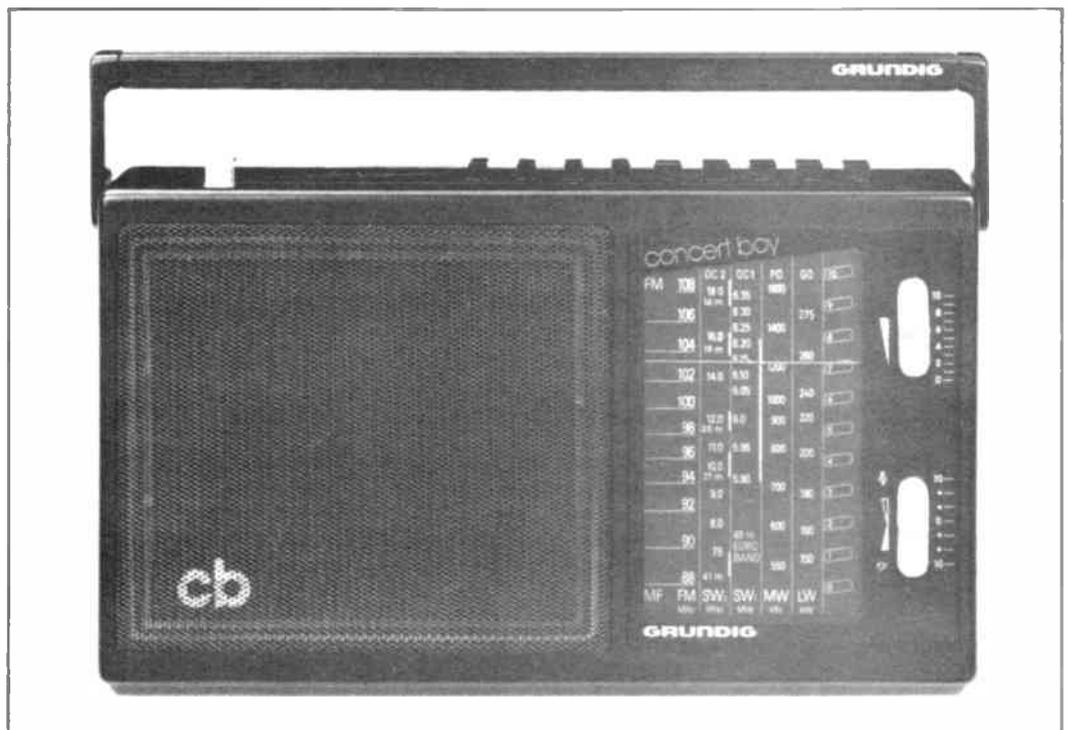
Equally suitable for use by left and right handed people, 'The Fixer' is an automatic work clamp that securely fastens a workpiece up to 5cm wide into position.

Freetrade (TEP) Ltd can now supply The Fixer which may be either permanently fixed to a workbench or clamped to any handy surface. Its design allows for work of virtually any length and rapid clamping and remo-

val of the work without screwing and unscrewing the fixing each time.

The Fixer will hold wood, metal and other objects with equal success, making it suitable for planing, sawing, drilling and holding the work during painting and other such operations. The Fixer has a RRP of £6.37.

For further information please contact: *Freetrade TEP Ltd, Moor Lane, Witton, Birmingham B6 7HH.*



POWER SUPPLY KIT

Perfect for powering the wide range of electronic kits now offered by ECW, the K2570 is a regulated power supply, capable of producing a stabilised output from 5 to 14V dc at 1 amp

The K2570 kit operates with any normal transformer, giving an output from 7 to 16V ac, including one of the super-efficient toroidal transformers from ECW. It features a ripple rejection of 78dB and a temperature stability of just 0.025%°C. Thermal overload protection is provided.

Full instructions are provided for this easy-build kit, and a large heatsink ensures a long, reliable lifetime. The K2570 is priced at £10.90, including post/packaging and VAT. Suitable toroidal transformers are available beginning at £14.15 (including P&P and VAT).

For further information please contact: *Electronic & Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH.*

AF POWER METER

Power outputs of up to 150W into 4, 8 and 16 ohm loads can be measured directly by the Crotech type 2018 audio frequency power meter.

Suitable for measuring the output of amplifiers and other audio circuits, the type 2018 terminates the circuits in accurate and known impedances. It will measure from 5mW up to 150W into standard loads, and up to 15W into loads from 50 ohms up to 10kohms. Load impedance accuracy is ±1% at 1kHz, falling to just ±3% at 20kHz. Power measurement accuracy is ±3% of full scale from 20Hz to 20kHz.

Overload protection is provided by an autotrip feature in the 150W range. This is operated when the temperature of the load exceeds 90°C and is indicated by a front-panel overload LED.

Powered by internal 6V batteries, the type 2018 can be used both as a desk-top and a rack mounted instrument. Together with the type 2016 low distortion signal generator and type 2017 auto tune distortion analyser, it forms a complete rack-mounting audio test system. RRP for the type 2018 is £220.00.

For further information

please contact: *Crotech Instruments Limited, 2 Stephenson Road, St Ives, Huntingdon, Cambridgeshire PE17 4WJ. Tel: (0480) 301818.*

NEW MAPLINS

Maplin Electronics, the UK's largest retail distributor of electronic products, has announced the opening of their latest shop, situated close to the city centre in Bristol.

In formally opening the new shop Brian Lodge, who is the Director of the Department of Industry's south-west region, said that many local electronic enthusiasts would welcome the arrival of a new Maplin store in Bristol. The new development was particularly relevant for Bristol as many youngsters will find positions in local companies which are heavily involved in electronics.

Maplin Electronic Supplies Ltd was established 15 years ago by co-founders Roger and Sandra Allen and Doug Simmons, from a modest bedroom base.

The company has become the UK's largest retail distributor of electronic products, employing nearly two hundred staff.

The company's mail order activities now occupy a custom-designed 40,000 sq ft complex in Southend-on-Sea. Supporting this operation are six retail stores located in Birmingham, London, Manchester, Southampton, Southend-on-Sea and now in Bristol.

The Bristol store is at 302 Gloucester Road, and is open six days a week.

For further information please contact: *Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 552911.*

THANDAR CATALOGUE

Thandar Electronics Ltd, the St Ives based test equipment manufacturer, has just launched a new brochure. Designated Issue Six, it includes the complete range of Thandar products many of which are highlighted in full colour.

For further information or your own copy, please contact: *Thandar Electronics Limited, London Road, St Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.*

CLUB NEWS

Earache

Fareham and District ARC members' ears are going to be working overtime this month – February 3rd brings an address by Trevor G3KVV of Hampshire, followed by a lecture on February 17th by Steve G4JCC. Very mysterious, these high level talks, as well – there are no clues as to what they're about... Someone out there knows, though. Just keep those long-suffering ears open!

This club meets every Wednesday at 7.30pm, with a Morse class from 6.30pm. The venue is the Portchester Community Centre, Westlands Grove, Portchester, Hants. To find out more about club activities contact the secretary, Alan G3CCB on (0329) 288139.

Bright SPARCS

What is that glow on the western horizon? Is it a bird? Is it a plane? No, it's the warm welcome which amateurs would receive if they joined South Powys Amateur Radio Club. This is a sparsely populated area in amateur terms, so all visitors are particularly welcome.

What about it, then? If this wonderful mag can't persuade the folks of Brecon to try for the RAE, what can? Perhaps a certain local club, which meets on the first Tuesday of the month for a talk, and on the third Tuesday for a social. Be at the RAFA club, first floor, The Struet, Brecon at 7.30pm on one of these days, and prepare to be welcomed!

For more information about the club, contact the club secretary on Bwlch (0374) 730158.

... 'Cos I was there

Welsh clubs are certainly making their presence felt this month, as Port Talbot ARC have also written in to tell us about their meetings, which take place every Thursday, with Morse tuition commencing at 6.30pm and main club activities at 7pm.

The first Thursday of each

month is given over to the general meeting, and it is intended to run an RAE course if enough members are interested.

The club meets at the BSC Sports and Leisure Club, Margam, Port Talbot, and all SWLs and licensed amateurs are welcome. More details can be obtained from Steven Hill, 31 Ynys Lee, Cwmavon, Port Talbot SA12 9AQ.

Hoe de hoe

GB400A is the callsign Plymouth Radio Club has obtained for use during July of this year, to celebrate the four hundredth anniversary of the defeat of the Armada by Sir Francis Drake, that famous bowling champion.

Despite the rumours spread by lesser men to the effect that Sir Francis was actually only the camp host of an early floating Maplins that went astray, or some similarly insulting twaddle, the fact remains that our callsigns currently begin with G, not EA! Someone must have done something...

All through July Plymouth (and many of its namesakes worldwide) will be celebrating this landmark in history with a programme of commemorative events.

Plymouth Radio Club will be in there with that callsign from July 21st to 28th. The station will be on the air each day, and late into the night, and a rare QSL card will be issued to all contacts – one which is sure to be highly prized.

The club is hoping to put the Lord Mayor in touch with the other 38 Plymouths around the world on July 28th. With Dublin's 1000th anniversary also falling in July, there will be plenty to listen out for then – don't say you haven't been warned!

Hamfeast

A hamfeast is in the air – Bury Radio Society will be holding one on March 13th in a brand new venue – the Castle Sports Centre, Bolton St, Bury.

This thoughtful club have made sure that bar and catering facilities are available, and everything is situated on the ground floor – no frantic searching of distant corners for facilities here!

Now is the time to book table space for this popular event – the price remains £9,

the same as last year.

To book or to find out more about this event, contact CDW Marcroft G4JAG, at the Bury Radio Society's address: The Mosses Community Centre, Cecil Street, Bury.

Thinking big

Coventry Amateur Radio Society is doing all sorts of interesting things this month – starting on February 5th with the indoor (!) DF contest – a cup qualifier. Strange... perhaps they craftily disguise their transmitters as arm-chairs, or teapots, even?

On February 12th, the club has its night on the air with Morse tuition. The 19th brings a talk on computers – the big ones this time, by G0AJB. Bring your Big Brother along!

The month is rounded off with another night on the air and Morse on February 26th – members are certainly kept occupied.

The club meets every Friday at 8pm in Baden Powell House, 121 St Nicholas Street, Radford, Coventry. For more details contact Jon G4HHT on (0203) 610408.

Brain strain

There will be a loud sound of head-scratching in Chelmsford this month. Not an outbreak of unmentionable beasts, but CARS interclub quiz with Braintree.

They could have picked opponents from somewhere less intellectual-sounding! Still, Chelmsford houses Marconi Aviation, so the club ought to know a thing or two about radio – we're still trying to figure out how to spell Guglielmo...

CARS meets on the first Tuesday of the month in the Marconi College, Arbour Lane, Chelmsford. For more information please contact Roy G3PMX or Ela G6HKM on (0245) 360545.

Packet talk

Farnborough and District Amateur Radio Society's meetings for the month are a talk and demonstration of Packet Radio by G3RRA on February 10th, and an instrumentation talk by G3HEJ on February 24th.

The society meets at 7.30pm on Wednesdays at the Railway Enthusiasts Club, Hawley Lane, Farnborough. Any further information or details can be obtained from Tim G4UQE on Camberley 29231.

Repeater talk

Torbay Amateur Radio Society has a new PRO, Bob McCreadie G0FGX, who tells us that the club's main meeting for the month will consist of a talk about GB3TR on Saturday, February 20th entitled 'How it works'. So instead of using your local repeater, you can hear about it for a change.

The club meets every Friday at 7.30pm at the English China Clay Social Club, Highweek, near Newton Abbot. New members and visitors are always welcome, and the club has stations on both HF and VHF. Further information can be obtained from Bob on (03646) 233.

Aerial display

Barry College of Further Education Radio Society is very active this month, with their club annual dinner taking place at the college on a date to be arranged.

Not only this, but a video show will be given on February 4th, entitled 'Aerial construction and principles' which will be hosted by G6CJ. Anyone who may be interested is invited to come along and see how to do it properly.

The club will also be holding a quiz on February 18th against local clubs, who must be brave to pit their wits against the clever crew from the college.

This year is the 21st

anniversary of the club, so it has now come of age, many congratulations to all concerned.

The club meets on Thursdays from 7.30pm at the college annexe, which is on the A4226, just a growl and a whoop from the old Barry Zoo, which is now the Welsh Hawking Centre. The club runs two very impressive stations, has three callsigns, and welcomes any amateur radio enthusiasts, particularly newcomers to the hobby.

To find out more, contact Dr Kevin Johnston GW4BCB, the club's publicity officer, at the college.

Metal doc

North Wakefield Radio Club start the month with a Natter Night on February 4th, getting their jaws in working order for the night on the air on February 11th, with G4NOK from the new shack.

The meetings for the month continue with a talk by G0COA entitled 'Machine Monitoring of Health in the Mining Industry' – never fear, machines will only ever be able to treat 'miner' ailments...

The last meeting in the month is the main one, which remains mysteriously untitled. So if you are in the mood for a surprise, pop along on February 25th, you never know your luck!

The club meets every

Thursday night from 8pm onwards, at the White Horse Public House, Fall Lane, East Ardsley.

Visitors and new members are always welcome, and all enquiries should be directed to Steve G4RCH on Leeds 536633.

Film night

The East Lancashire ARC have a new public relations officer, Philip Drew G1OPV. He tells us that the club is holding a film show this month, on February 2nd, but you'll have to go along to find out what it's all about. And why not?

To find out more about the club and where and when it meets, contact Philip on (0254) 32936.

President's tour

Irish amateur radio groups are in for a treat this year, as the president of IRTS, Mr Willie Barron EI6BUB is involved in a nationwide tour of clubs, which started with a Christmas visit to the South Dublin Radio Club.

Apparently, amateur radio is thriving in EI, so this tour may take some time! With the millenium celebrations also taking place this year, Mr Barron is going to be a very busy man.

Membership details for the IRTS can be obtained by writing to IRTS, PO Box 462, Dublin 9, Ireland.

Mr Willie Barron EI6BUB visiting the South Dublin Radio Club



Think about it

Sheffield ARC is going on the air as GB4GOS on Sunday, February 21st, to celebrate the Guides' Thinking Day. They will be operating from the Guides' HQ in Trippet Lane, Sheffield, and they hope to cover as many bands and modes as possible, including TV and Packet.

Maths tuition is available on the first two Mondays of the month, before meetings, for those who want to take the RAE – or just polish up their

rusty maths.

The club is also introducing a monthly Practical Evening, but February is obviously a bumper month, with two of these evenings, on February 1st and 29th. After this the sessions will be held on the first Monday of the month, on an ad hoc basis – bring along your problems and have the experts show you how to solve them.

The club meets every Monday evening at 8pm in the Firth Park Pavilion, Firth Park

Road, Sheffield S5 – Morse and RAE tuition takes place from 7pm. Visitors are welcome, and to find out more about the club, contact Alan G0ILG at the club's address.

Angus talks

Beg, borrow or hire transport for Verulam ARC's meeting on Tuesday, February 23rd, when Angus McKenzie G3OSS will be giving a talk entitled 'EMC matters'.

Those who read the magazine regularly (and shame on

you if you don't!) will know that anything Angus has to say is bound to be interesting. So get those roller skates on, hijack that Cadillac or jump on that train – don't miss it!

Earlier in the month the club is holding an activity evening – on Tuesday, February 9th. The club meets on the second and fourth Tuesdays of the month at the RAF Headquarters, New Kent Road, St Albans at 7.30pm. For further information, contact G4JKS on St Albans 59318.

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73 from Dave G4KQH, Technical Manager.

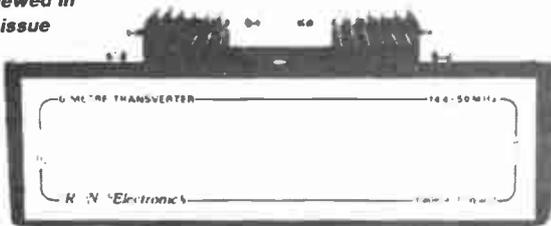


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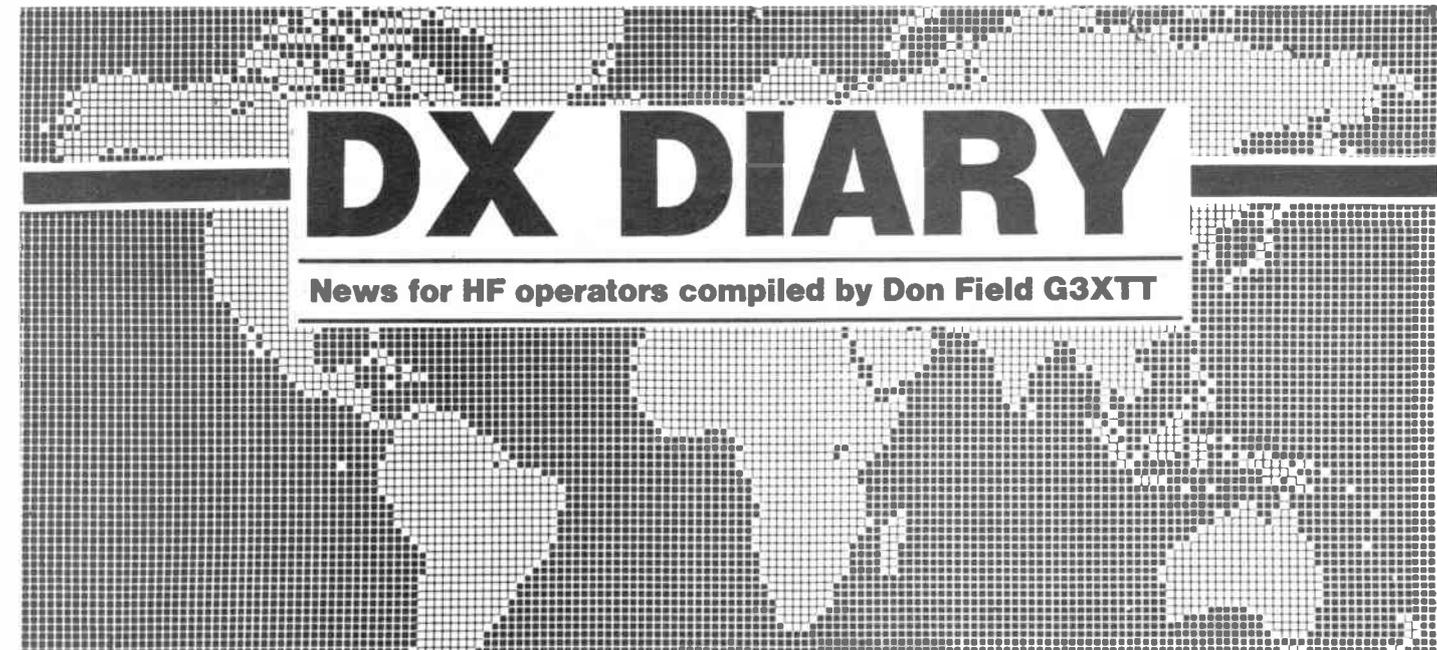
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DX DIARY

News for HF operators compiled by Don Field G3XTT

Conditions on the higher bands were disappointing during December, though the occasional ZL and VK showed up on ten metres. However, there was one excellent spell of LF conditions during which I was able to work KH6CC and various W7 stations on Top Band, and others worked KX6DS and other exotic DX on eighty metres. VS6DO was also workable on an almost daily basis on 160 and 80. TI9M appeared as promised from Cocos Island, with strong signals at the top end of 80, and VK9YV was busy on 20, 15 and 10, but otherwise there was little in the way of DXpedition activity to liven things up.

Aruba

One bright piece of news to emerge during December was the decision by ARRL to add Aruba to the DXCC list as a separate country. This brings the total of DXCC countries to 318, meaning that you will now require 309 to achieve Honour Roll status. There has been, and still is, lots of activity from Aruba, so you shouldn't have too much trouble putting this one (the prefix is P4) into the log. Contacts from January 1st 1986 count, and cards may be submitted to the ARRL for credit after April 1st 1988. With immediate effect, contacts with Aruba count for multiplier status in the various international contests.

Libya

I was fascinated recently to read in *The DX Bulletin* the story of 5A0A's operation

from Libya. Bert arrived in Libya in late 1985 as a guest lecturer in electrical engineering at the university in Benghazi. It took Bert nine months of effort to get permission to operate amateur radio equipment but, having got his permit, he was faced with the frustration of being allowed to operate but having no gear.

No help at hand

At this stage Bert asked the various amateur radio and DX foundations for help, but most wanted assurance that the operation would be accepted by the ARRL for DXCC purposes before offering assistance. Bert found this attitude unhelpful. As he says, 'Maybe someone from the ARRL would like to go there (Libya) and try to operate without appropriate authorisation? Good luck!' Meanwhile, ever resourceful, Bert located a Wavetek signal generator in the university lab which had reasonable frequency stability and could put out about half a watt into a makeshift antenna. A Rohde-Schwarz receiver was also available from the same source.

The arrangement wasn't exactly ideal. To switch from receive to transmit necessitated keying the operating frequency and power output from the memory of the signal generator for every new over. Neither was it possible to key the signal generator directly, so Bert keyed the antenna circuit using a banana plug and socket. No wonder Bert's CW in the early days sounded a bit odd!

Nevertheless, he managed

2,000 QSOs with this set-up before DJ2BW and DK1RV were able to ship an electronic key to him, and the QSO total was up to 6,000 before the newly-formed European DX Foundation provided an FT901D. Indexa sent out a tribander, but customs problems and a lack of rotator and cables meant that this was never erected, and Bert continued to manage with low dipoles.

By the time he left Libya in July 1987, Bert had amassed 35,569 QSOs in 167 countries, a truly remarkable achievement. By far the majority of these were on CW, and even included a few dozen QSOs on Top Band before rig problems forced him off the band (curses!). Bert's major complaint is of amateurs who called him time and again on the same band and mode for 'insurance' contacts. Every one of these potentially prevented someone more needy from putting Libya in the log and, let's face it, there's no telling when this rare country (in amateur terms) will turn up on the bands again.

Yasme

All active DXers will, from time to time, have come across DX stations whose QSL route was 'The Yasme Foundation'. In particular, this applies to all operations by Lloyd and Iris Colvin. But just what is the Yasme Foundation, and how did it come into being?

The story starts with Danny Weil who, in August 1954, set out in his yacht 'Yasme' with the aim of being the first Englishman to single-hand-

edly circumnavigate the globe. The name Yasme apparently derived from a Japanese word, sounding like Yasme, meaning 'freedom'. Danny took some amateur radio gear with him and used the unofficial call sign G7DW/MM to keep in touch with civilisation (a 'ploy' used in more recent years by Tom McLean).

It is in 1955 that the story really starts to take shape. In the US Virgin Islands Danny ran across the late Dick Spenceley, KV4AA, a devoted DXer and, at that time, DX editor of the American *CQ Magazine*. Dick persuaded Danny to learn CW and obtain a legitimate licence (VP2VB, issued to Danny in the neighbouring British Virgin Islands) as a prelude to turning his expedition into a DXpedition. Dick also organised some new gear to replace the old BC348 receiver and 30 watt transmitter which Danny had set out with.

Danny's first DXpedition operation was as FO8AN from Tahiti in December 1955. A number of Pacific operations followed before the Yasme was damaged by hurricane force winds, and had to be towed to Port Moresby in Papua. Worse was to follow. On October 24th 1956 the Yasme struck a reef and sank, leaving Danny with nothing to his name, as the boat and gear had been uninsured. But for a dinghy dropped from a rescue plane, Danny would not have survived at all.

You or I might have abandoned the affair at this stage, but Danny proceeded to

undertake a fund-raising tour in the USA, including talks to radio clubs, radio and TV appearances. The result was Yasme II, bought in Scotland in September 1957 after a brief operation as VP2VB en route back to the UK. Incidentally, while sailing Yasme II to his home port in the south of England, the boat blew up and Danny survived by clinging to a buoy until rescue arrived.

This time, however, he was insured and a third boat (still named Yasme II) was purchased. This boat was badly damaged when it broke its moorings during a storm, but eventually Danny got to sea and conducted a successful Caribbean DXpedition before hitting a jagged rock off the Grenadines!

This time Danny was rescued by the locals. Hallicrafters replaced his gear and donations from throughout the amateur world (Danny was something of a celebrity by this time) made possible the purchase and equipping of Yasme III. Danny's run of misfortune was over by now, and he was able to activate a number of rare Pacific Islands before retiring from the DX world in 1963.

Retired in Texas

Danny no longer holds an amateur licence, but is reputed to live in retirement in Texas after a career with General Dynamics. However, he still has contact with the Yasme Foundation, set up to commemorate his activities and to help modern DXpeditioners in their efforts. Along with Gus Browning and Don Miller (later rather discredited), Danny Weil ranks as one of the 'greats' of DXpeditioning and, in 1969, was inducted into the *CQ Magazine* DX Hall of Fame. Much of the above information was culled from the write-up of Danny's exploits which appeared at that time in *CQ Magazine*.

Forthcoming DX

It looks as though the major DXpedition during February will be an operation from the Auckland and Campbell Islands by ZL1AMO and others. The exact dates are unavailable as I write this.

DK7PE was due to show up from Egypt in the CQWW CW Contest at the end of January. Rudi operated briefly from there at the end of November, but made very few Top Band QSOs due to antenna limitations and poor propagation.

S0RASD continues to be active. The operator is using equipment left by the DXpedition group. He often shows on 80 metres around 2130GMT, with a list operation, but has been heard on 10 metres handling the pile-up very capably by himself.

KC7RD/5N9 is now active from Nigeria and is reported by *DX-NL* to be there until the middle of the year. The same bulletin also reports that DL0MAR is now operational as DL0MAR/4W from Yemen, though this seems highly unlikely. However, the true blue DXer always lives in hope.

Listen out for . . .

A92BE has been QRT recently, but should be back on the air more or less as this magazine hits the bookstalls. The special station EI1000 was due to operate from Dublin on three occasions during 1988 to celebrate the Dublin millenium. The first occasion was in January, the second will be March 17th (St Patrick's Day), and the third will be July 10th (the millenium itself). On the last of these there will be an attempt to link up via SSTV with as many other Dublins around the world as possible. Apparently there are something like a hundred of them!

GM4DMA, who has previously operated from the Antarctic, expects to be operational /VE8 from Ward Hunt and Axel Heiburg Islands during February as part of his scientific work. Do remember that the joint Russian/Canadian trans-polar trek will also be taking place around this time.

Active countries

DX News Sheet reports that well over 270 countries were active in 1987, so even the newcomers to the HF bands could well have some very respectable scores by this time. While talking about country scores, news is in that the DX Advisory Committee has voted overwhelmingly against backdating the start of the CW DXCC to 1945, to bring it into line with the Mixed and Phone awards. The start date will stay at 1/1/75.

At the time of writing the 'Nella Dan', which does service in the Antarctic to supply the various Australian bases, had run aground and would probably have to be salvaged. 102 Australian personnel were left stranded on Macquarie Island. No doubt, by

the time you read this another ship will have been pressed into service, and we will continue to see the regular exchange of personnel at these remote locations, which often leads to new amateur radio activity. Finally, on the prefix front it appears that the RSGB is making arrangements for 'official' overseas visitors to the UK during the Society's anniversary celebrations in July to be able to sign GV(home call), irrespective of the existence of a reciprocal licensing agreement with their home country. Some interesting call signs could show up on the bands. However, there appears to be no truth in the rumour that GB75 prefixes might be issued for special event operations.

Contests

Look out during February for the YU-DX Contest (6/7th), the PACC Dutch Contest (13/14th), the REF French SSB Contest (27/28th), the CQWW 160 SSB (26-28th), and the ARRL CW Contest (20/21st). The last of these is the big one, a 48 hour event offering an excellent opportunity to work those rare US states. The SSB leg follows on 5/6th March. And make an early note of the Bermuda contest on 19/20th March. This is one that even the XYL ought to let you enter, because the UK winner gets a free trip to Bermuda during October.

As always, I can usually help with more detailed informa-

tion and, in some cases, sample log and cover sheets, if you drop me a line.

YL-OM

DX News Sheet recently carried information about YL activity on the bands. YL activity days are scheduled for the 6th of every month and are an opportunity for YL operators to work each other and also for the OM fraternity to work YL stations for the various YL awards, such as YLDXCC. YLs call 'CQ YL' on the hour around the following frequencies: 3688, 7088, 14288, 21188, 21388, 28588 and 28688kHz.

The YLRL group also sponsor YL-OM contests, open to all amateurs. The SSB event is from 1400GMT on 13th February until 0200 on the 15th. The CW event is from 27th February to 1st March (same times). OMs call 'CQ YL' and vice versa. The contest exchange consists of RS(T) plus serial number plus state/province/country. The contests cover all the main HF bands. G4DYO is able to provide a photocopy of the full rules in exchange for two 18p stamps.

That's it for another month. Do keep me up to date with your HF news, especially if you have a special interest in a particular band or mode. I am particularly keen to get reports of RTTY, Amtor, SSTV and Packet activity, all of which are growing fast. My address is still 105 Shiplake Bottom, Peppard, Henley on Thames, RG9 5HJ. 73 and good DXing.

Pierre HB9AMO, a leading HF DXer and the first amateur to achieve Worked All Zones on 160m



THE G4EGH CAPACITY METER

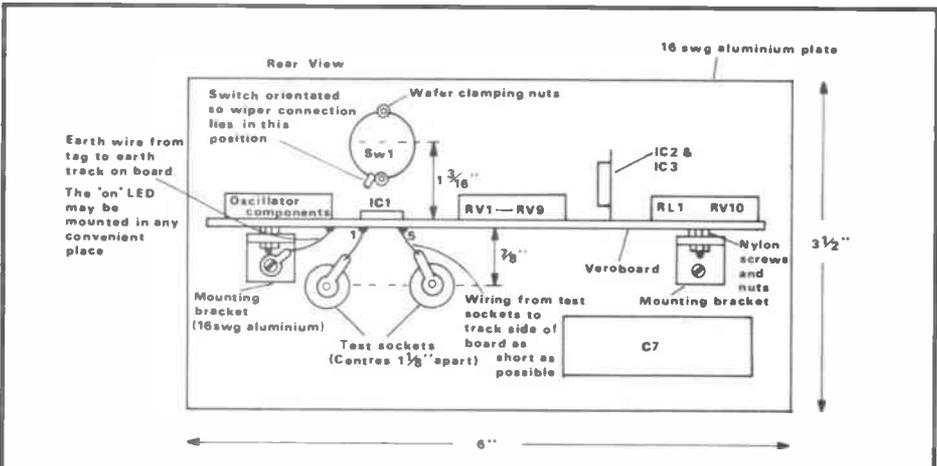


Fig 1a Component view of Veroboard (not to scale)

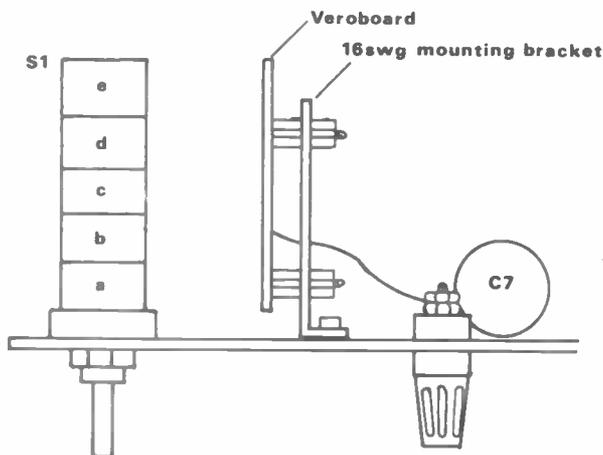


Fig 1b End view of Veroboard (not to scale)

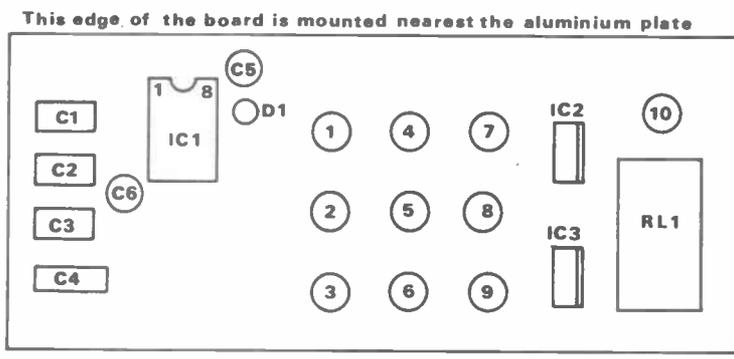


Fig 2 Component view of Veroboard

Looking around the amateur radio press over the last few years, designs for capacitance meters have been a regular feature. However, none of them were suitable when I was presented with the task of rebuilding a very elderly HF valve receiver, when all that remained of the RF and oscillator sections were the main tuning gang, associated trimmers and tuning scale.

For this project I needed to measure low capacity values accurately, complete lengthy calculations, and after this to wind the coils, but that is another story and maybe another article! Although the capacity meter became a project in its own right, for its original criteria it needed to be cheap to build, present few problems in construction and above all be accurate.

Description

One of the most important parts of any piece of test equipment is the visual indication device, and for this meter I used a 1mA meter. In fact, any meter with a range from 50µA to 1mA could be used, although the 1mA meter would be cheaper and more robust. If desired, this capacity meter could be constructed as an accessory to the station multimeter, provided it is an analogue type and not, of course, a digital meter which might not work with this particular circuit. Of course, the bigger the meter scale, the better the reading accuracy.

The meter enjoys the advantage of having a linear scale with excellent accuracy, which is dependent mainly on the meter movement itself, and a compensation circuit is utilised to null residual readings on the lower capacity ranges. Such residual readings are caused by internal wiring self-capacity.

Meter ranges

Seven ranges are available with this meter (0-10pF, 0-100pF, through to 0-10µF), which should match the normal 0 to 10 graduations available on standard meters. In my particular capacity meter I had scales of 0-15pF etc, which allowed the use of a 0 to 15 graduated meter I had available in my junk box. A real radio amateur adapts whatever is available! Whatever meter is used, the graduations should not exceed 15 as non-linearity will result on the highest range.

The range switch has 9 positions arranged as follows: 1, battery check; 2, off; 3, 0-10µF; 4, 0-1µF, etc through to 9, which is for 0-10pF. Using the 0-15 graduated meter as previously stated, all of the scales were, for example, 0-15pF

A more advanced meter for the home constructor - by Stan White G4EGH

and 0-15 μ F etc. With the switching arranged in this sequence there is some measure of meter protection; progressively switching down the ranges from the off ensures the higher ranges are selected first, so preventing excessive meter needle deflection. The meter protection is further enhanced by the use of a 'make before break' range switch, and by the electronics themselves. An LED is provided that only illuminates when a range is selected.

Since constructors' requirements will differ, final layout and details are not given, although attention should be paid to Figures 1 and 2 which will minimise stray capacity within the instrument. The only difference in circuitry for different meter sensitivities is the values of R8, R9, and RV9 and if needed, R10 and RV10. These extra components are fully covered in the section 'Testing and calibration'.

Power is derived from four PP3 batteries arranged in two pairs to give a plus and minus 18 volts supply. These

supply rails are further regulated to 12 volts using IC regulators. During development it was found that using 1 ampere regulators instead of 100mA regulators gave better linearity on higher ranges.

Circuit description

IC1a is configured as a square wave oscillator, the frequency being determined by C1, C2, C3 and C4, as selected by S1a. This part of the circuit is conventional for capacity meters, and the square wave signal is presented to test terminal CXa. When a capacitor to be tested is connected across CXa and CXb an ac current will flow through that capacitor which will be dependent on the capacitor value. This derived current now flows via S1b and, according to the range selected, one of the variable resistors RV1 to RV7. A voltage thereby developed across the variable resistor will be directly relative to the value of the capacitor under test.

The ac voltage is applied to the input of

IC1b, which is configured as a precision rectifier. IC1b input is a very high impedance, and will not load or reduce any test voltages. The output of IC1b is fed via D1 and RV8 to the meter.

Stray capacity due to internal wiring will give rise to residual readings on lower ranges; these are ruled by using a small negative bias from S1c, RV9, and R9, and if necessary R10 and RV10. If the layout given is closely adhered to, then components RV10 and R10 will not be needed. S1d and S1e merely serve to switch the battery supply on and off, or to relay RL1 in the 'battery check' position.

Construction

Figures 1a and b show the recommended layout after the veroboard circuitry is completed. Figure 2 gives details of the component layout. Attention should be paid to siting the oscillator and detector circuits with the switch bank and test terminals between. With this arrangement there will be minimal shelf capacity and in

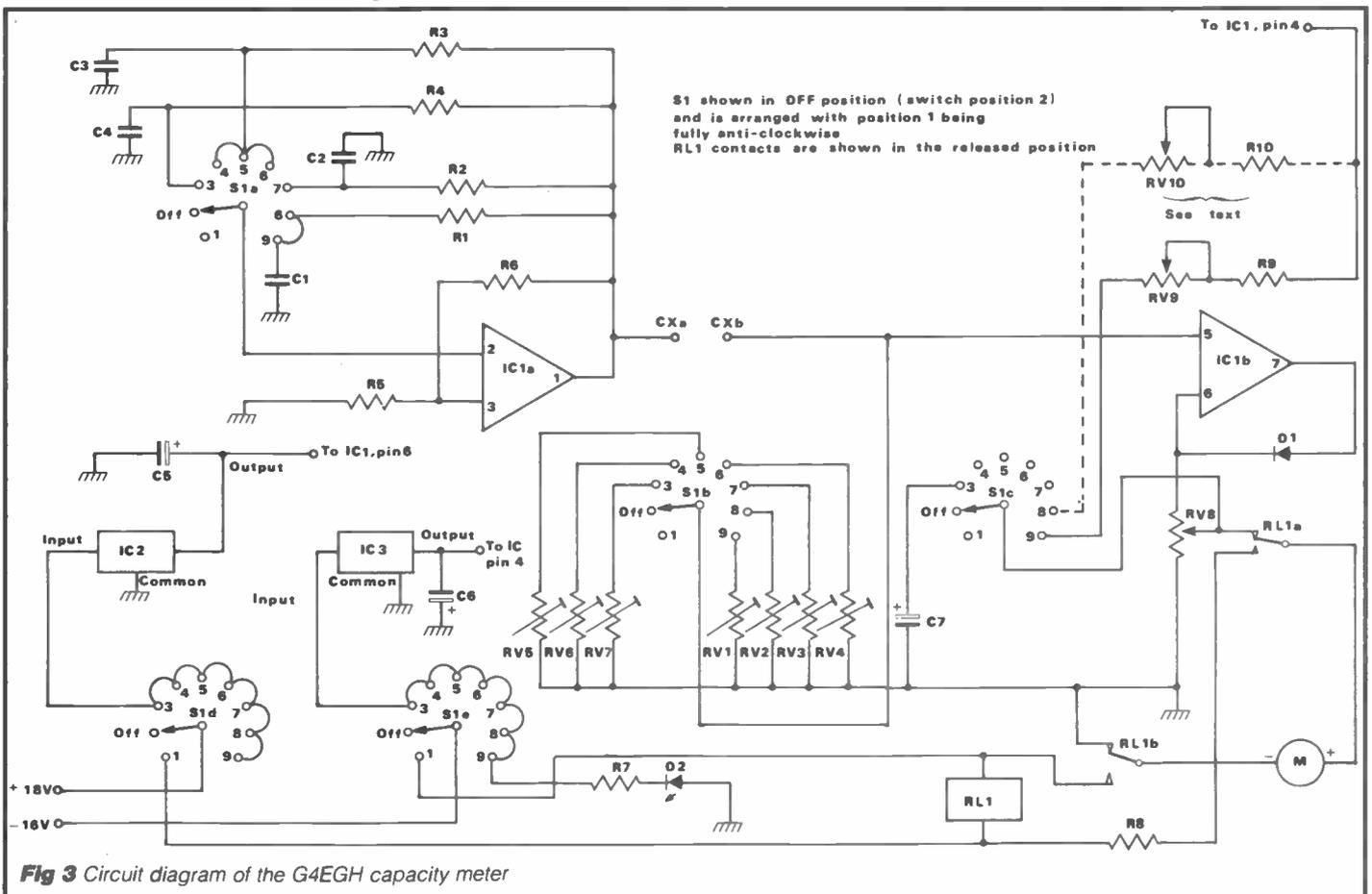


Fig 3 Circuit diagram of the G4EGH capacity meter

addition a metal screen is used to minimise hand capacity. After completion of the board, isolate unused tracking. Do not connect the wiring to the meter, since this is covered in the 'Testing and calibration' section. The final assembly can be fitted into a plastic box, the size of which will be dictated by the size of meter, if one is to be used, or the terminals for the station multimeter.

Testing and calibration

After thoroughly checking all wiring and connection, connect a multimeter in place of the indicating meter and set RV8 to minimum, RV2 to maximum, the range switch to 100pF and short circuit the test terminals CXa and CXb.

If, like me, you use a 1mA meter, adjust RV8 to give 2.8mA deflection. If your meter is of a value of other than 1mA, adjust RV8 to give a deflection of 2.8 times the full scale deflection of your meter. If this value is set too low the linearity of the readings suffers, and if set too high there is the possibility of meter damage. The over-high current setting will cause you to learn the similarities between meters and expensive RF power transistors!

The next step is to switch off and replace the multimeter with the meter to

be used. Set RV1, RV2 and RV3 to RV7 at minimum, and RV9 to maximum. Remove the short circuit from the test terminals, connecting instead an *accurate* 10pF capacitor. With the 'range' switch on the 10pF range, repeat the following two steps several times.

1. Adjust RV1 to give a reading of 10pF with test capacitor.
2. Disconnect the test capacitor from both terminals and adjust RV9 to give a reading of zero.

If, with RV9 at minimum resistance, it is not possible to obtain a zero reading, refer to *Figures 1 and 2* to find where you have not adhered to the layout. Rectifying the layout should reduce stray capacitance, but remember that the more stray capacitance there is between the test terminals, range switch and circuit board etc, the higher the residual reading. If reducing stray capacitance by this method fails, altering the value of R9 will resolve calibration errors.

Now, the next range to be calibrated is the '100pF' range, and this is accomplished by using an accurate 100pF capacitor; RV2 is adjusted for a reading of 100pF. When this test capacitor is disconnected, a zero reading should result, if not add R10 and RV10 and adjust RV2 and RV10 as in steps

1 and 2 above. It is suggested that values of 1M0 for RV10 and 3M3 for R10 be tried as a starting point.

That's the hard bit over with, the next operation is to calibrate the remaining ranges with appropriate *accurate* test capacitors for each range, adjusting RV3 to RV7.

Due to the rather large value of C7, allow the meter a couple of seconds to settle between adjustments of RV7. C7 is a large electrolytic capacitor required to stop meter pointer oscillations on the highest range, which works at a very low frequency. The most important criterion for the choice of C7 is a low working voltage, since electrolytics have the peculiar property of not having anything like their marked value until they have a certain potential across them, and in this circuit the applied potential is very low.

However, the application here is not critical, what is required is a lot of capacity, allowing the implementation of White's Junk Box Rule No One, which states: 'If it works, it is the correct component'. Finally R8 is selected to give as near full scale deflection as possible with fresh batteries, when the range switch is set to the battery check position. 39k is suitable for a 1mA meter.

Switch S1 should be of the 'make before break' variety, the parts list showing the choice when my junk box failed.

Conclusion

The most difficult part of home constructed projects is making them look presentable. To this end, I used a readily available black plastic box and Letraset. Since measurements are very linear, a 0 to 10, or 0 to 15 meter scale will not require alteration, and a more professional appearance will result. Somehow, accurate but 'tatty' test equipment instils less confidence than inaccurate equipment of professional appearance.

The meter shows some surprising facts about capacitors, particularly some of the variable types which seem to have maximum capacitances way in excess of their marked value, particularly the compression variety.

When measuring low value capacitors, lead lengths must be taken into account and the use of test leads is not recommended. However, it is easy enough to connect the leads, then measure *their* capacity and subtract it from the reading obtained when the leads are connected to the capacitor under test.

My instrument uses a 1mA 4 inch meter movement calibrated 0 to 15, and on the lowest range the meter pointer moves more than 1/4in for each picofarad of capacity! Battery life is several hours of continuous use with ordinary PP3 cells; the use of alkaline cells was not considered worth the extra expense, since they only grow on trees and not in junk boxes!

Components List

Resistors

R1 180k and 22k in series	RV1 1M0
R2 270k and 22k in series	RV2 100k
R3 270k and 22k in series	RV3 100k
R4 470k and 22k in series	RV4 100k
R5 10k	RV5 10k
R6 100k	RV6 1k
R7 3k3	RV7 2k2
R8 39k	RV8 10k
R9 220k	RV9 1M0
R10 see text	RV10 see text

All resistors are 1/4 watt, 5%. All variable resistors are sub-miniature

Capacitors

C1 1nF polyester	C5 10µF, 16V
C2 10nF polyester	C6 10µF, 16V
C3 100nF polyester	C7 2 × 3300µF, 6.3V in parallel, see text
C4 1µF polyester	
C1-C4 rated at 25V or better	

IC1 TL072	RL1 24V sub-miniature double pole changeover (RS Components 346-839)
IC2 7812	D1 1N914, 1N4148 etc
IC3 7912	D2 High intensity red LED (RS Components 588-364)

Meter - see text

S1 5 pole, 9 way, make before break. Conveniently assembled from the following RS Components parts:

One off, switch mechanism, 327-311

Five off, switch wafers, 327-399

One off, pack of five inter-wafer screens, 327-333

Miscellaneous

Batteries, battery clips, case, 4mm test terminals, knob, nylon screws, 3 1/2in × 6in aluminium sheet (16swg), 5in × 1 3/4in Veroboard (0.1in pitch) etc

ANGUS MCKENZIE

TESTS



ICOM IC575A

28/50MHz multimode transceiver

This new Icom transceiver not only covers the entire 28 and 50MHz bands with transceive capability, but receives all the way from 26 to 56MHz, and is thus ideal as an IF for many purposes. The PA is capable of delivering up to just 10W output as opposed to its 144 and 432MHz counterparts. The IC575 is identically styled, and operates exactly as the IC275 and 475 do, both of which I reviewed during 1987 and gave strong recommendations.

There have been very few transceivers in the past that have been satisfactory for 50MHz, and I have found that all the portables were very poor in one way or another, whilst the Icom 551E and H models had very poor quality audio. The Trio/Kenwood 660S was a very nice little rig, but very few were imported and the sensitivity was not particularly good; the SSB filter being a little bit wide at the bottom, although the audio was of superb quality. This was my own personal best choice of the past.

The TS670 was quite a nice rig, but in my review of it I pointed out that it had many snags, including a poor front end and being rather overpriced. The combination of 28 and 50MHz bands is excellent for the keen 50MHz enthusiast, as there is so much crossband working with 28MHz at the moment. Now that we are well up from the sunspot minimum, activity on both bands will be increasing rapidly, and openings will be more and more frequent. By the time we get into 1989, thousands of amateurs will be finding out how very remarkable the 50MHz band can be.

The very latest news about 50MHz

(which was released by the RSGB just as I was writing this at the beginning of December), is that Dutch amateurs will be allowed up to 30W output on 50MHz as from March 1st, but unfortunately only on CW.

This alone will probably stir up a few more class B operators in the UK to pass their Morse test. I would just like to pass a comment here most emphatically in reply to the predictions of doom and despondency that were flying around perhaps two years ago: 'If class B operators get 50MHz, we will have FM from one end of the band to the other, and the whole band will be destroyed!'

The complete opposite has happened, for not only have class B operators been using the band as enthusiastically as the original class As, but the class Bs have increased the activity on the band to great advantage, and their operating is just as good as anybody else's. Not only are they welcome on the band, but I see no reason why FM should not be used on the channels now allocated for it by the RSGB's VHF Committee. The main calling channel is 51.51MHz, with working channels ± 20 kHz steps from this calling frequency.

Features

The IC575 has Icom's latest type of synthesizer double phase locked loop circuit, which provides an extremely fast reaction time of around 5ms for lock, whilst preserving an excellent reciprocal mixing performance. Full computer interfacing is provided for RS232, and Icom UK can supply details of computer software which they are also marketing.

Two built-in VFOs are complemented by 99 memories, which can retain frequency and Tx/Rx split info, as well as specialised tone squelch data.

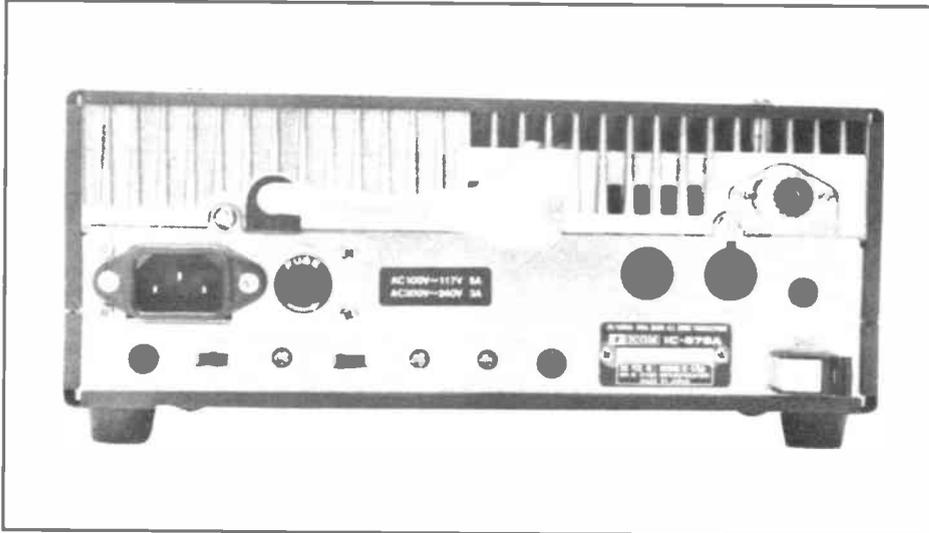
Many types of scanning are provided, including programme scan, memory scan and sweeping between two predetermined frequencies. A lock-out or skip facility is also available. The receiver has a built-in and switchable sensitive pre-amp stage for both bands, and this has around 10dB gain. A band switch selects 50 or 28MHz bands directly, and a dc voltage is put on to the output coaxial antenna socket, so as to switch an accessory two-way co-ax antenna selector, thus allowing two separate antennas to be used automatically.

In addition to FM, LSB, USB, and both wide and narrow CW (500Hz and 250Hz narrow filters are available as optional extras), an AM reception capability is provided, which can be useful if you are using the receive capability with specialised converters. Other important features are the inclusion of passband tuning and notch filtering.

Front panel controls

In order to save much repetition, I would like to refer readers back to the March and July issues of this magazine, for details of all the front panel controls. As a brief reminder, in addition to those already mentioned in features, there are the usual memory write and recall with memory to VFO facilities, and RIT of ± 9.9 kHz maximum shift. A data button allows very rapid Tx/Rx changeover, the rig being completely Packet and Amtor

G3OSS TESTS



compatible. A row of tiny rotaries provide adjustment of RF Tx power, mic gain, Rx audio tone, RF gain and CW semi break-in delay.

The usual Icom eight pin mic socket can supply power to pre-amplified or electret mics, and the Icom HM15 microphone supplied has a toneburst button on it, as well as up and down buttons for frequency QSY. Headphones with mono or stereo quarter inch jacks are compatible with the headphone jack socket, which will be found to be very useful.

Two tuning step rates are provided by using an appropriate button on the front panel. With the button out, 10Hz steps occur on CW, SSB and AM, whilst 5kHz steps are given for FM. When the button is pushed in, the steps are 1kHz for all modes. There is also a 1MHz step button, which can save a lot of time if you are using the equipment for receiving out of band signals. The digital frequency and

status indication display is very easy to read, being black on soft orange.

Like its 144 and 432MHz counterparts, the IC575 has a normal duplex working facility, as well as the capability of splitting between VFOs A and B for Rx and Tx. By using the 'set' button, the microprocessor can be programmed to give any required repeater shift, and we had no trouble at all programming 100kHz for use on 29MHz FM. Resetting this shift took no more than five seconds or so.

A 'check' button allows immediate monitoring of the repeater input frequency, which can be very useful indeed when you are working into DX repeaters on 29MHz, eg US East Coast ones. Many times I have found that I can actually hear the American mobile on the repeater input frequency, and have arranged a QSY to simplex, although, admittedly, this has not been possible for some years because of our present position in the

solar cycle. Please note that I am only covering some of the functions in detail, due to the similarity of the two almost identical models previously reviewed.

The back panel

In addition to a 13.8V dc input, there is an IEC ac mains socket provided on the rear panel, with an ac fuse and holder nearby. An SO239 socket is provided for the antenna connection, and an accessory coaxial antenna switch type EX20 (£49) is available from Icom, which operates from dc on the inner for changing over external antennas for 6 and 10m bands. A remote coaxial connector is provided for interfacing the rig with a personal computer, and various interface boards and software are available from Icom UK for use with this facility.

There is also a multipin AQS socket concerned with microprocessor control and computer operation which, in addition, provides 13.8V dc audio inputs and outputs and external mic stage muting. A multipin 'acc 1' socket also provides access to audio inputs and outputs, and also ALC, 13.8V dc, PTT, earth and squelch info, etc. 3.5mm jacks are fitted for feeding an external loudspeaker and also for interconnecting a Morse key.

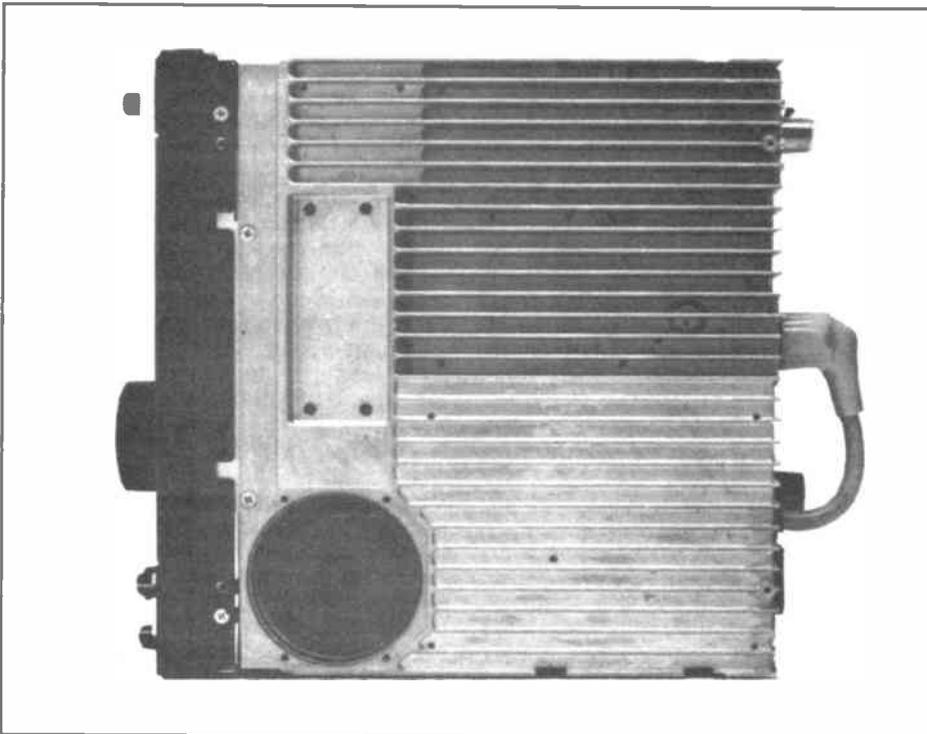
Three mini pre-set rotaries are used for adjusting the microphone amplifier frequency response, the amount of audio compression on Tx and the CW side tone level. A three position meter switch selects the indications on Tx, with positions for RF output, SWR set and SWR read. Another three position switch selects semi or full break-in CW keying, or CW with PTT control.

Two minute switches are used for controlling the external EX20 coaxial switch accessory. One of these switches turns the co-ax switch facility on and off, whilst the other one selects the bands which operate through to the two switch positions. There is also a ground terminal on the back, in addition to a large heatsink.

Operation as an IF source

This rig is ideal for driving commercial and DIY transverters for the VHF, UHF and microwave bands. If you know what you are doing, you should be able to add additional relays to select a low level Tx output, which you could take from just before the PA stage for feeding external transverters, and a relay could also be fitted to inject transverter Rx output signals directly into the first mixer.

With careful design, and the addition of an external transverter selector box, the rig could become the control centre for a very comprehensive multiband station, and this rig is particularly suitable as it has general receive coverage all the way from 26 to 56MHz, as well as transceiving on 6 and 10m. I am reasonably sure that only a minor modification would be required to enable transceiving all the way from 26 to 56MHz at a level somewhere between 1 and 10mW. All these facilities, used in conjunction with



the ample supply of memories built in, will allow great flexibility in operation. Note that this rig is one of the few specialised types that can be fitted with optional narrow CW filters, and this is especially important as practically all the other 50MHz rigs use the SSB filter for CW.

Subjective tests

I very much enjoyed using this rig on the 50MHz band, and the receiver worked admirably well. The review sample was not fitted with a narrow CW filter option, but I know that the narrow filters are excellent as I have tried them on the 144 and 432MHz models.

Two narrow filters are available as extras, the FL100 with 500Hz bandwidth at £54, and the FL101 with 250Hz bandwidth, costing £52. I did not try the rig with Packet, nor with Amtor, but it is quite clear from all the specifications, and from what I have heard from users of the two earlier models, that the rig would be very compatible with the various data modes, especially as it is actually fitted with so many special data functions.

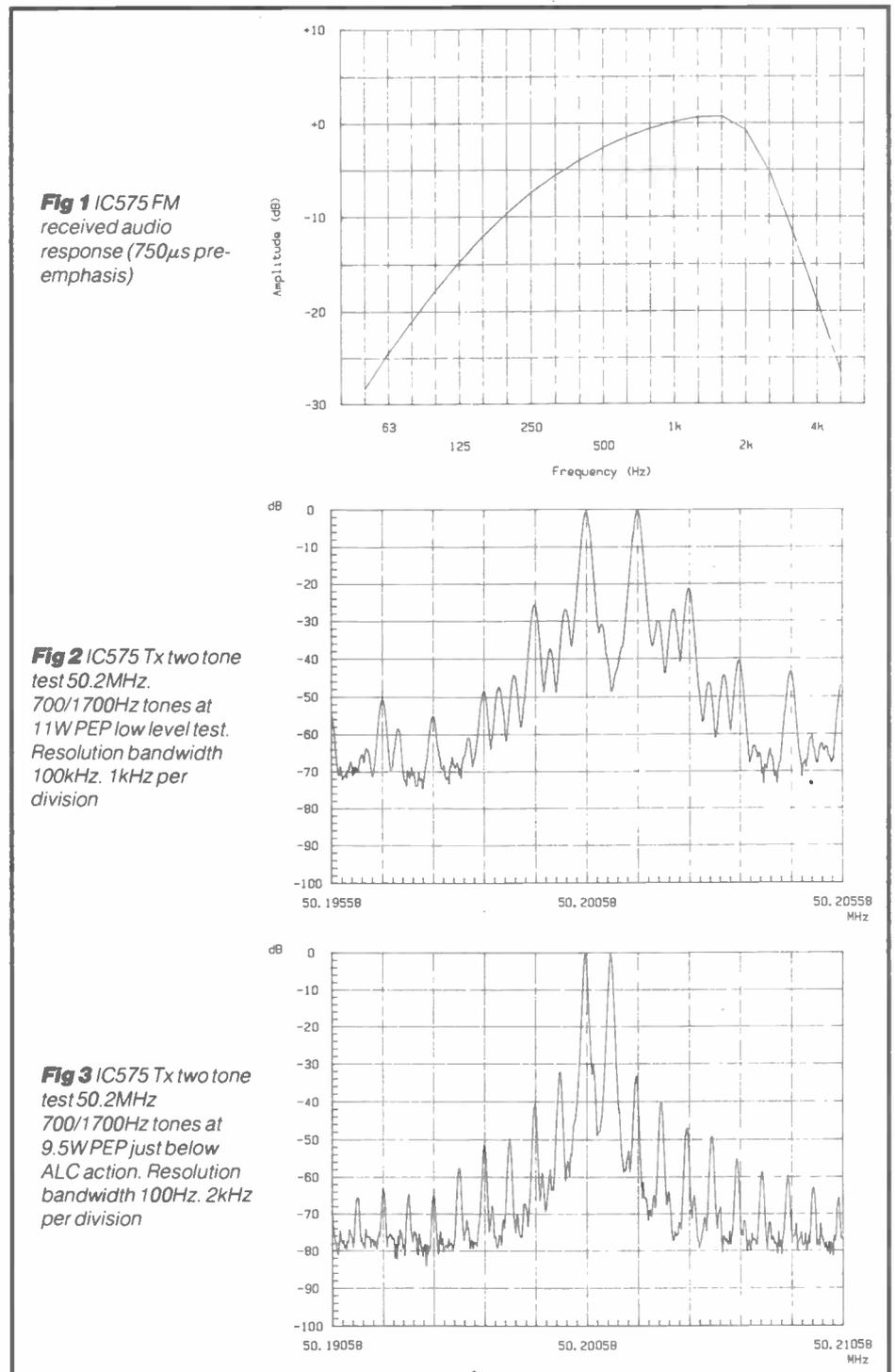
Although the basic RF facilities are good, and CW and SSB facilities are just about what one needs, the actual audio quality was just that little bit rougher than I have heard from some other rigs, and I am very puzzled as to why this should be. The built-in speaker is adequate, but perhaps there was not quite enough volume available if you wanted to fill a large room at a club, or you are using the rig portable in the open air. Some of the tiny pre-sets on the front panel were a little awkward to use, although you are not likely to use them too frequently. I do wonder how long they will last if the rig is taken out portable a lot, however, and used by many different operators.

The inclusion of a notch filter as well as bandpass tuning is quite an asset, and facilities such as RIT and memory to VFO all operated with ease.

I have often criticised an upper/lower SSB switching problem which has been a nuisance on many Icom rigs. I note that at last they seem to have put it right, for it becomes possible to switch sidebands on Rx without any change of carrier injection equivalent frequency, and also without the digital frequency readout changing. This allows immediate checking of someone's sideband suppression, and also it allows you to change sidebands when you are using SSB to demodulate AM in the presence of interference. There is an offset with CW, but this is quite normal.

I really do wonder if the majority of specialised functions, including various types of scanning with skip, are going to be required by the average user. Many have complained about the prices of modern rigs, and that if bells and whistles were left off, the prices could be a lot lower.

Surprisingly perhaps, once one has microprocessor control, most of the extra facilities can be provided for only a



few pounds per button, and it actually does make good sense to put them on. However, I suggest that herein lies the rub, for it might be said that some Japanese manufacturers put on as many bells and whistles as they can in order to justify the cost of high tech. Or perhaps, more truly, a high tech image.

As far as transmitted quality is concerned, this rig is very far ahead of its predecessor, the 551E, the latter having a dreadful transmitted quality, especially on SSB. Some 551Es that I have heard that have included the vox unit have put out a particularly nasty quality, because of the use of a strange bucket brigade filter to improve the vox facility, but at

the great expense of transmitted quality! Several stations have now removed the vox unit from the 551, and have been getting far better quality reports.

In using the IC575 on 10m FM, I found the selectivity completely inadequate for 10kHz spacing, although it coped with 20kHz channelling very well. In practice, stations can often be separated by only 10kHz, eg 29.55 and 29.56MHz, and unfortunately far too few rigs can cope with this in a sporadic E opening. There are rumours, however, that Icom may be changing to F or G filters on FM rigs during 1988, and as far as I am concerned, the sooner the better.

I found the overall sensitivity on both

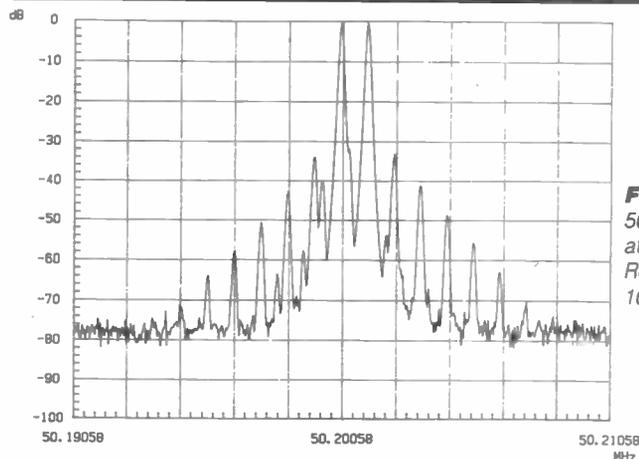


Fig 4 IC575 Tx two tone test
50.2MHz. 700/1700Hz tones
at 1W PEP low level test.
Resolution bandwidth
100Hz. 2kHz per division

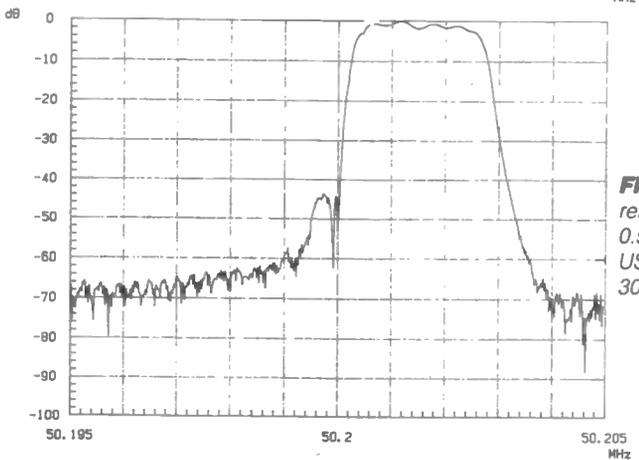


Fig 5 IC575 Tx AF/RF
response sweep taken at
0.5W, showing filter curve on
USB. Resolution bandwidth
30Hz. 1kHz per division

bands to be far better than I have noted on much of the competition, and front end intermod and reciprocal mixing problems seem to be absent. At the time of this review, my Hy Gain TH6 beam is resting on the grass in my garden suffering withdrawal symptoms, as is the top of my BXL tower, as a result of the severe storm during October. The mast is repaired, but I am having to use a simple Butternut antenna at ground level until I can get the TH6 back up again. I was amazed at how strongly the IC575 picked up GB3RAL on 28.215MHz with the Butternut, for it was almost as strong subjectively as my collapsed $\frac{3}{8}$ wave 28MHz vertical, which was at 30ft above ground level before the storm.

Laboratory tests, receiving section

The front end sensitivity on SSB was quite astonishingly good, and several dB better than that of an average HF transceiver. A 12dB sinad rating better than $0.1\mu\text{VEMF}/2$ is sensitive indeed, and the average HF rig usually measures somewhere between 0.16 and $0.25\mu\text{V}$! The RF intercept points on both bands were easily good enough for all normal purposes, and in any case these do get quite a lot better still if you switch out the built-in pre-amp.

The reciprocal mixing performance was checked at 28.55MHz, and proved to be very good, although not quite in the same class as rigs such as the IC751A. To put it into perspective, the IC575 is nearly 20dB better than the Yaesu FT767, so you

are not likely to have any problems in this area. The SSB selectivity is also good, down to around -40dB, but -60dB was just marginally wider than I would expect, although I think part of the apparent width may be very slight noise very close in to the local oscillator. FM selectivity was very good for 20kHz channelling, and thus completely suitable for 50MHz FM, but nowhere near good enough for use around 29.6MHz, let alone for use with transverters up to 144MHz.

The S meter gave around 23dB range between S1 and 9 on 50MHz SSB, but on FM we noted only 15dB range; a lot better than many rigs on FM, but still not good enough. Above S9 the meter calibration was rather non linear, but covered a very large level increase on SSB, but on FM only 3dB increases corresponded to indicated changes of 20dB! The S meter sensitivity was approximately the same on 28MHz.

The worst received frequency error noted in the Rx tests was just 70Hz, and this is quite remarkable. There did not seem to be any significant drift. On FM the limiting threshold was well below the 12dB sinad sensitivity point, and capture ratio measured well. Although audio distortion of lower deviations was insignificant, distortion was slightly high near peak deviation.

Distortion on SSB was much higher than usual at nearly 3.5% on a 1kHz beat note. The power output into an 8 ohm load was rather lower than usual, and we

could barely get 2W. Into 4 ohms matters were not that much better, for we only noted marginally over 3W at the rated 10% distortion.

The FM frequency response proved to have a surprisingly sharp roll-off above 2.5kHz (see Figure 1), and also a considerable degree of bass cut below 320Hz. I would have preferred a little bit more HF in the region 2.5 to 3.2kHz, but otherwise the curve is just about ideal. The FM discriminator was well designed, and the best Rx performance was achieved right on the tuned frequency.

A brief check of the notch filter showed a 27dB notch reduction with a reasonably narrow bandwidth, which is ideal for cutting out an annoying carrier. The noise blanker worked well, coping with ignition interference excellently, but unfortunately having no significant effect on the dreaded thermostats. About the only thing that would cope with thermostats in this area would be a sledge hammer!

Laboratory tests

The rig's power output on FM, CW and on SSB was typically at $11\text{W} \pm 0.5\text{W}$ on both bands with the power control fully up, reducing to a minimum of around 0.5W with the mini preset fully counter clockwise. Two tone tests on 50MHz again produced around 11W PEP, with the rig driven well into ALC. Figure 2 shows the intermodulation products for the lower orders at this level; note the relative absence of audio distortions.

With power reduced to 9.5W (Figure 3), just below the ALC threshold, low orders are a lot better, but the scan was taken over a wider band, and you will see that higher order products do not fall as rapidly as they should. Figure 4 shows the performance at 1W PEP - a marked improvement on the higher orders, but a similar performance for low orders.

A plot taken at 28.55MHz at around 10W PEP showed a very similar picture to Figure 3, but high orders seemed to stretch out either side for miles, not falling below -60dB for a considerable way.

If you compare these performances with those of the SSB Products transverter for 144MHz reviewed recently, you will see that Japanese PAs are nowhere near good enough for operation on really crowded bands, and I am very disappointed indeed that such a low power PA was not a lot better. At its price, I feel this rig should have had a 50W PA in it with a reasonable degree of standing current, which would have virtually eliminated the high order products which cause all the spreading that one tends to notice a lot these days.

An idea of the RF filter performance can be gained by the AF/RF plot shown in Figure 5. This shows a good passband with quite steep skirts, and a good sideband rejection. Actual measurements of carrier breakthrough and 1kHz sideband rejection were very satisfactory, incidentally. The transmitted frequency response on FM was rather too

wide, easily extending to 5kHz, which was only 10dB down, whilst 3kHz was just 3dB down ref 1kHz modulation, the figures being relative to 750µsec de-emphasis in the test equipment.

Maximum deviation was typically 5.2kHz, but reached a peak of 5.4kHz at 500Hz. All this is grossly excessive for 10m FM, and many amateurs using converted CB rigs will be very critical of this over deviation. However, it would be reasonable enough to use up to perhaps 4.5kHz deviation on the 50MHz band around 51.51MHz with 20kHz channelling. The toneburst of 1750.1Hz on the mic was set to deviate at 4kHz, which is just about right for 20kHz channelling on 6m, but may be found excessive for some of the 10m repeaters.

The frequency accuracy, even after several hours of use, was not noted to be any worse than 170Hz out, and this is certainly very good, although an even more accurate main crystal oscillator is available to special order. The 10Hz steps on SSB were surprisingly linear, and up to the best synthesizer performances that I have noted recently.

Conclusions

I have no doubt at all that this rig is easily the best 50MHz one that I have yet tested, although it has to be said that a good transverter interfaced with a very good HF rig is better, especially on Tx. It was an excellent idea of Icom's to include not only the 28MHz band but the Rx facility from 26 to 56MHz, for 50MHz enthusiasts are almost invariably quite keen on 28MHz, as the latter band is the main one for crossband working. It is simplicity itself to transmit on the 50MHz band and receive the 28MHz band using the second VFO.

Although I feel sure that this rig will be popular, I am very concerned that it is under-powered for use in Europe, as in the UK we typically need 25W PEP to get 100W ERP out of an average antenna, and Dutch amateurs will be coming on very shortly with a maximum of 30W CW.

I just cannot understand why Icom could not have done a bit more market research in Europe and the States before designing just a 10W PA for the rig. Considering the low power, the price of £999 including VAT does seem high. I don't say this too often, however, as I feel that in general we do get good value for money these days, as modern rigs have such good facilities and also tend to have a better performance than earlier models. Blind amateurs will be pleased that the rig can accommodate the optional UT36 speech frequency readout, costing £27.50 extra. I give this a hearty welcome though, as it will obviously become a standard, especially for 50MHz enthusiasts.

I would like to thank Icom UK very much for getting this review sample to me so quickly after it reached our shores, and I hope it will do a lot to popularise the band further. Very many thanks to my XYL, Fiona, for once again helping with all the measurements.

ICOM IC575A LABORATORY TESTS

Receiver Tests

All measurements are for Rx pre-amp in unless otherwise stated

Sensitivity 12dB sinad	
SSB/50.2MHz	-128dBm (0.09µV)
SSB/50.2MHz (pre-amp out)	-123dBm (0.16µV)
SSB/28.55MHz	-127.5dBm (0.095µV)
FM/51.51MHz	-123.5dBm (0.15µV)
FM/29.6MHz	-123.5dBm (0.15µV)
FM/26-56MHz	-122dBm (0.18µV)

RF input intercept point wide spacing 50.2MHz	-2dBm
RF input intercept point wide spacing 50.2MHz pre-amp out	+6dBm
RF input intercept point wide spacing 28.55MHz	+3dBm

Reciprocal mixing ratio of noise floor to disturbing carrier at stated offset

5kHz	85dB
10kHz	97dB
20kHz	105dB
50kHz	113dB
100kHz	119dB

Selectivity SSB

-3dB	1.7kHz
-6dB	2.1kHz
-40dB	3.2kHz
-60dB	4.1kHz
-80dB	5.8kHz

Selectivity FM modulation on and off channel

20kHz channelling	-50.5dB average
40kHz channelling	-65.5dB average

S meter	SSB 50.2MHz	FM 51.51MHz
S1	-114dBm	-100dBm
S3	-108dBm	-101dBm
S5	-104dBm	-98dBm
S7	-98dBm	-95dBm
S9	-91dBm (8.4µV)	-83dBm (5µV)
S9+20	-78dBm	-90dBm
S9+40	-65dBm	-88dBm
S9+60	-34dBm	-85dBm

meter readings for 28MHz are very similar to above

SSB AGC threshold	
50.2MHz	approx -119dBm
28.55MHz	approx -116dBm

Average RF pre-amp gain	approx 10dB
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SSB product detector distortion	3.4%
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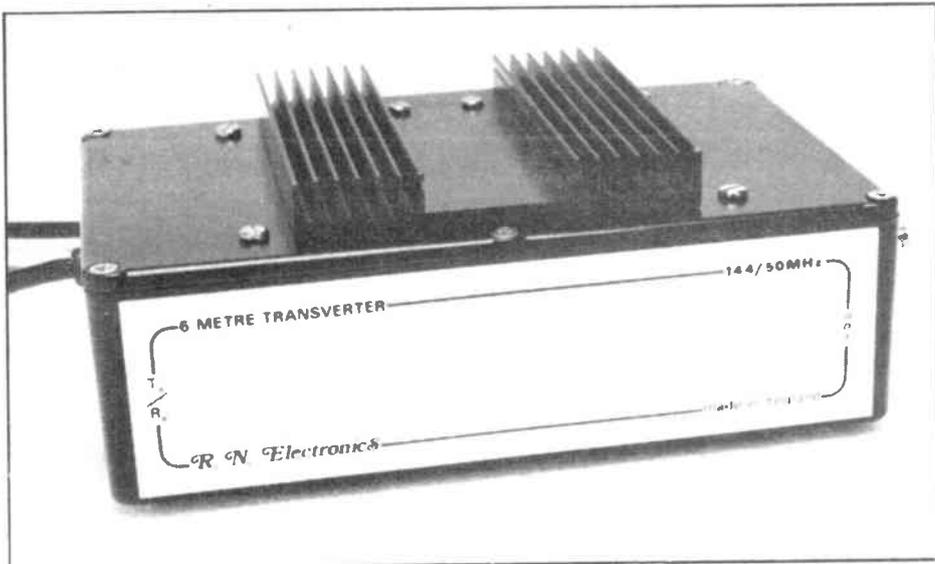
FM discriminator distortion 1kHz audio	
5kHz deviation	3.8%
3kHz deviation	3.3%
1kHz deviation	1.1%

Max audio output power for 10% distortion	
8 ohms	1.9W
4 ohms	3.1W

Maximum Rx frequency error	70Hz
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Transmitter Tests

Maximum output power, all modes	typically 10.5 to 11W
SSB carrier rejection	typically -53dB
Alt SSB rejection of 1kHz audio	-62dB
RF harmonics from 50.2MHz	
2nd harmonic (100.4MHz)	below -80dB
3rd harmonic (150.6MHz)	below -78dB
Max Tx frequency error after long warm up	170Hz
FM toneburst frequency	1750.1Hz
Toneburst deviation	4kHz
Max deviation at 1kHz	5.2kHz
Max deviation at any frequency	5.4kHz
Dimensions including projections	244mm(W) x 108mm(H) x 295mm(D)
Weight	6.1kg



RN ELECTRONICS RN6M/25B

A British company makes a transverter price breakthrough

There can be little doubt that the remarkable expansion of 50MHz operating in Europe at the time of sunspot minimum, due to the release of the band first by the UK DTI, and subsequently by the Norwegian, Dutch and other governments, has taken Japanese manufacturers completely by surprise. Up to the release of the Icom IC575, also reviewed in this issue, Japan only seems to have been able to supply fairly poor portables, or optional transverters for various rigs such as the Yaesu FT767 and FT726.

What we have needed has been: very high quality transverters as add-ons to existing rigs of one kind or another. muTek did much to show us that the

transverter approach can be an extremely sensible one, and as their products were reasonably priced and of excellent quality, it is a tragedy that they ceased trading in amateur radio equipment.

At last, however, an affordable 6m transverter has been launched, which is likely to become as popular as any other model yet produced. Comparatively recently, Roger Ray G8CUB and his XYL Sue formed RN Electronics, and launched their first product, the RN6M/25B. This transverter runs on 13.5V dc, and requires a direct connection to any 144MHz rig delivering not more than 2.5W, and drives directly into a 50MHz

antenna. The model under review gives 25W PEP output, and is supplied with normal RF sensing, giving a dropout time of around 0.5 to 1 second when returning to Rx from Tx.

The transverter is designed to cover the band from 50 to 52MHz, which, of course, means that the 144MHz driver has to cover the entire 2m band. The transverter is supplied with an excellent set of instructions, and provision is made for the rig to give full output under RF sensing conditions from 0.5 to 2.5W drive, the drive level requirement being pre-set internally.

Very low drive levels can be accommodated by slight changes to the input circuitry, which allow for levels as low as 1mW to give full output, but under these conditions it becomes necessary to use an alternative means to change the transverter over from Rx to Tx. A series of pins on the circuit board inside are provided to give different types of Tx control.

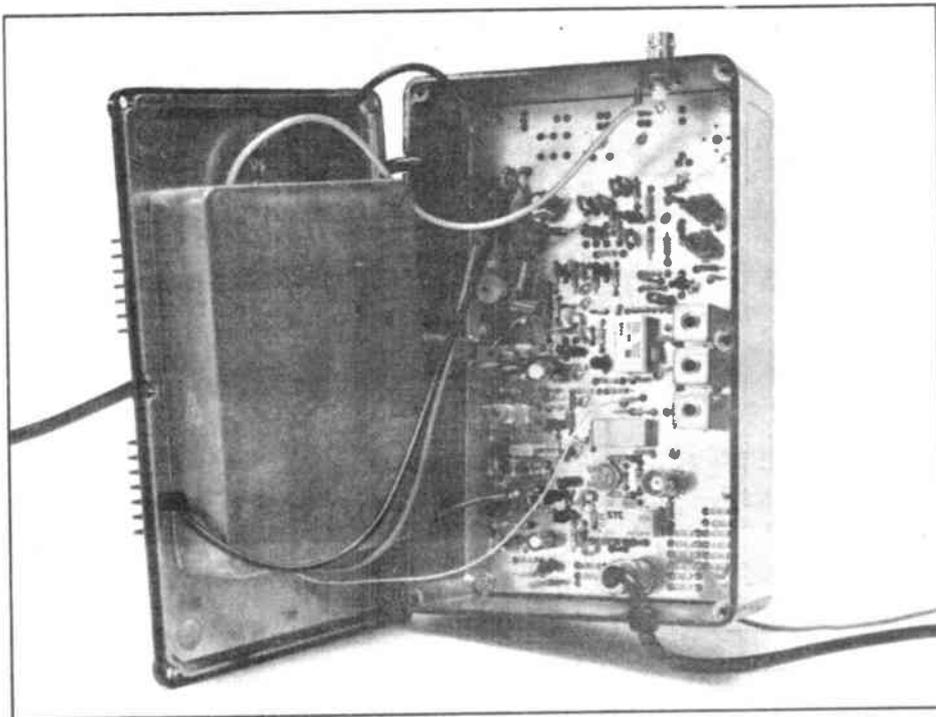
For all the subjective 'on air' tests I used a Yaesu FT290 as a drive source with RF sensing, but for all the lab tests we used a wire connected to pin 3, which we connected to the chassis for Tx. What my wife describes as 'a weevil hole' is provided by the manufacturer to allow a Tx control lead to feed through to the outside world, and provision is made for all the normal types of Tx control, including positive volts on Tx or Rx, or normal PTT. The characteristics of the RF sensing can also be changed if required, by varying the time constant capacitor.

Various models are available, the simplest one being a completely wired and tested circuit board giving just 2W output at £105, or alternatively the same circuit board mounted in a box at £135. This box has the provision of accepting a 2W to 25W linear at a later date, which costs £47. A 7dB power pad is available at £22, which can attenuate a drive power of 10 to 15W down to the level required by the transverter, and this has also to be supplied with 13V dc to operate the RF sensing circuit and changeover relay, which is required to remove any attenuation on Rx.

RN Electronics can also supply an 11dB pad with similar characteristics. What an excellent idea this is, as it makes for a far better system Rx performance than one requiring excessive Rx gain in the transverter to overcome the loss of a fixed pad in between the transceiver and the transverter, as supplied with some other makes.

Brief circuit description

The 50MHz Rx signal passes through a changeover relay and into a BF981 front end. Before mixing in an SBL1 hot carrier diode ring, the signal passes through a superbly designed bandpass filter with extremely steep skirts, which Roger designed with the help of his computer circuit design program. Note the Rx bandpass response shown in *Figure 1*, which is almost entirely due to this



important filter. No amplifier is provided, nor is it needed, as 5.5 to 6dB transversion gain is more than enough between a 50MHz antenna and a 144MHz rig.

The transmit path takes the input signal to a 50 ohm dummy load, a sample of which is passed through and attenuated down to the 0.5mW level into the same diode ring mixer. Careful attention is paid to circuit matching. The Tx drive sensitivity is changed by a pin diode with a preset altering its control voltage, and thus attenuation.

A three section filter follows into a single BF241, driving into push-pull ZTX327s. These are followed by a 3dB passive attenuator into an MRF476, which produces a maximum of around 2W PEP. The power amplifier board includes, in the lid of the transverter, an MRF477 PA transistor, and a 30W changeover relay.

The 144MHz drive/Rx output is taken via a captive co-ax lead to a BNC or PL259 plug, as requested, for direct connection to a 144MHz rig, or the optional drive attenuator. The 50MHz output can be supplied on a BNC or an SO239 socket, mounted on the transverter side chassis. The 13V power lead is a simple captive two core lead 710mm long, ending in bare wires, which I found far more convenient than having to deal with the dreaded 5 pin DIN connectors provided by some other manufacturers.

Subjective tests

I decided to use the transverter with my hotted up Yaesu FT290, which has a muTek front end on Rx, and which has been very carefully aligned on Tx to give third order products as low as -30dB for the onset of ALC on Tx at around 2.5W PEP. It only took a mintue or so to instal, and having set the FT290 to 144.200, I heard someone calling CQ virtually immediately. I called the station straight away, and got an immediate response.

Roger Ray had already told me that he had set up the transverter for a 2.5W level, so what a pleasure it was to have an immediate report of excellent transmitted quality. Many other reports were very good indeed, and the insertion of a Bird thurline wattmeter showed the output power level to be around 24W on a whistle, clearly dependent on the power available from the FT290.

The receiver seemed amply sensitive, and band noise caused the system noise to lift appreciably when the five element Tonna was connected to the antenna socket in place of a 50 ohm dummy load. The combination worked remarkably well, and the overall received quality was entirely what I would have expected from an FT290 in good working order on 144MHz. No drift was noted, and no spurii of any kind were heard, although of course I do suffer the usual thermostat and computer breakthrough problems!

The transverter took around 4A on Tx from my Daiwa 50A supply. On SSB the heatsink became only mildly warm, but in the lab tests, it did get very hot when transmitting a continuous carrier for 20

minutes or so. There was no sign of trouble, however, even after long periods of transmission.

I would personally have preferred a slightly longer RF sensed hold on Tx time, but in practice the 0.5 second or so time is a good compromise, as you can very easily instal almost any alternative PTT system, and not just an 'earth for Tx' type. You can hear the click of the changeover relay quite easily through the box, but it was certainly not loud enough to be annoying. The only criticism I have of the model as supplied was of the absence of two LEDs, one to show the presence of 13V, and the other to show that the rig is on Tx. I don't think that it would have cost much to have incorporated these.

The internal wiring and workmanship was of a high order, and it is quite clear that the manufacturers are taking a lot of care in making their product. The 13.5V lead includes brown and blue wires for positive and negative, and perhaps these might have been better coloured red and black. I just wonder if any idiot will actually try to put a 13A mains plug on it!

Laboratory tests

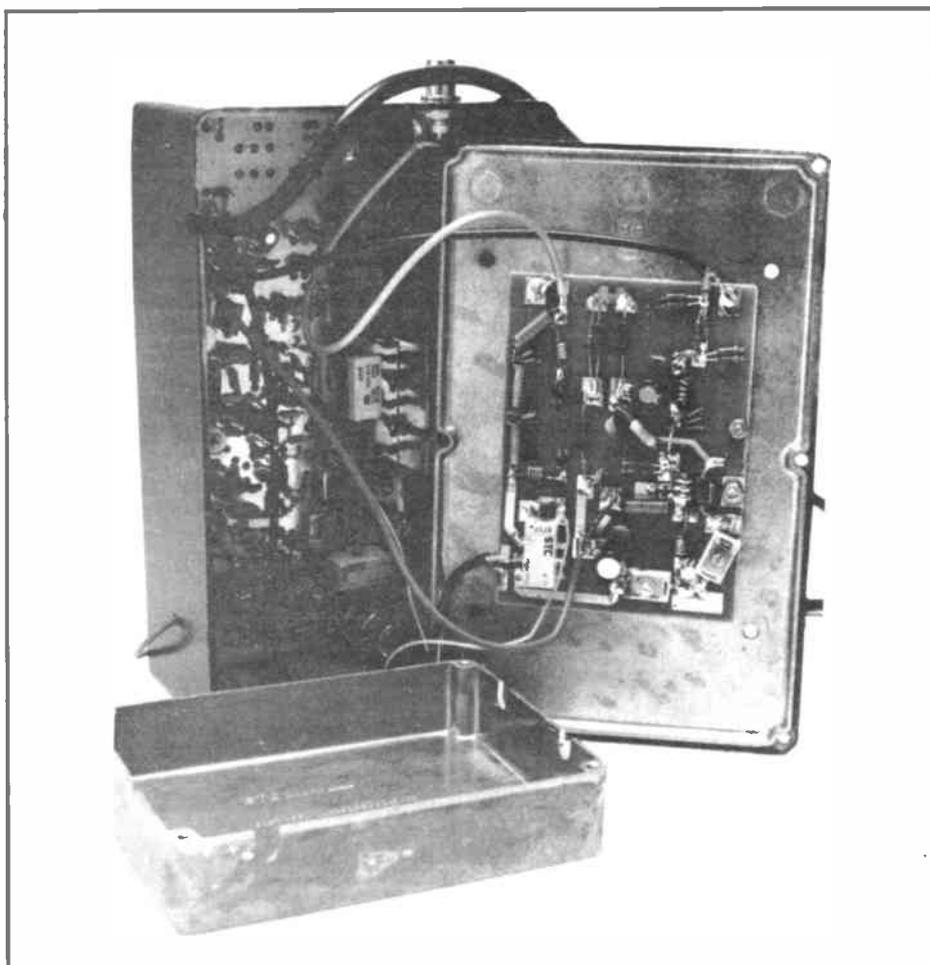
The overall gain was just under 6dB from 50MHz input to 144MHz output at the bottom end of the band. Note the *Figure 1* response again, which also shows very little gain change between 50 and 52MHz. To check the sensitivity, I first rechecked the sensitivity of the

FT290, which gave a figure of around 2.5dB as a noise figure, the FM 12dB sinad point being around -125dBm. The complete system with the transverter gave an FM 12dB sinad measurement of around -122.5dBm, and thus was 2.5dB inferior, corresponding to a system noise figure of 5dB or so.

The actual front end noise figure of the transverter is probably of the order of 3dB or so, but the overall performance is limited by the lack of transverter gain. I would suggest that this performance is not quite good enough for the most serious DX working at times when both band and environmental noise are very low, but bearing in mind that the gain has to be a good compromise between system sensitivity and intermodulation performance, the manufacturers have chosen an excellent compromise.

I am very impressed indeed with the performance of the front end bandpass filter, which is a lot better than that of some of the competition. The input intercept point measured out at -8dBm, checked at three separate input levels of two equal tones by feeding the output at 144MHz into my Marconi 2382 spectrum analyser. This intercept point is good enough for the band for average use, but to put it completely in perspective, the muTek was around 10dB better than this, but 50% more expensive.

Breakthrough from 144MHz on the 50MHz input socket was a remarkable 100dB down on the 144MHz output, so



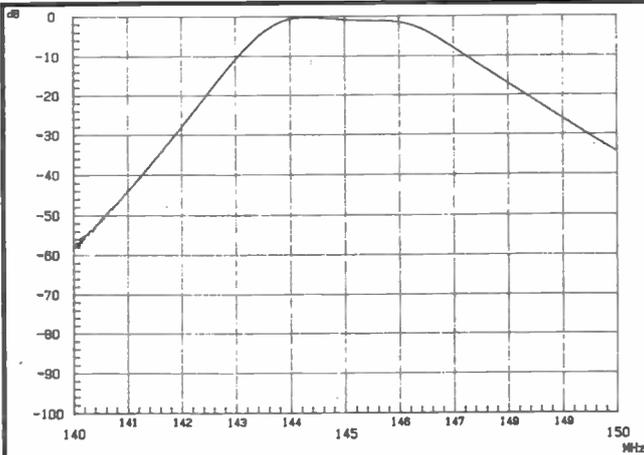


Fig 1 RN6M/25B
50/144MHz tvtr swept receiver response from 46 to 56MHz. Resolution bandwidth 3kHz. 1MHz per division

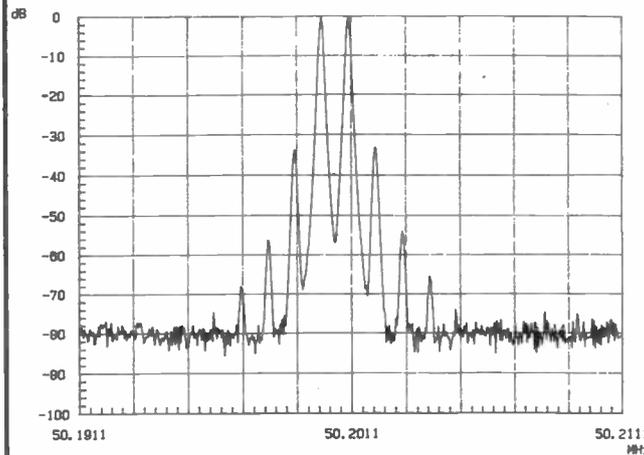


Fig 2 RN6M/25B Tx two tone test. 100mW PEP o/p very low level test. Sig gen source. Resolution bandwidth 100Hz. 2kHz per division

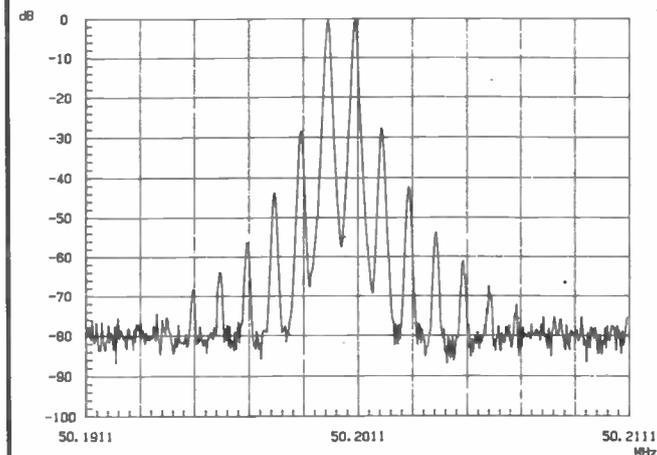


Fig 3 RN6M/25B Tx two tone test. Approx 1W PEP output from sig gen source. Resolution bandwidth 100Hz. 2kHz per division

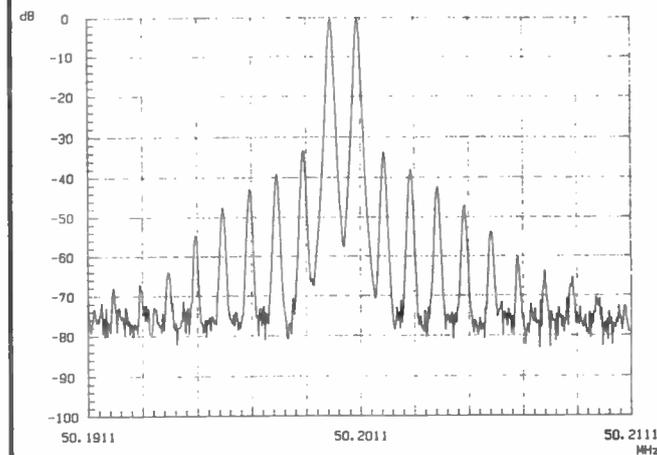


Fig 4 RN6M/25B Tx two tone test. Approx 10W PEP output from sig gen source. Resolution bandwidth 100Hz. 2kHz per division

you should not have any 144MHz band breakthrough other than that picked up by the end of the whip in the FT290!

94MHz local oscillator breakthrough on the Rx output was noted at just above 100µV, but this should not present any problem to 144MHz transceivers. The 94MHz local oscillator was 908Hz high, and this figure hardly varied by more than a few Hz either way over quite a long period of checking. This, therefore, gave just a slight transversion frequency error, which would be very simple to correct. No input image problems were noted, but the IF output was clearly extremely broadband, as there was also a 44 to 42MHz output, as well as 144 to 146MHz at about the same level.

I don't think this would cause any problems, but I would have liked to have seen a simple L/C tuned circuit in the IF output. In an effort to try and produce one obvious input image, I pumped the high level of -10dBm (70mV pd) at 238.2MHz into the 50MHz input, and was unable to detect any IF output at 144.2MHz above the noise level of -123dBm, and this is a really incredible performance, showing the superb design of the input filter.

Transmitting section

In order to test the transmitting section, I decided to use two Marconi 2019 signal generators coupling with a hybrid transformer, and feeding into the Tx low level drive input provided for the tests by Roger Ray. 10W output was given by an input of -4dBm on a single carrier, whilst +1dBm was required to give 25W carrier output, thus showing 1dB compression referred to the 10W gain. Checks were made at lower levels, and the results are noted in the table, from which you will see that the gain at lower levels is just slightly less than that at 10W.

This non linearity is quite acceptable, but is not as good as the performance of the SSB Products transverter reviewed recently, but which cost nearly two and a half times more! A saturation output of around 30W was reached, but I would in no way recommend you to use this transverter at more than 20W output CW/FM or Packet, and 25W PEP on SSB.

Two tone tests were taken, using two carriers locked to be 1kHz apart into the input, with the output feeding through a Bird thru-line watt/PEP meter and into the Marconi spectrum analyser via a calibrated attenuator dummy load. Figures 2, 3, 4 and 5 show the two tone intermodulation performance at levels from 100mW output to 25W PEP. You will see that at low levels the performance is very good indeed, whilst it is still good at 10W, and acceptable at 25W, although high order products are a little on the high side.

An important point is that the high order products fall very rapidly in amplitude with lower drive levels, and this explains the generally good subjective performance obtained on the band. Alan G3NQR is around 8 miles west of me, and claimed that I was hitting the end of his S meter (Trio 660), and yet I was

G3OSS TESTS

completely inaudible at $\pm 10\text{kHz}$, and just gently spitching at $\pm 5\text{kHz}$. This is a good performance considering that I must have been between 80 and 100dB above noise! Another station who gave me 20dB over 5/9 said that all traces of my transmissions disappeared outside $\pm 4.5\text{kHz}$.

Fiona and I had a very good check for RF harmonics and spuri. We could not see any harmonics at all on the spectrum analyser, and so the levels, even of second and third, must have been below -80dBc . I therefore cannot believe that this transverter could ever cause a problem on Band II. I am afraid this is more than can be said of one or two of the kits that are being marketed by others.

Only two spuri were noted at $\pm 8\text{MHz}$ approximately, with reference to a 51MHz carrier. The 43MHz one is probably caused by the second harmonic of the local oscillator at 188MHz beating with 145MHz, to give 43MHz. These two spuri averaged at -65dBc , but did alter in level up and down a little with changes of input drive level. Furthermore, the two levels were not normally the same, other than at full output. These products should not cause any trouble, but are worth mentioning.

The response of the transmit chain is shown in Figure 6, which again shows a very good bandpass characteristic. It is very clear that the designer has gone to considerable trouble to make the transverter free from nasties, and we scanned all the way from dc up to 400MHz in an attempt to find any other problems, but none turned up.

Conclusions

Not only am I very impressed with this transverter, as I found it very convenient to use, as well as a relatively good performer, but I feel that the price asked makes it quite a remarkable bargain, even including the VAT that RN Electronics are now charging, as their activities have increased somewhat over a very short period. This most recommendable product is clearly going to be responsible for putting very many amateurs who are already equipped for 144MHz onto the 50MHz band, where they will get a very warm welcome.

It was a very sensible idea to provide 25W PEP in this model, for this will allow you to obtain full legal power from a typical 50MHz antenna, assuming an average length of reasonable co-ax. By the time you are reading this, the manufacturers should also be marketing an equivalent 4m transverter at a fairly similar price, and if its performance is as good as this one, it too should receive a very warm welcome. Later in 1988 Roger and Sue hope to be marketing 28MHz IF versions, if there is a demand for these, and I sincerely hope there will be, as I very much prefer a 28MHz IF anyway.

Roger will be working full time for his new company from January 1988, and I wish them a prosperous future. I telephoned Roger with a request for a review sample, and I feel it shows his

Fig 5 RN6M/25B Tx two tone tests. Approx 25W PEP. Almost saturation output. Resolution bandwidth 100Hz. 2kHz per division

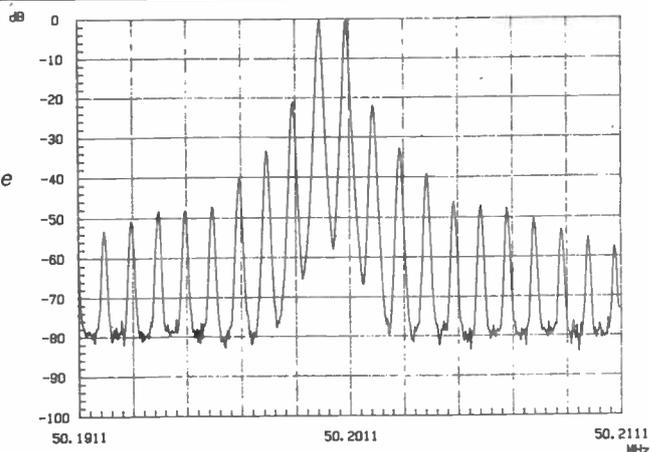
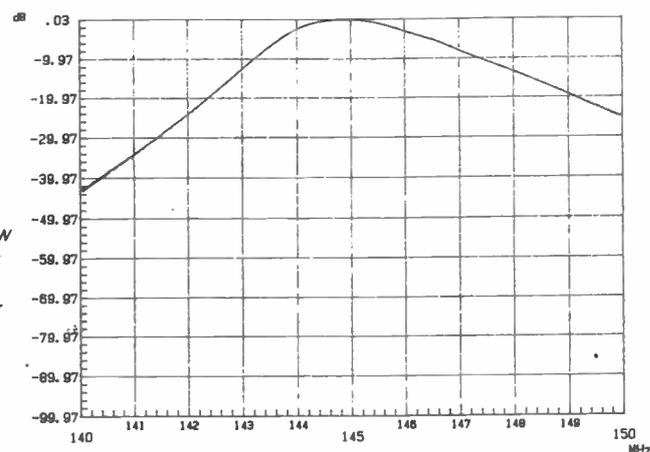


Fig 6 RN6M/25B Tx transversion response. Slow sweep from 140 to 150MHz output. Resolution bandwidth 3kHz. 1MHz per division



confidence in his own product that he should have supplied one so quickly for me to test, despite apparently being told at an exhibition that Angus has a

reputation for tearing things apart! Many thanks to Roger and Sue for all the help, and to Fiona for helping me with all the measurements and writing.

RN Electronics 6M/25B 50/144MHz Transverter Lab Tests

Receiving Section

System noise figure with Yaesu FT290
Average input/output gain
144MHz band breakthrough from input to output
Other measurements, see text and plot

typically around 5dB
5 to 6dB
-100dB

Transmitting Section

Saturation output power
Maximum recommended SSB power
Maximum recommended FM/CW carrier power
Typical input power for full output as delivered
RF harmonic distortions
Spuri, two noted, approx $\pm 8\text{MHz}$ from 51MHz
Transversion frequency error
94MHz local oscillator breakthrough on output

30W
25W PEP
20W
2.5W PEP
all below -80dB
averaging -65dB each
908Hz
below -80dB

Transmit linearity test

Input drive 144.3MHz dBm	Output 50.3MHz dBW	IP/OP gain dB
-44	-33.7	40.3
-34	-23.8	40.2
-24	-13.3	40.7
-14	-1.2	42.8
-4	+10	44
0	+13.3	43.3
+1	+14	43

Other measurements, see plots and text

Dimensions 190mm W x 120mm D x 75mm H



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INTEGRATED CIRCUITS

AN103	2.50	LA4300	2.50	AL12707	1.10	TA7699P	3.95	TCA760	2.50	UDA4050	2.95
AN124	2.50	LA4461	3.95	SN7474	1.50	TA7611AP	2.95	TC8000	2.50	UDA4600	2.50
AN214	2.50	LC7120	3.25	SN7421	0.85	TA7629	2.50	TC8000	6.95	UDA9503	3.15
AN214C	2.50	LC7130	3.50	SN76023N	3.95	TAA310A	3.50	TC8A305	1.95	TEA1009	1.35
AN236	1.95	LC7131	8.50	SN76110N	0.89	TAA320A	3.50	TC9A90	1.65	UPC41C	3.50
AN239	2.50	LC7137	8.50	SN76115N	1.25	TAA350A	1.95	TC9A40	2.50	UPC566H	2.95
AN240P	2.50	LM323K	4.95	SN76131N	1.50	TAA550B	1.95	TD4440	2.20	UPC575C2	
AN247	2.50	LM324N	0.45	SN76226N	1.50	TA570	1.95	TD41003A	2.95	UPC10001H	
AN260	2.95	LM380N	1.50	SN76227N	2.95	TAA621	3.95	TD10006A	1.95	UPC1020H	
AN262	1.95	LM3808N	2.85	SN76228N	1.95	TAA661B	2.95	TD1010	2.15	UPC1024H	
AN264	2.50	LM383T	2.95	SN75533N	1.65	TAA700	1.70	TD1005	2.25	UPC1025H	
AN271	3.50	LM390N	3.50	SN76500N	1.95	TAA930	3.95	TD1035	2.50	UPC1028H	
AN301	2.95	LM1011	3.15	SN76560N	0.60	TBA120AS/B/C		TD1037	1.95	UPC1028H	
AN303	3.50	M5155L	2.50	STK011	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN313	2.95	M51513L	2.30	STK014	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN315	2.25	M51521L	1.80	STK015	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN316	3.95	MB7035	1.50	STK016	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN331	3.95	MB7312	2.00	STK017	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN342	2.95	MB7356	2.50	STK018	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN362L	2.50	MC1307P	1.00	STK019	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN612	2.15	MC1310P	1.95	STK020	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN6362	3.95	MC1327	0.70	STK021	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN7140	3.50	MC1327Q	0.95	STK022	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN7145	3.50	MC1349P	1.75	STK023	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN7145M	3.95	MC1350P	1.75	STK024	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN7150	2.95	MC1357	2.50	STK025	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
AN7151	2.50	MC1359P	1.75	STK026	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
BA521	3.35	MC1358	1.58	STK027	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA1352E	1.75	MC1495	3.00	STK028	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA3086	0.46	MC1496	1.75	STK029	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA3120	2.50	MC1723	0.50	STK030	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA3131EM	1.95	MC1757	2.75	STK031	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA3140S	2.50	MC14166P	2.95	STK032	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
CA3140T	1.15	MC14518CP		STK033	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
ETT6016	2.50	ML231B	7.50	STK034	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1137M	1.95	ML232	2.95	STK035	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1156W	1.50	ML239	2.95	STK036	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1306	1.95	MSM5807	8.75	STK037	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1322	1.50	SA1500A	3.50	STK038	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1339A	2.95	SA1025	7.25	STK039	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1366W	2.75	SA11251	4.95	STK040	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1377	3.50	SA12040	5.35	STK041	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1406	1.95	SA1205AP	5.75	STK042	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
HA1551	2.95	SAB3210	3.50	STK043	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA1201	0.95	SAB3210	3.50	STK044	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA1230	1.95	SAB5606	1.75	STK045	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA3201	0.95	SAS5708	1.75	STK046	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4101	0.85	SAS580	2.85	STK047	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4102	0.95	SAS580	2.85	STK048	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4110	2.95	SLB18	7.95	STK049	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4301P	1.95	SL917B	6.65	STK050	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4400	3.50	SL1310	1.80	STK051	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4420	2.50	SL1327	1.10	STK052	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	
LA4422	2.50	SL1327	1.10	STK053	7.95	TBA120AS/B/C		TD1190	2.15	UPC1032H	

SEMICONDUCTORS

AA12	0.25	BC182B	0.10	BD237	0.40	BF493	0.35	MRF453	17.50	TV106	1.50
AC126	0.45	BC183	0.10	BD242	0.65	BF595	0.23	MRF454	26.50	TV106/2	1.50
AC127	0.20	BC183L	0.09	BD246	0.75	BF597	0.23	MRF455	17.50	ZRF0112	6.50
AC128	0.28	BC184LB	0.09	BD266	0.32	BF639	0.25	MRF475	2.95	2N1100	16.50
AC128K	0.32	BC204	0.28	BD379	0.45	BF640	0.23	MRF477	14.95	2N1308	1.35
AC141	0.28	BC207B	0.25	BD410	0.65	BF681	0.25	OC169	4.80	2N1711	0.30
AC141K	0.34	BC208E	0.20	BD434	0.65	BF688	0.30	OC229	1.95	2N2149	0.28
AC142K	0.45	BC212B	0.15	BD436	0.45	BF691	1.95	OC235	1.50	2N2426	0.55
AC176	0.45	BC214L	0.09	BD437	0.75	BF691	1.95	OC235	1.50	2N2905	0.40
AC176K	0.31	BC213	0.09	BD438	0.75	BF742	0.35	OC238	5.50	2N3053	0.50
AC187	0.25	BC213L	0.09	BD510	0.95	BF743	0.35	OC239	4.50	2N3054	0.49
AC187K	0.28	BC214	0.09	BD518	0.75	BF743	0.35	OC239	4.50	2N3055	0.52
AC188	0.25	BC214C	0.09	BD520	0.65	BF743	0.35	OC239	4.50	2N3055	0.52
AC188K	0.37	BC214L	0.09	BD534	0.45	BF743	0.35	OC239	4.50	2N3055	0.52
AD142	2.50	BC237B	0.15	BD535	0.45	BF743	0.35	OC239	4.50	2N3055	0.52
AD143	2.50	BC238	0.15	BD536	0.45	BF743	0.35	OC239	4.50	2N3055	0.52
AD149	0.70	BC239	0.18	BD575	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AD161	0.50	BC251A	0.15	BD587	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AD162	0.50	BC252A	0.15	BD588	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AF106	0.50	BC258	0.25	BD597	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AF114	1.95	BC258A	0.30	BD695	1.50	BF743	0.35	OC239	4.50	2N3055	0.52
AF121	0.60	BC284	0.30	BD698	1.50	BF743	0.35	OC239	4.50	2N3055	0.52
AF124	0.65	BC300	0.30	BD701	1.25	BF743	0.35	OC239	4.50	2N3055	0.52
AF125	0.65	BC303	0.28	BD702	1.25	BF743	0.35	OC239	4.50	2N3055	0.52
AF126	0.65	BC303	0.28	BD707	0.90	BF743	0.35	OC239	4.50	2N3055	0.52
AF127	0.65	BC307B	0.09	BDX32	1.50	BF743	0.35	OC239	4.50	2N3055	0.52
AF139	0.40	BC327	0.10	BDX53B	1.65	BF743	0.35	OC239	4.50	2N3055	0.52
AF150	0.60	BC328	0.10	BF115	0.35	BF743	0.35	OC239	4.50	2N3055	0.52
AF178	1.95	BC337	0.10	BF119	0.85	BF743	0.35	OC239	4.50	2N3055	0.52
AF239	0.95	BC348	0.10	BF127	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AY106	0.13	BC374	0.15	BF132	0.95	BF743	0.35	OC239	4.50	2N3055	0.52
AY102	4.25	BC381	0.35	BF177	0.38	BF743	0.35	OC239	4.50	2N3055	0.52
BC107A	0.11	BC478	0.20	BF160	0.27	BSW64	0.95	RCA16029	0.85	25C784	0.75
BC107B	0.11	BC527	0.20	BF173	0.22	BSX66	1.25	RCA16039	0.85	25C785	0.75
BC108	0.10	BC547	0.10	BF158	0.22	BT100A/02		RCA16181	0.85	25C789	0.55
BC108B	0.12	BC548	0.10	BF158	0.22	BT100A/02		RCA16334	0.85	25C931D	0.95
BC109	0.10	BC549A	0.10	BF179	0.34	BT106	1.49	RCA16335	0.85	25C937	1.95
BC109B	0.12	BC550	0.14	BF180	0.29	BT116	1.20	RCA16572	0.85	25C1034	4.50
BC109C	0.12	BC557	0.08	BF182	0.29	BT120	1.65	S2060D	0.95	25C1036	0.80
BC115	0.55	BC568	0.10	BF182	0.29	BT120	1.65	SKE5F	1.45	25C1106	2.50
BC115A	0.55	BC639/10	0.30	BF183	0.29	BU005	1.05	T6021V	0.45	25C1124	0.95
BC116A	0.55	BCY33A	19.50	BF184	0.35	BU008	1.59	T6027V	0.45	25C1162	0.95
BC116A	0.55	BD115	0.30	BF185	0.28	BU012	1.25	T6029V	0.45	25C1172	2.20
BC117	0.19	BD124P	0.59	BF194	0.11	BU125	1.25	T6369V	0.55	25C1173	1.15
BC119	0.24	BD131	0.42	BF195	0.11	BU126	1.60	T9002V	0.55	25C1307	2.95
BC125	0.25	BD132	0.42	BF197	0.11	BU204	1.15	T9011V	0.75	25C1446	0.50
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ES80L 29.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	S106/1K 10.00	XR1-3200A 79.50	4CX1500B 398.50	6EA7 2.80	12A6 3.95	50K14 4.50	5963 1.75
ES81CC 5.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	S130P 5.95	XR1-6400A 149.50	4CX500A 4.50	6E8B 2.50	12AD6 1.50	50L14 3.50	5965 2.15
ES81L 12.00	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/800 5.95	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AE5 1.50	50M14 3.50	5965 2.15
ES82CC 4.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1100 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AE6 5.00	50N14 3.50	5965 2.15
ES83 5.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1200 5.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AE7 4.95	50O14 3.50	5965 2.15
ES84 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1300 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AE8 4.95	50P14 3.50	5965 2.15
ES85 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1400 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AE9 4.95	50Q14 3.50	5965 2.15
ES86 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1500 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AEGT 4.95	50R14 3.50	5965 2.15
ES87 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1600 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL5 1.50	50S14 3.50	5965 2.15
ES88 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1700 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL6 1.25	50T14 3.50	5965 2.15
ES89 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1800 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL7 1.25	50U14 3.50	5965 2.15
ES90 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/1900 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL8 1.25	50V14 3.50	5965 2.15
ES91 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2000 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL9 1.25	50W14 3.50	5965 2.15
ES92 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2100 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL10 1.25	50X14 3.50	5965 2.15
ES93 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2200 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL11 1.25	50Y14 3.50	5965 2.15
ES94 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2300 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL12 1.25	50Z14 3.50	5965 2.15
ES95 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2400 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL13 1.25	50A14 3.50	5965 2.15
ES96 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2500 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL14 1.25	50B14 3.50	5965 2.15
ES97 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2600 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL15 1.25	50C14 3.50	5965 2.15
ES98 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2700 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL16 1.25	50D14 3.50	5965 2.15
ES99 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2800 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL17 1.25	50E14 3.50	5965 2.15
ES100 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/2900 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL18 1.25	50F14 3.50	5965 2.15
ES101 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3000 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL19 1.25	50G14 3.50	5965 2.15
ES102 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3100 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL20 1.25	50H14 3.50	5965 2.15
ES103 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3200 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL21 1.25	50I14 3.50	5965 2.15
ES104 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3300 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL22 1.25	50J14 3.50	5965 2.15
ES105 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3400 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL23 1.25	50K14 3.50	5965 2.15
ES106 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3500 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL24 1.25	50L14 3.50	5965 2.15
ES107 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3600 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL25 1.25	50M14 3.50	5965 2.15
ES108 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3700 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL26 1.25	50N14 3.50	5965 2.15
ES109 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3800 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL27 1.25	50O14 3.50	5965 2.15
ES110 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/3900 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL28 1.25	50P14 3.50	5965 2.15
ES111 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4000 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL29 1.25	50Q14 3.50	5965 2.15
ES112 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4100 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL30 1.25	50R14 3.50	5965 2.15
ES113 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4200 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL31 1.25	50S14 3.50	5965 2.15
ES114 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4300 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL32 1.25	50T14 3.50	5965 2.15
ES115 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4400 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL33 1.25	50U14 3.50	5965 2.15
ES116 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4500 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL34 1.25	50V14 3.50	5965 2.15
ES117 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4600 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL35 1.25	50W14 3.50	5965 2.15
ES118 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4700 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL36 1.25	50X14 3.50	5965 2.15
ES119 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4800 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL37 1.25	50Y14 3.50	5965 2.15
ES120 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/4900 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL38 1.25	50Z14 3.50	5965 2.15
ES121 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/5000 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL39 1.25	50A14 3.50	5965 2.15
ES122 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/5100 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL40 1.25	50B14 3.50	5965 2.15
ES123 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/5200 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL41 1.25	50C14 3.50	5965 2.15
ES124 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/5300 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL42 1.25	50D14 3.50	5965 2.15
ES125 9.50	EF86 Mullard 9.50	KT66 Sp y ap- 19.50	PC99 0.70	SC1/5400 6.00	Y65 149.50	4CX500A 4.50	6E8B 2.50	12AL43 1.		

SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

The mailbag has been very heavy this month, and we'll start off with Stan Porter of Malawi, who has been on holiday in the UK. Stan took the opportunity of making use of a visit to HMS Belfast on the Thames to get in on the JOTA activity. During his visit, Stan gave me a call and we had an interesting chat. Following a recent move, Stan has been re-siting his aeriels. His QRM problems are not electrical, but are caused by a group of forty or so hippos that appear upset that Stan has his new house on their grazing ground!

Philip Davies of Market Drayton got a bit of logging done during contests. The RSGB 21/28MHz do gave him a new oblast in UW0CW (110) as well as JH4DIT and HR2FP on fifteen, and 9J2BO and 4X5000 on ten. The CQWW SSB contest was fruitful with NR5M, P40R, VP9AD and PJ1B on eighty, OF2HE, RU1DZ, CR4CQK and FJ5BL (Barthelamy Island) on forty, JW5E (Svalbard), ZD8RP (Ascension Island), YT1W and RG5XE on twenty, RL9PZZ, PJ0J, NY2L, YY1C, AZ6ETB, 5N27KBM, CW4C and EF7CW yomping in on fifteen, and even ten doing its best with IL3, TA2, PY7, ZY4, ZY5, ZC4, 8P9, FM5 and YV6. But the cream on ten were AZ4F and S0RASD who was working stations as fast as he could.

Phil has logged 151 prefixes on 10 metres since January '87 and is looking forward to the 'big lift' on ten.

Guides on the air

Duncan Wheelhouse G8TRP, of Penrith, sent me some interesting literature about the 'Guides on the Air' weekend that was held in February. This is a similar idea to the Scout 'JOTA' which is held in October but not quite so big (yet!). Certainly, the Guides seem to have enjoyed their weekend, and they received plenty of listener reports, which are being responded to.

As for the JOTA weekend last October, the Jamboree

Awards attracted a fair number of entries and raised some money for Mencap (last year's chosen charity).

So for the results. The top log was from the 1st Tiddington Scouts of Stratford on Avon, who submitted a list of 267 stations, scoring 397 points. This was their first attempt at the contest and, under the guidance of Tony Blackburn ILA059, they had a thoroughly enjoyable time. To be fair to our second place listener, this was a multi-operator entry... but nonetheless, a superb effort!

Second place went to Chris Gibbs ILA086 of Camberley, who submitted a superb solo score of 311 points (236 stations), to take yet another award. Well done, Chris!

Well done

Third place broke the discrimination barrier for Joan Slater ILA185 of Matlock, with a score of 254 points (189 stations). This was a particularly good effort by Joan who had a new receiver (HF125) and a temporary aerial. Well done, Joan. As usual, all participants will receive certificates, and the top three receive trophies also.

The final scores table was as follows:

Philip Davies (196 points), Clifford Tooke (171), Eric Franks (152), Ken Burnell (107), Joe Sammut (89), Darrell Jacobs (80), Steve Beazley (75), Hedley Falkinder (70), Brian Pearson (68), Stan Taylor (68), Cliff Queeley (55).

David Williams (43), Matty Bell (34) and John Doughty, who put in a score of 8... just for the hell of it, to give the charity the fee!

I also received a cheque from Philip le Brun who didn't send a list, but got himself sponsored to the tune of nearly £15.00! Thank you all for taking part in the contest. Apparently you all enjoyed it and you raised £40.00 for Mencap in the process. *Well done everyone!!*

Peter Wood of Crowborough lost a chunk of his roof during that terrible storm we

had last year, but he managed to concentrate on the dots and dashes enough to have his callsign changed to G0HWQ. He's now using a TS120S with a G5RV. Congratulations, Peter!

I've said it before. There are some people who just can't wait for a challenge! I no sooner get an award in print than someone gets a claim in before the ink is dry. Such is the case with Steve Beazley of Chingford, who saw the details of the International Listeners Association 'Continental Awards' and sent a claim off by return post! The new awards are for logging 100 stations in one continent... amateur or broadcast.

Not satisfied with that, Steve sent a claim for the Bronze Prefix award too, and listed 3C1, 4N2, 5H3, 9Y4, HV2, HH2, PZ5, TK5, VK7, VO1, XE3, YB5 and ZL4 amongst the loggings, and just to be really nasty, they were all RTTY contacts too! What can I say? Well done, Steve!

Another claim for the Bronze award came from Terry Lincoln of Weymouth, who sent in his first ever effort at awards. Amongst the loggings were 5H3, JA6, VK2, VK7, PP6, YV5, ZC4, and C30. A nice first effort, and signs of good things to come from Weymouth. Well done, Terry!

Rare square

Seems that Eric Franks of Paignton came up lucky while logging the JOTA stations, when he heard a group working from the Portland Lighthouse... handy, that, because that happens to be in a rare WAB square! A lot of listeners work the WAB awards, and good fun it is too.

For the purpose, the British Isles are divided into 10km squares, each identified by a grid reference (I am in SS69) and the idea is to log a station in each square. However, some squares are in uninhabited areas, so brave lads have to go out portable to get the square on the air. When this happens, all hell breaks

loose, and everyone and his brother is trying to work the poor chap in the square who is, more often than not, cold, wet and hungry and looking frantically for an empty bottle or large bush!

Joking apart, the WAB gives you good training in listening, and is very well organised. Try listening to the lads on 3760 and you'll get the hang of it. The essential checklog costs a fiver, but is personalised and no-one else has that book number. You can get all the gen from Brian G4KSQ, QTHR.

How much?

Of the many questions raised in letters I have received through this column, probably the most asked regards the cost of getting into the hobby and what there is in the hobby to keep one interested.

Let's take a look at the cost question first. You can draw a parallel between short wave listening and fishing, really. A youngster may see a keen angler by a lake and note that he has a carbon rod, a fixed spool reel and all the extras and he seems to be catching quality fish. Take this to the experienced listener, who probably has a top-of-the-range receiver, an extensive aerial system and displays a selection of exotic QSL cards.

In both cases, the admiring youngster would probably think that he would need the same equipment to get started, a lot of money to buy it with, and another young person who could have been encouraged is lost!

It is very often the story that is repeated throughout radio (and many other hobbies for that matter), and the fault lies with both the experienced listeners who insist that only the best is good enough, and the industry that tells all who will listen that the bells and whistles are essential.

The most interesting and informative way of starting in the listening hobby is on the broadcast bands (howls from the amateur band types!).

There are good reasons for saying this: firstly, the equipment need only be a simple domestic receiver, which most households have anyway, in one form or another. Secondly, broadcast stations are virtually guaranteed to be on certain frequencies at certain times, so are easier for the novice to find. There are many stations that devote time to the listener, and that will even supply the listener with as much information as he requires about his new hobby... *free!* The novice will quickly learn what times it is best to listen for certain stations, and what areas they are broadcasting from and to. He will also quickly learn about which aereals perform best from his location.

To do these things, the newcomer needs no technical know-how, no tests and no licence. Just a desire to get the most enjoyment he can from the hobby while learning about radio and communication.

Bells and whistles

The specialised communications receiver has extended coverage of the radio frequencies, and a large number of facilities such as filters, memories and the ability to resolve amateur signals. However, these facilities are not essential for interesting listening, and a quite simple receiver will do the job.

If your domestic radio receiver has short wave band coverage, so much the better, as the majority of long distance transmissions are made on short wave. However, there are many interesting stations to be heard on the long and medium wave bands

from many countries. The idea is to tune slowly through each band, stopping as soon as a readable signal is heard, each time noting the frequency and details of the station.

This way, you will soon find out the range of reception of your receiver with the standard aerial that is fitted. If you only have a hi-fi system, it may be necessary to fit an aerial yourself, and your instruction manual will tell you what is required (usually a simple length of wire).

Although you will not always agree with the politics of the country received, or may not like the particular programme, it always pays to listen through the thirty minutes or so in case there are announcements regarding future programmes and times of transmission which you can note for later use.

Cheap Rx

There may be some of you who have no receiver at the moment, or would rather buy something of your own. In this case, there is still no need to spend a lot of money.

One of the cheapest receivers on the market is the Russian 'Selena', which can be found in most high streets at less than £20. Despite its obvious outdated appearance and rather antiquated tuning and switching systems, this receiver is capable of very good long distance reception on short wave, even on the telescopic aerial fitted, so is a very good introduction to listening. Even if you decide later that radio DXing is not for you, it is still a useful domestic receiver.

So, what is so interesting about short wave (or medium,

long or other band) listening? To some listeners, it is the interest in other people's points of view on topical subjects, the different folk music, the travelogues or the history of a particular region.

For others, it is the pure mystery of radio, the way the signals are transmitted, the way the signals travel all over the world, or the way weather and atmospheric conditions affect them. Or you may become interested in the electronics of radio. The way transistors work, why a capacitor or resistor is used and how the whole circuit gathers the signal and converts it to the sounds you hear.

You may decide to investigate the amateur use of radio, and even take the exam to become a licensed amateur yourself, or you may become interested in the external technologies associated with radio, such as computers and coding systems.

There are any number of reasons, or combinations of them, which explain why people are interested in listening, and you can take your pick. The important thing is that it is not necessarily an expensive hobby, but can be a very absorbing one.

Now for those of you who make a point of listening out for the special event GB callsigns - the 91st Leicester Scouts are promoting a very nice certificate for you.

The basic requirement is for 100 confirmed reports for stations with the GB/GE/GK/GV prefixes. There are endorsing stamps available for 150, 200, 250, 300, 350, 400, 450 and 500. The cost is only £1.50 for the original certificate, and 50p per claim for the stamps (maximum of three

stamps per claim). The log extracts should be verified by two licensed amateurs or a club official, and sent to M J Harriman G4SJJ, PO Box 49, Leicester.

There has, in the past, been a little confusion over what constitutes a prefix, particularly in claims for the *Amateur Radio* prefix awards. For those who have not tried award hunting, these awards are a good starter. There are certificates for 250 and 500 prefixes and trophies for 1000 and 2000 prefixes. The prefixes all have to be different, and this is where confusion sets in. Some people are confused by the variations in prefixes and, with changes to them being made almost weekly - I'm not surprised.

Luckily, Geoff Watts has for a long time now been issuing a complete list, which gives the countries, their prefixes and the ITU or CQ zones they are in, as well as other information. The list costs £1.00 and is available from Geoff Watts, 62 Belmore Road, Norwich NR7 0PU.

Now, a prefix can have letters and numbers mixed, and Britain is no exception. As allocations of callsigns increase, the need for variations in the prefixes become necessary, so numbers become part of the prefix, like G3 or GW4.

Some countries have allocations of one letter and two numbers or letter/number/letter, such as Y55 (East Germany) or 9Y5 (Trinidad), and there are a few four digit/letter combinations, usually special licences.

Well, that's about it for this month. I hope you have a good month's listening. 73 for now de Trevor.

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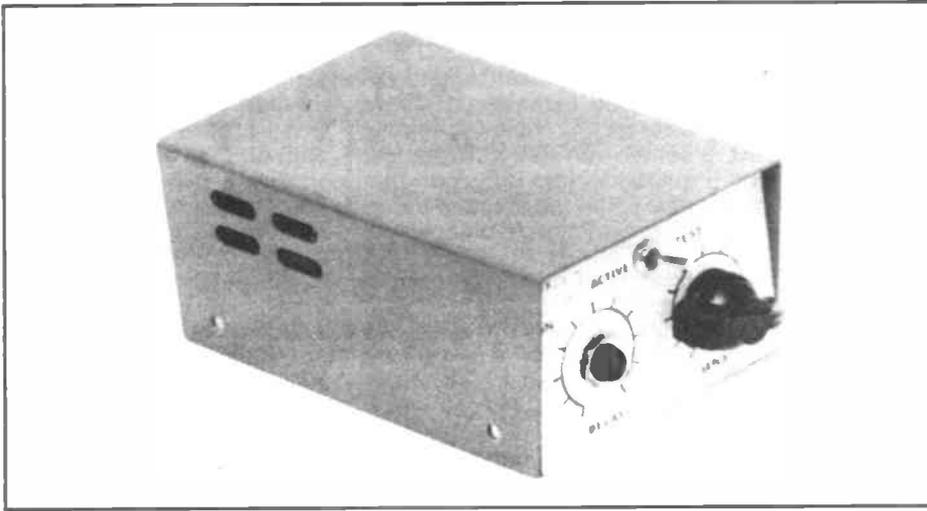


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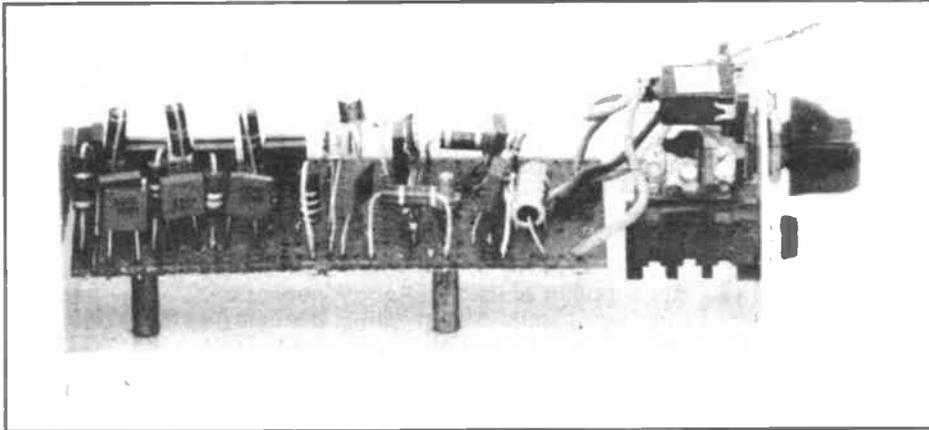
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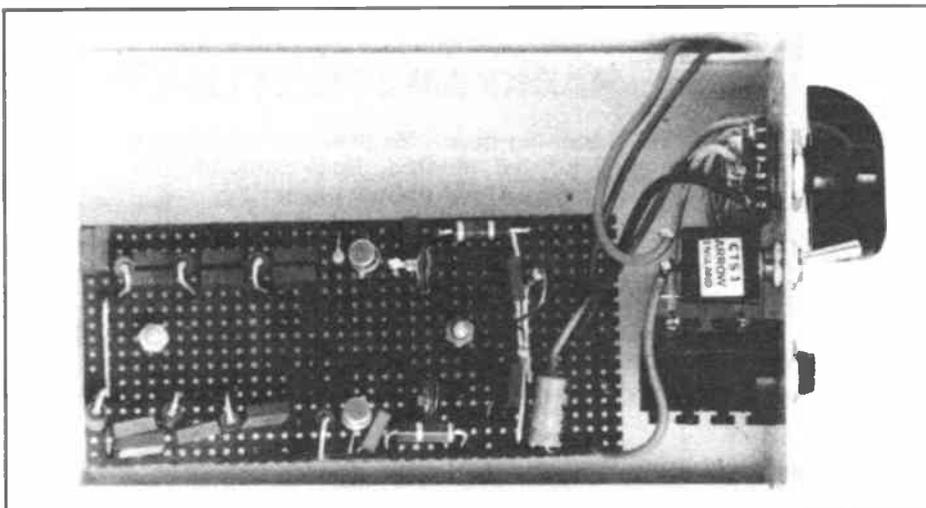
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A SIMPLE TWO TONE OSCILLATOR



Clean up your SSB signal with this simple construction project from Brian Kendal G3GDU



It is an unfortunate fact of life that many of the SSB signals heard on the bands take up far more frequency space than they should.

Apart from cases where the signal is of sufficient strength to cause overloading of the early stages of the receiver, the problem usually lies in the adjustment, or in non-linearity of the final amplifier.

Even commercial linear amplifiers are not immune from these problems, for they are not necessarily caused by faulty design, but may be due to other factors such as inadvertent overdriving or poor regulation of the power supplies.

Ideally, the output of linear amplifiers should be checked on a spectrum analyser, but these instruments are expensive and are rarely found in amateur shacks. Fortunately, however, an adequate assessment of the quality of the transmitted signal can be made by the use of a two tone oscillator, and observing the output waveform on an oscilloscope.

The need to construct a two tone oscillator for such checks recently arose in the author's shack, and consideration had to be given to the design of a suitable instrument.

The required parameters were: that it should be simple to construct; provide a good waveform, and have a variable output level comparable with that of the microphones normally used with the equipment.

The chosen design

Various oscillator circuits were considered, but it was finally decided to use an RC phase shift circuit. This is a solid-state version, of that known to generations of RAF technicians as the 'Dippy' oscillator, for it was reputed to have been designed by a member of the original Bawdsey radar research team of that name, whilst working at RAF Yatesbury.

This oscillator is simple to construct, and gives a good waveform at adequate output level. The first oscillator was constructed along one long edge of a piece of veroboard

$3\frac{3}{4} \times 1\frac{3}{4}$ inches using components to hand and a 2S104 transistor. The reason for the use of 10nF capacitors and these particular transistors throughout was a result of obtaining a copious supply of each at a recent club junk sale!

Having confirmed the quality of the first oscillator, a second was constructed along the other edge, this time 'doubling up' the capacitors to provide a lower frequency of oscillation. The only other difference between the two circuits was the value of the base-collector feedback resistors, which were selected in each case for best output waveform. The measured frequencies of the two oscillators were 1560Hz and 620Hz respectively.

Photographs

Top: The completed two tone oscillator unit

Middle: Side view of the PCB under construction

Bottom: Top view of the PCB mounted inside the case

Three problems still remained: to balance the output levels; to mix the outputs of the oscillators; and to provide a means of varying the output level.

Various methods were considered, but finally the simplest possible solution was adopted – a simple resistive mixer.

The output of each oscillator was fed via a 10nF capacitor to a preset 100kohm potentiometer, from the slider of which the signal was taken via another 10nF capacitor through a 10kohm resistor to a common point, this being earthed via a 4.7kohm potentiometer. The output signal was taken from the slider of the 4.7kohm potentiometer to a jack socket on the front panel.

The combination of resistors and capacitors provides sufficient isolation between the two oscillators, such that no distortion of waveform is discernible at the collector of either oscillator. The 100kohm preset potentiometers provide the means to equalise the output of the two oscillators, at a level such that the signal from the output jack is compatible with the station microphones.

In the author's circuit, the output of each potentiometer was set to give 1 volt peak to peak at the test point. This resulted in an output variation of approximately 0.1 to 300 millivolts at the output jack.

In use, the complete circuit consumes about 2mA, a level at which a PP3 battery will give a long period of service. When complete, the oscillator was mounted in a small metal equipment box which was of sufficient size to include a PP9 battery.

Any reader intending to duplicate this circuit will probably find that almost any audio transistor should perform just as well as those used by the author, and that there is also a considerable latitude in the selection of component values, although this will alter the frequency of the oscillator. On completion of each oscillator, however, carefully examine the output waveform, for any impurity can have a serious effect on results when in use.

Using the oscillator

The first question that the first-time user might ask is: 'Why use a two tone oscillator?'

The simple answer is that, in order to check the linearity of the transmitter, it is necessary to radiate a modulated carrier wave. If a single tone were inserted into the audio circuits, the output would be a CW signal. By inserting two tones, a modulated carrier wave output signal will be obtained.

In order to perform the checks, the transmitter output should be connected to a dummy load, such as a 50 or 75 ohm, 100 watt, non-inductive resistor. The vertical amplifier of an oscilloscope is then connected across this load. The two tone oscillator is applied to the microphone input and the output waveform observed.

The oscilloscope should then be indicating a perfect sine wave output, the particular points to observe being that the 'crossover' is sharp and well defined, and that there is no flattening of the signal peaks. If any distortion at all is

perceptible, investigation is necessary, for any visible on the oscilloscope pattern indicates a considerable increase in intermodulation distortion products.

In commercial equipment such distortion may be caused by overdriving the equipment. This can easily be confirmed by reducing the drive from the two tone oscillator until a clean undistorted waveform is obtained. The peak output level at this point can be used as a reference for future operation.

In home constructed equipment, it should be possible to trace back to the

stage in which the non linearity is occurring, where an adjustment to the drive or bias levels may well effect a cure.

With solid-state linear amplifiers, in addition to the factors already mentioned, the regulation of the power supply, as measured at the amplifier, may well merit investigation.

At this point, a few words about the oscilloscope may be appropriate.

Whilst on the lower HF bands, no problems may be anticipated with any of the instruments presently available, but some people may be concerned if, for

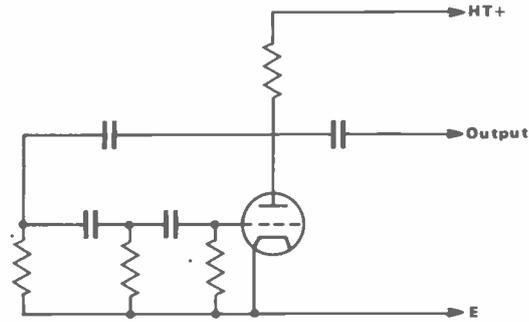


Fig 1 The RC phase shift oscillator as designed by R J Dippy in the late 1930s

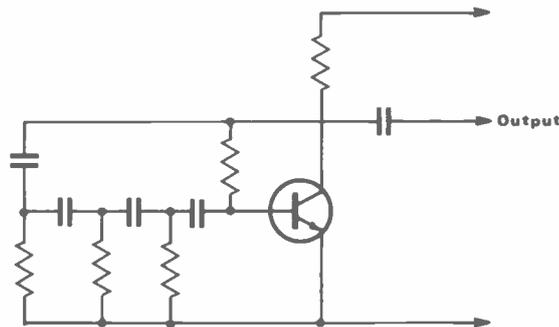
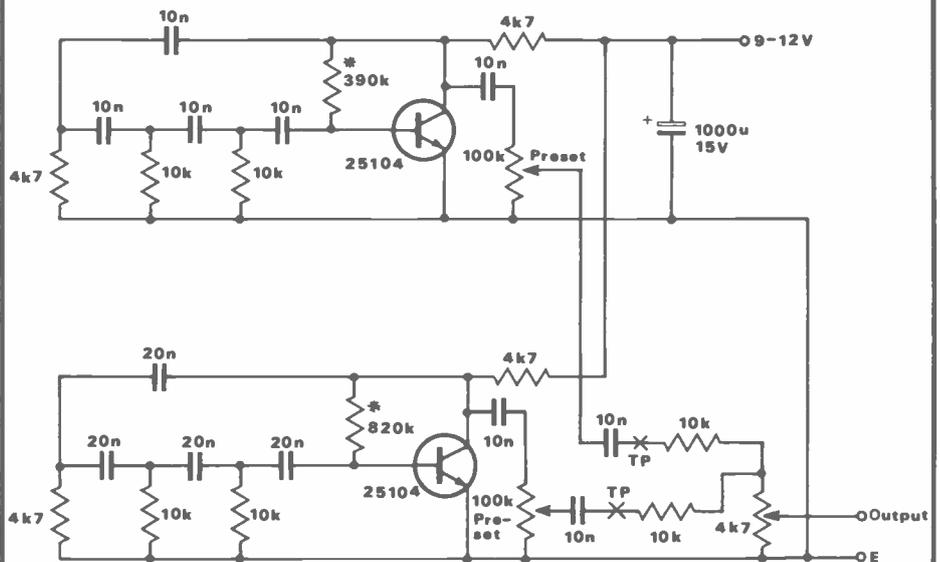


Fig 2 Solid-state version of the Dippy oscillator



* Selected for best waveform
TP-Test points

Fig 3 Circuit of the complete two tone oscillator
The output level waveform is monitored at the test points (TP)

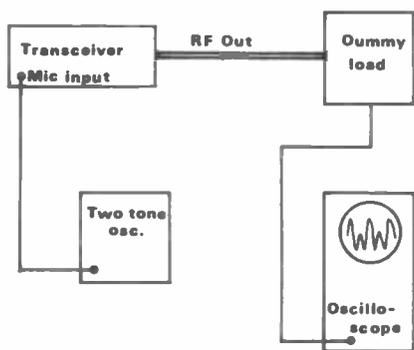


Fig 4 Set up for using the two tone oscillator

instance, they wish to examine a 21MHz amplifier on a 15MHz oscilloscope.

This need cause little concern, for the rating of an oscilloscope is not the maximum frequency at which it may be used, but that at which the gain of the internal amplifiers is reduced by 3dB.

Consequently, the instrument may be used for observing waveforms at a much higher frequency than it is rated, but at these frequencies the calibration will be considerably in error. Provided that a reasonable deflection can be obtained, almost any oscilloscope may be used for the tests described on the HF bands.

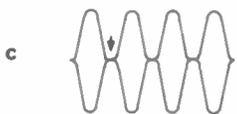
On VHF a different situation exists, for few, if any, oscilloscopes normally found in amateur shacks are capable of operation on these frequencies.



Oscilloscope pattern showing the ideal RF envelope during a two tone test. No serious non-linearity present



In this two tone test pattern, peak flattening indicates either excessive drive, poor regulation of driver stage or power supplies, or insufficient aerial loading



Sloppy crossover characteristics are indicated in this test pattern. The bias should be reduced until a sharp crossover, such as A is obtained

Fig 5 Oscilloscope patterns seen in two tone tests

One of two methods can be used, the first of which involves applying the signal across the dummy load directly to the oscilloscope vertical deflection plates.

This is usually quite simple for the experienced constructor, but a more simple means is to place a simple potentiometer made from two fixed resistors across the dummy load, and rectify the signal at the mid point with a VHF diode such as a 1N914. The output

from this can then be applied to the input of the vertical deflection amplifier and the waveform examined as described previously.

The construction of a two tone oscillator, such as described in this article, can be completed in a single evening, using only components which can be found in the average shack. The effort of construction will be well repaid in the future.

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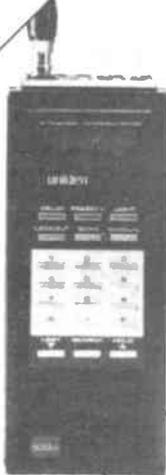
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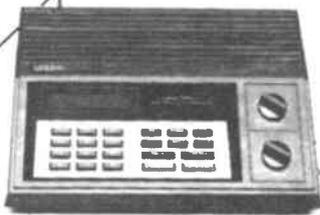
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SECONDHAND COL

Up until two years ago I had gone out of my way to avoid computers. I just couldn't understand colleagues staying up half the night to de-bug a program, whatever that meant. The world changed for me one night at the radio club annual junk sale. My father had indicated an interest in computing – not to the extent, you understand, of him spending his own money on it – but he was interested enough to let me spend my money on it for him. At the junk sale was a ZX81 Sinclair, sold as working, and with no reserve price. After much bidding, and with price increments of the previously unheard of 10p a bid, it was 'mine' (or my father's) for £3, a record price for the club that was to stand for two years!

As usual, radio junk was thrown onto the hall floor to await the annual tidy up and sort out. My two year old son found the ZX81 about a week later and enquired what it was. Not really knowing myself, I told him it was a special kind of typewriter that could write on the television. Intrigued, he asked for it to be set up, and within minutes was typing up words.

This was a great surprise to the wife and I, since up until then we didn't even know he could read. Sentences soon followed words, and then one day I noticed he had it 'doing' things (he had read the handbook). Lunchtime conversations, conducted from his babies' highchair, started centering on subscripted variables and other gobbledygook I didn't understand. Since there was no way a two year old was going to outsmart me, I started secretly reading the handbook, and also received valuable coaching in computing from my colleagues at work. Before I knew it I was hooked!

Other computers

Again, junior was to blame; I try to attend as many rallies a year as is

physically possible, and he comes along. He started noticing other computers for sale and kept asking for them. Since the wife and I had had weeks of peace and quiet out of the ZX81, anything with a big thick handbook for under a fiver seemed like reasonable value for money. We were extremely lucky to buy a non-working Commodore PET for £2 with several carrier bags full of programs, instructions, users magazines etc quite early on in our collection. The PET is a wonderful machine for a child since it has everything built in (no wiring up yards of spaghetti to TVs and mains adaptors to be plugged in, TVs to be tuned etc), the PET simply stands on a desk with its own built-in screen and he can safely switch it on and use it whenever he wants (that's six in the morning until midnight if given the chance!)

Amateur radio and computing

Obviously, computers bought at rallies stand a high chance of being previously owned by amateurs, so a lot of our machines came with amateur related programs. After junior had gone to bed, these had to be tried out in the shack, and very good some of them were, too. These days a fiver really isn't a lot of money, especially compared with the grand or so required for your average HF rig, and I assure you that every computer described below has been bought for under this. A machine sold as a package, with a printer or disc drive, may well cost more. I do not claim the list below covers every cheap secondhand computer available, they are merely the ones we have bought in the last couple of years, and must therefore be fairly representative of what's currently available.

If you have ever considered computing and have a fiver to spare, the list below will hopefully give you a guide as to what

you are buying, and what you can do with it. An excellent investment is the RSGB software register. Costing all of a quid to members (including postage) it lists amateur software available, both from other amateurs and commercially. Obviously the main computers featured are the Spectrum (some ZX81 derivatives), Amstrad and Vic, but there are one or two oddball machines.

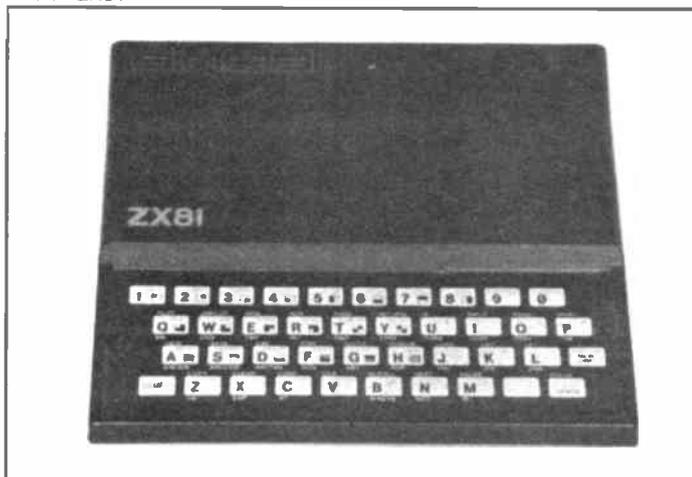
Sinclair ZX81

Since this was our first machine, it seems a good place to start this review. They are dirt cheap nowadays, never ever pay more than £3 for a ZX81, and that should be complete with the truly excellent handbook, power supply, leads for use with a tape recorder etc. Cost new varied from £65 to about £30 during their production run. They are available everywhere, from jumble sales, car boot sales, local newspapers etc. Many radio magazines carried useful program listings for these machines four or five years ago. Very common amateur radio programs are a QRA locator, all sorts of Morse tutors, contest logs, grey line calculators, distance and bearing, satellite orbit predictors etc.

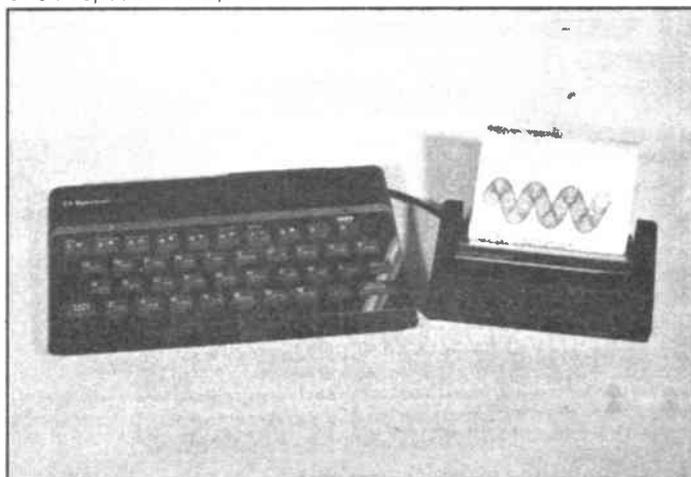
Note that the machine only has a very limited memory (I know the problem!), but add-on memory, usually 16K, is available secondhand for 50p or so. Note that we are only talking about black and white pictures. Another common add-on is the dreaded ZX printer. These are teeny weeny things that use special paper. I'll repeat that, they use special paper. The paper is still available, but it costs roughly £2 a roll and suppliers take some finding. Since the printers seem to sell for about £2, if it comes with several rolls of paper you've got yourself a bargain.

Most serious computer freaks will roll around on the floor laughing when you mention this printer, but we love it. They

Sinclair ZX81



Sinclair Spectrum and printer



COMPUTER SPECIAL

by Hugh Allison

were really built down to a price, but I love the way they work, with a stylus rushing round on rubber bands. It's interesting to note that you cannot produce a level straight line on these, the mechanism that drives the stylus across moves up the paper at the same time. My son prefers to use his in the dark. Since the printer uses electro-conductive paper with styluses charring it, in the dark there are flashes and clouds of fumes. Great fun.

Since the 'faults' on the ZX81 are similar to the Spectrum, please read on!

The Spectrum

With the Spectrum we are discussing early 16 and 48K machines. The more modern Spectrums + (that also includes +2 and +3) are not, yet, in the £5 price bracket. The machines we are talking of boast colour and a whole host of built-in features, such as circle and mathematical functions, which I've never heard of. Great value for money, and again an 'easy for two year old to read' handbook. It will use the above ZX printer, or can drive much better printers via fairly easily obtainable interfaces. A whole host of programs are still available, from shoot 'em up games to some superb SSTV programs. This is an excellent choice as a first machine.

Circuit diagrams are available, so if it goes wrong it might be home repairable. Most of the bits are obtainable, PM Components—who advertise in this magnificent magazine—carry vast stocks of bits for these, though they only advertise this fact in computing comics. The external power supply runs a horrendous inverter inside the machine that has a habit of blowing up when a memory chip goes down. If offered a non-working Spectrum that just produces a few coloured squares on the screen, leave your wallet in your pocket and get running! Despite rumours of unreliability

(and I have also repaired a few), I can only say that ours have all been quite reliable.

The best way to destroy any Sinclair computer is to attach or remove an accessory with the machine running. One real fun plug-in I bought quite recently for a couple of quid is a speech synthesizer. There are hours of fun to be had getting it to mumble your callsign, sing Happy Birthday, or make it say whatever your perverted mind can dream up.

Right, this is the Sinclair ZX81 and Spectrum problem corner. Problem one, the keyboards. The ZX81 is called touch sensitive, and I have nothing against it personally, though your serious computer freak may well be on the floor again. The keyboard on the Spectrum is best described as feeling like pressing dead flesh, the only thing I can say is that you either like them or loathe them. We get by.

The second, and most serious problem, is one of RFI (Radio Frequency Interference). Can they chuck out a barrage of noise! You will find grunts, clicks and very rude noises from audio to 23cm coming out of them. Perhaps that's why they call them Spectrum? If your shack consists of neat, well earthed, coaxial cables and the aerials are hundreds of yards away, then you will only have problems. If your shack is like mine, a rat's nest of wires and an open feeder long wire antenna that comes back on itself over the house, you have a nightmare on your hands.

One super intelligent amateur I know wrote a superb high speed Morse reader/sender program for his Sinclair, but couldn't use it for meteor scatter (its intended purpose) since the weak signals were blotted out by the hash of the computer, even on two metres. He eventually got some success by putting the computer in a carrier bag, the bag

wrapped in tin foil then the whole thing in a biscuit tin, but what a performance. I would seriously suggest that you buy your computer and try it in the shack before buying or writing any amateur 'use on the air' type programs.

The ZX80

No mention of the Sinclair range of computers would be complete without including the ZX80. Remember these? Some were sold as kits, others as ready built. Two quid is too much to pay for this piece of history, the computer that started a revolution, the first one sold for under £100. Most of them overheat after 20 minutes, they will last for an hour if a pint carton of milk from the fridge is stood on top of them (I'm serious, honest). The screen blanks while the machine actions your program, they are slow and have a very limited instruction set. They are almost totally useless, but great fun! Incidentally these really are museum pieces, there is one in the Science Museum.

The Commodore PET

In total contrast to the Sinclair plastic-cased RFI radiating machine, the PET (Personal Electronic Transactor), comes in a metal box and is not only quiet in the shack, it's RF bombproof as well. Get your hand-held right up against the screen and there is an it'sy bitsy bit of patterning, but no memory loss occurs and the PET is back to its RFI quiet state the moment you release the transmit button. The earliest PETs were the 2001 series, with a blue, red and silver not-quite-proper keyboard. First sold in 1977 at about 800 dollars, PETs range from the excellent basic 2001, which has a built-in cassette player, through to, I think, the 8032 which can do all sorts of tricks. For your fiver, working, you are restricted to the 2001, but as a guide an 8032, plus printer and a dual disc drive sold at

Lightly modified Sinclair ZX80



Commodore PET





Commodore Vic 20

Longleat for £80.

Apart from the sheer joy of being totally self contained, there is a whole host of programs available, both domestic and amateur. We have a Morse tutor, Morse reader/transceiver, RTTY terminal and all the more usual stuff for ours. A decent proper Commodore printer, with leads and mains plug cost only £2 at the BARTG rally at Sandown park, then a mile of teleprinter paper for it was 20 pence, so this can be a cheap machine. Additional memory boards, once £200 new, now go for £2/3.

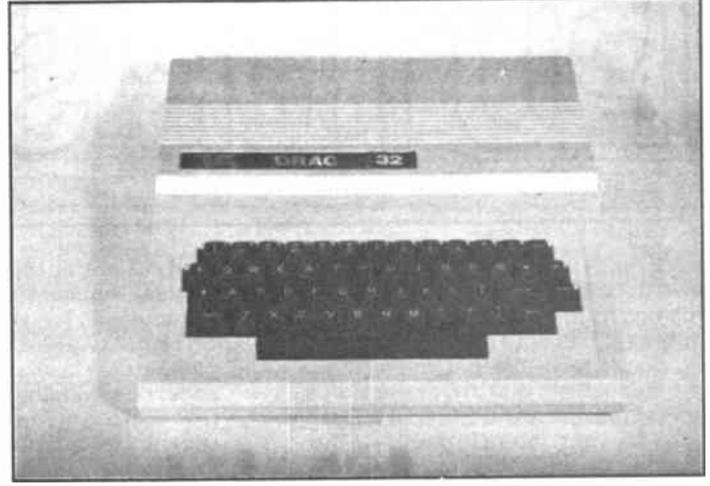
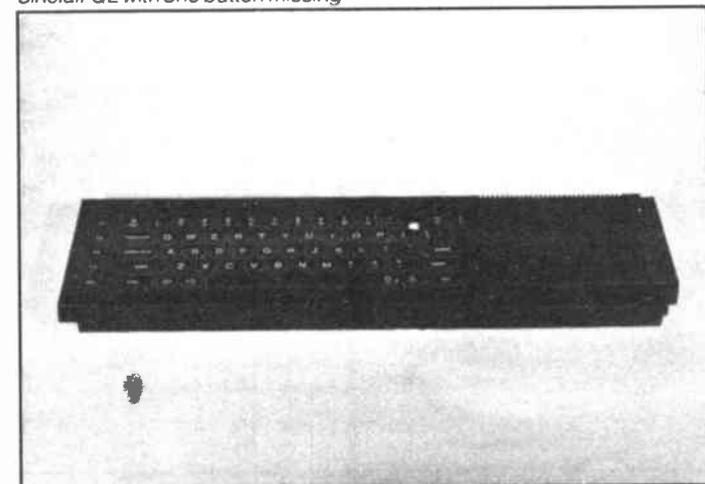
Problems include the hinge on the back oxidising up, allowing out a bit of RFI; to cure this simply lift the lid up and down a few times. The connector from the mains transformer to the board can overheat and go open circuit, simply cut it off and hard wire; additionally, the big rectifiers can unsolder themselves occasionally.

The Commodore Vic 20

This is, in a way, a plastic cased, no built-in screen version of the PET. The main difference is a superb keyboard, with real feel keys, and colour. RFI is appalling if someone has worked on the machine and not re-fitted the metallised paper shielding, and bad if they have!

The computer sucks phenomenal amounts of current, and beware, the power supplies changed (naturally, so did the PSU plug/computer socket) during the production run. Take great

Sinclair QL with one button missing



Dragon 32

care to make sure there is a power supply with the machine you buy, then check that the supply will fit into the computer.

A lot of the 'surplus' Vic 20s have come onto the market from catalogue warehouses and things seem to have got mixed up. Even the latest version (well, the latest version I have) eats an awe inspiring 3 amps at 5 volts. Quite a lot of the more normal amateur software is available for this machine (see the RSGB software list) and a good, if brief, handbook should come with it. Lots of Vics are obtainable, often 'nude' (no PSU, handbook or programs) for £3/5.

The Dragon

No, not the mother in law, but a very unusual computer. It's unusual because, in company with lots of other computers, the price plummeted, but now it's going back up! This is almost entirely due to some good amateur related programs having come available recently, particularly RTTY and Packet. Thus, a machine costing the best part of two hundred sovs about six years ago dropped to a fiver a couple of years ago, and is now hovering above the £10/15 mark, unless you are lucky like I was! They are also available 'new' (the firm that made them, like lots of others, has gone bankrupt, but someone is building them up).

There is a good handbook, colour is available and it has a great keyboard. Also available at the rallies are plug-in

games for about a quid a go, some of which are great fun. The Dragon is surprisingly quiet RFI wise, and is well worth considering.

The Sinclair QL

I've made a special point of separating this machine out from the three other Sinclair boxes above. This is due to it being a totally different animal to those you have just read about. QL stood for quantum leap - do those funny adverts on the telly two years ago, with uncle Clive jumping over things, makes sense now? In many ways the QL is different: for starters it's got the dubious honour of having made the most spectacular depreciation of the lot - £350 to £5 in two years takes some beating!

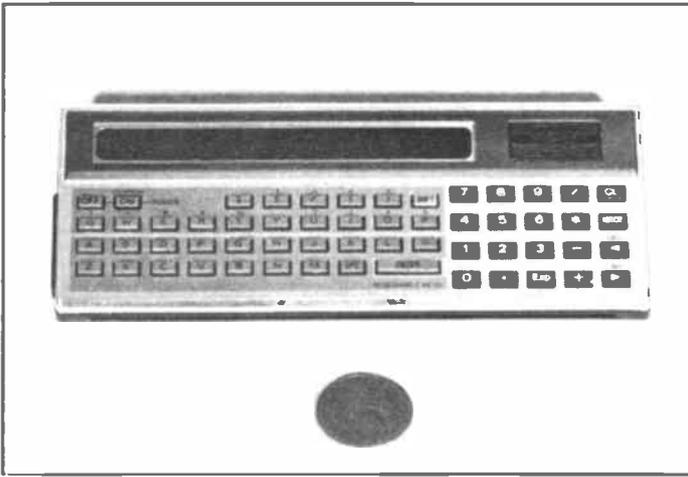
To be fair, it really is a fantastic machine, astonishingly fast running with excellent colour, good high definition graphics, a superb handbook, built-in micro-drives (a sort of tape based storage system) and a reasonable-ish keyboard. RFI-wise it is quite quiet. What a great shame that amateur related programs for it are so thin on the ground! If you have bought a cheap, less powerful machine and are already into computing, this could well be an excellent next step. Micro-drive tapes are available, but again, take some hunting down.

The Oric Atmos

Again, we are looking at awe inspiring depreciation. Originally these cost two

Oric Atmos 48K





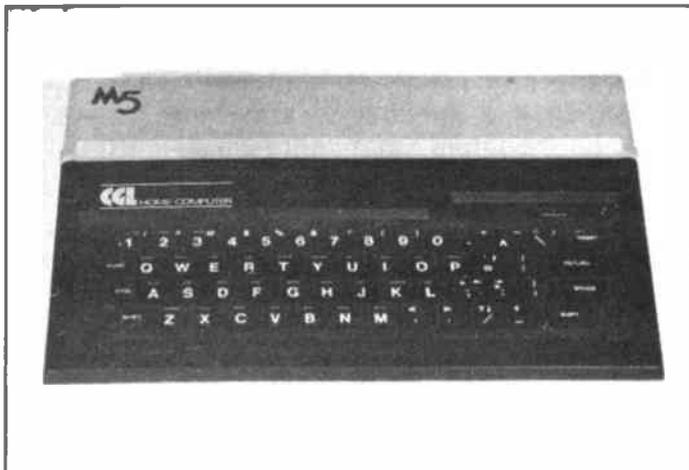
Tandy TRS80

hundred sovs but a couple of years ago, when Oric went under, several high street stores were outing them at about £40. I bought one at Cranfield for £2 last year. The handbook comes on a bit strong a bit quickly – well it does for my feeble brain, but computing wise it is quite a machine. Plastic cased and very noisy RFI wise, you are also scratching around for any ready made programs beyond the normal Morse, great circle, QRA, etc. The machine will produce colour and sounds, some of which are built-in such as zap, shoot, ping and explode – none of them too handy for amateur use!

Tandy TRS80

This is an unusual machine in as much as it's battery powered and portable. It has a single line alphanumeric display built in, and the batteries seem to last for ever. It is a little cumbersome in use, especially as you have to keep changing mode if your programming is the same low, hit and miss standard as mine. The more usual amateur programs are available for this box, as is a cassette interface and a portable printer. Although I have bought the TRS80 alone for £5, it's more normal to find one for sale with interface, printer, additional handbooks (some are still on the shelves in Tandy) and some games tapes. This sort of package will set you back about £20. Not of any great use for interactive amateur programs, which is a great

Sord



Aquarius

shame since its low power dissipation and metal case make it the quietest RFI computer we own!

The funnies

Probably not funny to the people who made them, but of little use amateur wise, are the following. I mention them since they are often available at rallies, well under £5, and you might be tempted. For serious amateur radio use, don't be. For a dabble at computers, or to keep your child amused, consider them.

Aquarius

This was intended for the toy market, though I have come across people who use them for serious applications. The built-in graphics contain aeroplanes and running men as well as the more usual stuff, so it is fun to play with. The handbook is a bit childish. An interesting and unusual feature is that you can either type in your instructions, ie I-N-P-U-T, or hit a keyword (a la Sinclair) and do the whole word in one press. Dedicated printers and memory expansion were available for this machine, though today these are as rare as crutches with wheels on. There is very little amateur software available.

Sord

This machine is a pain to use. When using BASIC (the main computer language) you require a line number, say 100, then you put in your instruction, say

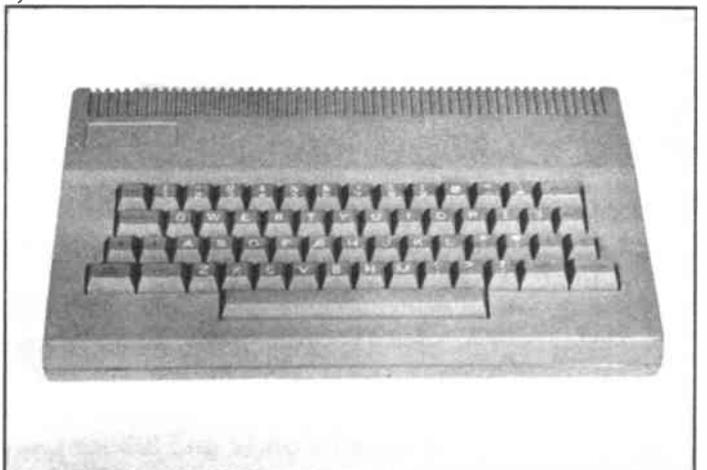
GOTO10. Normal computers let you bash in just that, 100GOTO10. Not the Sord. You have to meticulously type out 100(space)GOTO(space)10. That doesn't sound too bad, but if you are used to any other machine it comes as a culture shock and has tended to restrict our use of this otherwise excellent machine. A really good handbook comes with it, and the Extended BASIC plug-in module, which often accompanies secondhand machines, is extremely well written. There is no known amateur software available.

Lynx

This is a machine and a half. Well in advance of a lot of much more modern computers, I'm afraid it has to be listed in the funnies area only due to the unfortunate lack of available amateur related software. As a computer, it is the bee's knees. It features a superb keyboard; good resolution (though slow); AUTO, where it will number up the next line for you; and RENUM, which will let you renumber the lines when you run out of space. Three basic flavours of Lynx are often seen at rallies, 48K, 96K and 128K, all numbers referring to memory size. The 128 has, I believe, commands such as circle, triangle etc, which are interesting. Prices are £5, £20 and £30 respectively, and these machines are freely available on the surplus market.

The handbook doesn't feature a very good index, it being difficult to find the

Lynx



details of an instruction you are stuck with, though an excellent alternative handbook was available and often accompanies secondhand examples. The user magazines for these were well written, and it's often possible to pick up the whole lot ever published in a bundle for a quid or so. Those that know these things say that a child used to the Lynx will soon adapt to a school's BBC 'B', so it's a good investment at £5 if you cannot (or will not) afford a Beeb. The Lynx uses mainly fairly freely available normal chips – there are no 'special-to-type' ones in it – and circuit diagrams are available, so a dead one might be repairable.

Jupiter Ace

This oft-seen machine uses not your more normal BASIC computer language but Forth. When buying an Ace, a handbook is essential! It has a yucky keyboard, no amateur software and some spares are impossible to obtain. Nuf Sed?

The BBC 'B'

No, we've stopped the funnies listings, and we have also dropped the £5 price limit. The cheapest you can get a Beeb for is about the ton, but £125 to £150 is more normal for a 'bog standard' machine. There ain't nuffink you cannot do with a Beeb. Speech synthesizer, Morse reader, SSTV, RTTY, everything is available, as is a whole host of add-ons

such as printers and disc drives. This is the 'school's micro' and is what your child will use first. It's the sheer versatility of the thing that has kept its price up, plus, no doubt, the school's side of it. I only include it here since my normal *Secondhand* column brings forth lots of enquiries as to what a Beeb is worth, and now you know.

In conclusion

All het up because your 'pet' computer wasn't mentioned, or mad because a super amateur radio program you have bought (or written) isn't detailed above? Then why not write into this magazine and let others know about it, then send details to the RSGB for inclusion on the 'Register'.

List of relevant suppliers

J & P Electronics,
New Road Complex,
New Road,
Kidderminster DY10 1AL.
Tel: (0562) 753893.

Moray Microcomputing,
Enzie Slackhead,
Buckie,
Moray AB5 2BR.
Tel: (05427) 384.

Technical Software,
Fron,
Upper Llandwrog,

Caernarfon,
Gwynedd LL54 7RF.
Tel: (0286) 881886.

Scarab Systems,
39 Stafford Street,
Gillingham,
Kent ME7 5EN.

T Systems Ltd,
The Signal Cabin,
61 High Street,
Orpington,
Kent BR6 0JF.
Tel: (0689) 22196.

Grosvenor Software,
2 Beacon Close,
Seaford,
East Sussex BN25 2JZ.
Tel: (0323) 893378.

P Goodrum,
9 Royston Close,
Downham Market,
Norfolk PE38 9BD.

Scientific and Engineering Software,
PO Box 416,
Marlow SL7 1XU.
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BITS TO BUILD

Not another marker! An essential item for the shack

'Now these are the ordinances which ye shall set before them'
Exodus 21:1

I assume that every radio amateur has read the ordinances set out upon the DTI 'tablets of stone'... at least to pass the licensing regulations section of the Radio Amateurs Examination. You will recall... I think... the regulations about frequency measurement.

'A licensee must be able to verify that his transmissions are within the authorized frequency band.'

'As a general rule, a station requires a crystal reference source to comply with the above.'

'... a 100kHz crystal is usually adequate for checking frequencies up to 4MHz. For higher frequencies the spacing

between 100kHz marker points can be too small for accuracy, and a crystal of 500kHz, or preferably 1MHz should be used in addition.'

So there you have it: the requirement for some kind of crystal marking equipment to identify frequencies. Usually most amateur stations interpret this requirement in terms of a crystal controlled frequency marker. The preferred option these days is not to use a range of crystals, but a high frequency standard crystal, and divide down to give small frequency divisions.

Figure 1 shows typical divisions, although many stations begin with a 1MHz source and divide down from that spacing. The usual method of division employs integrated circuit logic, but I well remember building rows of transistor flip-flop dividers in the past. Another former method was to use a 100kHz multivibrator circuit locked to a 1MHz crystal - a method which had the delightful habit of locking onto the 11th harmonic, giving eleven 100kHz points in 1MHz!

The amateur radio market is full of crystal calibrator units. Some are sold ready built, but the calibrator is a common and easy home construction project, and several kits are available. The circuit I am about to outline is available in kit form, but for several reasons it is a cut above some of the other units.

Many of the existing kits and ready built calibrators have inherent problems, especially if they are to be used as test bench items as well as receiver calibration sources. It is common for the designs not to have a 1:1 mark-space ratio on the square wave of the output. Not much of a problem for simple receiver calibration, but it can cause problems if other digital circuitry is



driven from the unit. Also it is not usual to inhibit the unwanted dividers. So even when a 1MHz signal is required, the 100kHz and 10kHz dividers may still be running. This can produce annoying weak signals between the marker points. The circuit described below produces a signal with an equal mark-space ratio and the unwanted dividers are disabled to give a clean output signal.

The circuit

The circuit is shown in Figure 2. The oscillator, TR1, uses a 10MHz standard crystal in a Colpitts circuit. A trimmer, CT1, enables the oscillator to be set exactly on 10MHz. Notice that the oscillator runs from a stabilised 5 volt power line. This is provided by a 78L05 integrated circuit regulator, IC1. Some constructors assume that a regulated supply is not required for a crystal controlled oscillator, but a low voltage regulated supply is a great help in a 10MHz crystal controlled oscillator circuit. The oscillator drives a single stage (TR2) transistor stage to interface it to

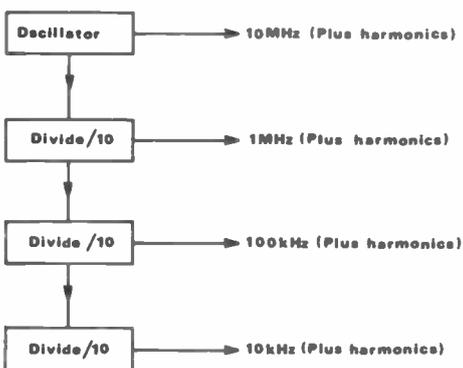


Fig 1 Typical divider chain in crystal marker units

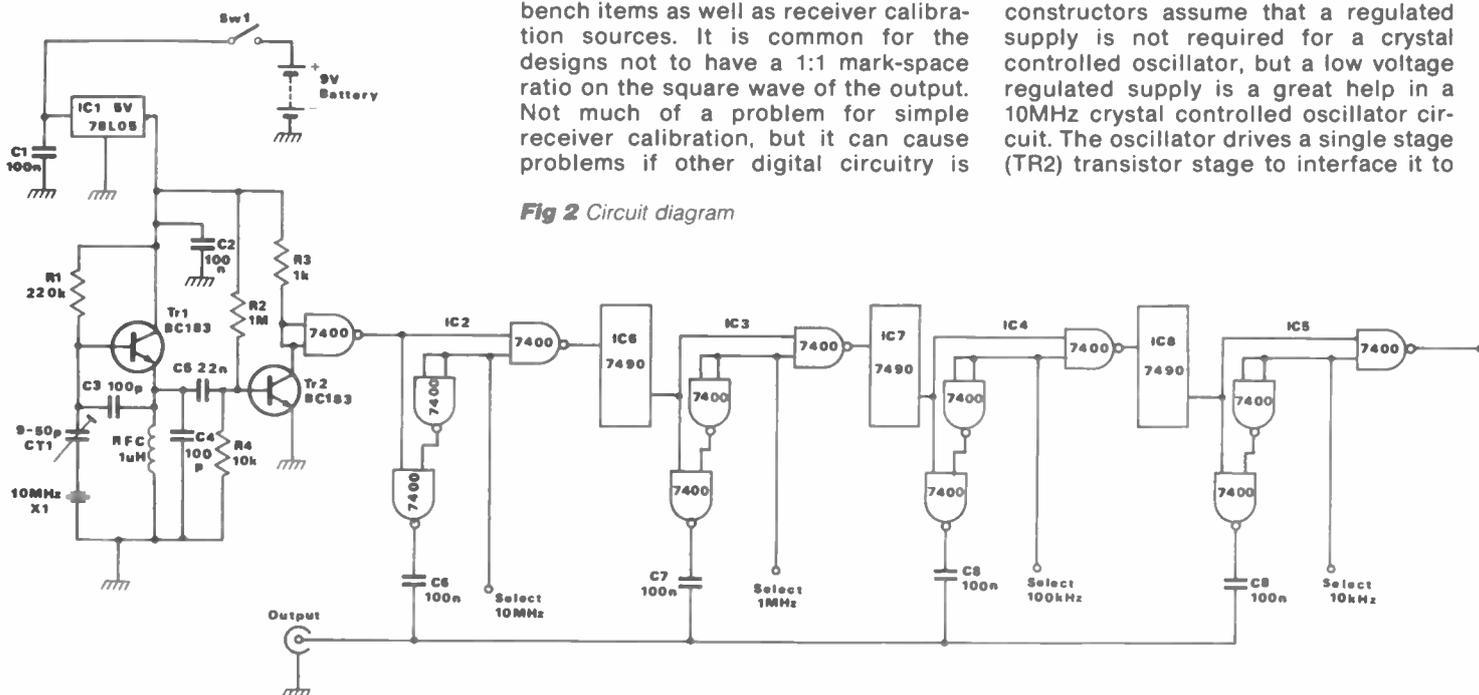


Fig 2 Circuit diagram

BITS TO BUILD

trying to work out which pin is which. Building this unit was just a 'drop in and solder' job.

Connecting up the board

The completed board has terminations for a supply and selecting the required output, so it requires some switching. The least that is required is a 4 way switch to choose the required output and an on/off switch for the battery. The switching arrangement that I adopted is shown in *Figure 4*.

The 'select' switch is a 4 way wafer switch, and as wafer switches usually have 12 switching terminals, the standard type comes as a 3 pole, 4 way switch. That is to say, three 4 way switch sections operated by the same shaft rotation. It seemed a shame to waste all the other switch positions, so a second pole of the switch was used to indicate the selected output.

The select switch, SW1 in *Figure 4*, connects the required output point to ground as shown at the top of the circuit. One of the spare 4 way sets of switch action is used to drive four LEDs to indicate the selected output. In fact, I used a 4 LED 'Bar of Light Display'; that is, four LEDs in the same casing. This gives a rather smart refinement to the front panel and provides a positive indication of which output is being selected. A single switch pole miniature toggle switch, SW2, connects the supply

to the board and to the wiper arm of the switch section controlling LEDs 1-4.

Casing the unit

The complete marker unit is housed in a Minford Engineering A25 aluminium box which measures 3in wide by 5½in deep by 1½in high. The printed circuit board fits easily into the box, allowing plenty of room to add the switches and LEDs on the front panel, and an output socket on the back panel. A PP3 battery fits alongside the printed circuit board, held in place by Blu-tack stationery putty.

The front panel has my usual false front made from thin white card, with markings in Letrasheet. The final finish and protection are provided by sticky-backed clear plastic library film. The completed unit looks smart and the Bar of Light LED Display adds a 'commercial touch'. The oscillator can be calibrated against an existing frequency standard. Radio 4 on the Long Wave provides a very accurate 200kHz standard... or at least it does until the EEC force us to move it! The 100kHz output can be heard on its 2nd harmonic on the Radio 4 signal and the trimmer CT1 may then be adjusted to produce zero beat with the radio signal.

I already have crystal calibrators in the shack, but this little unit produces an accurate source of clean marker points which will be very useful on my work bench.

Table of Values

Figure 1

R1	220k
R2	1MΩ
R3	1k
R4	10k
C1	0.1μF
C2	0.1μF
C3	100pF
C4	100pF
C5	0.022μF
C6/7/8/9	0.1μF
CT1	9 - 50p trimmer
TR1	BC183
TR2	BC183
IC1	78L05
IC2/3/4/5	7400LS
IC6/7/8	7490LS

Figure 4

SW1	3 pole, 4 way wafer switch
SW2	single pole on/off switch
LED 1-4	4 LED display bar
R1	680Ω
PP3	battery

Sources

Marker Kit: All components and PCB, less switches and case £9.45 including postage and packing
Kanga Products, 3 Limes Road, Folkestone, Kent ET19 4AU. Tel: (0303) 76171
A25 Aluminium Box: Minford Engineering, Sun Street, Ffestiniog, Gwynedd LL4 14NE. Tel: (0766) 762572



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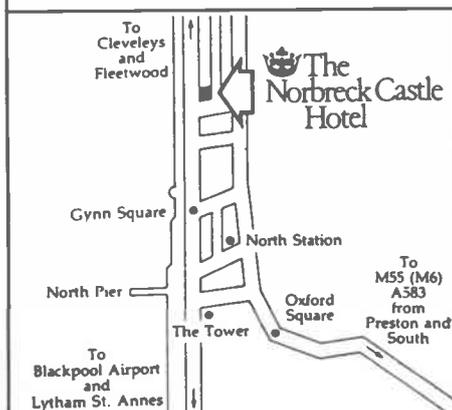
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BLACK JAGUAR BJ200 MkII HAND-HELD SCANNING RECEIVER FROM NEVADA

This month *Amateur Radio* looks at the Black Jaguar BJ200 MkII hand-held scanning receiver, which has recently been introduced by Nevada.

Like most current hand-helds, the Black Jaguar is a 'black box' (185mm(H) × 80mm(W) × 37mm(D)), albeit a small and very portable one. Nevertheless, its layout is quite distinctive. A small display panel occupies the top quarter of the front, with about half the available space below being taken up by recessed black push-buttons, which are the shape and size of a Tic-Tac mint . . . The speaker panel occupies the remaining space.

A squat 9in helical antenna sits on the left-hand side of the top of the unit, next to the workmanlike volume and squelch controls, and push-on/push-off power and high/low tone controls. The two tiny recesses behind the antenna conceal an earphone jack (taking a standard 'tranny' type earpiece, which is supplied) and, interestingly, an AF input/output jack, which can take an external digital descrambler.

On the right-hand side is another recessed button – the light switch, and below this is the battery charging jack for the internal NiCads. Needless to say, care must be taken when charging these, as overcharging NiCads can prove expensive, and the instruction manual carries dire warnings for those who might be tempted to 'open the box'.

Frequency coverage

The frequency ranges covered are: 26-29.995MHz, 60-80MHz and 115-178MHz in 5kHz steps, as well as 210-260MHz and 410-520MHz in 10kHz or 12.5kHz steps. This means that the 4 metre, 2 metre and 70cm amateur bands are covered, as well as the CB, military, aviation, marine and coastguard rescue bands.

Two of those naughty carphone bands are covered, as are some telemetry and satellite bands, and part of a TV band. All interesting stuff, and the manual does add that the frequency coverage may be somewhat wider than stated due to the initial adjustment of the PLL circuitry.

The manufacturer's specifications for the scanner are as follows: The sensitivity is 12dB sinad for FM, and 10dB sinad for AM. In FM mode the squelch sensitivity threshold is 0.5µV for VHF, 0.7µV for UHF; in AM, 1.0µV for HF and VHF, and 1.5µV for UHF. IF selectivity is 60dB at ±20kHz, and spurious and image response is at more than 40dB. Audio output power is 125mW minimum into 8 ohms at 10% THD. The scan and search speed is 10 channels per second, and the optional delay is 2 seconds. The batteries are a NiCad pack totalling 6V, and power consumption is 80mA when squelch is on, and 170mA at maximum audio. This translates roughly into three weeks' fairly regular use from a fully charged pack.

Accessories

Accessories supplied as standard include the NiCad pack, the helical antenna, a carrying case, battery charger, earphone and TNC(M)-M(F) adaptor. Facilities include a sixteen channel memory, delay and lockout

capability, priority channel search and scan, and selectable AM or FM.

Subjective tests

The manual was read carefully before switching on, and it was found to be a little confusing – re-reading it several times is advised! This is definitely an inscrutable Japanese effort, and there should be a prize for anyone who can find the 'auto-squelch' facility referred to, as the position certainly isn't labelled, and no amount of squelch-tiddling would reveal its whereabouts. It might pay to ask your dealer before buying, unless you happen to be an expert in finding auto-squelches.

Strangely, the manual states that at power-on the LCD should indicate irregular figures or letters. In fact, it displays one of the memory channels and frequencies in fairly small characters (black on grey). This section probably only applies to the initial power-up of a brand new scanner, though this isn't clear.

The manual goes into the procedure for programming channels and frequencies at some length, with several examples, so this procedure should be fairly obvious to all. If non-valid frequencies are entered an 'error' message is supposed to appear, although a little trial revealed some idiosyncracies: frequencies several megahertz wide of those listed can be keyed in and will be accepted, and will not throw up an 'error' message, while others closer to the working frequencies produce the 'error' response.

Unfortunately, the scanner was first tried in a dark corner of a car park (the magazine staff are fearless and intrepid), and this revealed that pressing the 'light switch' affords a feeble amount of illumination which can only be kept on by continuously pressing it, resulting in an aching digit. Perhaps the intention is to save power, if so, the ruse certainly works.

In the daylight, sanity prevailing, the sixteen memory channels were soon filled. The manual doesn't mention this, but mode (AM or FM) and delay function can be individually programmed into memories and retained, to be changed at will while scanning without having to reprogram the entire memory – a very handy function.

The priority channel is 1, but using this facility seemed to send the display scattering back to 1 (not what the manual said it would do!), often before reaching memory 16, restarting randomly. This jumping about was slightly disconcerting, and it was found to be easier to leave 'prio' off, as the normal scan speed is rapid enough. There is probably a logical reason for this behaviour, but we have not yet found it.

The section in the manual on the search function is complicated: firstly, when the 'high' frequency is entered, the 'down' button is pressed (sic), and vice versa for the low frequency.

The search step sizes are also fixed in an unusual manner, ie if a frequency ending in zero below the third or fourth decimal point is set, the step will be

10kHz. Anything else below the third or fourth decimal point results in a 12.5kHz step. Very inscrutable!

On the air

The scanner was only tested with the helical antenna supplied: after all, half of the attraction of a hand-held is its mobility. Despite this, there was plenty to be found on the scanner. Air bands where less distinct than the amateur bands, none of the London VOLMETs were heard despite their relative proximity (approx 40 miles), and the transmissions suffered from interference except when they were very local. However, the use of an external aerial would have cleared this up, as the two metre and 70cm transmissions were very clear.

We were fortunate to be testing the scanner over the Christmas period, when there were two very good lifts – on December 22nd and 23rd. These were to prove that this receiver works very well.

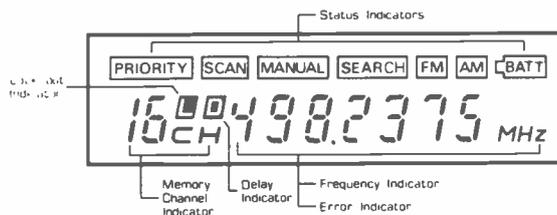
The helical antenna supplied must be more sensitive than the normal indoor extendable antenna supplied with some base rigs. Some unusual repeaters were found in besides the more normal Danbury repeater GB3DA on R5 – the QTH at which the tests took place is in Chelmsford in Essex. On both of these

the 70cm band was excellent, though four metres was, as usual, very quiet. Some of the signals picked up were faint, but were locked on to without difficulty, and the conversations could be picked out even from heavy QRM, where the stations concerned were having difficulty hearing each other. GB3NL, GB3PI and GB3KN came in quite distinctly, though our Morse is such that the identification signals had to be listened to very carefully. Not all of the QSOs were through repeaters, by any means; many simplex channels were heard, and one Raynet exercise was heard – the professional standard of operation was a revelation – not all two metre transmissions are that careful!

The BJ200's controls are easy to use, though the recessed buttons are a little fiddly if you have fingernails of any length. Every control is very solid, and looks as if it was built to last. The built-in NiCads last a reasonable time before they need recharging, though when the battery is low, the audio goes very suddenly, to be followed by the low battery warning display. Power consumption is usefully low, and this feature should, with care, prove most useful.

The scanner is simple to operate once you have found ways round the

LCD display



days GB3KN near Maidstone was coming in clearly, and a QSO was heard between G1XYE, (QTH north of Norwich) and G4ZBY in Rochester, Kent – a total distance of 150 miles, a considerable amount of that being the distance between G1XYE and the repeater. Astonishingly, G1XYE is a fifteen year old boy who has only recently passed the RAE, and was using a hand-held with only 2½ watts out. A very creditable performance, this receiver picking up everything, with very little QRM. This proves that hand-helds can hold their own against base rigs, even without the 'bells and whistles', when the conditions are right.

This lift provided more unusual catches, though the continental DX rumoured to be around could not be picked up. G0IFH on the Isle of Wight was heard, faintly but clearly – again, top marks to the 'big ears' of the BJ200.

Two metres was alive on both nights, with many amateurs taking advantage of the conditions. Most channels were received with little difficulty; the magazine may yet qualify for one of Trevor Morgan's awards... The Essex Children in Need station was heard on the air as GB1, trying for 500 contacts from the 23rd to midnight on the 24th – although, being situated in Chelmsford, this hardly qualified as DX!

The scanner's performance on this and

instruction manual, and it performs most creditably, with high quality audio for such a small device. With an external aerial airband quality should pick up tremendously; this type of reception always seems more difficult without an outside antenna. At £225, the BJ200 has to be good value for money, especially for anyone with a nest of antennas already available or a yen to listen in to digitally encoded transmissions – several of which were heard coming over clearly.

The 5kHz step available is usefully small, on some occasions transmissions spanned more than one channel, and the set's sensitivity is such that it often locked on to the first, fainter signal, the next step up proving to have better reception. The helical antenna provided performed better than any expectations, signals being picked up from most bands except CB, which seems to be out of favour, and four metres, which is also sparsely inhabited. The signs are that this is already proving to be a very popular little hand-held, which is scarcely surprising. This is a lovely scanner, with a frequency coverage that should interest anyone who likes listening in to these bands.

We would like to thank Nevada for lending us a review sample of this scanner. Their address is: 189 London Road, North End, Portsmouth, Hampshire PO29AE. Tel: (0705) 660036.

50MHz

The period under review this month has been most exciting and interesting, with increased activity and some excellent conditions. Without being too optimistic, the present trend of upsurge in solar activity indicates the probability of 1988 being the start of the peak of cycle 22. The periods of main interest will be:

- 1) The TEP season during the Spring Equinox – March and the beginning of April, when once again we can expect openings to South Africa, and possibly Central America.
- 2) The sporadic E season, possibly starting again during early May and peaking around midsummer, carrying on to early autumn. During this exciting period we can again – as last year – expect DX openings to North America, and other inter-continental DX. I have not yet had news of any planned DX trips to exotic locations by the usual DXpeditions, but no doubt the regulars are already planning something.

50MHz in Holland

From Marc PA0XMA we hear that the Dutch amateurs will be re-granted permits to operate on six metres again; 50.000-50.450MHz, CW only at 30 watts maximum. This is very good news as, due to the problems during the peak of cycle 21 when the temporary permits were abused and cancelled, the authorities took a hard line; consequently it was feared that permits would not be renewed. Is it too much to hope that even the Antwerp problems can be resolved and permits be granted? The situation in France seems to be improving, with regional permits being granted on a 'non-interference' basis. Steve G4JCC, who has operated crossband 28/50 over the last few years from southern France may, we hope, operate two-way next year on six metres.

50MHz on Ascension Island

Mike Barry ZD8MB (G4MAB) has received permission from the Governor of St Helena, who is the licensing authority, to install and operate beacons on 28 and 50MHz in addition to his ZD8MB station. It is proposed to operate the beacon on 50.0325MHz.

The 50MHz Club report

Due to the length of this report (12 pages), I can only include the first part this month: This report covers the period March 1st to August 31st 1987, and is based on most enthusiastic reporting by nearly all club members. Many comments were received, and most were complimentary, although several wanted 50.200MHz restored as a calling channel. There is no rule against using it as a calling frequency, for as long as it serves its purpose, as it is only under crowded

band conditions that its usefulness breaks down.

Fewer claims for records and significant firsts have been received than were expected. The best claims so far received are as follows:

1. Maximum distance two-way: no claim received, but there was a crossband G4BPY-VK6RTV contact on 27th October 1979.
2. Maximum distance at sunspot minimum two-way: GM4DGT-A22KZ on 22nd October 1987 with an astonishing 8529km. Crossband: G2ADR-A22KZ on 22nd October 1987.
3. Maximum distance within the British Isles: G5KW/A at Penzance to GM4FZH at John O' Groats.

Significant firsts

These are applicable to the British Isles as a whole:

1. Transatlantic: G6DH-W1HDQ on November 5th 1947.
 2. Transatlantic sporadic E: GJ3YHU-WA1OUB at 2232Z on 1st July 1983. There are no claims for crossband QSOs.
 3. Britain-South Africa crossband: G5BY-ZS1P on 4th October 1947.
- There are no claims for Britain-Asia or Britain-South America.
6. First TEP QSOs: crossband contact between MD5KW-VQ2PL at 1600Z on 5th October 1947. Two-way contact was made between MD5KW-VQ2PL at 1515Z on 16th October 1947.
 7. First TEP + sporadic E at sunspot minimum: claimed by G2ADR-A22Z on 22nd October 1987.
 8. Britain-Australia: G5BY-VK6RTV on 27th October 1979.

Continental two-way 50MHz

Cyprus-ZC4VHF/5B4 counts as Asia. Greece-SZ2DH operates as SV1DH on other bands. Holland PA0XMA; Ireland E12W, E16AS, E18EF, E19Q, and E19BG. Madeira CT3BX and CT3DK (counts as Africa); Malta, 9H1BT, 9H1CG and 9H1FL; Norway LA1BEA, LA1K, LA2AB, LA3EQ, LA3UU, LA5UBA, LA6QBA, LA9DL and LA9UX; Portugal CT1AWO, CT1LN, CT1ON, CT1WB, CT1WW, CT1KQ and CT4PI.

Continental countries reported working crossband and qualifying for the 50MHz DX certificate are: Andorra, Austria, Azores, Denmark, Finland, France, Germany, Hungary, Italy, Luxembourg, Norway, Portugal, Rumania, Spain, Sweden, Switzerland and Yugoslavia.

Beacons and DXpeditions

GB3SIX is on 50.020, GB3NHQ on 50.050; GB3RMK on 50.060; all functioned throughout the period. ZC2VHF on 50.030 was QRT during the winter, and did not resume until October as his QTH was damaged by rats. 5B4CY on 50.500 was

QRT for most of the period due to rebuilding at Zyyi, CT1WW on 50.030 operated most of the time, and was a most valuable signal. 9H1SIX is beaming south for TEP tests, and plans to beam NW during the next E season. For news on ZD8VHF, see the details later in this column.

ZC4VHF/5B4 operated from Mount Trudos from June 6th-20th. A22KZ operated from Botswana from October 2nd-December 7th 1987. G4UPS operated as C30DAW, F/G4UPS and LX/G4UPS in June/July. G4JCC operated from the south of France during most of the E season.

North America: The season may be said to have opened on May 29th when K1TOL heard GB3SIX at 2015-2025Z, and the first transatlantic QSO between CT4KQ and W1 on June 6th at 2355Z. There were many more minor openings than experienced during previous years, and major openings on June 17th-19th and 17th and 19th July.

Good propagation conditions to central America during June 1987 were highlighted by the W6JKV/N4HSN expeditions to Antigua (V2A) and Avis Island (YV0). Antigua was available on June 14th and 15th, and Avis Island on June 24th. The FY7THF beacon was received consistently from 28th May to 15th July 1987. Martyn G3UKV produced an interesting comparison with previous years' reception: 1983 – June 6th, 7th, 8th, 21st. 1986 – May 29th, 30th, 31st; June 2nd, 4th, 5th, 6th, 7th, July 4th, 9th, 1987 – May 28th; June 5th, 6th, 11th, 12th, 13th, 14th, 18th, 19th; July 15th. It is remarkable, with the high level of amateur stations equipped for 50MHz in central America and the West Indies, that so few of them have been heard in Europe. The reason is probably simply that in June their beams are likely to remain directed at the USA, so all those making contact on other bands are requested to direct attention to Europe during the most favourable period for 50MHz.

From the mailbag

I have received a letter from G M Taylor of SMC in Eastleigh: 'I and other keen 6m enthusiasts within our company read your 50MHz column each month with interest. However, I feel that your comments about commercial equipment in the November edition of *Amateur Radio* would have been more meaningful had they been received from a better informed source.

'Yaesu have been market leaders for over a decade in the manufacture of commercial 6m transceivers and transverters, yet the only reference to Yaesu equipment was a questionable statement disparaging their FT767 transceiver. No mention was made about past models, such as the FT620, FT620b,

by Ken Ellis G5KW

FT680 or FT690 with its matching 10 watt PA, nor even their current models such as the FT726R with 6m module, or the FT690RII with matching PA unit.

'All these transceivers, including those with the matching PA units, fall in the 10 watt category; there was even the FT625RD 25 watt transceiver, the 6m equivalent of the famous FT225RD. On the transverter front, Yaesu produced the FT650, FTV650b, FTV901, FTV107, FTV707 and FTV700, all with power capability of 10 watts or greater. There are examples of all the above mentioned equipment in the UK, which we ourselves imported and supplied to customers. However, good luck with your 6m column, we find it a useful source of DX information.'

The comments about commercial equipment were not intended to be a comprehensive review, but were reprinted from a report in 50MHz Reporting Club's news by Angus McKenzie G3OSS, whose authoritative and detailed reviews of commercial equipment set an extremely exacting standard.

From Hal Lund ZS6WB: 'TEP tests are over for this year, with ZS being badly outscored by A22KZ. Hopefully March and April will produce better results for us, with the sunspot number apparently increasing fairly rapidly; congratulations to Dave, Kosie (ZS3E) and the others who were successful, and better luck in March to those who were not.'

'The six metre beacon located north of Pretoria on 50.0225MHz runs about 50 watts to a 6 element Yagi at 35 feet. CW identifier transmits 'DE ZS6LW' continuously. Hopefully, by the beginning of February beams to UK and South America will be added to the VK beam using 'time sharing'.'

From Harry Schools KA3B (*International 6 Metre Digest*), Thermal Inversions at 50MHz. 'Thermal inversions form in the troposphere and permit contacts on 6 metres up to 200 miles beyond 'normal range'. They are also referred to as radiation inversions, causing a condition commonly termed as 'band enhancement' by VHFers. In a normal atmosphere, air temperature decreases with rising altitude. Inversions occur when the air temperature increases with rising altitude instead of decreasing.

'This phenomenon occurs to a degree almost every day of the year during sunrise and sunset. During sunrise, the ground heats up, warming up the surrounding air. This warm air rises above the lower layer of cool air, forming an inversion. As the sun continues to heat the ground, this cooler layer of air will eventually warm up as well, enabling the troposphere to become more 'uniform'. This uniformity causes the

inversion to dissipate. At sunset, the air near the ground cools more quickly than the air in the upper atmosphere, thus creating an inversion once again.

'Even in winter, the effects of inversions formed at sunset and sunrise are easily noticed. In most cases, this form of band enhancement will only allow more consistent reception of low power stations that are usually weakly received, but within the normal range. The sunrise/sunset inversions are generally short lived and do not allow for consistent extended range communication. Inversions can form at other times as well; they are most prevalent in the summer, and fall during clear and calm evenings. Windy conditions prevent the formation of inversions, due to the constant mixing of the warm and cool layers of air.'

Crossband co-ordination frequencies

The 10 metre liaison frequency of 28.885MHz has proved over the years to be a valuable asset to the 6 metre DX community. This frequency has been used to pass along DX information, serves as an early warning system of possible band openings, and has been a centralised frequency for 6m/10m crossband operation (The UK six metre group meet each morning from approx 0800Z to exchange information; all are welcome to join us).

Proper use of 28.885MHz is required; keep transmissions short, with frequent pauses for stations trying to break in with important information. If you want to hold a 'ragechew', particularly if it is not to do with 6 metres, QSY to some other frequency. Encourage European stations working crossband to do it on either side of the liaison frequency.

We heard from Ted Collins, G4UPS ex ZD8TC, who offers some basic facts about Ascension Island: 'It is situated in the South Atlantic 7 degrees 57' south and 14 degrees 22' west. It was discovered by the Portuguese navigator

Joao da Nova Castella on Ascension day 150. This small island of volcanic origin has an area of 34 square miles which remained uninhabited until 1815, when Napoleon was placed on St Helena in exile. To prevent any attempts at escape, HMS Peruvian and Zenobia took possession of the island. The island has a very mild and healthy climate; the average temperature is in the mid seventies throughout the year.

'Amongst the installations on the island are the US tracking station, the BBC relay station and the Cable and Wireless ground station. Mike Barry ZD8MB (G4MAB) has received permission from the Governor of St Helena, the licensing authority, to install and operate beacons on ten and six metres - valuable world-wide propagation guides for the future. The six metre beacon will be installed on Green Mountain, an extinct volcano about 2350 feet asl. It will operate on 50.0325MHz, beaming 010 degrees, and should be operating early in 1988.

'Random Electronics of Abingdon have kindly donated a 5 element F9FT yagi beam. The beacon has been built by Mike Walters G3JVL and the keyer to the design by G4FRE (*Radcom*, Nov 1986). The project is funded by the UK Six Metre Group. ZD8MB is already active on ten and six metres and has had some interesting DX QSOs and heard stations from other continents.'

Bearing in mind the important contribution that Ted, operating as ZD8TC, made during sunspot cycle 21, when he managed the highest number of countries worked - 175 at the time he left the island, the future of ZD8MB is assured.

May I take this opportunity of thanking all those who have helped me during 1987 to produce this column, and hope for continued support during the run-up to the peak of cycle 22. Thanks in advance. Ken Ellis, 18 Joyes Road, Folkestone, Kent CT196NX. Good DX on Six.

Read about the latest equipment for 50MHz in Angus McKenzie's report this month





News and comment from Glen Ross G8MWR

Ullo, ullo! What's all this then? It seems that some very strange things are going on in Belgium. The good news for us is that the ONs have been granted the use of the 50MHz band, so another country comes onto the six metre man's map. The odd thing is that, as far as I can ascertain at the moment, it seems as though they are being allowed to use 30 watts to an unrestricted aerial system. So what do I find strange about that?

Well, the current restrictions on the power and aerials that we can use on the band were based on the idea of making sure that we did not cause any interference to the domestic TV system in, amongst other places, Belgium. It seems rather odd then that they are a lot closer to the TV sets than we are, and yet can use far more power.

If you assume an aerial with 10dB gain, they would actually have an effective radiated power of around 300 watts. That is three times the level that we are permitted to use, and yet most of us are located several hundred miles away from any problems we might cause them, rather than a few yards up the road. It certainly sounds like a way of making sure that you are going to have a great TVI problem. Perhaps you can work it out?

Moonbounce

From Marty Barrack in Virginia, USA (we have spies everywhere), comes news of what may well be a new world record for moonbounce operating on the 2.3GHz band. The contact was made early in October between W3IWI and ZL2AQE. Now the great problem with moonbounce is that most of the power you send up misses the target, just think how wide the wavefront is going to be at that distance!

The surface of the moon absorbs a lot of the power that actually hits it. And to really lower your chances of getting any power back to Earth, most of that which does hit the surface gets reflected back to anywhere but here; remember that the Moon has a spherical surface. Due to all

this, you need some pretty good gear, as well as excellent operating techniques.

The gear

The gear used at the ZL end of the path is believed to have been a watercooled 2C39 giving 12 watts out, but this had dropped to around six watts at the aerial due to feeder losses.

The dish itself was a twelve footer, and the receive pre-amp with a noise figure of 1dB certainly helped a lot. In contrast to this, W3IWI runs 100 watts to a 140 foot dish; some size of back garden that must need, and what about planning permission?

The only amateur dish of anything like that size that I have seen was the one at the Cheltenham club at Washington DC, an awe-inspiring sight indeed. Is it a new world record? The total ground distance involved is about 13,800km, but the round trip distance, of course, is something like half a million miles in round figures. Congratulations to both stations.

HF crossband

I am still getting letters from readers which ask whether it is legal for a class B operator to work crossband to a class A operator operating on, say, 80 metres. There has been a lot of bad feeling on the bands when people are heard to do this, most of it coming, it must be said, from Old Timers who do not seem to have checked the facts. The answer is that this practice is fully within the terms of your licence.

The problem seems to arise because, although the information was contained in a letter from the DTI around August 1985, the RSGB have not, as far as I am aware, ever given it any publicity in *Radcom*.

Just to sort it all out let me quote from the DTI letter; 'It is perfectly in order for a class B licensee to receive an HF transmission from another licensed amateur and to respond by transmitting on frequencies for which he/she is licensed to transmit'. And that has come straight from the horse's mouth.

Headings

G8OIT brings up the old problem of people not giving enough information about where they are located when calling CQ. This usually occurs with people who have recently graduated to SSB and beam aerials after a period of FM and omnidirectional systems like the ubiquitous Slim Jim. On FM it is normal to call CQ with no thought of directivity, simply because you have not got any.

This is not good enough on SSB, where it is normal to use fairly high gain aerials with a very narrow beamwidth. It should be obvious that you can significantly improve your chances of a reply, simply by giving more information as to where you are located, and which way you are beaming. This helps the other man to get his beam turned in the right direction before replying to you, and, perhaps more importantly, also gives him an indication that your weak signal may be due to him hearing you off the back of your beam.

If he can attract your attention and get you to turn your beam in his direction, then you are in with a much better chance of a solid contact. It is also worth giving your locator square and county from time to time, as a lot of people are hunting for these for various certificates, including our own, and you could be in an area that he wants. He won't know unless you make it clear in your CQ call.

The repeaters

A very common problem for those who run repeater groups is that they find it very hard work to prise any cash out of those who use the machines. The good old 'let's have something for nothing routine', I suppose. It could be that a lot of people do not understand just what is involved in both building and keeping the repeaters running.

As an example of this, I have recently heard of a repeater group who have been told that they may have to find £700 a year rental for just one of the sites that they use. Perhaps if the repeater users were better informed as to what the groups are doing, and of the amount of money involved, the cash would be forthcoming. There are a lot of interesting projects coming along so, if you are involved with a repeater group, how about sending some news along for inclusion in this column?

Is it used?

It is also still true that repeater groups often put up machines that no-one really wants, simply because of the technical challenge to get them up and running, and perhaps an examination as to whether a particular unit is really providing a useful service might help to conserve some of the cash that is available.

By the way, whatever happened to the SSB repeater that came on air in the Sheffield area? It was going to run for one year and then there was going to be an evaluation of its operation; this does not seem to have happened. Perhaps the fact that it was only used by the fellow who built it, and one or two others, may have resulted in a conspiracy of silence.

The certificates

It has been quite a long time since we had a run down on the certificates that have been issued, so let's pull out the paperwork and see what we have to report, not in the order in which they were issued I might add, I'm not that well organised! To put the awards into some sort of perspective I will also give details of the equipment used, and the best DX where these are known.

Part 1

Steve G1SGB from Rotherham wrote for information about the awards, and practically by return post submitted a claim for 144 Gold. He uses a Trio TS711 with a Dressler D200 linear and a Halbar Quad aerial and the best DX was with YU1GT at 1844km. Eric G1PEY, from Barnsley, claims 144 Bronze and Silver; details of the gear are not known, but the best DX was with OK1KRA at 1148km.

Then on to Little Hayward in Staffordshire and Ian G4OUT, who claims a 144 Silver with a nice contact to SM6CYZ at 1042km. Not far away at Chesterfield G6OKU, who already had a 144 Bronze, has sent in a claim for upgrading to Silver; his best contact being to OK2VQF at 1435km.

Part 2

Right up to Bedlington in Northumberland next, and a claim for 144 Gold from

G1SUC. He runs 100 watts and the best contact was with HG1SR at 1400km. From Northfleet in Kent comes a claim for 144 Bronze from G1TXS, with a best contact to EI4DQ at 696km. That is an unusual direction for the best DX contact, but we can better it by looking at the claim from G1LSB at Spalding. He goes for a 432 Gold, claims best DX with OK1AYR at 1163km, but also includes a contact with OY9JD in the Faroe Islands, and that is a real rarity in anyone's book. That is, unless you happen to be Janice GM1KHV up in Insch, Aberdeenshire, who includes the same station in her claim for 144 Silver. Her best DX was to SP9CSO in Poland at 'over 800km'.

Part 3

G1BTU from Meopham claims a 144 Bronze with a best distance of 545km to G14TAP. Another 144 Bronze award goes to G1TOS from Gosport, his best contact was with F3ASC at 66km. Now for a change of band and on to G6LAU from Iver in Bucks. He goes for 432 Silver with an 'All SSB' endorsement. Pride of place is a contact with OK1KHI at 1133km. Do you notice how the distances on the 432 awards are very similar to those claimed on 144? From Doncaster, G1HRP claims a 144 Silver with a best contact to Y38ZA at 988km, and also claims a 432 Bronze award. A rather nice claim from Linda G0AJJ from North Walsham in Norfolk;

she claims Gold on both 144 and 432 with the comment that she hopes she is the first YL to make the double claim. She certainly is, although she is not the first YL to get Gold on both bands.

Part 4

Just up the road from the editorial offices, Southend on Sea to be exact, we find Ron G6WEM who has finally made it to 144 Gold. He describes his gear as a 'typical starter kit', running just 30 watts to a nine element Tonna, and his list includes such things as IW9, 9H1, IK8, EA3 and YU2. Move across country a bit to Stevenage and G0HGA, who runs just ten watts to a four element beam, just eleven feet above ground. She claims a 144 Bronze, and says it is her first award; you came to the right place, Angie.

Last but not least is another low power specialist. G4OUT runs up to 25 watts to a twelve element ZL special and claims a 144 Bronze; the first ever to be endorsed 'CW operation only'. Well done! Do not forget that if you want information on the awards, drop me an SAE and you will get the information by return post.

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That is it for this month, keep the comments coming to me at 81 Ringwood Highway, Coventry or on Prestel 203616941. Love to hear from you repeater group people.



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PROJECT BOOK

by Martyn Williams

Several letters have been received asking for information about the various codes used to indicate the values of components. In the old days life was simple, if a resistor had a value of 50,000 ohms, then that is what you found printed on it. This is also the system which is gradually replacing the colour codes that have been used for many years, but the printed value now uses shorthand, as there is not much space on a modern component.

Colour codes

These have been used since well before the last war and are still very common. The colours are used in groups of dots or bands and, as well as the obvious uses for indicating resistance and capacity, they are also used for such diverse things as the ratings of fuses and dial lights. The fact that there always seem to be at least three ways of applying the codes has not made matters easy. Fortunately, the one thing that is common to them all and that has not changed is the actual colours used to indicate values, and these are shown in Table 1.

A simple aid to memorising the code is to remember that the figures 2 to 7 are

indicated by the colours of the rainbow, with the addition of the darker colours (brown and black) extending down to zero, and lighter colours (grey and white) extending the code up to 9.

Work it out

Now let us look at a sample of resistor coding. On the resistor you will find various coloured bands as shown in Figure 1, the resistor should always be held with the coding starting at the left hand end of the body. The first band indicates the 'tens', the second one shows the 'units' and the third band tells us how many noughts to add to the previous two figures.

Let us take a resistor with bands showing yellow, violet and orange. This will decode as yellow equals 4, violet equals 7 and orange (the number of zeros to add) 3. Put them all in sequence and we get 47000 or 47kohms as the actual value.

Tolerance ratings

If the resistor has only three colour bands, this gives the value, and also shows that the resistor value has a 'tolerance' of plus or minus 20% of the nominal value. You may find a fourth

band which this gives the tolerance rating using the code shown in Table 2.

The odd balls

You will notice that 10% can be indicated in several different ways. Yellow is the odd man out and is only used in the tolerance code for capacitors where it indicates a tolerance of minus 0% to plus 100%. This indicates that the component will not have a value less than that indicated but it could be up to double that value.

Fuse ratings

These are frequently only shown by colour coding, usually on the glass envelope, although the rating may also be printed on one of the end caps. The colour code used is shown in Table 3.

Next month we will continue by looking at the bewildering number of ways of putting codes on capacitors.

Table 1 Resistor colour codes

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

Table 2 Resistor tolerance rating

Black	20%
Brown	1%
Red	2%
Orange	3%
Yellow	*
Green	5%
Blue	6%
White	10%
Gold	5%
Silver	10%

Table 3 Fuse ratings

Green and Yellow	10mA
Red and Turquoise	15mA
Eau de Nil	25mA
Salmon Pink	50mA
Black	60mA
Grey	100mA
Red	150mA
Brown	250mA
Yellow	500mA
Green	750mA
Blue	1A
Light Blue	1.5A
Purple	2A
Yellow and Purple	2.5A
White	3A
Black and White	5A
Orange	10A

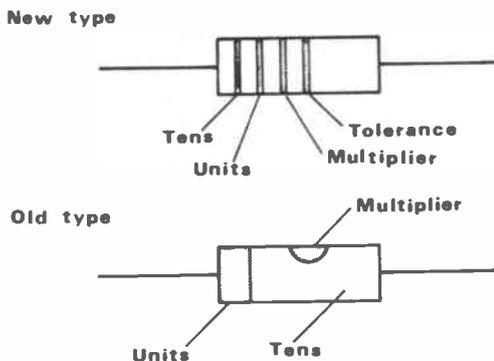


Fig 1 Resistor colour coding bands

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

Your scribe had been on holiday and returned to hear a tale of woe regarding a very modern stereo tuner (VHF, obviously) that worked ok on mono, but muted one channel when stereo was selected. It belonged to a Very Important Person, and it was imperative that it be repaired. There were, of course, no circuit diagrams or other info.

Probably still relaxed from the holiday, I called the engineers who had attempted to repair it during my absence – peasants – and offered to fix it within five minutes. Four minutes into the repair I must admit that I was sweating a bit. The trouble was that the stereo/mono switch doubled up as the inter-channel mute, and it was a nightmare trying to work out what part of the somewhat massive switch routed what through to where. The only definite clue was that one of the linear switch ICs had a dc level on it, his friend in the working channel did not.

A little blue thing

Something in my feeble brain was telling me that I had just seen something wrong, when I remembered an engineer who had taught me fault finding many years ago. 'There ain't much mileage in an electrolytic with the same volts on both ends' was one of his sayings, and I'd just seen exactly that. With seconds to go I rechecked, and sure enough a 4.7 μ F, 10 volt little blue thing was a dead short, hence it had the same volts on both ends of it. I considered that I had repaired it within the stated time, but the 'peasants' insisted I hadn't, because they considered a repair was timed 'covers off', to 'covers on'. Anyway, that was a tip I'm glad I remembered.

Instruments, bicycles and Gandhi

Worked out the connection between that lot and amateur radio? Not too obvious, really is it? I was idly flicking through the *Exchange and Mart*, waiting for the wife to finish fitting a new engine in the car or something, when a little ad caught my eye. It was announcing a forthcoming flea market for bicycle, musical and radio jumble only. Gandhi? It was being held in Gandhi Hall, which is near Warren Street underground station in London.

Personally, I'd never heard of this event, certainly it had not been mentioned in the amateur radio press. Since my son wanted to go to the British Museum anyway, this seemed a good time to combine the two, and what a success the 'jumble' was.

According to one of the organisers I spoke to, the event had been going on for a few years now, normally being held about the beginning of November. Sellers were only charged £4 a table, and most of the stuff on sale was genuine down to earth tat, absolutely smashing. I bought so many short wave portable radios – Perdio Town and Countrys, Roberts, Hackers etc, none for over a quid – that the wife could hardly carry them all. There were quite reasonably priced communications receivers of all flavours, Hamurlands, HROs, 1155s, Yaesu etc, all mixed up with bike frames and piano accordions. The absolute jewel of the day was a superb Morse key, so big that on a foggy day you cannot see from one end to the other. Made out of a big brass RSJ (?) it's probably pre World War One, and I don't know how the seller could bring himself to part with it.

Certainly I never shall. The aforementioned organiser has promised to inform your scribe well in advance of the next one, so I'll try and pass on the hint if it arrives in time. Best check *E & M* next October though, a real 'find' was this one!

Mohican

This Heathkit receiver, also known as the GC1U, was one of the first portable transistorised short wave receivers. A feature of its design was that it was one of the first radios ever sold using 'transfilters', nowadays more usually called ceramic resonators. These show their presence when you examine the selectivity curves, ± 3 kHz wide, 6dB down. It was designed to run on 12 volts, either from an internal pack of two 6 volt dry cells or an external source. You can just about get away with a single PP9 9 volt battery, though sensitivity and stability suffer.

There is also a built-in fifty inch heavy duty telescopic, more of a fishing rod than an aerial. We are talking of a 10 transistor single conversion (455kHz) superhet, built like the proverbial brick outhouse. The only real drawback is image response, only a laughable 14 or 15dB down. Sensitivity is of the order of a microvolt, give or take a bit.

Cost new was £38 15s 0d, to you in decimal £38.75. Nowadays a really clean example, with handbook and no mods is £40 absolute top whack, though I did see one comedian not sell one at Woburn for £65. Thirty sovs is fair for your average worker, and a fiver is the going rate for a dud.

The scope for a set to die is almost

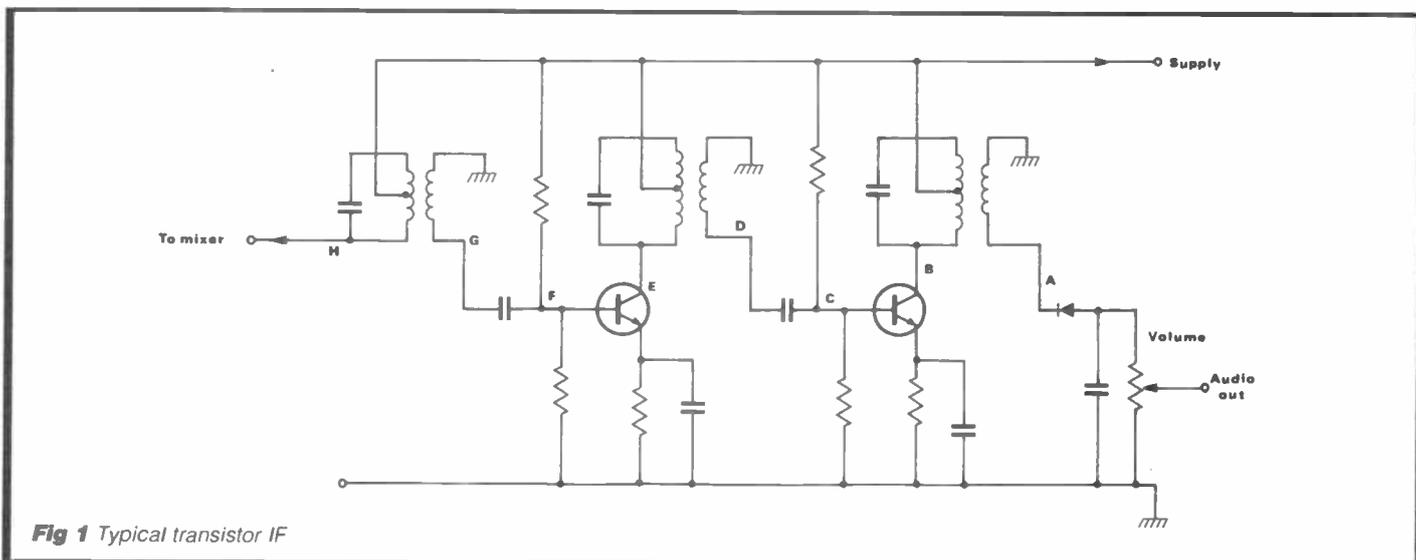
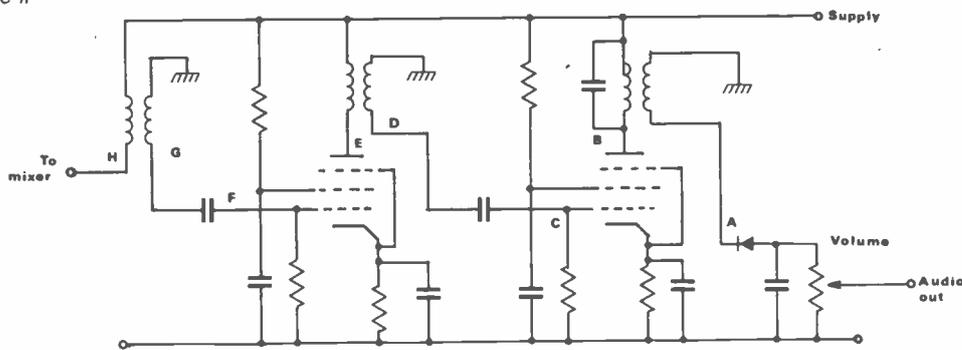


Fig 1 Typical transistor IF

Fig 2 Typical valve IF



limitless. Really maltreated, badly stored examples are a bit prone to having the bearings on the dial cord mechanisms seize up, normally swiftly followed by a bust dial cord (one of my pet hates). If you have one with a snatching tuning knob, careful oiling of everything may be required. A drop of oil is too much, you do not want any excess at all since it will get into the cord and cause slippage.

The anti-backlash dual gear and spring thingy (its proper name is the spring loaded split gear) tends to seize up, so if you have a sloppy tuner, have a good look here (the bit on the end of the tuning capacitor).

The BFO, which is a pot on the front panel controlling a 'voltage variable capacitance diode' (varicap to you and me), is a real diode eater for some reason - it goes a short and the BFO departs for lower frequencies, hence no BFO action and strange 'birdies' every 400kHz or so. Simply stuff in an 0A91 or whatever is to hand (we are only talking 6kHz shift for a decent voltage swing, so almost anything will do here).

You have been warned

Talking of repairing Mohicans, *never ever, not no how* clean the inside of the front panel, the bit with the calibration markings printed on. Well, you could clean it with meths if you happen to like Mohicans with plain glass fronts and no calibration. The markings are fragile and will come off if you even look at them for too long. Well, I lie a bit, but leave well alone, you have been warned.

The most common 'fault' on Mohicans is broken cores, both in the IF and RF coils. The majority of Mohicans have the hexagon 'hole all the way through' type of core. They will crack if you get within a yard of them with anything but the correct adjusting tool. A broken core can be drilled out, but it's hard work. Start with a drill that will just go through the middle, and slowly work up in drill size until you can just see the tops of the coil former threads, it's then possible to get the last bits out with a pin. All of this is as exciting as acute dysentery, so use the correct adjuster if you must twiddle.

RF mixer and (separate) oscillator are all AF115 transistors, thus Mohicans are susceptible to the dreaded collector to screen short - cut the screen wire off if required. The IF section consists of three 0C45s, which can get really noisy. Hold a soldering iron near them in turn (say an

inch away), and if the noise level rises, that one could well be the culprit. If the noisy one is the first IF amplifier, dramatic improvements can sometimes be brought about by swapping it over with the last IF transistor, if no suitable replacement is to hand.

One annoying fault is the set going dead when you turn the AVC switch on. I'll admit to a quarter of an hour of head-scratching the first time I came across this, naturally in a badly made example. It's caused by the S meter going open circuit.

As in all Heathkit stuff, the handbooks are superb, with an excellent circuit description. Your average amateur with a half decent junk box ought to be able to resurrect a dead 'un on the kitchen table without much aggro. Personally, I tend to ignore circuit diagrams - I find them confusing - I'd rather just repair the set. However, the clear easy-to-see layout of the Mohican makes them a doddle.

Please don't let the above somewhat daunting list of faults put you off buying one. I've repaired dozens of them, but there must be thousands about that have given their owners no trouble at all. Well worth considering as a first 'serious' short wave radio; they are a step up from your average domestic radio with a short wave band, and you are likely to get your money back on it when you tire of it, provided you don't exceed the above prices.

I've got this dead set....

If I had a fiver for every reader's letter I've received that expects me to be able to tell them how to repair a set without even seeing it, then I'd be a millionaire. Sure, there are standard faults on some sets, but there are so many ways to produce a dead set, it's almost impossible to say 'R14 on the mixer board is open circuit' or somesuch, especially after only being given such helpful information as 'there is a faint hum in the speaker'.

The only real way to repair a receiver that is dead is to do it logically. For starters, the audio stages have got to be the simplest thing ever to test out. Merely touch a screwdriver blade onto the centre contact of the volume control and listen for a click out of the speaker.

Obviously this has to be done with due regard to your own personal safety, remember that in mains powered sets the on/off switch is often a part of the

volume control. This little test tells you that the speaker (and its switching through headphone sockets) is ok, and there is some sort of power getting around.

Next bash a bloody great signal up its aerial rat hole and see if it will do something. An RF signal generator capable of wopping out half a volt or so of urge is a great asset. The amount of RF required can give you an indication of what is wrong. 20dB up on normal input (we will define normal as a microvolt), for normal output sort of says one stage is down. 100dB up required, and you have a whole chain of IF amplifiers biased hard off. Naff all getting through, despite a 'blow its socks off' signal, either equals no local oscillator (sometimes mixer), or no volts down the RF/IF stages.

You now need to know the IF frequency, often 455kHz in 'simple' receivers, though 1.6MHz and 10.7 are common. If you have no handbook, a look at the IF filters might give a clue. If you didn't succeed in bashing your massive signal through at received frequency, dial up the nearest waveband to the IF, say the medium wave on a 455kHz set, then throw handfuls of RF in the aerial hole on the IF frequency. If you now get something through, but didn't before, then the mixer/local oscillator is duff.

Keeping the signal generator on the IF frequency flat out and modulated, move number one is to hit the detector. Figures 1 and 2 show typical transistor and valve IFs respectively. I have deliberately left out the AGC line - more of this anon.

To hit the various stages, it's best to have dc isolation through the signal generator, so you want a 0.01µF capacitor in series with it.

If you inject your signal at 'A', a weak audio tone should be heard. It should be roughly this loud when you transfer to 'B', give or take a bit. The level will be different to that at 'A' due to impedance mismatches etc, but should be of the same order. If you cannot get a tone out, then the diode's gone. Just to be helpful, it's often hiding in the last IF can. For some inexplicable reason, open circuit detector diodes are quite common in earlier transistor car radios. Remember that the diode may be a valve in a valve set.

Now wop your signal up the active device, ie inject it up 'C'. You should be able to back off the signal generator

about 20dB or so, to get the same audio out that you had at 'A' or 'B'. Fairly obvious really, the active device is there for a reason, and that reason is to provide gain. If there is no increase, ie no gain, you've got to find out why. The most obvious is that the device has gone, be it valve or transistor. Check it, or bung in a known good substitute.

A nip round with a voltmeter should now be on the cards. Whatever it is, valve or transistor, is there volts across it? If it is practical, I like to measure across the device, ie emitter/collector (or cathode/anode), rather than up from earth. You've thus done a rough check of the emitter/cathode bias network at the same time. If it's a valve, have a quick look at the grid volts – you want something there, and it ought to be a third of the rail or greater. G2 decoupling capacitors do go leaky, especially on wartime receivers, so it is well worth a check.

So the device has volts across it and is known good. All that's left to ruin its chances of gain is open circuit capacitors or the bias being shot – perhaps the AGC has gone walkies. With regard to the capacitors, a 1µF 250 volt working thing is handy, just smash it across whatever is in the stage and see if there is an improvement. If there is, replace whatever seems suspect.

Biasing problems are a pain. Have a look at the grid/cathode or the base/emitter volts. If they are wrong, or non-existent, then I hunt round to find the

'source' of the AGC – often a diode or somesuch at the detector stage, and disconnect it. With your signal generator still bashing away into the last IF, give the stage a few dc volts up the AGC line to turn it on – a PP3 and a couple of kΩ in series can often do it, be we talking valve or transistor. Then go back and sort out the AGC problem. This may all seem a bit complicated, but you've covered the lot: volts, decoupling, the active device and its bias. There isn't anything left, so the stage must burst into life at some point during the above.

The first IF stage is often more or less the same as the last, and the same applies. The level required at 'C' should be sufficient to produce a tone at 'D' and 'E'. By the time you are at 'F', the signal generator should be right down, well below a millivolt, and that sort of level should still work at 'G' and 'H'.

We have now arrived at the mixer, perhaps via the IF crystal filter, if applicable. It should be possible, again give or take 6dB of level, to get your IF signal through that stage. With it still going into the mixer, re-tune your signal generator to the receive frequency, whereupon it will re-appear, probably even louder. If it doesn't appear, you are short on local oscillator injection or somesuch.

If your receiver boasts an RF stage, well, work back through that; RF stages are the same as IF stages but tuneable, so use the same techniques to see if it has gain.

IC2E/ICDC1

The ICDC1 is a thing that looks like a battery pack, but is really a regulator. It allows an IC2E to be run on a 12V dc supply. Inside it is a thin wire link between the outer, negative side of the input socket, and the negative 'plate' that contacts to the battery contact of the IC2E. The wire is only a quarter of an inch long and is of uninsulated multi-strand construction. During manufacture the multi-stranding 'wicks up' solder, so that, by the time both ends have been soldered, the wire is saturated with solder. Solder is not noted for its pliability, so even opening it up will snap this wire.

I've had dozens in to repair lately, where the owner has admitted opening it up 'just for a look'. They think that it weighs so little that there cannot be anything in there, and want to see if they have been ripped off. It's actually full of gubbins. The problem is made worse because the wire is so short that it's easy to overlook. Moral, don't open up DC1s if there is nothing wrong with them!

Credit cards

Many thanks to the several readers who wrote in on the subject of buying abroad with credit cards, which I mentioned a few months back. All seemed very pleased at both the price they paid, and the exchange rate they received. This method of making international purchases without involving banks, foreign currency etc could well be worth considering.

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■ Zetagi B300DS mobile amplifier, 200 watts FM/AM, 400 watts SSB. Pre-amp, 6 position, power output, switchable, £80 plus postage. J&P Electronics RTTY terminal unit. Filter with program and instruction book for Spectrum ZX +2, £25.00 plus postage. Also Tarran 3 amp PSU, £10.00 plus postage; also Sinclair Spectrum ZX +2 computer with RX3 and RX4 programs for RTTY. Also 1 joystick, 6 games programs, 7 blank computer tapes, 1 record keeping program. Boxed, as new, £170.00 plus postage. Tel: Brian (0249) 816334 evenings or weekends

■ Microwave Modules MML144/100S, 10W input - 100W output 2m linear amplifier. Ex cond, orig packing, £90. Dressler ARA30 active receiving antenna, mint cond, used internally only, £65. Tel: Patrick (0909) 565443

■ Cobra 148GTL DX Mk1, fitted super low, in original box, very nice cond, £95; also ham multimode, £75; 2 super low fitted, also good working order. Breml 210 amp, 100 watts AM/FM, 200W SSB, new valve fitted, £55. Tagra 3 element beam antenna, one month old, cost £48, first £25, buyer collects. Tel: (061) 927 7325 (Cheshire)

■ Trio TS711E 2m multimode base station, £595. muTek SBLA144E 2m masthead pre-amp, £40. 9 ele 2m Tonna, new type, £18. 19 ele 70cm Tonna old type (unused), £16. 3 ele 6m met, £20. W2AU 50-75 ohms, 1:1 balun 3-40MHz, 1kW rating, £5. Daiwa DR7500 heavy duty rotator, £50. Wanted: *World Radio TV Handbook* 1986 or 1987. Tel: (0926) 498388

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■ I have an Icom 240 with super-scan, I would like a circuit diagram for the super-scan, can be a photocopy, all appropriate costs refunded. Contact Steve G1YRE, 30 Haugh Lane, Woodbridge, Suffolk IP12 1LA. Tel: (03943) 7669 24hrs

■ Can anyone help me with interface etc, for SSTV for a beginner to use with Spec 48, also cheap VHF radio, anything for radio for Spec 48, also AR88. Tel: Len (0977) 797063

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■ In any condition, for spare parts and project test beds: Codar AT5 Tx plus ac/PUs, also Heath RA1, RG1 Rxs. Details of condition and price to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA

■ Stop! Are there any scanner owners who want to swap frequencies and radio information in the

Swansea, Port Talbot, Barry, Weston-Super-Mare, Minehead or Ilfracombe areas? Contact: Phil Lee, Nevadd Gilbertson, Mill Lane, Blackpill, Swansea SA3 5BA

■ Back issues of *RadCom* for reference, pre 1982 if poss. Wind up tilt-over tower, min 30ft, also HF beam, prefer TET but WHY? CBM 64 for present, have 128 if you are upgrading. Martyn Bolt G4SUI, 112 Leeds Rd, Mirfield, West Yorkshire WF14 0JE. Tel: (0924) 495916

■ Puma linear amp, model bit O7, for 70cm band, plus power pack, model bit B, (if available). Both to be in mint condition, complete and with original instructions and original packaging (if possible). Derek G4ZJL QTHR, *RadCom*. Tel: (0524) 52042, 24hr answerphone

■ Pye Cambridge remote head and cable form for AM10 boot mount. Tel: Paul (0920) 871639

■ Parts urgently needed: audio output trans for CR100, and slow-motion 'gearbox' drive for AR88D. Once again - urgent! Please write to Mr A Hawkins, 166C Kestrels View, Southgate, Runcorn, Cheshire WA7 2RX

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		1 issue	3 issues	6 issues	12 issues
depth mm x width mm	ad space				
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS	Covers, Bleed, Facing Matter:	Outside back cover 20% extra, inside covers 10% extra 10% extra [Bleed area = 307 x 220] 15% extra
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DEADLINES		*Dates affected by public holidays			
issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thru	
Jan 88	26 Nov 87	2 Dec 87	4 Dec 87	24 Dec 87	
Feb 88	24 Dec 87	6 Jan 88	8 Jan 88	28 Jan 88	
Mar 88	28 Jan 88	3 Feb 88	5 Feb 88	25 Feb 88	
Apr 88	3 Mar 88	9 Mar 88	11 Mar 88	31 Mar 88	

CONDITIONS & INFORMATION	
<p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p>	<p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.</p> <p>COPY Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations. Printed - web offset.</p>
<p>PAYMENT Above rates exclude VAT. All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by the publication date. Overseas payments by International Money Order or credit card.</p> <p>FOR FURTHER INFORMATION CONTACT Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 218676</p>	<p>Commission to approved advertising agencies is 10%.</p> <p>CONDITIONS 10% discount if advertising in both Amateur Radio and Radio & Electronics World. A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request.</p>

AMATEUR RADIO BACK ISSUES SERVICE

TO: Back Issues Department • Amateur Radio
• Sovereign House • Brentwood • Essex • CM14 4SE

NAME

ADDRESS

POSTCODE

PLEASE SUPPLY: (state month and year of issue/s required) **NOTE:**
Only issues from August 1986 are available
..... at £1.45 each

PAYMENT ENCLOSED: £ -

Cheques should be made payable to **Amateur Radio** Overseas payment by International Money Order or credit card

CREDIT CARD PAYMENT: EXPIRY DATE

SIGNATURE

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£1 BAKERS DOZEN PACKS

Price per pack is £1.00. Order 12 you may choose another free. Items marked (sh) are not new but guaranteed OK.

- 1 - 513 amp ring main junction boxes
- 2 - 513 amp ring main spur boxes
- 5 - 3 flush electrical switches
- 7 - 4in flex line switches with neons
- 8 - 2 80 watt brass cased elements
- 9 - 2 mains transformers with 6V 1A secondaries
- 10 - 2 mains transformers with 12V 1/2A secondaries
- 11 - 1 extension speaker cabinet for 6 1/2" speaker
- 12 - 5 octal bases for relays or valves
- 13 - 12 glass reed switches
- 14 - 4 OCP 70 photo transistors
- 16 - 4 tape heads, 2 record, 2 erase
- 17 - 1 ultrasonic transmitter and 1 ditto receiver
- 18 - 2 15000 mfd computer grade electrolytics
- 19 - 2 light dependent resistors
- 20 - 5 different micro switches
- 21 - 2 mains interference suppressors
- 22 - 2 25 watt crossover units 2 way
- 23 - 1 40 watt 3 way crossover unit
- 28 - 1 6 digit counter mains voltage
- 30 - 2 Nicad battery chargers
- 31 - 1 key switch with key
- 32 - 2 humidity switches
- 34 - 96 x 1 metre lengths colour-coded connecting wires
- 36 - 2 air spaced 2 gang tuning condensers
- 37 - 2 solid dielectric 2 gang tuning condensers
- 38 - 10 compression trimmers
- 41 - 6 Rocker Switches 10 amp mains SPST
- 43 - 5 Rocker Switches 10 amp SPDT Centre Off
- 44 - 4 Rocker Switches 10 amp DPST
- 45 - 1 24 hour time switch mains operated (sh)
- 46 - 1 6 hour clock timeswitch
- 48 - 2 6V operated reed switches relays
- 49 - 10 neon valves - make good night lights
- 50 - 2 x 12V DC or 24V AC, 4 CO relays
- 51 - 1 x 12V 2C O very sensitive relay
- 52 - 1 12V 4C relay
- 55 - 1 locking mechanism with 2 days
- 56 - Miniature Uniselector with circuit for electric jigsaw
- 57 - 5 Dolls' Houses switches
- 60 - 5 ferrite rods 4" x 5/16" diameter aeriols
- 61 - 4 ferrite slab aeriols with L & M wave coils
- 62 - 4 200 ohm earpiece coils
- 63 - 1 Mullard thyristor trigger module
- 64 - 10 assort'd knobs 1/4" spindles
- 65 - 5 different thermostats, mainly bi metal
- 66 - Magnetic brake - stops rotation instantly
- 67 - Low pressure 3 level switch
- 69 - 2 25 watt pots 8 ohm
- 70 - 2 25 watt pots 1000 ohm
- 71 - 4 wire wound pots - 18, 33, 50 and 100 ohm
- 73 - 3 watt wire wound pots 50 ohm
- 77 - 1 time reminder adjustable 1-60 mins
- 78 - 5 amp stud rectifier 400V
- 85 - 1 mains shaded pole motor 3/4" stack - 1/4 shaft
- 86 - 2 5" all fan blades fit 1/4" shaft
- 87 - 2 3" plastic fan blades fit 1/4" shaft
- 88 - Mains motor suitable for above blades
- 89 - 1 mains motor with gearbox 1 rev per 24 hours
- 91 - 2 mains motors with gearbox 16 rpm
- 93 - 4 11 pin moulded bases for relays
- 94 - 5 B7G valve bases
- 95 - 4 skirted B9A valve bases
- 96 - 1 thermostat for fridge
- 98 - 1 motorised stator 9 ohm (sh)
- 101 - 1 2 1/2 hours delay switch
- 103 - 1 6v mains power supply unit
- 104 - 1 4 1/2 V mains power supply unit
- 105 - 1 5 pin flex plug and panel socket
- 107 - 15" speaker size radio cabinet with handle
- 109 - 10 1/4" spindle type volume controls
- 110 - 10 slider type volume controls
- 112 - 1 heating pad 2000 watts mains
- 114 - 1 1W amplifier Mullard 1172
- 115 - 1 Wall mounting thermostat 24V
- 118 - 1 Teak effect extension 5" speaker cabinet
- 120 - 2 pcb with 2 amp full wave and 17 other recs
- 122 - 10 mtrs twin screened flex white pvc outer
- 132 - 2 plastic boxes with windows, ideal for interrupted beam switch etc
- 155 - 3 varicap push button tuners with knobs
- 188 - 1 plastic box, sloping metal front, 16x95mm, average depth 45mm
- 241 - 1 car door speaker (v flat) 6 1/2" 15 ohm made for Radiomobile
- 243 - 2 speakers 6" x 4" 15 ohms 5 watt made for Radiomobile
- 266 - 2 mains transformers 9V 1/2A secondary split primary so OK also for 115V
- 267 - 1 mains transformers 15V 1A secondary pcb mounting
- 330 - 2.6V 0.6V mains transformer .3a pcb mounting
- 350 - 40 double pole leaf switches
- 365 - 1 7uf 660V 50hz metal case condenser
- 453 - 453 - 2 2 1/4 in 60 ohm loudspeakers
- 454 - 2 2 1/4 in 8 ohm loudspeakers
- 455 - 1 mains operated relay with 2 sets c/o contacts
- 464 - 2 packets resin filler/sealer with cures
- 465 - 3 5A round 3 pin plugs will fit item 193
- 466 - 4 7 segment led displays
- 470 - 4 pc boards for stripping, lots of valuable parts
- 480 - 1 3A double pole magnetic trip, saves repairing fuses
- 498 - 4 1000uf 25V axial electrolytic capacitors
- 504 - 1 Audax PM 8" speaker 15 ohms 5 watt rating
- 515 - 100 4BA 1 1/2" cheesehead plated screws and 100 4BA nuts
- 541 - 1 pair stereo tape head as in cassette recorder/players
- 546 - 1 bridge rectifier 600V international rectifier ref 35B100
- 548 - 2 battery operated relays (3-6v) each with 5A c/o contacts 2 pairs
- 553 - 2 lithium 3V batteries (everlasting shelf life)

OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's dozen range and you can become entitled to a free gift with each dozen packs.

A classified list of these packs and our latest 'News Letter' will be enclosed with your goods and you will automatically receive our next news letter.



THIS MONTHS SNIP

3 1/2 floppy Disk Drive, made by the Chinon Company of Japan. Beautifully made and probably the most compact device of its kind as it weighs only 600g and measures only 104mm wide, 162mm deep and has a height of only 32mm, other features are high precision head positioning - a single push loading and eject - direct drive brushless motor - 500K per disc - Shugart compatible interface - standard connections - interchangeable with most other 3 1/2 and 5 1/4 drives. Brand new with copy of makers manual. Offered this month at **£28.50** post and VAT included.

CASE - adaptable for 3 or 3 1/2 FDD has room for power supply components price only **£4** includes circuit of PSU. Our Ref 4P8

POWER SUPPLY FOR FDD - 5V and 12V voltage regulated outputs complete kit of parts will fit into case 4P8 price **£8** or with case **£11**

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules - ie Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for **£6.00** plus £2 postage. For prices of modules bought separately see TWO POUNDSERS

CAR STARTER/CHARGER KIT

Flat Battery! Don't worry you will start your car in a few minutes this kit - 250 watt transformer 20 amp rectifiers, case and all parts with data case **£17.50** post £2

MINO MONO AMP

Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.15 each, or £13 for £12.00.**



LIGHT BOX

This when completed measures approximately 15" x 14" The light source is the Philips fluorescent W tube. Above the light a sheet of fibreglass and through this should be sufficient light to enable you to follow the circuit on fibreglass PCBs. Price for the complete kit that is the box, choke, starter tube and switch and fibreglass is **£5** plus £2 post order ref 5P69

TANGENTIAL HEATERS

We again have very good stocks of these quiet running instant heat units. They require only a simple case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 12kw, 2kw, 2.5kw and 3kw. Prices are **£5** each for the first 3 and **£6.95** for the 3k. Add post £1.50 per heater if not collecting.

CONTROL SWITCH enabling full heat, half heat or cold blow with connection diagram, 50p for 2kw, 75p for 3kw

FANS & BLOWERS

5" **£5** - £125 post 6" **£6** - £150 post
4" x 4" Muffin equipment cooling fan 115V **£2.00**
4" x 4" Muffin equipment cooling fan 230/240V **£5.00**
9" Extractor or blower 115V supplied with 230 to 115V adaptor **£9.50** - £2 post
All above are ex computers but guaranteed 12 months
10" x 3" Tangential Blower New Very quiet - supplied with 230 to 115V adaptor on use two in series to give strong blow **£2.00** - £1.50 post or **£4.00** - £2.00 post for two

9" MONITOR

Ideal to work with computer or video camera uses Philips black and white tube ref M24/306W. Which tube is implosion and X-Ray radiation protected. VDU is brand new and has a time base and EHT circuitry. Requires only a 16V dc supply to set it going. It's made up in a lacquered metal framework but has open sides so should be used. The VDU comes complete with circuit diagram and has been line tested and has our six months guarantee. Offered at a lot less than some firms are asking for the tube alone only **£19** plus £5 post

LOW COST OSCILLOSCOPE

Convert our 9" monitor into an oscilloscope with switched time bases to allow very high and very low frequency waveforms to be observed and measured. Signal amplitudes from as low as 10mV and as high as 1kV can easily be observed and measured. Ideal for servicing, also for investigating TV, radio and audio circuits. Kit containing all the parts for the conversion and the power supply to operate from mains **£25** our ref 25P3

TELEPHONE LEAD

3 mtrs long terminating one end with new BT flat plug and the other end with 4 correctly coloured coded wires to fit to phone or appliance. Replaces the lead on old phone making it suitable for new BT socket. Price **£1** ref BD552 or 3 for **£2** ref 2P164

COMPACT FLOPPY DISC DRIVE EME-101

The EME-101 drives a 3 1/2" disc of the new standard which despite its small size provides a capacity of 500K per disc which is equivalent to the 3 1/2" and 5 1/4" discs. We supply Operators Manual and other information showing how to use this with popular computers. BBC Spectrum Amstrad etc. All at a special snip price of **£27.50** including post and VAT. Data available separately **£2** refundable if you purchase the drive

POWERFUL IONISER

Generates approx 10 times more IONS than the ETI and similar circuits. Will refresh your home office shop workroom etc. Makes you feel better and work harder - a complete mains operated kit case included **£11.50** - £3 P&P

J & N BULL ELECTRICAL

Dept AR, 250 PORTLAND ROAD, HOVE

BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO, or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted. Brighton (0273) 203500.

NEW ITEMS

Some of the many described in our current list which you will receive with your parcel



SUPER WATER PUMP - Approx 1/2 hp mains operated originally intended to operate a £300 shower unit at controlled pressure - but of course suitable for many other water or liquid moving operations - where a good flow at a constant pressure is required - Price £25 each VAT and Post Paid. Our Ref 25P2

VERY USEFUL MULTI TESTERS - These have all usual ranges AC & DC volts - DC MA and OHMS etc but an unusual and very useful feature is a low OHMS range. Very useful for checking dry joints etc. They are ex GPO and may have faults but we test and guarantee the movement to be OK. Price £3 each Ref 3P30

AGAIN AVAILABLE - 12 mini fluorescent tubes - Price £1 each Ref BD314

POWER PACK OF AMPLIFIER CASE - Size approx 10 x 8 1/4 x 4 1/4" plated steel - with ample perforations for cooling. Front panel has on/off switch and EEC mains inlet plug with built-in RF filter - undoubtedly a very fine case which would cost at least £50 from regular sources. Our price is £5 each and £3 post Ref 5P11

MINIATURE BCO THUMP WHEEL SWITCH - Matt black edge switch engraved white on black - gold plated make before break contacts - size approx 25mm high, 8mm wide, 20mm deep - made by the famous Cherry Company and designed for easy stacking. Price £1 each Ref BD501

DO NOT FREEZE UP! - We have had the strongest winds for over 200 years and who knows we may be in for the coldest winter so if you have not already protected your water pipes you should do so now - our heating wire wound around the pipes will do this and will only about 50p per week to run - 15 metres (minimum length to connect to 230/240v mains) Price £5. Our Ref 5P 109

PIEZO ELECTRIC FAN an unusual fan more like the one used by Madame Butterfly, than the conventional type it does not rotate. The air movement is caused by the two vibrating arms. It is American made, mains operated, very economical and causes no interference. So it is ideal for computer and instrument cooling. Price is only £1 each Ref BD605

SPRING LOADED TEST PRODS - heavy duty made by the famous Bulgin company. Very good quality. Price four for £1. Ref BD599

CURLY LEAD four core standard replacement for telephone handset extends to nearly two metres. Price £1 each Ref BD599

TELEPHONE BELLS - these will work off our standard mains through a transformer but to sound exactly like a telephone they then must be fed with 25Hz 50v. So with these bells we give a circuit for a suitable power supply. Price 2 bells for £1. Ref BD500

ULTRA SENSITIVE POCKET MULTIMETER - 4k ohms per volt - 11 ranges - carry one of these and os be always ready to test ac/dc volts to 1000 DC milliamms and have an ohms range for circuit testing - will earn its cost in no time. Price only £7. Ref 7P2

BLOW YOUR ROOF OFF! 140 watt speaker systems - new type you must not hide! They have golden cones and golden surrounds and look really 'bootful'! 12 Woofer Midrange and Tweeter and comes with a crossover at a special introductory price of £49, carriage paid. Two sets for £95 carriage paid! 140W Woofer only £35 carriage paid.

3 1/2 to 5 1/4 FLOPPY DISC DRIVES now in stock all are new and made by famous Epson company. All are double sided drives with storage capacity of 1 megabyte. They have standard connections and are fully compatible with conventional systems. Both are small size and light weight. Price - either model is £37.50 plus £2 post. Price includes copy operating data.

APPLIANCE THERMOSTATS - spindle type suitable for convector heaters or similar. Price 2 for £1. Ref BD582

COMPUTERS

Big consignment of computers expected in mid Jan, various makes and numbers, write or phone for details

NOVEL NIGHT LIGHT - plugs into a 13A socket. Gives out a surprising amount of light, certainly enough to navigate along passages at night or to keep a nervous child happy. Very low consumption, probably not enough to move the meter. Price £1. Ref BD563

CASE WITH 13A PRONGS - to go into 13A socket, nice size and suitable for plenty of projects, such as car battery trickle charger, speed controller, time switch, night light, noise suppressor, dimmers etc. Price - 2 for £1. Ref BD565

SPEAKER EXTENSION CABLE - twin 0.7mm conductors so you can have long runs with minimum sound loss and for telephone extensions or burglar alarms, bells, intercoms etc. 250m coil only £3 plus £1 post. Ref 3P28

ALPHA NUMERIC KEYBOARD - this keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area fields is QWERTY array and on the right is a 5 key number pad, board size is approx 13" x 4" - brand new but offered at only a fraction of its cost namely £3 plus £1 post. Ref 3P27

TELEPHONE EXTENSIONS - it is no longer for you to undertake the wiring of telephone extensions. For this we can supply 4 core telephone cable, 100m coil £5.50. Extension BT sockets £2.95. Packet of 500 plastic headed staples £2. Dual adaptor for taking two appliances from one socket £3.95. Leads with BT plug for changing old phones 3 for £2

MODULAR SWITCH - Panel mounting highest quality and ideal where extra special front panel appearance is required, can be illuminated if required, dpnl and latching. Price - 2 for £1. Ref BD607

WIRE BARGAIN - 500 metres 0.7mm solid copper tinned and pvc covered. Only £3 - £1 post. Ref 3P31 - that's well under 1p per metre and this wire is ideal for push on connections.

INTERRUPTED BEAM KIT - this kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components - relay photo transistor, resistors and caps etc. Circuit diagram but no case. Price £2. Ref 2P15

3-30V VARIABLE VOLTAGE POWER SUPPLY UNIT - with 1 amp DC output. Intended for use on the bench for experiments, students, inventors, service engineers etc. This is probably the most important piece of equipment you can own. (After a multi-range test meter). It gives a variable output from 3-30 volts and has an automatic short circuit and overload protection which operates at 1.1 amp approx. Other features are very low ripple output, a typical ripple is 3mV pk pk, 1mV rms. Mounted in a metal fronted plastic case, this has a voltmeter on the front panel in addition to the output control knob and the output terminals. Price for complete kit with full instructions is £15. Ref 15P7

TRANSMITTER SURVEILLANCE (BUG) tiny easily hidden but which will enable conversation to be picked up with FM radio. Can be housed in a matchbox, all electronic parts and circuit. Price £2. Ref 2P52

- ★ 2m/70cm
- ★ 25 Watts output
- ★ Full duplex operation
- ★ 21 Memories
- ★ 2 Call channels
- ★ Priority channel
- ★ Dual VFO's
- ★ 12.5 & 25kHz steps
- ★ Memory Scan
- ★ Programme Scan
- ★ Memory Skip

£449 inc vat

ALD-24E

ALINCO DUAL BANDER



This transceiver could transform your operating habits! It contains completely separate 2m and 70cms transceivers, permitting full duplex operation. To the un-initiated, this means you can transmit on 2m whilst receiving on 70cms, or vice versa. The built-in duplexer means a single antenna socket with a full 25 watts output on both bands. Measuring only 5.5"x2"x6.5" it is the ideal mobile rig. Its comprehensive memory and scanning facilities provide rapid access to both

simplex and repeater channels on 2m & 70cms. Using the dual VFO's you can instantly switch between 2m & 70cm and the single knob tuning provides simple and quick frequency selection. The large LCD readout incorporates an S-meter and is back lighted. If you are looking for a completely self contained 2m & 70cm station, then look no further. At this price it has to be a bargain. For further details of this amazing transceiver, send today for the full colour brochure.

OUR FAMOUS FREQUENCY MANUALS!

UK LISTENERS CONFIDENTIAL FREQUENCY LIST LATEST EDITION

This publication has now sold well over 3500 copies since it was advertised only a few months ago. Now the recent updated version is selling even better. No self respecting listener should be without a copy. If you enjoy exploring the short wave bands then this publication will add to your enjoyment. It covers the hf spectrum from 2 to 30 MHz and gives details of transmissions outside the amateur bands. Specially designed for the UK and European listener it sets out in a very easy way a comprehensive list of hundreds of interesting transmissions that will keep you occupied for days on end! Only a fraction of the cost of other similar publications it contains details of Marine, Air, Military, Embassy, Press and News agencies. Many listings have time schedules included together with comprehensive RTTY details. It tells you the frequencies used by civil and military aircraft whilst flying the Atlantic, when and where to pick up the press bulletins, long distance marine traffic etc and much more. Send today for your copy of this worthwhile publication.

£5.95 p&p 90p

4th EDITION VHF-UHF AIRBAND FREQUENCY LIST

This frequency manual is without doubt the most comprehensive list of VHF/UHF aircraft listings available in the UK. Of vital importance to the airband enthusiast or indeed any keen VHF/UHF listener it sets out in a very easy to follow manner full details of a whole host of stations. Every known UK airfield frequencies, etc. Included are Civil, RAF, USAF, MOD, Naval fields on both VHF and UHF bands. There are also air to air frequencies, the Red Arrows frequency, and much more. Send today for your copy and find out just how much you have been missing!

£5.95 p&p 90p

THE COMPLETE UHF-VHF FREQUENCY GUIDE 26-2000 MHz

New 1988 Edition Many listeners have asked for a guide to the wide VHF/UHF spectrum and to meet this request we have recently published this frequency manual. It covers the range 26 to 2000 MHz and has been specially prepared for the UK listener. Anybody who has used a scanning receiver will know that the wide frequency range involved means that it is difficult to know exactly where to listen. This guide takes all the guessing out of monitoring. It lists all the services throughout the spectrum together with both simplex and duplex frequency splits. If you've spent your hard earned money on a scanning receiver or are considering buying one you'll find that this publication contains a wealth of information that has previously remained un-published!

£5.95 p&p 75p

HF OCEANIC AIRBAND COMMUNICATIONS 1988 EDITION.

Prepared in response to many requests for more information about the air traffic on the hf bands this little guide sets out to explain to the beginner how the hf band works in relation to air traffic. It contains full details of the world aircraft frequency bands in the range 2 to 23 MHz together with control frequencies and those commonly used for Oceanic control. Also included are many VOLMET frequencies, the Search and Rescue frequencies used by RAF helicopters and Nimrods, the Hf RT network, London Company frequencies, European control centres etc. An ideal companion for the hf airband listener. Send today for your copy.

£3.50 p&p 70p

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& STANTON
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