HAM RADIO TODAY
AN ARGUS SPECIALIST PUBLICATION
FEBRUARY 1987 £1.20

TWO METRE MINI HANDIES

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- FT290 AUTO-TONE MOD
- THE PSYCHOLOGY OF QRP
- WHO WAS AMBROSE FLEMING?

HAM RADIO TODAY

VOLUME FIVE NO 2 FEBRUARY 1987

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CONSTRUCTION

FEATURES

REVIEWS

The Amateurs' Pre

IC

The World

1. IC-2E. 2 metre FM Handportable.
1.5 watts with standard nicad pack. Thumbwheel frequency entry.

2. IC-MICRO 2E. 2 metre FM Handportable.
1.5 watts with standard pack. 2.5 watts possible. Toggle switch frequency entry. LCD display. 10 memories.

3. IC-02E. 2 metre FM Handportable.
2.5 watts with standard nicad pack. 5 watts from 13.8 volts DC. LCD display, keypad frequency entry, 10 memories, scanning.

4. IC-28E. 2 metre FM Mobile.
25 watts, 21 memories, scanning.

5. IC-27E. 2 metre FM Mobile.
25 watts, 9 memories, scanning.

6. IC-290D. 2 metre Multimode mobile.
25 watts, 5 memories, scanning.

7. IC-275E. 2 metre Base station.
Multimode operation. 25 watts power output. New DDS system, 99 memories, high sensitivity and dynamic range. Ideal for PACKET and AMTOR.

8. IC-271E. 2 metre Base station.
Multimode. 10 or 25 watt models. IC-271H 100 watt model also available. 32 memories, scanning.

9. IC-3200E. Dual-band FM Mobile.
2 metre and 70 cm operation. 25 watt on both bands. 10 memories, scanning.

10. IC-SP3.
External base-station loudspeaker, 8 ohms.

11. IC-1271E. 23 cm Base station.
10 watt power output, 1240MHz-1300MHz. Multimode operation, 32 memories, scanning.

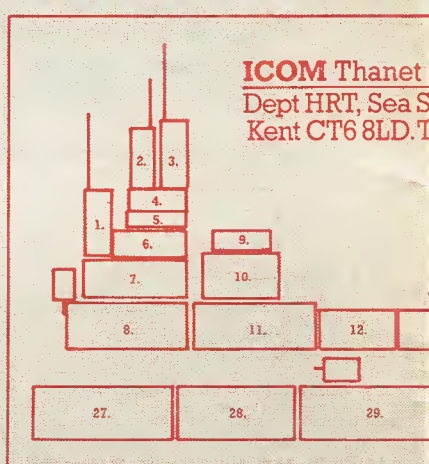
12. IC-PS55. External power supply.
Styled to match IC-735, 20 amp rating.

13. IC-735. HF Transceiver.
Amateur bands 160-10 metres, general coverage receiver from 100 kHz to 30 MHz. CW/SSB/AM/FM modes. 100 watt power output, 12 memories.

14. IC-AT150. Automatic antenna tuner.
Styled to match IC-735. 100 watt power rating.

15. IC-GC5. Station world clock.

16. IC-AH2a. HF Mobile antenna tuner.
IC-AH2b mobile whip and mount also available. Fully automatic when used with IC-735 HF transceiver.



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17. IC-505. 6 metre Portable or Base station.
50-54 MHz. CW/SSB/FM (optional). 10 watt power output from 13.8 volts.

18. IC-551. 6 metre Base Station.
50-54 MHz. CW/SSB/FM (optional). 10 watt power output. A.C. mains PSU standard. IC-551D 80 watt model also available.

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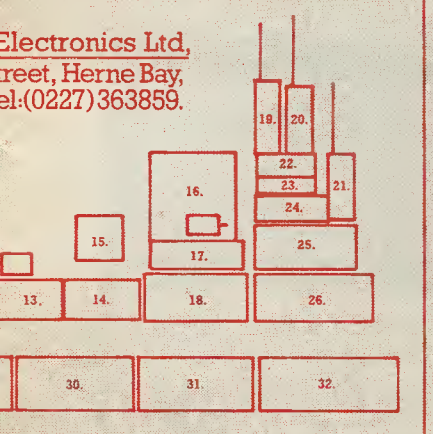

19. IC-12E. 23 cm. FM Handportable.
1260-1300 MHz, 1 watt with standard nicad pack. Keypad frequency entry, LCD display, 10 memories, scanning.

20. IC-04E. 70 cm. FM Handportable.
2.5 watts with standard nicad pack. 5 watts possible. Keypad frequency entry, LCD display, 10 memories, scanning.

21. IC-4E. 70 cm. FM Handportable.
2.5 watts with standard nicad pack. Thumbwheel frequency entry

22. IC-48E. 70 cm. FM Mobile.
25 watt, 21 memories, scanning.

23. IC-47E. 70 cm. FM Mobile.
25 watt, 9 memories, scanning.

24. IC-490E. 70 cm. Multimode Mobile.
10 watt power output, 5 memories, scanning.

25. IC-PS30. System power supply.
25 amp. rating, fully protected. Up to 4 ICOM units may be connected.

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27. IC-R71E. 70 cm. Receiver.
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LETTERS

Is there anybody there?

Dear HRT, How I agree with Jack Hum's comments (December 1986) about 2 metres. It is a great shame that his comments are necessary, but necessary indeed they are.

One Friday evening, over a year ago, I was fortunate to speak with Jack on both 2 metres and then 70cms. He certainly made me welcome, and invited me into the local 'natter-nets'. I had a very interesting and enjoyable evening, and left the Leicestershire area feeling pleased. I wish this was always the case, in other areas!

Over the past three years as a licensed amateur, most of my time has been spent in West Germany. So much so that I have only completed two pages in my UK log book! Imagine then, that I have spent a year away from home, I put the 2m/70cm rigs in the car and look forward to the English language contacts 'back home'.

I arrive and switch over to the UK repeaters. I call CQ for a few times . . . but without result. OK, you might say, there is nobody around. Wrong!

The point I wish to make is, with a few exceptions, if you are not known in an area (especially the SE corner of England) then it appears as if you are being ignored. There seems to be plenty of people quick enough to answer a direct call from another (known) amateur. So there must be people monitoring these frequencies.

So, Jack, I am afraid there is another 'rule' for maintaining standards on 2m and 70cms:

'Please be friendly and welcoming to all amateurs that are 'new' to your area.'

I see this criticism as *constructive*, for I am sure that the majority of amateurs do not realise the impression such action gives.

I thank those few amateurs who have recently come back to my CQ call, their comments were interesting: 'Thought I'd quickly reply to you, I am about to arrive, so must soon go QRT. I thought you were being ignored!'

As a rule, the average German amateur is only too happy to reply to a CQ call! So come on, folks, let's keep the spirit of amateur radio going . . . and not let it turn into 'clique groups'.

J Rivers, DA4CN/G1FHO

I'm sure that your letter strikes a familiar note with many 2m FM users, John. Perhaps part of the problem is that contacts on these bands are too easy now that we have a widespread repeater system — people treat them like cheap telephones and, as a result, don't take too kindly to 'wrong numbers'. If my guess is correct then the latest developments in selective calling technology are not going to help things one jot — your CQ call won't even make it past the 'favoured few filter' on future rigs!

Asst Ed, G4IRQ

Three cheers for KW

Dear HRT, I should like to bring to your attention an amazing back up service provided by a UK manufacturer.

The manufacturer is KW Communications Ltd and the service provided in my case is that I recently acquired a KW2000A but no handbook so I was a bit in the dark as to the best way to operate it, it's parameters etc, so I telephoned KW one afternoon to see if they could help me out. Since the set was introduced in 1964 and has long been out of production I did not hold out too much hope.

On explaining my problem to the gentleman on the phone he replied "No problem. I will post you one. It costs £6.50 so I will put an invoice in with it" (a rarity in itself as most people today require full payment before sending anything). With that the phone call ended and I expected to receive the book in a week or ten days time. The following morning on my doormat sitting there smiling up at me was the book, seventeen hours after requesting it.

I would like to say a public thank you to KW for being friendly, helpful and quick. They also said that they still had some spares for that rig which may be of interest to any other KW users.

Trevor Lund, G0FUG

RSGB GB QSL Bureau

Dear HRT, A little over a year ago I took over as the QSL sub-manager for GB callsigns on behalf of the RSGB. Although this information was published in Radcom and subsequently printed in the 1986 Callbook, envelopes are still being sent to the address of my predecessor, the late Mr Newman, and occasionally to *his* predecessor too. Mrs Newman has now moved. Whilst temporary arrangements have been made to forward any mail to me, this arrangement cannot continue indefinitely.

I would be grateful if your readers would note the following points in respect of **GB** QSL's:

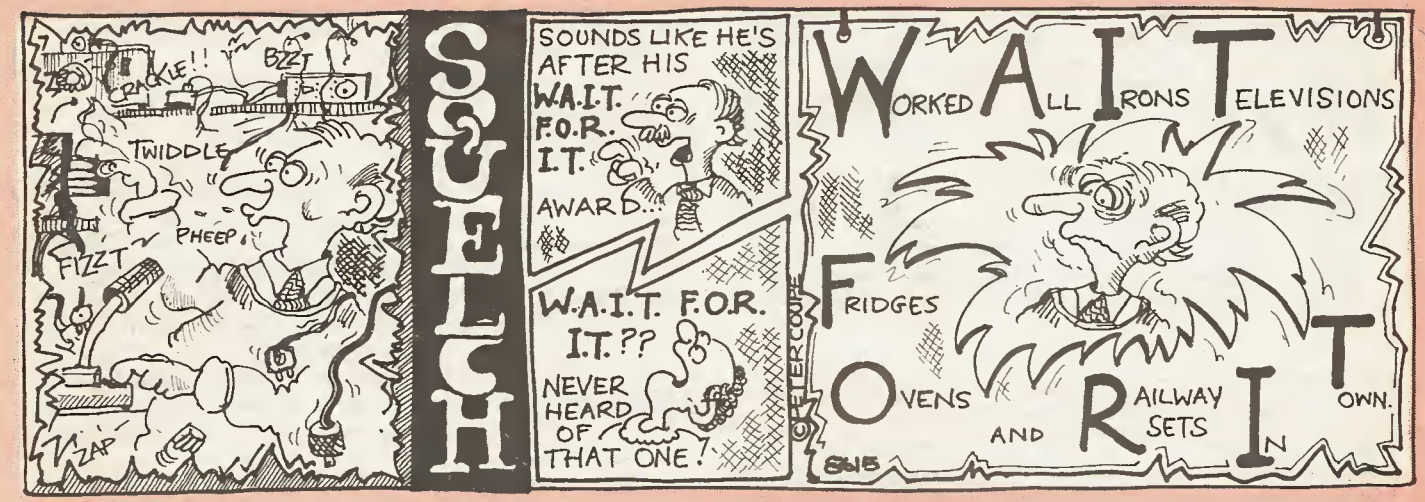
1. All evelopes for the collection of cards for GB stations should be sent to me, G4RVV. I am QTHR in the 1985 and subsequent Callbooks.
2. Send envelopes as soon as possible after the event when you have some idea how many cards there will be to collect. A 5x7.5 inch envelope at 13p will hold about 20 cards.
3. Send in cards for GB stations as soon as possible. Do not wait until your card arrives from the GB station. Cards arriving with me a year after the event may well not be collected if it was a 'one off' event.
4. Cards are to be sent to the main bureau, G3DRN. Cards for GB stations only may be sent direct to me.
5. GB Station Managers please note that I can only hold uncollected cards for the statutory three months. They are then destroyed.

M W Stoneham, G4RVV

Rapid Results reply

Dear HRT, As an author of The Rapid Results College for their RAE correspondence course I feel I must take issue with Sharon Metcalf's review of the course published in the November issue of HRT.

Let me deal firstly with the last point raised by Ms Metcalf, namely cost. If you are lucky you may find a College RAE course for £35 (plus a hefty supplement if one lives outside the College area). But this is only one of the costs involved. Text books will



cost at least another £10, and even a short course will involve 35 attendances. If we put travelling and incidentals at £1 per session this is £35, making a grand total of £80. This means that even for a 35 session course (and the better courses involve 50) the cost is the same as the RRC course. Also, non-attendance at a session because of business, domestic or health reasons means that most of the instructional content of that session is lost. If an RRC student is unable to study on a particular day there is no such problem.

Next let me examine the claim that the mathematical side "could cause confusion". Looking through my mark book I found that when attempting the formal test associated with this book 78% of my students obtained a mark of 70% or more, that only one obtained a mark of less than 50% (48% in this case), and that the average mark for all students was 79%. This group included all ages and classes of people, ranging from a housewife to an OAP. Incidentally both the latter obtained extremely good results in the May 1986 RAE.

Regarding FETs and MOSFETS I frankly wonder whose course Ms Metcalf has been reading! I assume that she is referring to Lecture 9 in Book b1, which actually devotes FIVE PAGES to FETs and MOSFETS. And this is only a start. In later lectures considerable space is devoted to how these devices can be employed.

Regarding "directional" and "beam antennas" Ms Metcalf is on delicate ground. Even such an authority as Chamber's Technical Dictionary says when defining "directional antenna", "See also beam antenna". Ms Metcalf also overlooks the fact that a few pages before the discussion on multi-element antennas is reached, the effects produced when the length of a half wave antenna is increased have been covered.

The points raised by Ms Metcalf on drawings are noted, and where essential changes will be made. Interestingly, the students seem to understand them.

If it was so manifestly unbalanced and biased one would be tempted to laugh at the pompous comment "It would be a daunting task for the average candidate, who would certainly need additional personal tuition, rather defeating the object of a correspondence course!" Ms Metcalf, you malign ordinary people. many have already completed this course, without the traumatic effects you mention, and have passed their RAE and obtained licences. So, could it just be that you are actually wrong in your comments? So far the available evidence points to this being so.

Angus Taylor, FISTC, G8PG

Bring & buys are fair

Dear HRT, I feel that it would be wrong to allow Peter Croslands ill-considered remarks about rally 'bring and buys' to pass without comment. As Chairman of the organisation which arranges one of the largest rallies and bring & buys at Longleat each year, perhaps I may offer an alternative view?

Unlike even the largest dealer, a rally such as Longleat acts as a focus for Radio Amateurs over a very wide area. Such large gatherings are few in number each year, and consequently it has become very popular to other potential buyers and sellers the opportunity to exchange unwanted equipment of all types, including items which many dealers would find unattractive to handle. The bring and buy arrangement is enormously successful at Longleat, and it does remove the bulk of the effort from both those buying and selling. The hard work then falls upon our faithful band of trusty helpers. I do not feel it is unreasonable for us, in return, to levy a commission on items which are sold; after all no sale means no commission to pay.

The costs involved in running a large event, such as Longleat, are immense. Since we do not charge an admission fee to the rally, a commission of 10% is necessary in order for us to meet our expenses. A 140' marquee devoted almost entirely to the bring and buy represents a substantial investment on our behalf. Few organisations survive for long on a margin as low as even 10%.

The vast majority of our 'customers' are very satisfied with the service we provide. Any profit that we make is ploughed back into supporting amatateur radio activities in Bristol, including subsidising monthly lectures, local repeater groups, special event stations and coach trips to other events. I suspect that a similar pattern occurs at the other rallies.

Now then Peter, where is the 'rip off'?

Shaun P. O'Sullivan, G8VPG

PCBs are older

Dear HRT, I have just read the article on making your own PCBs, by Tony bailey (HRT November 1986). He is incorrect in his statement that PCBs were developed about 1947. They were in fact produced by the Zenith Radio Corporation of the USA in the proximity fuses of anti-aircraft shells and were particularly effective against flying bombs, during 1944.

Frank H Thomas

Please address correspondence to:
Letters, Ham Radio Today,
1, Golden Square,
LONDON W1R 3AB.

RADIO TODAY

RSGB Annual General Meeting

By some odd quirk of fate, the date of this year's RSGB AGM coincided with a repeat showing of Paula Milnes play 'CQ' on Channel Four — would the AGM itself also follow a path of high drama? Reuters couldn't make it so we dispatched intrepid reporter G4IJF to find out . . .

This year, in addition to the Annual General Meeting required by the Companies Acts, the RSGB held an Extraordinary General Meeting to consider four Special Resolutions to amend the Articles of Association of the Society: In plain English these were:

1. To allow a President to be reappointed by Council, with a maximum term of office of three years.

2. To increase the membership period required, before being eligible for election to RSGB Council, from three to five years.

3. To increase the membership period required, before being able to nominate a candidate for the RSGB Council, from zero to five years.

4. To increase the mininum number of Council members which have to be present for decision making from seven to eleven.

The first and last resolutions comfortably achieved the necessary two-thirds majority but both the second and third motions proved to be much more controversial. It was apparent that many of the 200 or so people present considered them to be really one proposal, and there was a lot of opposition to the idea of disenfranchising or restricting the participation of RSGB members in the decision making process. Notable speakers *for* the resolution were Council members Angus McKenzie G3OSS and Dain Evans, DL/G3RPE, while most eloquent *against* were G3YMM, G5CO, and G6LX.

When resolution 2 was put to the vote there was a clear majority against, and as no member called for a poll vote, the President declared the Resolution had failed to achieve the required two-thirds majority.

The debate on resolution 3 was much shorter, and on a card vote the majority against the resolution was greater than that against resolution 2. Just as the President was about to move on to resolution 4, however, Angus McKenzie, G3OSS demanded the right of a poll vote. This meant that any proxy votes were also required to be counted and whilst a number of people held proxies, mostly in single figures, three members held considerably more. They were Mr W J McClintock, G3VPK (RSGB President) 811; Mr F D Hall, GM8BZX (Executive Vice President) 96; Mrs J Heathershaw, G4CHH (Immediate Past President) 266.

It is unremarkable to note that these were the names suggested on the official proxy forms sent out by the RSGB. The meeting held its breath as those members holding large numbers of proxies cast theirs. Peter Crosland, G6JNS and others called on the President and Mrs Heathershaw to abstain in view of the obvious will of the meeting.

The votes cast by the large proxy holders were as follows: G3VPK (811 proxy votes) Abstain; GM8BZX (96 proxy votes) For; G4CHH (266 proxy votes) Abstain.

Resolution 3 therefore failed to make the necessary two-thirds majority by a large margin.

After the meeting closed, the traditional Open Forum was held in which a variety of topics were discussed. This part of the event proved as popular and as lively as ever, and the meeting closed at 19:00.

G4IJF

Editorial comment — I can't help feeling that there is a certain error of logic when a Society which claims to represent the interests of radio amateurs is actually debating motions which will decrease the scope of participation amongst its members. Are we to assume that the 1500 or so voters present or represented at this meeting are a) representative or b) the sum total of all the members who are interested in Society affairs? Perhaps the Society should consider the idea of postal voting (if only on fundamental issues such as these) so that members can consider the issues and register their views accordingly. Asst. Ed.

G4IRQ

Errata: Omega QRP PA

Several errors crept into the article describing the alternative Omega QRP PA described in the December 1986 issue, and we appologise for this. The corrections are as follows:

Page 22: Last sentence, third paragraph should read: "Considerable thermal protection is included but overdrive protection must be provided from the PA accessory circuit. **Figure 1:** a) T1 should be marked 6t and 2t; b) C22* across T4 secondary not labelled. **Figure 4:** a) Input pin to T1 omitted; b) Drive pin to R2 omitted; c) PO and Ea pins transposed.

Figure 6: Dept of the RF shield should be 30mm. Line 29 in third column should read ". . . while the *resistor* is removed . . .".

General:

Universal Semiconductor Devices advise that the output transistors 2SC2509 are available in two pin-out formats. Specify **Centre Emitter** when ordering. The driver 2SC2075 is difficult to obtain and may be replaced by 2SC2078 which is a slightly better transistor and more readily obtainable.

RA519 Coax

Geefor Enterprises of 112 Leeds Road, Mirfield, W Yorkshire, WF14 0JE inform us that they now have stocks of this cable at a price of 80p per metre. This cable is claimed to be of a particular use for VHF and higher, with losses on 100m of 3.2 dB at 100MHz, 5.4 dB at 200MHz, 7.2 dB at 400MHz and 13 dB at 1GHz. The cable is easy to work with as it has a minimum bending radius of 55mm.

TV Weatherman Jim Bacon G3YLA, visited Chesham & District Amateur Radio Society recently, and unravelled some of the mysteries of lift conditions and weather forecasting to the members of the club. During the evening, Jim also cut the ribbon to officially open the Club's new extension to the premises. Here we see Jim exhibiting his usual confidence in meteorological prestidigitation!

Look Before You Buy

The following Amateur Radio equipment was stolen on the night of 7/8 November 1986 from Roy Bailey, G6WLE, of the Malt House, Great Shefford, Newbury, Berks:

YAESU FT208R 2 metre hand held Serial No. 2CO81428, with speaker/microphone and ni-cad battery pack. The case that holds the battery has recently been renewed, and the internal resistor to the ear socket has been shorted, giving an improved audio level to an external speaker;
ALINCO ELH-230E 2 metre linear amplifier Serial No. 31106083, housed in a silvery case that is very scratched on one surface;
Oscar Dual-Band Mobile Antenna;
Ham International MS50 Extension Speaker.
Also stolen was a home-made power adaptor.

If your are offered any of these items for sale or repair, please contact your local police station and/or Roy on 048839 441. There is a reward of £25 for information leading to the recovery of all of the above property.

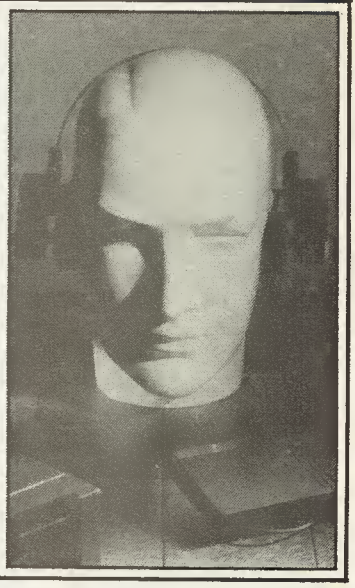
Charity Event

Success can sometimes bring problems of its own, and this has been the case with the treatment of children at Harefield hospital by Professor Magdi Yacoub. As a direct result of the advances in heart surgery, more and more children are able to be treated, and there is now a desperate need for a major extension to the childrens' wards.

In response to this, and as part of the Mayor of Hillingdon's Charity Appeal, local amateurs have banded together to set up a special event station GB2HHT over the weekend of Friday 16th to Sunday 18th January. They are looking forward to a large number of contacts on 80m and 2m over the weekend and are hoping that fellow amateurs will have a enough money left to send donations with their QSL cards.

Whilst the staff at HRT wish GB2HHT every success, it seems sad that such an important, vital service should have to rely so much on charity. Donations and QSL cards should be sent to London Borough of Hillingdon, Mayor's Parlour, Civic Centre, Uxbridge, Middlesex UB8 1UW (cheques made payable to The Mayor's Charity Appeal 1986/7). Special QSL cards will be sent out by GB2HHT.

The ultimate in laid-back ear-wigging? Kewmode Ltd have introduced this infra-red headphone system which not only takes the wiring out of your 'cans' but also adds a simulated stereo effect to the headphone socket output of any audio device. The AR980 TRX has a range of up to 40ft, for those of us having exceptionally large radio rooms, and costs about £40. Kewmode can be contacted at Unit C, Faircharm Industrial Estate, Evelyn Drive, Leicester LE3 2BU. I wonder if they do an infra-red microphone link too . . .



YL-OM Midwinter Contest

Over the weekend of the 10th and 11th January there will be a contest based on contacting YLs. YLs in the contest accumulate points for working other YLs and OMs; OMs score points only by contacting YLs. Each OM is worth three points (to YLs only, remember) and each YL is worth five points, SWLs may also enter.

The contest will cover all of Europe on all HF bands, and both CW and SSB will be used (CW on Saturday 10th, SSB phone on Sunday 11th), but cross mode working isn't allowed. The exact frequencies being used are given below.

The contests are scheduled to start at 0700 UTC and run to 1900 UTC each day. YLs should call 'CQ Contest' and OMs 'CQ OM'. Contestants should exchange the callsign of the station worked, reception report and the QSO serial number (start OMs at 001 and YLs at 2001). The same station worked more than once on the same band counts only once; stations outside Europe can count provided the other competition rules are followed. (Other log details should include time, date, band, YL or OM and multiplier.) The multiplier 13 for the number of DXCC countries worked: multiply the sum of the QSO points by the total number of different DXCC countries worked (each DXCC counts once regardless of the number of different bands you've worked it on).

On your logs, you will need to use separate logs for CW and phone, and you will need to show how you've calculated the score you're claiming, and use a multiplier column (entering it only once as it comes up). Print or type your name and address, and sign it, and send to the contest manager, D Wildeboer, PA3CEB, Kettingweg 3, 8281 PN Genemuiden, The Netherlands. Certificates will be awarded to the YL and OM winners, seconds and thirds in each category.

SWLs should show in their logs as well as the YL station they hear (OMs don't count) the station being worked.

Inflation? Not Here!

The British Amateur Radio and Teleprinter Group (BARTG) are very pleased with themselves because they've managed to hold down the cost of their membership subs to £7 for 1987, the same as last year. BARTG are heavily into all sorts of digital communication, including teleprinters, facsimile, AMTOR, and packet radio, and if this is what interests you then send your sub to: John & Pat Beedie, Ffnnonlas, Salem, Llandeilo, Dyfed SA19 7NP.

Digipeater operational!

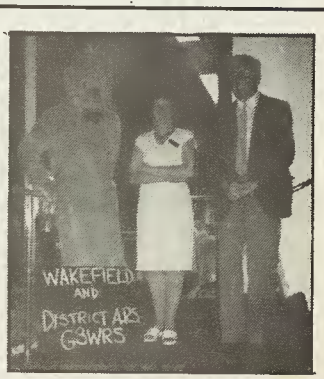
The Packet Radio Digipeater GB3HP located at Olivers Battery near Winchester, Hants, is now operational. It was constructed by members of AMRAC (AMateur Radio And Computer club) and operates on 144.650MHz using the AX.25 packet protocol.

The hardware consists of a standard PK-80 terminal node controller supplied at a discount by ICS, and a 25 watt FM PMR rig generously donated by Pace Mobile Radio. The antenna is an Isopole supplied by ICS. It is hoped, licence permitting, to add an IBM PC clone to the repeater to provide a mailbox/bulletin board service.

The digipeater is expected to provide good coverage of Hampshire and AMRAC would welcome any reception reports from Amateurs and SWL's. They should be sent to the GB3HP project leader, Lloyd Arrow GIJAR QTHR.

AMRAC publish a bi-monthly newsletter which deals with all forms of computer communications such as AMTOR/ ASCII/RTTY as well as packet radio. Membership is currently £5 per annum in the U.K. and £8 for Europe. Further details may be obtained by sending an SAE to the secretary: Phil Bridges, G6DLJ, 9 Hollydene Villas, Hythe, Hants SO4 5HU. Tel: 0703-847754, or Prestel Mailbox 703847754.

Some people will do anything for a bit of publicity, and believe it or not the person in the animal hide is the secretary of Wakefield & District ARS, John Bryan, G4VRY. Standing with him but trying to look as if they don't know him are Chair Rae, G4JMT, and Treasurer Arthur who's an SWL: photo by G3WWF (They wanted us to say that John was *bearly* recognisable, but we couldn't print such an atrocious pun).



Government to sell Airwaves?

The allocation of radio frequencies for all forms of radio communication should be handed over to the private sector and be run on a profit-seeking basis, a DTI-commissioned report now being considered by the government recommends.

As revealed at the COMEX 86 specialist mobile-radio conference being held here by the trade body, The Federation of Communications Services (FCS), the report from consultants CSP International Ltd. recommends the wholesale adoption of the concept that has become known in the industry as 'spectrum pricing' — the allocation of radio frequencies not on the traditional "first come, first served" basis by government licence, but instead according to market forces.

According to Mr H. Collins of CSP International, the report recommends that the government effectively gives up detailed control of the whole civilian radio spectrum — which it has exercised ever since Marconi first came to London in the 1890s to build the world's first practical radio communications system.

Instead, according to the report, the government should hand detailed control over the whole radio spectrum to independent Spectrum Management Licensees (SMLs). Each SML would be given control over a whole block of radio frequencies in order to act as a spectrum "wholesaler", selling on individual radio frequencies within the block to radio-communications end-users on an effectively "retail" basis.

Of these SMLs, several would be existing major users of radio frequencies. Examples given by Mr Collins included British Telecom (BT), BBC, IBA and possibly the independent telecommunications operator Mercury. These major users would be allocated overall blocks of frequencies that would then be re-allocated to individual internal departments.

Most SMLs, however, would be a new kind of private-sector "licensing bureau", termed Frequency Planning Oranisations (FPOs). According to Mr Collins these would typically be divisions of existing professional radio-engineering companies, to be selected for the role by the government by the kind of evaluation exercise recently undertaken to choose the network-operator companies now running the UK's cellular-radio systems.

The number of FPOs selected and the frequencies allocated to them would be chosen so as to ensure direct competition between them in allocating individual frequencies to end-users. FPOs would have full responsibility for ensuring that their allocations would meet technical standards to avoid interference etc. and would have to police "their" sections of the radio spectrum to ensure that they were not being used improperly.

In return, each FPO would then be free to allocate frequencies under its control essentially as it sees fit, and to levy its own charges accordingly. Any dangerthat this would result in exploitative overcharging of radio users would be overcome by the competition between FPOs built into the new market structure. Typically, it was expected, each FPO would base its charges on its own costs plus a normal commercial operating margin. It was admitted, however, that even this would probably result in higher charges being faced by existing radio users.

For both existing and new radio users, the real advantage of the new approach would be increased flexibility and ease of obtaining access to radio frequencies. The private-sector FPOs, it is felt, would be much more responsive to users' needs and much more efficient in meeting them than the government's existing Radio Regulatory Division (RRD), part of the Department of Trade and Industry (DTI). Under the new market structure, the RRD's role would shrink to simply providing technical co-ordination between SMLs and also acting as an umbrella spectrum-regulating organisation for representing the UK in international negotiations etc.

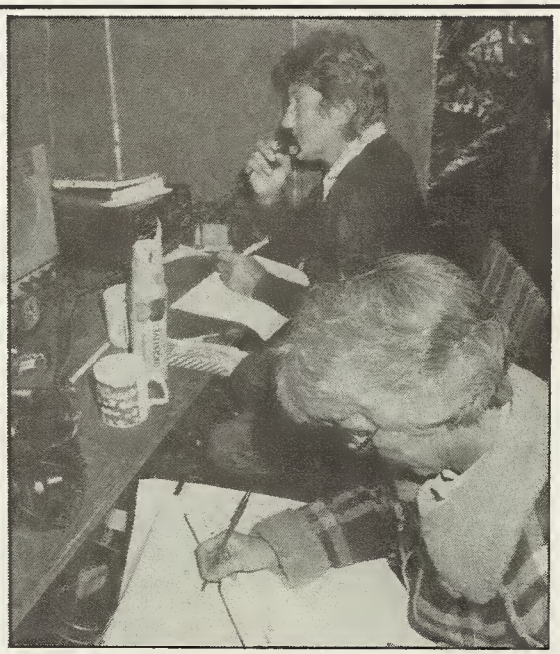
According to the report, the new privatised approach would provide the most efficient basis for encouraging what is seen as a coming explosion in radio-communication usage in the UK. For example, while there are currently only some 400,000 mobile-rados in use in the UK, this is expected to rise to over 1,000,000 by 1995, most of the growth being in the new technically advanced "trunking" systems due to come into operation for the first time next year. By 1995, there should also be over 500,000 cellular-radio users, over 1,000,000 radiopager users, and over 3,000,000 users of 'cordless' telephones.

Also, it is felt that the "pay as you use" approach built into the new market structure will act as a spur to new technical developments that allow more efficient use to be made of individual radio frequencies. With users having a direct commercial incentive to reduce the size of radio-spectrum "bandwidth" they employ for each communications task, the overall efficiency with which the radio spectrum is used should increase dramatically. In fact, the report predicts that all the expansion in radio-communications usage expected between now and 1995 will as a result require only some 20%-40% more "bandwidth" to be allocated.

The report therefore seeks to overturn what has been the generally accepted argument in favour of the present approach to the allocation of radio frequencies: that the radio spectrum is a limited resource that needs to be "rationed" by government licensing in order to allow fair access to all the benefits of radio communication. Instead, the report argues, there is no practical shortage of radio frequencies, and that the widest possible access to the benefits of radio communication can be best ensured by the new 'free market" approach.

At the COMEX 86 conference discussion of the CSP International presentation dominated question time. The general tone of questions from COMEX delegates, all of whom are professional participants in the mobile-communications industry, was summarised by the Conference Chairman, Prof. M. Beesley of the London Business School, as "guarded". Doubts were expressed about the likely cost increases to be faced by users, the technical resources that the new FPOs could bring to their tak, and the effect on current attempts to promote pan-European radio-communication standards that the adoption of the new system by the UK would have — none of the UK's European partners are likely to be in favour of any such "privatisation" of their own radio-frequency allocation procedures in the foreseeable future.

Exactly how these proposals will affect radio amateurs is not yet clear; will our licence fee be increased to pay for the frequencies we use? Time alone will tell...



One healthy trend in amateur radio over recent years is the growing number of women getting into the hobby, here we see Liz — G0ETU and Shirley — G4HES (nearest the camera) working the night shift for the Chesham DARS during the RSGB 144MHz Trophy Contest.

Multi-mods for the FT290

Say goodbye to button fumbling on your FT290 with this auto-toneburst mod from Brian Kent, G6EXX. You'll get a one touch listen-on-input and a pip-tone too!

This circuit is designed to control an FT290R, although it can be used successfully on many rigs. It will automatically cause a 1750Hz tone to be transmitted for a period of 0.7 secs when the PTT is closed.

The associated control logic allows the circuit to determine simplex or repeater shift mode and therefore only allows full operational status when using repeaters, leaving simplex clear of any tone. In addition to this, several amateurs have mentioned that they would like an end of transmission tone when keying down on SSB, and as the 4013 used in this design is a dual D type package, there is a spare D type that will perform this function admirably. Provision for 'listen on input' is made by use of the now redundant 'call' button, though you have the choice to retain this function.

The design has taken into consideration various triggering standards so that it should be as easy to adapt the unit for use in other rigs. One point should be noted and that is there must be a 1750Hz tone generator fitted to the rig so that this mod can control it.

How it works

Nearly all 4-bit processor controlled transceivers have two shift lines for up and down repeater shift. This is true for 2m and well as 70cms equipment. With internal pull up, these lines are normally high and mode selection is by means of a switched line being pulled low. This action is used to our advantage here and allows the circuit described to determine when to and when not to switch on the timed 1750Hz tone.

Two NAND gates (IC1a and IC1b) are used which are wired as inverters, the inputs of which are connected to the up and down processor control leads. The two outputs are diode OR'ed and fed to IC1c where the output of the inverter then controls the final gate, IC1d. With both input control lines high (simplex), the output of IC1d will be low. However if either up or down shift is selected, this output will go high and it is this that dictates the next action of the D type flip flop — used here as a non-retriggerable mono-stable, (IC2).

The D (Data) input determines the output state of Q following a clock pulse which is generated each time the PTT is closed. This pulse is simply the 6.8V that is relay switched to the transmitter section. Assuming repeater shift has been selected, IC1d will be active high as will 'D', and on PTT operation the clocking pulse will transfer this high to the 'Q' output which will begin to charge C1 via R2. Eventually this charge will force a reset of the mono-stable and the timing cycle is complete.

The duration of the tone is determined by 0.7 x RC, which in our case gives an active period of 0.7 seconds. The 'Q' output also drives transistor Q1 via R3 and this transistor is left open collector to act as a switch and activate the tone generator and transmitter. *Do not* be tempted to include any pull-up on the input gates as they may exceed the supply voltage to the processor and irreparably damage the chip. A positive triggering edge is used as against the negative going PTT line so as to allow easy transfer of the design to different rigs.

However, for the SSB end of transmission tone, the PTT line is used to obtain the clocking pulse. When transmitting, the PTT line will be low and when released it will go high, which will clock the D type and cause it to begin its timed cycle in the same way as described before. The 'Q' output will then bias on the Tx switch and tone generator

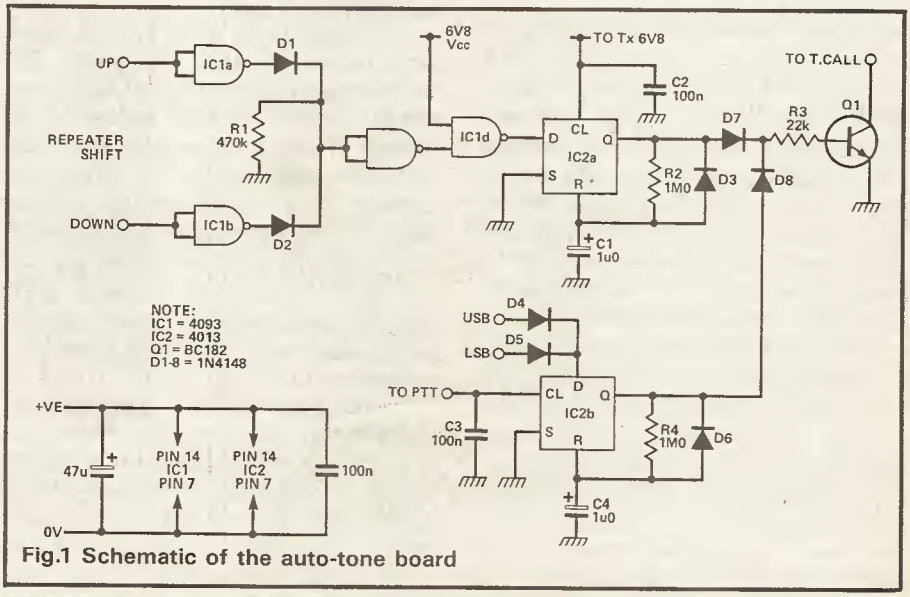
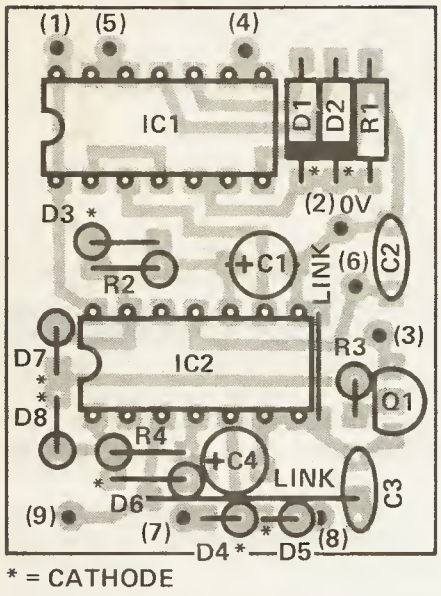


Fig.1 Schematic of the auto-tone board



* = CATHODE

Fig.2 PCB component placement

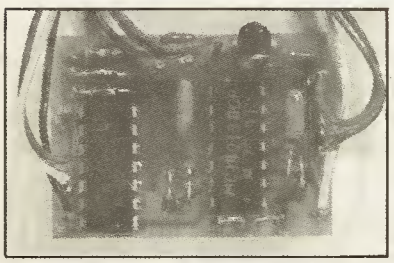


Photo of the finished board

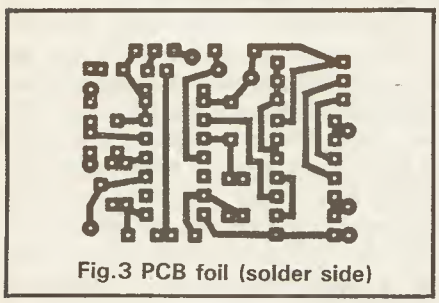


Fig.3 PCB foil (solder side)

resulting in a 400mS tone burst at the end of an SSB transmission. The USB and LSB 6.8V lines are used to control the D type, these lines are diode OR'ed and fed to the D input which again means that the transceiver has to be in SSB mode before this circuit can work. It will not therefore put a tone on the end of FM, CW, or repeater transmissions. The major advantage of this design is that everything is fully automatic.

When fitted to the FT290R, you can turn off these functions if you remove the two wires on the noise blanker switch, short them together and insulate the join. The open collector output from the mod board can now be routed through this switch to the T.Call position as normal, only now you will be able to switch the functions on or off — with the exception of listen on input.

Construction

Construction of the circuit is very straightforward and although the use of the PCB is recommended, it can be built on a small piece of Veroboard. Start by fitting the two links, Vero pins and the four resistors, then fit the capacitors and diodes. Finally, fit the two IC's and transistor. The IC's are CMOS and the normal handling procedures should be used; I must say that I have been using CMOS for years and have never lost one yet. Finally, solder the wires to their respective pins and try to use the colour code shown in the drawings. Before fitting the board, wrap it in insulating tape.

Installation

To install the unit, open up the 290 with the battery compartment uppermost then find a small panel with two switches on it located toward the back of the transceiver, above the aerial. Unscrew and lift this away to reveal an area by the side of the battery compartment where the wrapped board can be gently eased into position. This assumes that you have a MuTek preamp fitted, otherwise you will have plenty of space by the side of the synthesizer. There is no other convenient way to mount this board as space is at a premium but when the switch panel is replaced, the board is held solid.

Wiring up is very simple once you unscrew and lift away the battery compartment. But note that there should be no batteries or power of any kind on the rig while you are working on it. With the battery holder removed you will be able to see the solder terminals of SK1 and you start by soldering the red lead (1) to pin 5 counting from the right and looking from the solder side, this is the 6.8V regulated DC supply.

The black (2) 0V lead can be soldered to any convenient point on the chassis, for instance if a MuTek board is fitted as in my rig, then solder this lead to the earth plane. Refer to **Fig.5** to check against the rig's wiring colour code. Solder the orange (3) lead to pin 11 which is T.Call.

COMPONENTS LIST

RESISTORS
R1 470k
R2 1M
R3 22k
R4 560k
All resistors ⅛ or ¼ W carbon film

CAPACITORS
C1,3 1uF 16V tant
C2,3 0.1uF Min ceramic

SEMICONDUCTORS
Q1 BC182 or ZTX108
D1-9 1N4148 or similar
IC1 4093 CMOS
IC2 4013 CMOS

MISCELLANEOUS
PCB, Vero pins, stranded wire (red, orange, yellow, black, blue, mauve, green, grey, white), insulating tape.

At this stage you should ask yourself if you still want to use the 'Call' button on the rig as normal, bearing in mind that repeater access will be automatic when the mod is completed. If you don't (because you can always give the PTT a quick stab and let the mod do the work), then remove the white/red wire as indicated in **Fig.4**, insulate the end and tuck it away somewhere safely. Then connect a diode in place of the wire and solder the other end to SK2, as shown. This will have disabled the call button from transmitting a tone and turned it into 'listen on input' so that on receive you can quickly check on the input frequency to see if a simplex copy is possible. Good eh! If you *do* want to keep the call facility then leave the white/red lead connected and don't fit the diode.

Turn the rig over and remove the cover, then unsolder the speaker wires, it will make life easier! Refer to **Fig.5** and locate the two control wires, green and black/white on SK3. It is easier to remove some of the insulation from these wires and solder to the bare wires than trying to solder directly to the plug. Connect the yellow lead (5) to the green lead and the mauve (4) to the black/white one, then insulate the joints. The trigger comes from the Tx6.8 point which is from the relay so you should now connect the blue (6) to TX6.8 as shown. As you can see, this positive going trigger pulse

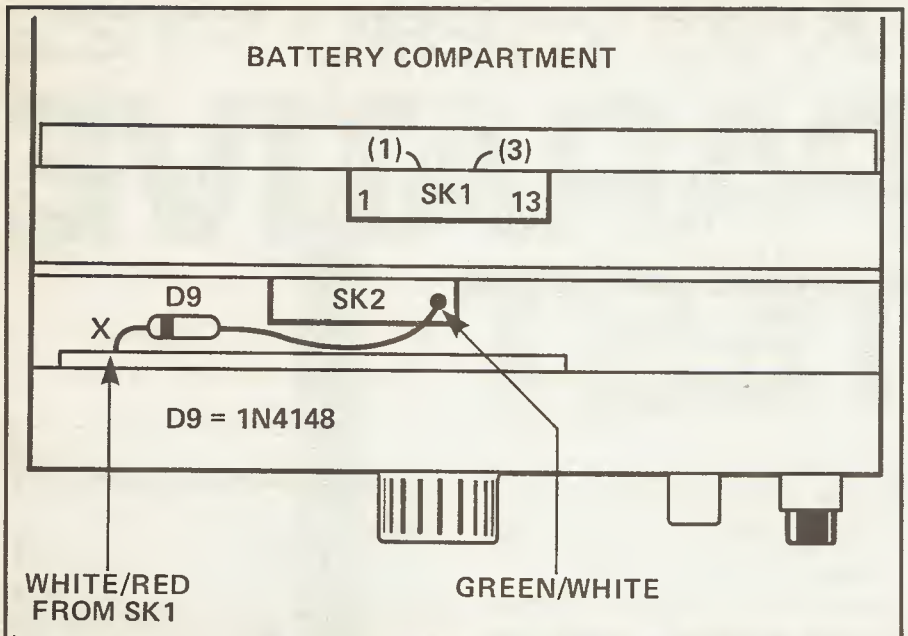


Fig.4 Listen-on-input modification. Remove White/Red wire and insulate. Then connect the D9 diode as shown.

is the same on all rigs which makes it easy to adapt the design for other makes.

Up to this point we have now fitted the auto repeater tone burst and opted for or against listen on input. Now you have the choice of fitting the SSB end of transmission tone or not, should you decide against it then connect the grey, green and white leads to ground and put the 290 back together. Otherwise, refer to **Fig.5** and connect green (7) to yellow, grey (8) to blue, and lastly white (9) to white/green. Reconnect the speaker and refit the battery compartment, then double check your work. When you are sure, power up, and away you go!

In use

When in simplex mode, no tone bust will be transmitted due to the simple control logic and on SSB, keying down will insert a 400mS tone burst, or to be more precise, 395mS.

As fitting this mod will leave the call button redundant, I do recommend that you fit the listen on input mod which is very simple and enhances the rig. This is only effective on repeater shift mode.

There will be no interaction between modes, each modification has its own specific function and is under complete control of the logic. For those who may be saying "at what expense in battery power", the answer is that this unit has been designed with CMOS, just for that reason and consumes no more than 0.5uA quiescent and 30uA active, a simple LED takes over 10 times this.

This mod will fit most Yaesu rigs and some others, as processor controlled rigs follow similar lines and I will be happy to answer any questions you have on individual rigs. On a non processor rig, simply connect the yellow and mauve leads to the positive supply rail.

Suppliers

A complete kit is available for £9.95 (or £14.45 built and tested) from:
Southern Electronics
47 Jocketts Road
Hemel Hempstead
Herts HP1 2JX.

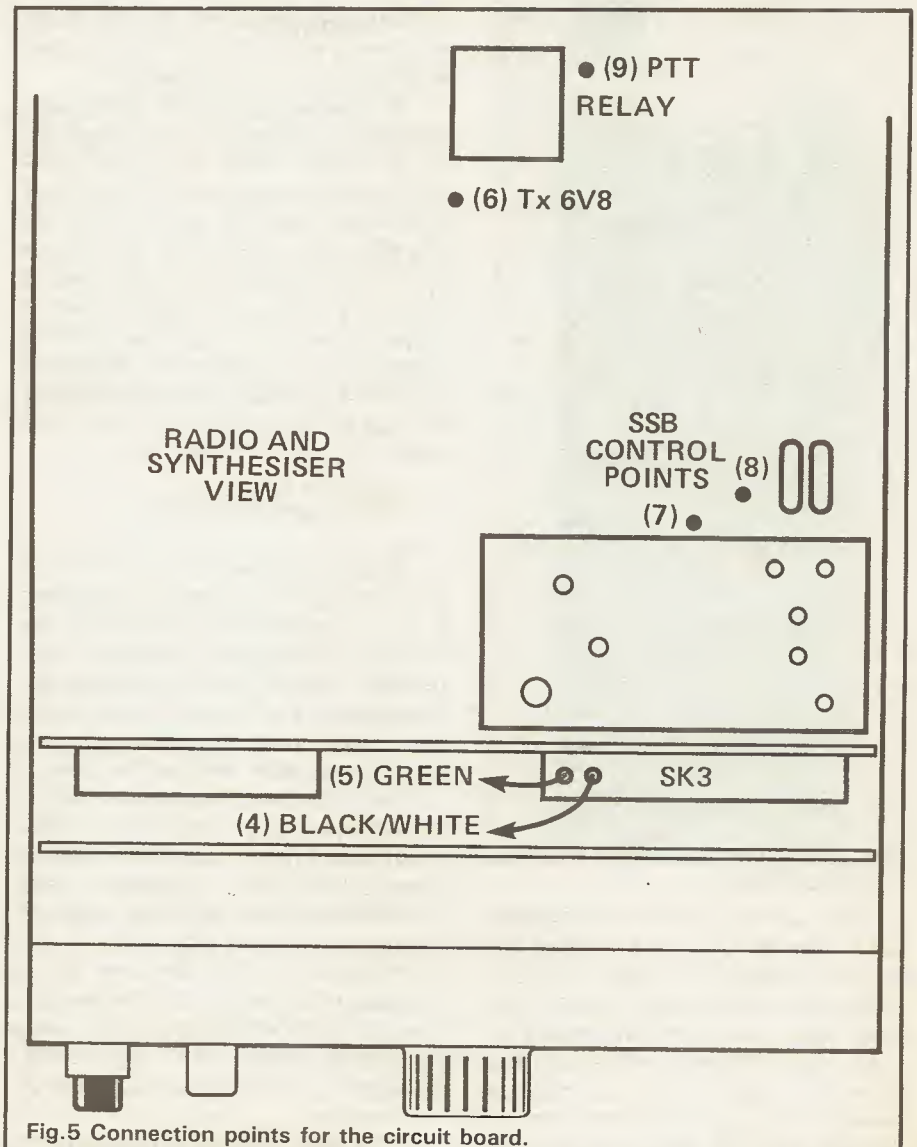
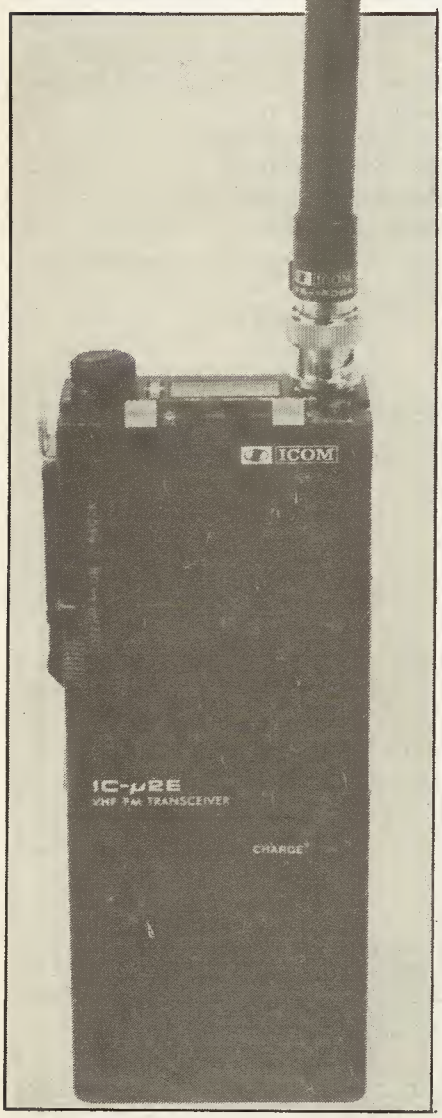


Fig.5 Connection points for the circuit board.

ICOM µ2E AND YAESU FT23 COMPARATIVE TEST

Yaesu and Icom come out of their corners ready to fight for the mini-handheld market. Chris Lorek, G4HCL, finds out how they square up.



The Icom u2E

The Yaesu FT23

At the Leicester Show, two new handhelds for 2m were shown off. No, you couldn't by them, but you could look, touch, and gasp at their small size. The question asked by many was "When will you have them for sale?" with no definite answer being given! The sets in question are, of course, the Yaesu FT23R and the Icom IC-u2E, both appearing within days of each other and obviously in competition.

Both are roughly the same size and weight, offer full coverage of 2m in 12.5kHz steps with an LCD frequency display, have ten memory channels, and to cap it all are virtually the same price! So what's the difference between the two, is one by far the best or is each a compromise? Who will be able to repair such tiny gear when (or indeed if) it goes wrong, or are we reaching the age of throw-away sets, just like digital watches? Read on . . .

Different Markets

No matter how good a set it, if you can't get the hang of operating it then it's virtually useless to the owner. AOR and Icom were the first to bring thumbwheel-controlled 2m handhelds to amateurs many years ago. These were incredibly popular, almost everyone seemed to have an IC2E somewhere. They were fine for simple use, but were very fiddly when changing channels or tuning across the band. However many amateurs swear by this type of operation, because they know where they are and what they are doing (mostly!). At the other extreme, the gadget-orientated amateur likes facilities such as scanning, memories, and digital displays of everything.

The Yaesu FT23R is aimed at the latter individual, whilst the Icom IC-u2E is aimed at the former but giving a little more versatility over the thumbwheel type set, so it would be unfair to perform a direct comparison in many areas. Each set is therefore treated separately for review purposes, but with a comparative assessment only at the end.

Yaesu FT23R

The set is tiny, and until you have held it in your hand you cannot really appreciate this fact. With the 600mAh FNB-10 battery it measures 150mm(H) x 62mm(W) x 42mm(D) including the knobs but excluding the PTT bar extrusion and weighs in at 429g. The battery itself takes up nearly half this volume and weight, in fact you can easily cover the radio part with your palm. Optional lower and higher capacity batteries are available with corresponding changes in size. The standard transmit power is 2.5W nominal, with a switchable low power mode. Using a 12V supply, such as the FNB-11 battery, gives you an increased power output of 5W nominal.

Frequency coverage is from 144MHz to 146MHz in selectable 25kHz or 12.5kHz steps. The suppliers of the review set also offer a modification to the receive range covering 140MHz to 164MHz for the more nosey amongst us, providing an alternative if 2m is quiet! Frequencies may be stepped up or down by either the rotary top control, or by Up/Down buttons on the facia. 1MHz steps are selected by pressing the 'Function' button, as is full reverse repeater operation. Ten memories are available, each storing frequency and any repeater offset. If the optional sub-audio tone squelch unit is fitted, the tone frequency may also be stored. Seven of the memories may be used for non-standard transmit-receive splits if you wish, by use of the PTT switch whilst programming.

Scanning the entire frequency band is possible by keeping either of the up or down buttons pressed for at least a second, with the scan halting on an occupied frequency and resuming a couple of seconds after the squelch has closed. Similarly, scanning of programmed memories can be initiated in the same way and you may skip channels from the scan by 'hiding' them with a further few button pushing operations. Priority channel scanning is another single button-push function which checks a preset frequency every few seconds, locking onto it when it is occupied. Sub audible tone frequencies, if fitted, may be selected by a combination of button pushes or knob

Detail of the controls, FT23 — lack of LCD backlighting is a drawback.

rotation, and to save you altering everything accidentally in use you may enable a keyboard lock function, which allows you to change frequency using the rotary channel knob but disables all the facia controls.

With all these features operated by eight buttons, Yaesu thoughtfully provide a small foldout pocket guide to operation, designed as a 'memory jogger' to help you get used to controlling the set. The LCD display shows operation frequency, memory channel in use, a tiny + or − indication for a selected repeater offset, and a nice bargraph display of relative transmit power and received signal strength. A dual colour LED next to the LCD lights up in green when the receive squelch has lifted, and in red when in transmit mode.

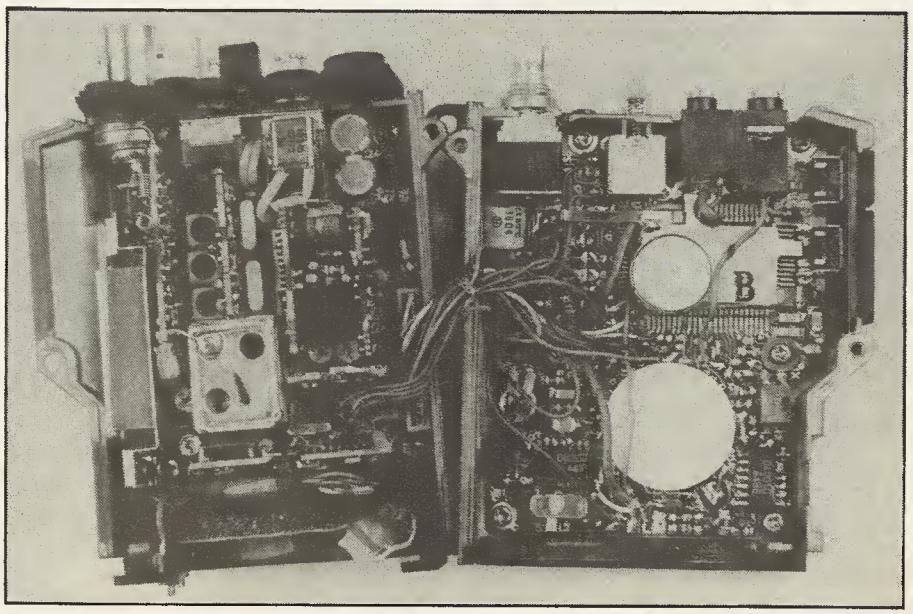
The PTT switch on the side of the set has a 1750Hz tone button adjacent to it and the set top houses external mic and speaker connectors, high/low transmit power switch, rotary controls for on/off/volume, squelch, and channel/frequency change functions.

Mechanically Rugged

The upper part of the radio is completely sealed against moisture by the use of rubber gaskets, the only way water can enter is if you remove the battery and turn the set upside down to expose the battery contacts. A diecast chassis is used for the radio section and Yaesu claim that it may be dropped from one metre without damaging the set. When I collected the review unit, the dealer offered to demonstrate this, however I declined the suggestion — wishing to ensure I had a working set to take away! A stubby helical whip is supplied, at 100mm long this is around half the length of a normal helical and increases the set's compactness further. A soft plastic case and carrying wrist strap are also supplied, but you have to pay extra for the required nicad charger.

Opening the set up shows two main printed circuit areas, one on the front panel housing the microprocessor control side, the other on the rear chassis containing the analogue circuitry. The latter employs a 'mother' board with seven 'daughter' boards soldered in, the TX power amplifier module being mounted onto the PTT extrusion to provide heatsinking. The vast majority of the circuitry is in surface mounted 'chip' form with its production convenience and maintenance inconvenience! All components are accessable however, but I would think that board replacement would be the norm in case of a fault rather than

Internal view of the Yaesu rig



repair down to actual component level. Not exactly a 'throw-away' set, but we're getting there.

Circuit Description

The handbook has no circuit information whatsoever, not even a block diagram, which I feel is very unsatisfactory. I suppose Yaesu think we're all black box operators and want to send the set to the dealer if the microphone gain or deviation needs adjusting! A workshop service manual will be available for purchase *'sometime in the future'*, but I feel basic adjustment information and at least a circuit block diagram should be included in the handbook — black mark Yaesu. Following enquiries, a circuit diagram copy was promised to be available to users on request, although this hadn't been received at the time of writing. As a result, the following is educated guesswork, so please don't shout me down too much if I'm not exactly right!

The aerial connector solders straight onto the low pass filter and PIN diode switch board, where the signal is passed to the Rx or Tx circuitry as appropriate. On receive, a four stage varicap tuned front end is used, followed by a mixer with local oscillator injection from the VCO (voltage controlled oscillator) operating at the receive frequency minus the first IF (intermediate frequency) of 10.7MHz. The resultant IF signal is passed via two monolithic dual crystal filters to a Toko 10240 IF subsystem IC which performs mixing (to the second IF of 455kHz), demodulation, noise squelch detection and switching. A 455kHz ceramic resonator is used rather than a quadrature coil for demodulation and a single-in-line audio IC amplifies the demodulated audio to loudspeaker level.

On transmit, the VCO operates at the final fequency and is directly modulated to provide FM. This is then amplified and fed to the block PA module for amplification to the final transmit power level, before being fed to the low pass filter and aerial connector. The VCO signal is also fed to a discrete 8-pin dual modulus prescaler, under the control of a Motorola MC145156 synthesiser IC. Here the divided signal is phase compared with a crystal controlled reference and the error signal is used to phase lock the VCO onto the programmed frequency.

An 80 pin custom microprocessor IC controls the housekeeping functions of the set and has a small metal screen soldered over it to prevent EMC problems with the receiver RF circuits. On transmit the processor goes into a 'dead' state to prevent further EMC problems, the toneburst being separately generated with a 4066 CMOS IC. A large lithium battery, cleverly disguised as the rear of the internal speaker, supports the memory facility when the rig is switched off. This is not mentioned at all in the handbook, but I would expect a reasonable service life.

An interesting feature is a 'cloning' capability which uses a built-in modem similar to home computers, where the memory contents of one set may be fed via the speaker and mic connections to any number of other sets. This could be extremely useful for RAYNET groups wishing to use 'channelised' operation.

On The Air

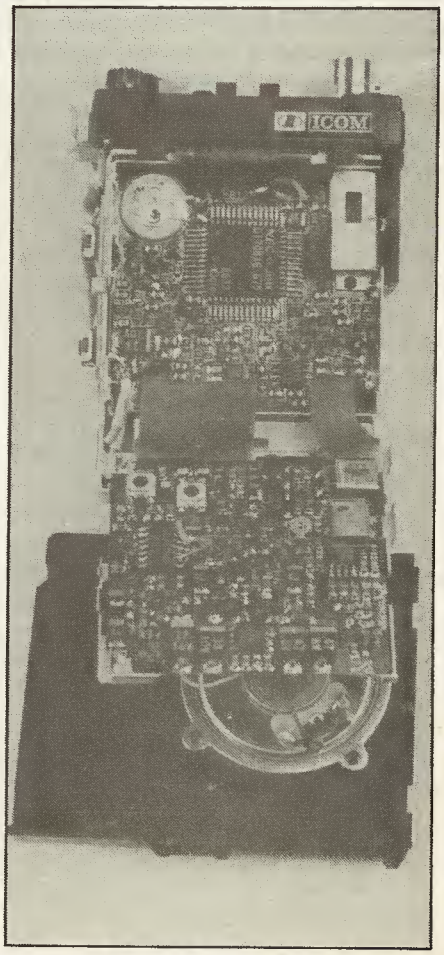
I must confess that I couldn't wait to try the set out without reading the manual first; in doing so I found it very easy and straightforward to use, showing a sensible logic in Yaesu's choice of operation modes. Due to the many second functions required from so few buttons, I must commend the designers on this point as many keyboard controlled sets really are difficult to operate. Eventually reading the manual confirmed what I had learned from a minute or two of experimentation, an internal piezoceramic transducer gives a small 'bleep' with each correct button push, and two bleeps if you do something wrong, this also functions as a low battery warning indicator when sounding constantly.

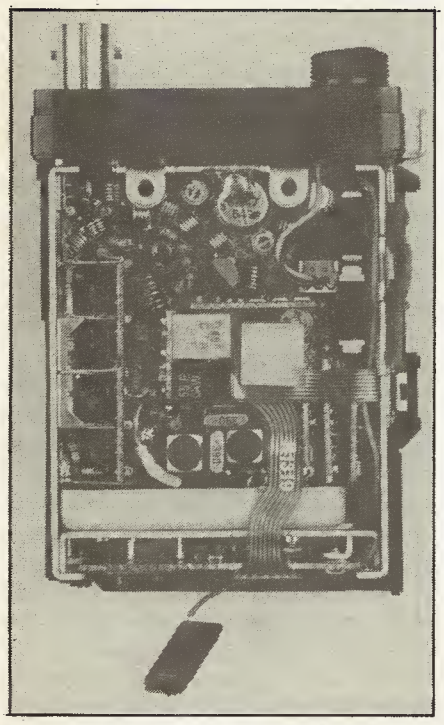
Reports of the transmitted audio were quite good, without excessive colouration or breath noise pickup. The receive audio I thought was just about ample for most uses though it would be rather lacking if you had the set in an inside pocket as I often did. I missed one or two calls as a result, even with the volume at maximum, and the speaker cone also tended to rattle at high volumes, limiting the readability further.

The short aerial was more efficient than I had hoped, being only a dB or two down on a 'full size' helical, and the receive sensitivity appeared reasonable. Testing the set on my home aerial system showed good rejection of +/−12.5kHz spaced signals and I experienced no blocking problems even from my local amateur friend 200m down the road.

One serious problem I did note was the complete lack of any LCD backlight! Walking down the street on these dark evenings, trying to QSY from the local repeater to a simplex channel without falling foul of the microprocessor was rather difficult, there was no way I could find out what frequency the set was on. Tut tut Yaesu, which designer's got the sack for this omission? I also found the on/off/volume control awkwardly placed in between the squelch knob and the rotary frequency control, nimble fingers would have few problems but I found it difficult when wearing gloves. In all, I was very pleased with the simplicity of operation and the radio performance, but only when done in daylight.

Internal shot of the Icom unit





FT23 Laboratory Tests

Measuring the receive sensitivity showed it to be reasonable but not oversensitive, taking into account the transmitter output power. What impressed me was the excellent +/−12.5kHz rejection, and the generally good strong signal handling capabilities of the set in other respects. The high maximum squelch setting would allow rejection of unwanted co-channel signals such as distant repeaters, and the bargraph signal strength meter had a useful range of over 20dB, even if it was reluctant to start indicating on weak signals. The receive current was a bit high, doubtless due to the ECL (Emitter Coupled Logic) prescaler IC in the synthesiser, although the economiser reduced this to an acceptable level if the rig was not in scan mode and there was no received signal. The low battery indication sounded as 4.8V was reached and the set remained operable in a fashion right down to this low voltage.

The transmitter showed reasonable harmonic suppression, and no untoward spurii were noted. The power efficiency was reasonable at 35% overall, taking into account the use of a wideband PA module. A very useful power level of over 6W was noted with a 12V supply, but I would not like to use this too much for long ragchews from home due to heatsinking limitations of the PA, my fingers would start getting hot! The deviation was set well at just below the 5kHz absolute maximum level.

As the transmitter was keyed, I noticed a quick 'splurge' of RF power as the synthesiser settled onto frequency, further investigation showed there was no out-of-lock inhibit either on transmit or receive. This should not cause too many problems though it shows that corners have been cut in the set's design stages.

LABORATORY RESULTS — FT23R

Receiver

Sensitivity: 0.20uV pd for 12db SINAD

Squelch Sensitivity	
Threshold	0.112uV
Maximum	0.356uV

Receive Current Consumption	
Economiser	18mA
Standy	68mA
Mid Volume	123mA
Max Volume	198mA

Max receiver audio output: Measured into an 8ohm load at the onset of clipping 235mW (480mW with 12v supply).

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

Separation	Rejection
212.5 kHz	51 dB
−12.5 kHz	41 dB
+25 kHz	69 dB
−25 kHz	69 dB

Image Rejection: Increase in level of signal at −21.4MHz to give identical 12dB SINAD signals 64.5 dB

Blocking: Increase over 12dB SINAD level of signal 1MHz away to cause 6dB degradation in 12dB SINAD on-channel signal

+1MHz	93dB
−1MHz	87dB

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

Spacing	Rejection
12.5/25kHz	68dB
25/50kHz	72dB
50/100kHz	71.5dB

S-Meter Linearity		
2 units	0.75 uV pd	0dB ref
4	1.175	+3.9dB
6	1.718	+7.2
8	2.37	+10.0
10	3.24	+12.7
12	4.47	+15.5
14	8.22	+20.8

Transmitter

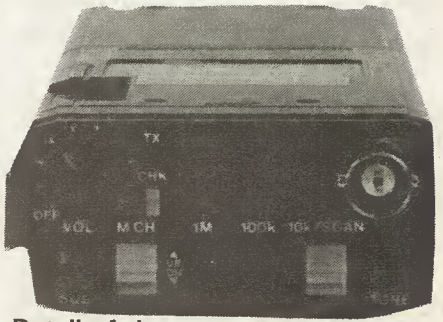
TX Power and Current Consumption		
	7.2V	12.0V
Low Power	0.23W/412mA	0.31W/485mA
High Power	2.34W/907mA	6.55W/1.47A

Harmonics/Spurii	
2nd Harmonic	−62dBc
3rd	−75
4th	−72
5th	−83
6th	−58
All other outputs less than −85dBc	

Peak Deviation	4.82 kHz
Toneburst Deviation	3.54 kHz
Frequency Accuracy	Within 50Hz on switch-on

Icom IC-u2E

When Icom brought out the IC2E, it was very popular, amateurs liked the facility of a go-everywhere set that offered versatility but was still simple to operate. Trio brought out the TH21E, a minature version of a thumbwheel set, so it was natural for Icom to have come up with something new, in this case a very advanced set indeed in my opinion yet still giving a simple mode of control.



Detail of the control panel, u2E

Offerings

From the photographs you can see it is virtually the same size as the Yaesu, in this case 150mm(H) × 60mm(W) × 30mm(D), and weighing 345g including the supplied 270mAh BP22 battery pack. Optional battery packs of 120mAh

and 600mAh are also available. It's predecessor's thumbwheels have been replaced by spring loaded centre off toggle switches adjacent to an LCD display, which step the operation frequency in units of 1MHz, 100kHz, and 12.5kHz. As well as discrete frequency stepping, it is possible to manually scan the frequency range by keeping the 12.5kHz switch pressed. A further toggle switch allows access to ten user-programmed memory channels. Band coverage is 144MHz to 146MHz, but receive coverage can be extended from 139MHz to approximately 167MHz, the tens of MHz units being shown by a small dot-type indicator preceding the MHz digit. Transmitter power output is quoted as 1W, with switchable low power to 100mW. A graduated bargraph display on the LCD indicates relative TX power becoming an S-meter on receive.

Top-mounted rotary controls are fitted for volume and squelch, with push buttons for 1750Hz toneburst and reverse repeater check. The rear of the set houses slide switches for +/— repeater shift and high/low TX power, and a vertical side-mounted sliding bar allows frequency locking to prevent accidental shifts. The standard 600kHz repeater shift can be modified to any shift up to 39.9875MHz or so the manual says, to which I would reply — pull the other one! Adjacent to the PTT bar is a push switch for LCD backlight, which will remain on for a few seconds to allow frequency selection and so on without needing to use two hands. A red TX LED lights when you are generating power, serving as a low battery warning when failing to light on transmit.

The set comes supplied with a stubby helical aerial (very similar to that of the Yaesu FT23R), a wrist strap, a two pin plug-in wall charger and a user manual.

Impressions

The set is certainly an improvement in terms of size and operability over the IC2E. I've lost count of the number of times I've heard distorted signals through the local repeater due to owners having wrongly selected the +5kHz shift, this cannot happen with the u2E of course. It's a pity about the repeater shift though, this is still on the back panel and in my opinion just as difficult to use correctly. Again without reading the instructions first, I found the set extremely easy to use, the only problem I had was trying to find how to program memory frequencies. In the end, the manual was consulted and I found I was suffering from a case of not being able to see the wood from the trees, memories were automatically programmed for me as I selected each channel. Each memory holds what is selected by the toggle switches whilst on that channel, sheer simplicity! The plastic case however does have an 'economic' look and feel to it, suggesting to observers that it was little more than a toy — which is a shame.

Innards

Opening the case reveals the usual Icom technique of a metal hinged frame housing the PCBs. Thirteen of them in this case. All visible main circuitry, apart from the transmitter PA, was surface mounted 'chip', even the preset potentiometers. Two main motherboards house subboards, with the control board mounted directly to the top panel. The crystal-controlled toneburst is an 'add-on' board screwed to the underside.

The synthesiser VCO is mounted in a sealed module sandwiched between the other boards and much use is made of flexible wiring strips for interconnections. This should give a high degree of reliability to the set, consoling the serviceman a little until he becomes redundant. He may still have a job though, changing lithium memory backup batteries as there is a tiny one soldered into this set with an estimated lifetime of just 'one or two years'. This seems a rather silly state of affairs, as I'm sure they could have fitted a larger one, or two in parallel in the space available.

Circuitry

On receive, a dual conversion superheterodyne approach is used, with signals passing via a low pass filter to a four stage varicap tuned front end, employing 3SK302 FETs for both RF amp and mixer. The VCO operates at final frequency minus the first IF of 16.9MHz; this is mixed with the amplified receive signal and fed to the usual pair of monolithic dual crystal filters. From there into an MC3357 IC, where it is downconverted to the second IF of 455 kHz, filtered again in a CFUM455E ceramic filter, demodulated and passed to an NJM386 audio IC for amplification to loudspeaker level.

On transmit, the VCO is directly modulated by the processed audio and passes through three stages of transistor amplification to reach the final output power, a 2SC1947 being used as the PA whose case is soldered to the chassis as a heatsink. In the past, the use of power amplifier modules has been virtually standard in all Japanese transceivers and it is interesting to note Icom have done a U-turn in this respect.

Of further interest is the total absence of any synthesiser IC! The VCO is mixed down to a lower frequency in the region of 13MHz on transmit, and up to 34Mhz on receive — this being applied directly to pin 9 of the uPD1708AG micro IC, which apart from performing the usual housekeeping functions also acts as a programmable divider and phase comparator. Soon the day will come when we inject 2m into one pin of an IC and get audio out of the other end. No, I'm not joking, this is clearly one step towards that goal.

On The Air

I first tried the set mobile in my car, and was greeted with the response of 'turn it off, it sounds horrible!'. The reason for this was grossly excessive microphone gain, which brought up rather a lot of background noise. When using the set portable I had to hold it around 200mm from my mouth so as not to make me sound like an obscene phone call with all the heavy breathing. As the manual gives no mic gain adjustment information and the circuit diagram shows no potentiometer for this, I could not do very much about it. Apart from this, the transmitted audio was crisp and clear, not suffering from the usual 'woolly' audio experienced from it's predecessor.

The receiver seemed very sensitive indeed, with plenty of audio available from the tiny speaker, although I disliked it's slightly tinny response, again giving the impression of a cheap transistor radio. The backlight facility was superb however, the best I have yet seen in any portable, giving clear and bright illumination over the whole

display. Using the set mainly on receive, I found the battery life very reasonable considering the 270mAh capacity and I could easily monitor the local repeater at low volume all day as well as having the odd QSO without the set needing a recharge.

The on/off volume control was nice and large, and very easy to adjust. Similarly the toneburst control was easy to operate on transmit using one hand, this was very difficult on the IC2E so Icom must have learned from their mistakes. The first segment of the S-meter bargraph display appeared to operate as a 'busy' indicator, coming on whenever the squelch was raised.

Replacing the stubby helical with a 'full-size' one made more difference than was observed with the FT23R, a direct comparison between the two confirmed the Icom helical was around 2dB worse than the Yaesu one, a pity bearing in mind the low power output which must be used to it's best effect.

IC-u2E Laboratory Tests

Out came the signal generators and spectrum analyser again, the receive sensitivity was found to be impressive at 0.16uV, confirming the results found on the air. However due to this good sensitivity, the strong signal handling ability was found to be lacking, but this would probably only cause problems if you regularly use the set from home with a high gain aerial. You certainly won't need to switch an external preamp in with an add-on linear. The adjacent channel rejection of +/−12.5kHz was not too clever, although still far better than that of some other sets so I must not be too critical.

The maximum audio measured of just over 200mW was rather surprising taking into account the audible volume, signifying a highly efficient speaker. The low receive current measured was excellent, enabling a small battery pack such as that supplied to go a long way. The S-meter had a range of only 7dB between S3 and S9++ which is of limited use.

On transmit, the deviation was too high showing incorrect setting at the factory. This combined with the excessive mic gain would cause problems to others operating 12.5kHz away, as the set is designed for 12.5kHz steps I feel this is inexcusable. I would not have critisised this so strongly if Icom had shown in the manual how to adjust it, but of course they didn't.

The transmitter harmonics were well down in level and no other spurious outputs were detected above −85dBc. The power efficiency of just above 35% was lower than I expected for a discrete narrowband PA, but still reasonable and would not flatten the nicads too much. If attempting to transmit out of 2m, or in fact operating whenever the synthesiser became unlocked, the memory channel indicator changed to a 'U', and transmission caused the set to revert to 145.00MHz which is a useful safety feature.

Overall Conclusions

In comparing the two sets, there really is not an overall winner, the ruggedness and performance of the Yaesu is offset by the advanced technology coupled with ease of use of the Icom, so it really does depend on what you are after.

I must criticise the Icom for the outer case construction which I don't think will stand up to rough usage, a protective case would be money well spent as you would have saved some cash by not having to buy a nicad charger. The Yaesu offers greater versatility, but at the expense of button pushing operations that do not suit all amateurs. I must commend the rotary stepping knob which simplifies frequency changing enormously, whilst at the same time criticising the lack of any LCD illumination.

One thing is certain however, both sets really are marvellous and certainly an improvement over their predecessors.

My thanks go to R. Withers Communications for the loan of the review samples.

LABORATORY RESULTS — IC-u2E

Receiver

Sensitivity: 0.16uV pd for 12dB SINAD

Squelch Sensitivity	
Threshold	0.100uV
Maximum	0.195uV

Receive Current Consumption	
Economiser	7mA
Standy	24.8mA
Mid Volume	89mA
Max Volume	128mA

Max receiver audio output: Measured into an 8ohm load at the onset of clipping **210mW**

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

Separation	Rejection
+12.5 kHz	28 dB
−12.5 kHz	35 dB
+25 kHz	60 dB
−25 kHz	63 dB

Image Rejection: Increase in level of signal at −21.4MHz to give identical 12dB SINAD signals **74.0 dB**

Blocking: Increase over 12dB SINAD level of signal 1MHz away to cause 6dB degradation in 12dB SINAD on-channel signal

+1MHz	84dB
−1MHz	87dB

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

Spacing	Rejection
12.5/25kHz	70dB
25/50kHz	60dB
50/100kHz	59dB

S-Meter Linearity		
S1	Squelch Open	
S3	1.72 uV pd	−4.9dB
S5	2.14	−3.0
S7	2.63	−1.2
S9	3.02	0dB Ref
S9+	3.47	+1.2
S9++	3.85	+2.1

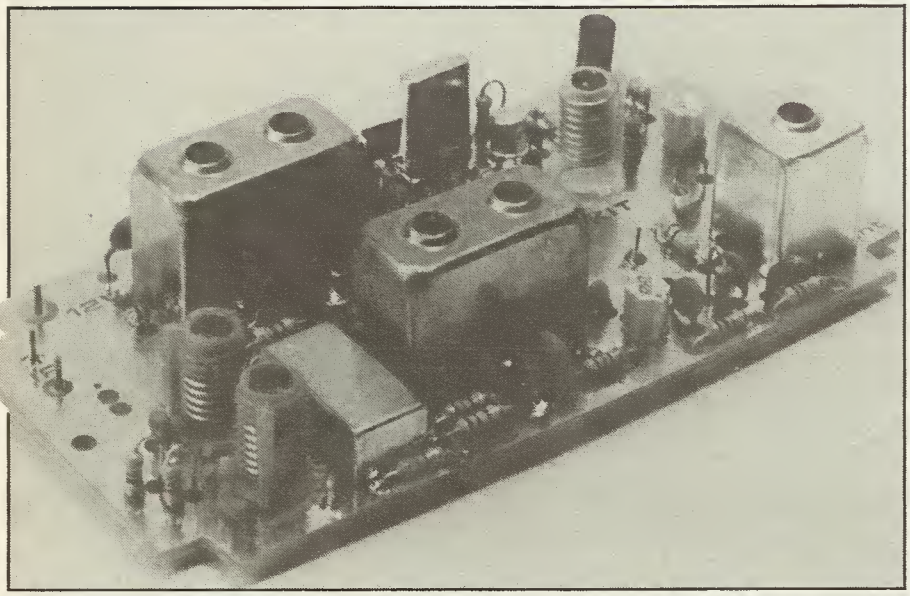
Transmitter

TX Power and Current Consumption		
	8.4V	10.8V
Low Power	0.05W/182mA	0.10W/210mA
High Power	1.43W/480mA	2.37W/592mA

Harmonics/Spurii	
2nd Harmonic	−79dBc
3rd	−70
4th	−68
5th	−95
6th	−76
All other outputs less than −85dBc	

Peak Deviation	5.73 kHz
Toneburst Deviation	3.60 kHz
Frequency Accuracy	−110Hz at switch-on

50MHz Converter for Two and Ten



Interested in 50MHz but reluctant to shell out on expensive transverters? This handy converter from the Cirkit design team could be the answer.

Since the six metre transverter was published in the February 86 issue of HRT, there have been a large number of requests for a receive-only converter version. This article meets those requests and also gives details of an alternative version with a 144MHz IF so that 6m signals can be heard on a 2m receiver. The performance is identical to that of the original receive portion of the transverter.

The Circuit

This closely follows the design of the original transverter but is built on a smaller PCB with an optional output attenuator for the 144MHz version. This is because the converter gain will probably be too high for the average 2m rig, which will generally be more sensitive than a 28MHz receiver.

Six metre signals are link coupled into T1 which provides initial selectivity for the following MOSFET RF amplifier stage. The amplifier is followed by a screened bandpass filter with a −3dB nose bandwidth of around 2 MHz, covering the likely final 6m allocation. As mixer matching is important if unwanted IMD products are to be avoided, a −3dB 50ohm pad is used after the bandpass filter to provide a wideband termination for the mixer RF port. To match the output IF port, a diplexer is used to avoid unwanted output products being reflected back into the mixer — these are rejected by the series and parallel tuned circuits (L2, C10 and L3, C11) and absorbed by the 47ohm resistors leaving the wanted IF signal at either 28 or 144MHz passing straight to the IF receiver.

The SBL-1 Schottky double balanced mixer requires a +7dBm (5mW) local oscillator signal for correct operation, either at 22MHz for a 28MHz IF, or 94MHz for 144MHz IF. This is derived from an overtone crystal oscillator (Q2) operating directly at the appropriate frequency and amplified to a high level by Q3. As a resistive pad is again used at the mixers LO port for matching purposes, the LO output is dropped to the required +7dBm by R23/24/25. The pad value differs between the 28 and 144MHz versions due to a lower LO output at 144MHz. Harmonics of the LO signal are removed by the low pass filter designed around L6/7 with a cut-off of about 26MHz or 110MHz depending on the version.

For the 2m IF version, an optional attenuator (R9/10/11) can be placed in circuit by cutting a PCB track so as to reduce the output from the converter. Attenuation of about −6dB is a good starting point for the average 2m rig.

Construction

The converter is built on a double sided PCB with the top foil acting as a continuous earth plane with etched areas where component leads pass through to the other side. Earth connections are made by soldering the leads directly to the top foil.

Unless otherwise instructed, horizontally mounted resistors and capacitors lie flush against the PCB top surface, making leads as short as possible. Vertically mounted resistors have one end of the body against the PCB, with the other end soldered directly to the top foil where indicated by a cross at the end of the lead, always follow the layout diagram as to which end is which. Note that some components are soldered *both* sides of the PCB in order to take an earth connection through to the underside of the board. These points can be found by visual inspection during construction.

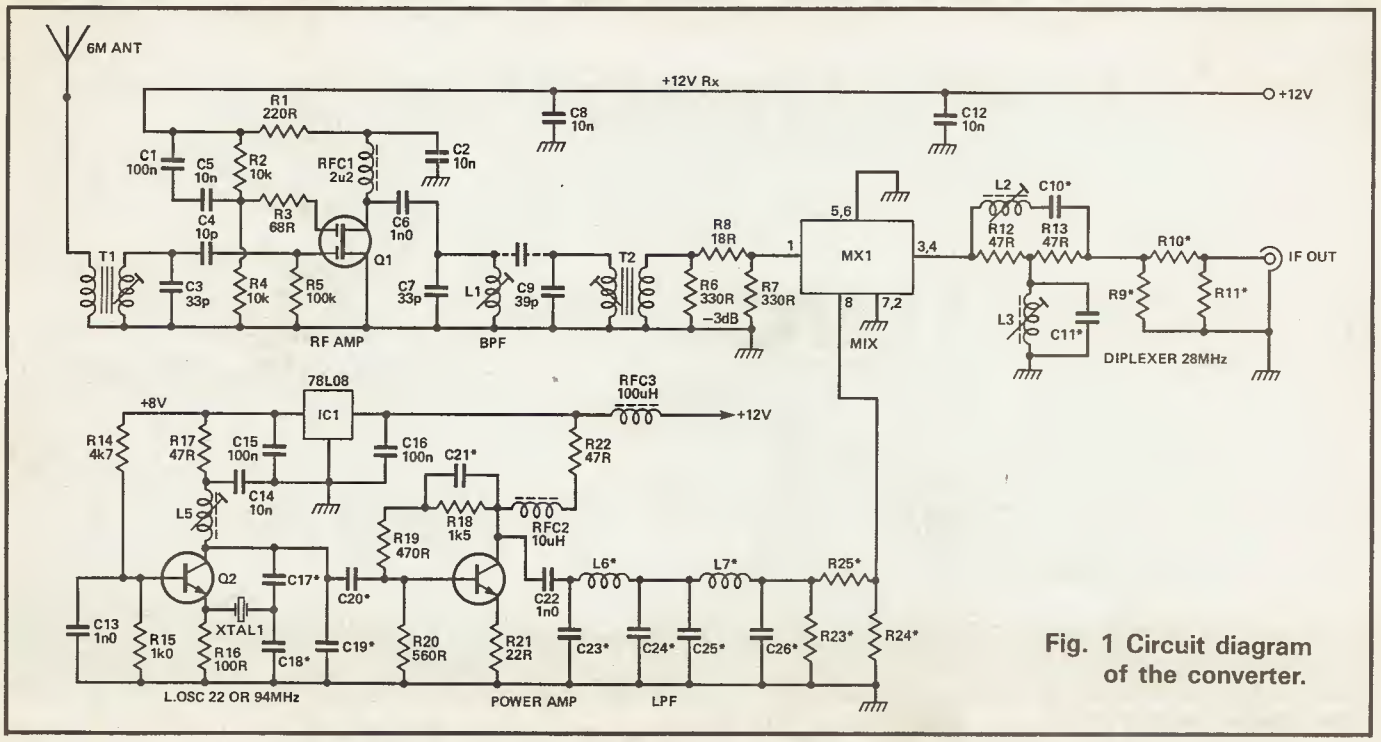


Fig. 1 Circuit diagram of the converter.

Capacitors such as disc ceramics should be pushed into the PCB holes as far as they will go without straining the leads on the body, many will go right to the board and others to within a few mm. *Never* have leads longer than 4mm above the PCB surface as this can lead to instability. Transistors are pushed into their holes until the underside of the device is about 4mm above the board. *Never* leave all the excess lead that comes with the device above the PCB (this is quite a common constructional fault!).

1. Insert and solder the seven 1mm PCB connection pins at the places indicated by a cross on the layout diagram. In each case, these are pushed in from the underside of the board as far as they will go, then the splines are pushed hard into the board using a blunt nosed tool. Solder top and bottom where necessary. Cut off the excess pin above the board on the pin located near L2 and Q1.

2. Insert and solder IC1 (78L08) with the centre lead soldered to the top foil, then C16, C15, C14 and RFC3. Apply +12v to the correct pins and check that +8v ±0.25v appears at the output pin of IC1.

3. Insert and solder in all the fixed value resistors. If you are building the 2m IF version, cut the track at the point marked 'X' on the underside of the board and insert and solder R9/10/11 — omit this step for the 28MHz IF version.

4. Insert and solder all fixed capacitors checking that you have used the *correct values* for the IF in use. Note that C19 and 21 are not used for 2m IFs.

5. Insert and solder RFC1 & RFC2, then Q2 and Q3, checking that orientation is correct.

6. Take Q1 and place it in position on the underside of the board so that the legend (K88) is facing up through the board and can be read from the top. It must be orientated with the longer (drain) lead facing C6. Solder all four leads into place on the underside with the transistor seated in the hole.

7. Insert and solder L1, 2, 3, 5, 6 & 7. Make sure you have the correct colour coil for the IF, and remove the core if none is required using a proper plastic tool, one is supplied with the kit. The shaded part of the coil on the diagram shows where the shorter shoulder of the coil is placed.

8. Insert and solder the coils for T1 and T2, again getting the short shoulders in the right place. Take a length of 24swg enamelled copper wire and solder one end into the top left hand hole by the side of coil T1. Wind the wire down past the left hand side of the coil, in an anti-clockwise direction until you can feed it down through the other hole at the lower right of the coil (thus getting 1½ turns). The wire should rest on the top of the short shoulder, and level with it on the other side (ie you are trying to get the winding as low down on the former as possible). Solder this end in place on the underside. Insert the single tinned screening can and solder both lugs on the underside. There is no need to solder the can itself to the top foil.

9. Repeat the above process for T2, starting at the top right hand corner. Insert and solder the double copper screening can and *solder both ends of the can* to the foil, as well as soldering the lugs on the underside — you may get instability if this is omitted. Also solder in the screening can around L6/7 and solder *both* ends, top *and* bottom.

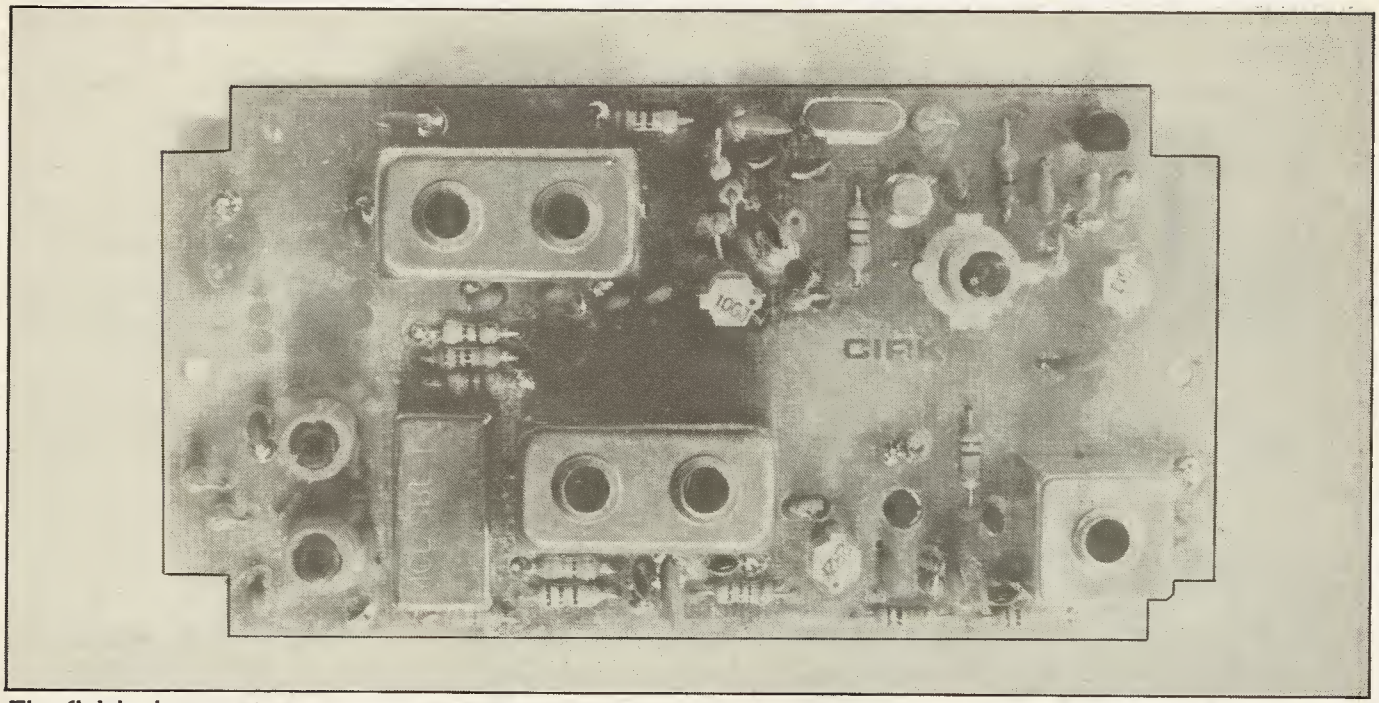
10. Insert and solder X1, with the can resting against the board.

11. Insert and solder MX1 so that the legend 'mcl' is near the bottom edge of the board. Note that the mixer has pins 7 & 8 interchanged on the PCB to aid layout — this has no effect on operation.

12. Double check all components and orientations before going further.

Alignment

Connect the output of the converter to a suitable IF, using coaxial cable. The antenna input should be connected to a signal generator at 50MHz. Set the cores of L2 and L3 3mm into the coil former (both IF versions) and leave them at this setting. For L6 & L7,



The finished converter.

there are no cores on the 28MHz version, but for 2m, screw both cores as far down as they will go into the former and leave them there.

Apply power, and initially adjust the cores of T1, L1 and T2 for maximum noise in the receiver. If you are using a generator, tune for best signal at 51MHz (either 29MHz or 145MHz depending on IF), whilst reducing the generator output as required to avoid overload. If you can't get any noise, the crystal oscillator probably isn't running so adjust the core of L5 until it starts up reliably when power is removed and replaced.

Connecting up a 6m antenna should enable signals to be heard, almost certainly one of the beacons, and T1, L1 and T2 can be tweaked up on an off-air signal for best results.

The converter will fit into a standard diecast box (Cirkit 21-95003) using BNC connectors for the RF end and insulated lead-throughs for the power leads. Connect a 1n capacitor across the power leads for decoupling purposes.

A complete kit of parts (less case) is available from Cirkit Distribution, Park Lane, Broxbourne, Herts. EN10 7NQ. Please specify which IF version is required. The price is £29.22 inc post and VAT.

COMPONENTS LIST

Resistors

R1		220R
R2,4		10k
R3		68R
R5		100k
R6,7		330R
R8		18R
R9,11 (2m IF only)		150R
R10 (2m IF only)		39R
R12,13,17,22		47R
R14		4k7
R15		1k0
R16		100R
R18		1k5
R19		470R
R20		560R
R21		22R
R23,24	10m	91R
	2m	330R
R25	10m	68R
	2m	18R

All 0.25W 5% Carbon film types

Capacitors

C1		100n
C2,5,8,12,14		10n
C3,7		33p
C4		10p
C6,13,22		1n
C9		39p
C10,11	10m	150p
	2m	10p
C15,16		100n Monolithic
C17	10m	56p
	2m	22p
C18	10m	220p
	2m	47p
C19	10m	68p
	2m	not used
C20	10m	33p
	2m	10p
C21	10m	1n
	2m	not used
C23,24,25,26	10m	150p
	2m	15p

(All fixed capacitors are either ceramic disc or plaquette types unless otherwise stated)

Semiconductors

Q1	3SK88
Q2	2N2369A
Q3	ZTX327
MX1	SBL-1
IC1	78L08

Inductors

L1		S18 White FE Core
L2,3	10m	S18 Green FE Core
	2m	S18 Orange FE Core
L4		not used
L5	10m	S18 White FE Core
	2m	S18 Orange FE Core
L6,7	10m	S18 White No Core
	2m	S18 Orange FE Core
T1,2		S18 White FE Core with 1.5 turn link over cold end
RFC1		2.2uH TOKO 7BS
RFC2		10uH TOKO 7BS
RFC3		100uH TOKO 7BS

Miscellaneous

X1	10m	22.000MHz HC18/U
	2m	94.000MHz HC18/U

7 PCB connection pins 1mm dia, 1 PCB, 2 Twin S18 copper screening cans, 1 Single S18 screening can, connecting wire (24swg en Cu wire), Length RG174A/U, Hex trim tool.

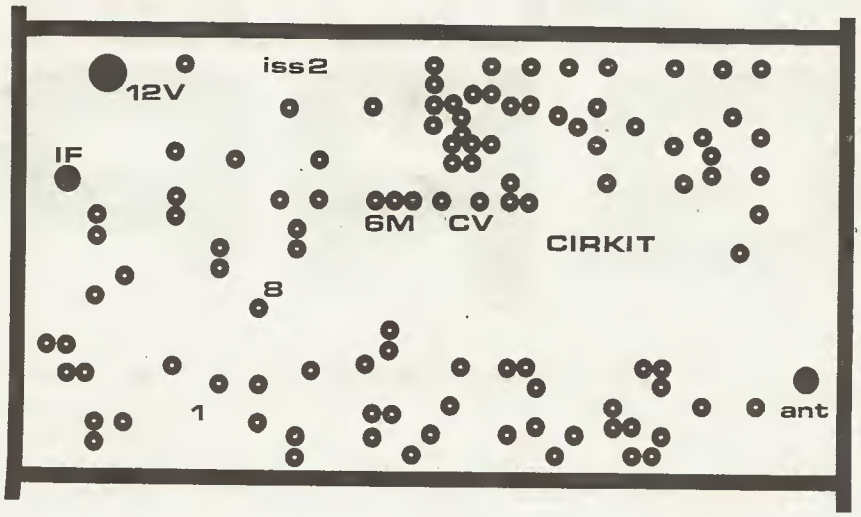


Fig. 2 Component overlay showing the earthing points.

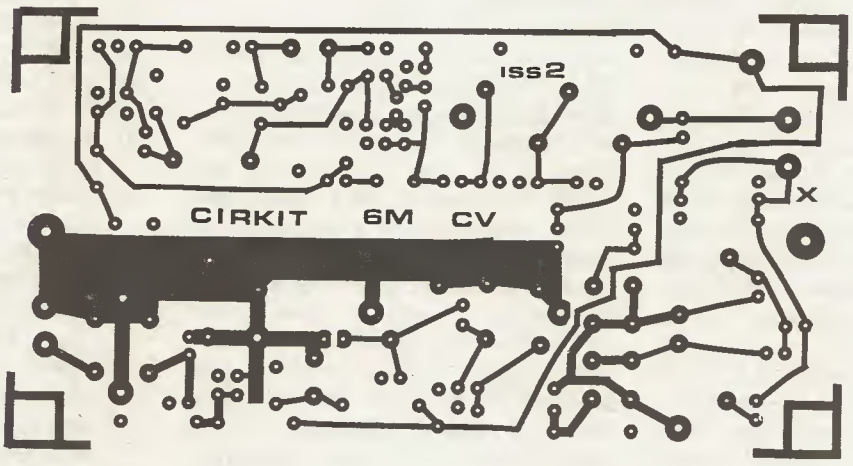
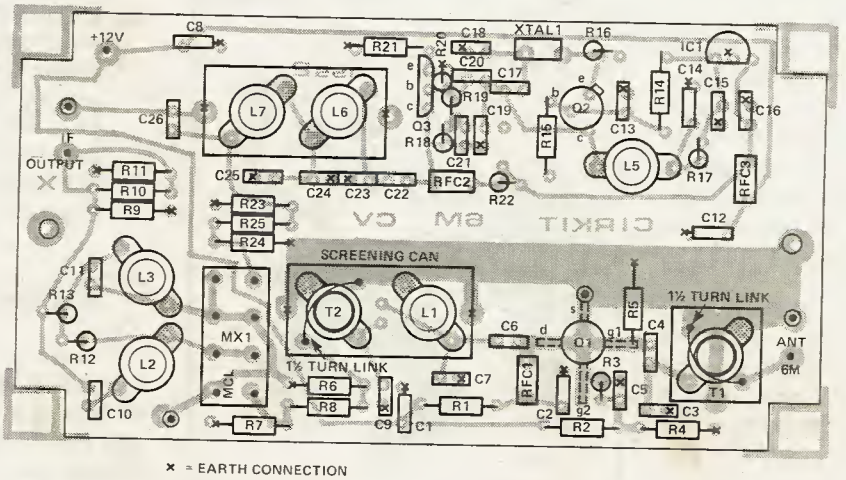


Fig. 3 Underside track layout — cut track at point 'X' for attenuator on 144MHz version.



× = EARTH CONNECTION

• = PCB PIN

◉ = EARTHED PCB PIN

Fig. 4 Topside earth plane layout.

PSYCHOLOGY OF QRP

A little bit of history (visualise that northern bakery, the aroma of freshly baked farmhouse, the gentle strains of the Brighouse and Rastrick Brass Band in the background . . .

Did the title of this piece grab your attention? Did it make you want to know more? If so, read Ian Wade's guide to the psychology of QRP.

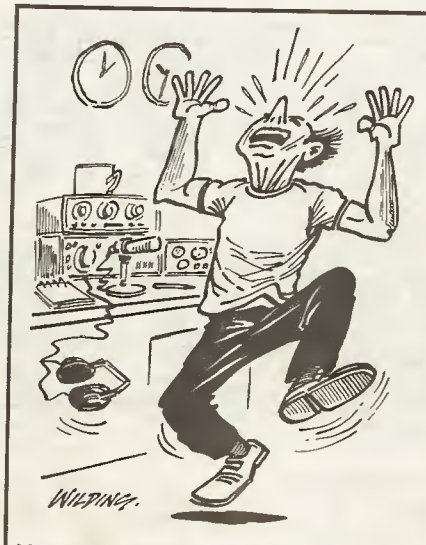
Many years ago, when I was first licensed, shiny black boxes were out of the question — they didn't even make them at the time — so I had to roll my own. With pocket money pegged at three shillings a week (Mac said I had never had it so good), a 6V6 valve in the final was the ultimate, which meant QRP CW. Problem was, although I was convinced that my signal was getting out, nobody seemed to want to talk to me. The early pages of my first logbook were very bare, with many CQ calls and only a few contacts.

As the years went by, I got interested in other things, but every now and then I had another go at QRP, and the logbook took on that empty, ghostly look yet again! Something in my operating technique was obviously very wrong. In desperation I joined the QRP Club, and while I found their magazine very interesting and their divine influence uplifting, it still did not tell me where I was straying off the straight and narrow.

Then about three or four years ago, the QRP bug bit again. This time I was determined to crack it once and for all, and spent many hours in the bath — contemplating. The argument was simple, assuming that the other fellow could hear me, how could I attract his attention and make him want to work me? I tried to put myself in his position, receiving my signal way down in the noise, and all I came up with was a dozen reasons why he should ignore me.

I was only a G station; he had worked hundreds of G's already, and didn't want any more. He had called CQ DX, and I had answered his call, when quite plainly I wasn't a DX. He had called CQ VK, and G isn't very close to VK. He couldn't read my signal, because it was weak and being swamped by a raucous UA with a T5 note And so on, and so on.

Archimedes got there first, otherwise I would have been credited with the expletive "Eureka!" The answer was so simple, it just couldn't be true! To test my new theory, I wound the power on my 20m rig down to 50mW (having first leapt out of the bath), and waited. Along came an Italian. Bang, he was in the bag. Then a German. Ditto.



You may find the average DXer to be less than keen to get 'G' calls!

Then a Russian in the Urals. Ditto again. Since then, even though I rarely operate CW with more than one or two watts to a dipole, nearly every call has been answered.

General rules

How does it work? To use the word psychology is perhaps a little (or very!) pretentious; I certainly don't claim to be a psychologist, so let's put it down to applied common sense. First, a few general rules:

(1) Never call CQ. I have found it to be a complete waste of time;
(2) Send your CW very slowly, around six to eight words per minute. This is quite different from most other stations on the band, so your signal stands out like a lighthouse. Also, as the signal will probably be very weak, the slow speed will give your prey more time to decode it and sort it out from the high speed QRM all around you;
(3) Your signal must be exactly zero beat with the other station; I have found that the more off-frequency I am, the less likelihood there is of making a QSO, presumably because filters are getting narrower all the time. This means you will have to understand thoroughly how your RIT works when netting onto a signal.

Getting ready for action

None of what I have just said explains how to get a QSO started, so let's get down to business. The first step is to lie in wait for someone calling CQ. If the station is of interest, net accurately onto the signal and wait for the end of the CQ call. Don't worry if he is only a few miles away and is calling "CQ DX

ONLY"; you may not be DX to him, but he is certainly DX to you, so the tactic is justified.

When his CQ call is finished, do nothing. Yes, nothing. Wait for about a second (which seems like an eternity) to see what happens on the frequency. If the world springs into life, with at least fifteen S9-plus signals pounding in, then forget it; you won't stand a chance. On the other hand, if the coast is fairly clear, give him a call.

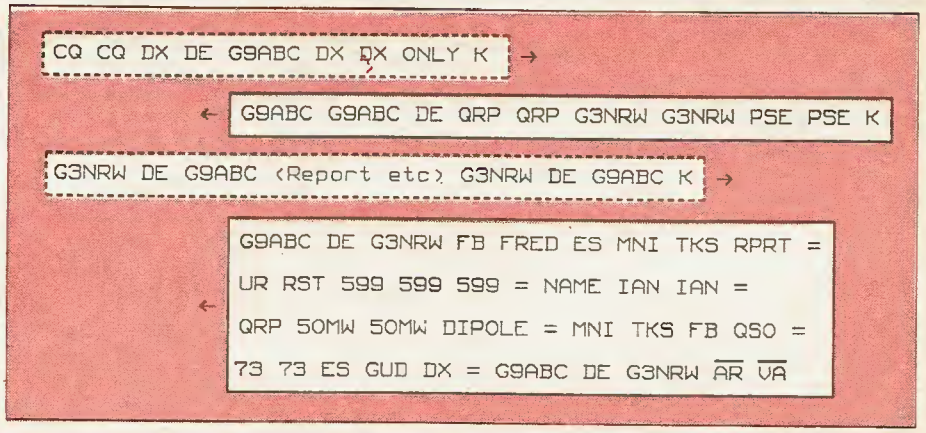
Throw out the line

This is where the action really starts, and where you have to be at your most cunning. Do exactly what I am about to describe. Send the other station's callsign twice, at six to eight words per minute. Putting yourself in his shoes, you will realise that he is expecting to hear his own call, so even though your signal is weak he should pick up enough fragments to realise that you are calling him. Also, recognising that your signal is weak, he assumes that it must be coming from a very long way away. so it is worth waiting to hear who it is.

Wait for the fish to bite

What is the other station expecting to hear now? The letters DE, of course. So send them, again slowly. Now comes the crunch. What is he expecting to hear next? Your callsign. But as soon as you send that first letter G of your call, you've blown yourself out of the water! You can see him fuming: "I called CQ DX, and this idiot G came back to me! I've worked a million G's before". In five seconds he will be calling CQ again, while you are still sending your call to him. You didn't even get the chance to tell him that you are a QRP station.

This is exactly where I used to go wrong. To make it go right, do the following. After the letters DE, when the other station is expecting to hear your call, do not send it, but send the letters QRP QRP instead. When he hears the first QRP he won't believe his ears; no country has a prefix beginning with the letter Q, so he will assume that he misread your call. This will make him concentrate all the harder, so he is almost certain to get the message on the second



QRP the G3NRW way. After hearing a station calling CQ, wait for one second to make sure the frequency is relatively clear. Then call him slowly (6-8 wpm), inserting the letters "QRP QRP" before your callsign, and "PSE PSE" before the "K". Your second (and final) over should be polite but very brief.

QRP. Now you've got his undivided attention!

Reel him in

Now send your own callsign, twice. With any luck, even though he will at last discover that you are only a common-or-garden G, the odds are that you have softened him up enough to forgive you for calling him, despite the fact that he was really looking for DX. I have certainly found this to be the case in nine calls out ot ten, but you will of course always come across the tough nut who won't reply to a mere G station under any circumstances.

In the bag

And finally, what does he expect to hear next? The letter K? Don't send it yet, because he may be the one-in-ten tough nut who still needs to be softened up. Instead, send the letters PSE PSE K. It's guaranteed to melt the stoniest of hearts into submission! Now switch back to receive, and pray. With any luck you have got him.

Don't overstay your welcome

With the QSO now in progress, don't overdo it. Remember that the other station probably didn't really want to work you anyway, so keep it short. Send his report three times (to keep him interested), send your name twice (in case he didn't copy it the first time), and don't send your QTH at all (he will assume it is London, or will ask you if he is really interested). Finally, send a phrase like QRP 50mW 50mW DIPOLE, wish him 73 ES GUD DX, and leave it at that. Anything more is gilding the lily; remember, the other station wants to get away to work the real DX, so keep it as short as possible to minimise the agony!

But you made it! You feel good because you got your DX contact. He feels good because he has done his fraternal bit in giving you a report, and with any luck you will eventually receive a QSL card endorsed with "QRP 50mW dipole". Everybody's happy!

/QRP

Some people suffix their callsigns with /QRP, but this is not legal. In any case, the other station would have mentally switched off long before hearing those letters at the end of the callsign. But with the approach that I have suggested, there is no question of the letters QRP being part of a callsign, or being interpreted as a callsign (it's really no different from a CQ call on phone like "This is QRP station G3NRW calling CQ"), and so it is perfectly acceptable to do it this way.

Proof of the pudding

Although I don't claim any originality for this method of working QRP (someone somewhere must have thought of it before), the bottom line is that it really works! Try it, it's good for the soul and it makes a nice change from data comms!

Dxpedition to the Scilly Isles

Opening up a rare square by a DXpedition is a lot of hard work — even if its just on the Isles of Scilly. Tony Bevington, G4ZUI, reports on the trials and tribulations — and the triumph too.

Our first hurdle was obtaining the permission needed to use the island. Since all the Isles of Scilly are part of the Duchy of Cornwall, we had to obtain permission from that quarter.

Then the Nature Conservancy Council became involved because many of the uninhabited islands are nature reserves; they kindly agreed to let us set up our camp and Special Event Station on Great Ganilly.

We decided to contact commercial firms throughout the country to seek their assistance, either by loaning equipment or donating raffle prizes.

We also wanted to support a charity and seek sponsorship around the UK, both from other amateurs and from various businesses. Choosing the charity was easy — who else could it be but the RNLI? We might have need of their services ourselves in the light of the proposed destination!

Some firms were superb in the help they offered us. Microwave Modules lent a considerable amount of equipment and Mick Senior, their rep., went so far as to lend us some of his personal gear, for which we were extremely grateful. BNOS lent us two 40 amp power supplies, meaty great beasts when you have to carry them over a hundred yards of rocky beach, but invaluable. Thanet lent us an Icom 735 HF transceiver, a most robust little radio that stood up to all we gave it — our morse operator couldn't sing its praises highly enough. We also thank Nigel of Mutek for the two metre transverter he lent us.

In the process we also acquired a number of very nice raffle prizes. Microwave Modules gave us a two metre linear and a UHF pre-amp kit and Datong a speech processor; also prizes were donated by local Cornish firms, ranging from a free hair-do to hampers of groceries. However, the piece de resistance was the prize offered by Colin, G0AEA, of a free weekend at his home QTH on St. Mary's in the Isle of Scilly. Colin, who is the harbour master on St. Mary's, was our link man 'on the spot' so to speak and proved invaluable in overcoming many of the snags that cropped up over the months of planning.

Raffle tickets were printed and distributed to clubs around the country together with details of the expedition. We had decided that the charity side of this event would be done in advance, so that we could enjoy our QSOs without any pressure and without causing any offence.

As the island had been uninhabited since Roman times all modern conveniences had to be shipped out with us. Necessary calculations involved how much water seventeen people would need and how much fuel our diesel generator would require. We had

been lent a 5Kva diesel generator with two 50 metre leads and were told that it used one gallon every three hours, so we planned to pick up 35 gallons of diesel together with 65 gallons of water in St. Mary's. In the event, both estimates proved to be wildly inaccurate (we only used five gallons of diesel and didn't bother much with washing!) but, as it was a strong possibility that we could be trapped on the island if the weather worsened, it was better to be safe than sorry.

How to get there

The Isles of Scilly Steamship Company had kindly agreed to take us at a reduced fare and our equipment free of charge. We saw all our equipment safely onto the boat at Penzance, including the nine 20 foot scaffold poles which would not fit into the container and had to be craned on last as deck cargo, together with the precious generator and our gas bottles — equally precious if we were to have hot food and drinks!

As the islands come into view, you realise you are entering a

different environment. At St. Mary's our container was unloaded onto the quayside and, with our next boat waiting at the bottom of the steep flight of steps we began to transfer our gear. This boat was considerably smaller, usually being used to transport sightseers around the off-islands, and was totally open except for the cockpit where our boatman stood. It was almost completely filled by our gear and the seventeen of us, as well as the three members of a local TV crew who had now joined us for the day.

The island we had chosen, Great Ganilly, is some twenty minutes from the main island, and is the most Easterly of the whole Isles of Scilly group and the furthest out into the Atlantic. The water was quite choppy with the waves running at about three to four feet and a stiff breeze blowing. Our island was in sight. We were discussing which beach we would be landed on when the boatman suddenly asked for a consultation with those in charge of the party. Consternation! He said, "I can possibly land you, but it will be difficult. I cannot guarantee that I will be able to pick you up on Monday." Was the whole expedition to be aborted before it had begun!

The boatman continued, "However, if you are prepared to use another island, I can land you on Little Arthur, which is only another 300 yards further inland and get you off again with no problems."

Hurried consultations took place. We had set our hearts on Great Ganilly; all our plans were based on aerial photos taken by RNAS Culdrose. We knew nothing of Little Arthur. We were tired, dis-spirited and a change at this late stage could mean total disaster. However, in truth, our options were very limited as we were in no position to ignore the advice and opinions of a local boatman with an extensive knowledge of the area. It was decided to take his advice and make for Little Arthur. With this decision made, our spirits rose again and we all looked eagerly ahead at 'our island' — no longer Great Ganilly, but Little Arthur.

Landfall at last

Our boatman may have considered our landing easier, but for us it was very hard graft. He anchored about 20 yards from the shore and told us that was as far as he could go. We all spent agonising moments looking into the fairly deep, inevitably

freezing cold water and I don't know who looked the more horrified — us or the TV crew! We gazed at the beach, so near and still so far and everyone waited for inspiration. Then, we had a hero — yes, a real-live hero. Superman, look to your laurels; you have competition! Mike, G1FRZ, stripped off to reveal a dashing pair of shorts and dived into the water. As we gazed over the side in wonder, he re-appeared, spluttering and told us the water was lovely. We believe the temperature was about 10C, but Tony, G6JFX, stripped down to bathing trunks (now that *is* being prepared) and followed Mike into the water. The rest of us, initially, declined the invitation and stepped into the dinghy that Mike and Tony pulled to the shore.

It took about eight boat-loads to get everyone and everything onto the island and then the job began in earnest. While Mike, G4HOL, went up the island to reconnoitre to find a suitable site for our camp, the rest of us frantically carried the gear away from the approaching high tide. It was now mid-afternoon and the site chosen was about 100 yards from the beach, involving a journey over soft, wet sand and then large, loose rocks onto a small grassy plateau about 20 feet ASL with a high Spring tide expected. We pitched our camp on an area approximately 100 x 45 yards, which seemed to be the only flat area available. That journey from the beach to our camp site seemed interminable, but at last all the gear was on site, though strewn around.

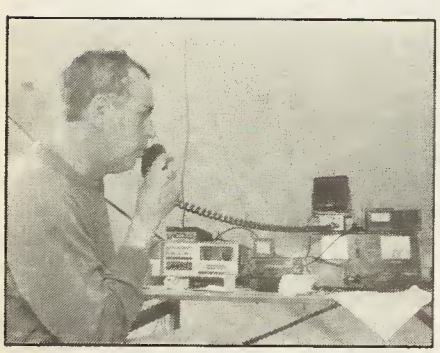
Little Arthur is actually joined to the adjacent island, Great Arthur, by a causeway of rocks and, thus, at low tide the two islands are one and at high tide become two. The TV crew had filmed all they wanted for the moment and to get out of the way of the maniacs running around trying to set up a radio station for them to film, decided to walk across the causeway to Great Arthur, leaving their gear with us. We were greatly amused and it certainly lightened the atmosphere, when we saw they had neglected to keep an eye on the tide and were cut off! Having brought a video camera with us, we were able to film them wading back to us with shoes in hand and trousers rolled up.

We were now ready for the last bit of TV film. They had asked for the radio to be out in the open, since the backdrop of the island was so

beautiful and they felt if they filmed inside a tent we could be anywhere. So, picture G4HOL sitting at a table (kindly donated by St. Mary's Church Hall) with his FT290 on it attached to a 17 element Tonna, 50 feet up our mast in a howling gale, which blew his log book all over the place, making our first contact into Wales. So GW1OOP in Port Talbot goes down in history! Of course, the TV men had hoped for Australia — not much hope at 15.40 GMT on two metres. We finally got rid of them and it was quite a relief to have the pressure off. Peace settled as the tents went up. Another cup of tea from the cook tent and everything seemed to be coming together. By 17.00 BST we had everything functioning.

We had two rigs in the HF tent — the Icom 735 which was used with a three-band vertical on a post in the sea with the vertical sat about six inches above water at high tide; the other was a Yaesu 101Z which was used on an end-fed long wire about 400 metres long that had been tied off to the very top of Great Arthur while the tide was out. This was a most effective aerial on all bands worked. From time to time we were able to use a 'dipole of delight' on the 735 but, thought the aerial worked well, it was difficult to secure due to the wind around the masts, which was starting to gust to force eight by this time.

The VHF/UHF station had an Icom 260 for two metres, working to a 17 element Tonna with 100 watts from a M/M linear and 70cms used an Icom 490 with a M/M 50 watts linear, both driven simultaneously from one of the BNOS 40 amp power supplies, a very fine piece of equipment that hardly got warm. We did try 4 metres, but though we had it tested before we left, the transverter proved to be slightly deaf through the 4 element Jaybeam, so, unfortunately, that band was unworkable.



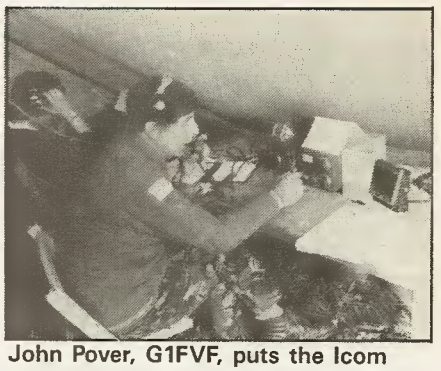
No he's not shaving! Mike Denning, G1FRZ, gets things rolling on two metres.

Exhaustion proved to be the major problem. Humping all that equipment so many times had taken its toll of all personnel and, although we had intended to operate all night, it was necessary to close all the stations around midnight for the sake of our health, sanity and tempers. One or two stalwart folk did operate till 2.00am on Saturday night and resumed transmissions at 5.00am on Sunday. This did mean that we failed to make the hoped-for number of contacts. We also knew that the boat was coming back to pick us up at 9.00am on Monday.

A beautiful place

The island of Little Arthur, when separated from Great Arthur, is approximately five to six acres in size, running from the low-lying Northerly plateau to the highest point in the South. From our small camping area it rose fairly sharply to about 60 feet ASL. The whole perimeter of the island was of granite boulders usually covered by the tide. At first sight the island appeared grassy, but after a while we discovered this to be deceptive as, in fact, it was made up of granite boulders covered by very loose sandy soil. This did cause problems when we were erecting our tents as there was absolutely nothing of substance to drive our tent pegs into. This problem was solved by using the abundance of rocks to hold the pegs down. There were no trees at all, hence the necessity for our poles. The vegetation mostly consisted of marram grass and sea cabbage, though the exposed rocks were covered with a variety of very colourful lichens and small rock sedums. Since the island was uninhabited and unvisited under normal circumstances, what grass there was had grown thick and deep on the surface and walking on it was extremely tiring. You sank in for about 10 inches at each step so walking required lifting the knees high each time.

The island had many black-backed gulls nesting on it, some in very close proximity to the tents. Being careful not to alarm the birds, three of our number were lucky enough to watch a seagull chick actually hatching.



John Pover, G1FVF, puts the Icom 735 to work on HF.

Human ablutions had a particular fascination for the seals, since every time anyone went down to the sea to wash or to the toilet tent, which was only six feet from the sea, the seals' heads would pop up to stare at these strange creatures that had invaded their territory.

Back to civilisation

By late Sunday night most of the tents, apart form the cook tent, had been packed and everyone spent the night in the cook tent for a 5am start. When we woke the weather was misty and for a change, windy! 8.30am found us sitting disconsolately on the beach with our gear packed around us and the sun breaking through, promising a beautiful day. We all gazed out to sea looking for our boat, each secretly hoping it wouldn't turn up. None of us wanted to leave. We had really enjoyed ourselves and though we had not achieved everything we had intended, we had opened a rare square and gained a considerable amount of experience and knowledge for next time. In fact, we made 770 contacts and raised of £500 for the RNLI.

A dot on the horizon — was it? — yes, there was our boat. We left our conversations of what we would do next year to hump our gear nearer the water-line. We left sad, but satisfied.

We do intend to try again. We hope to actually make it to Great Ganilly if we can get the necessary permission once more. We will go for a week and try to transmit continuously as far as we can. So, if you failed to make it to us this year, keep scanning the magazines for next year. As G4ZUI said, we were all just beginning to get the hang of those pile-ups!

WHO WAS Ambrose Fleming?

Ambrose Fleming is one of the great names in the early development of wireless.

He was a slim, fair haired man with a typically Victorian moustache. He enjoyed teaching and giving lectures and could easily keep the interest of his listeners in spite of the fact that he used to talk very fast and had become hard of hearing at an early age. He was a man of remarkable intelligence and ingenuity and his life was one of innovation and invention. Not only did he invent the diode valve, and participate in early wireless experiments, but he was also an electrical engineer of great standing.

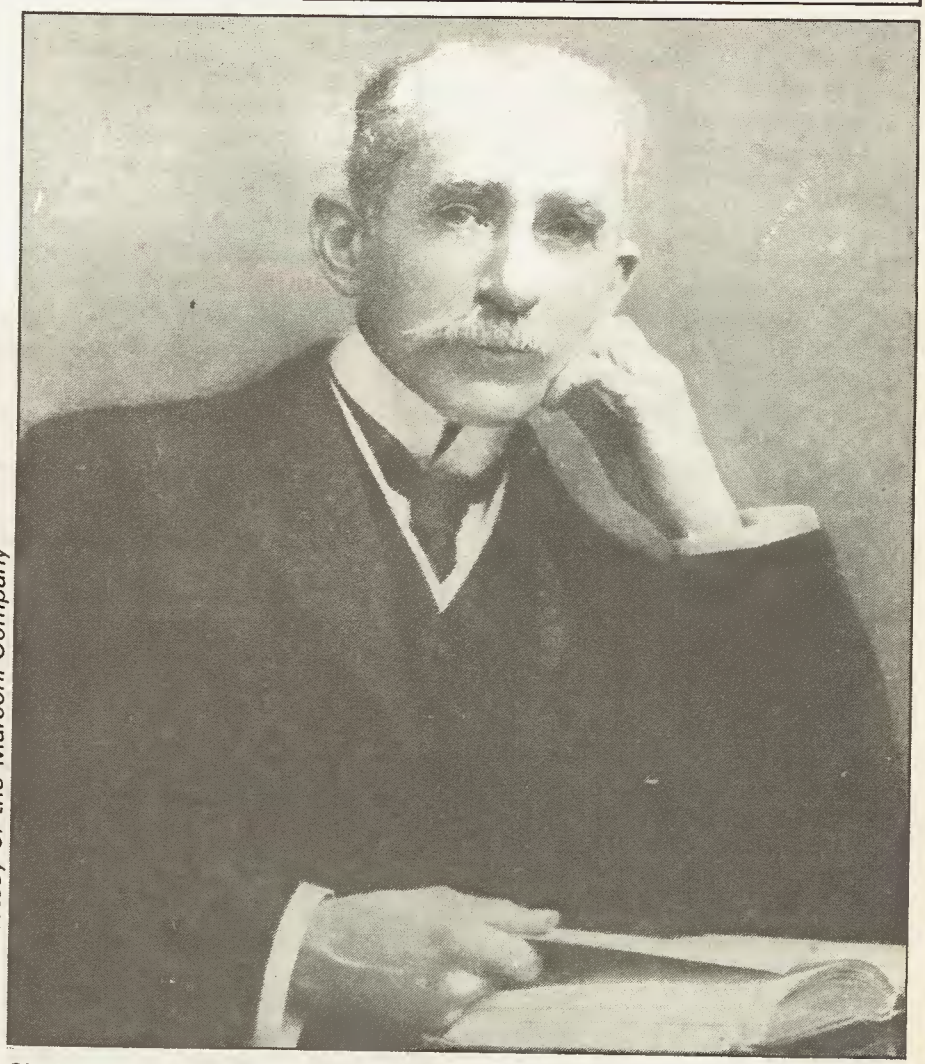


Photo courtesy of the Marconi Company

Sir Ambrose Fleming.

Radio as we know it wouldn't exist if it wasn't for the early pioneers — but who were they? In the first of a new series, Ian Poole, G3YWX, introduces the inventor of the detector diode.

His early years

John Ambrose Fleming was born in Lancaster on 29th November 1849. Ambrose, as he was known, was the eldest of seven children. His father was a minister in the Congregational Church in Lancaster, where they lived until Ambrose was five, when they moved to Kentish Town in London.

He was educated at University College School in Gower Street, London, and University College where he studied physics and mathematics for two years until he was forced to leave in order to earn money to finance his studies.

Initially Fleming worked for a firm of shipbuilders, but left to become a jobbing clerk on the stock exchange, where he found that the work was easy and the hours were such that he could finish his studies in the evenings. Fleming became a science master, but soon decided that he needed to further his studies, so he returned to London, this time to the Royal School of Mines where he studied Chemistry.

Despite his income from teaching Fleming once again had to return to work to provide funds for his training, so in 1874 he took up a post as a science master at Cheltenham College. It was whilst he was here that Fleming saw some of the work of Maxwell, who formulated many of todays fundamental theories of electricity and magnetism. As a result of reading Maxwell's book 'Electricity and Magnetism' Fleming decided that he had to go to Cambridge in order to study under him.

A career develops

So in 1877 Fleming found himself in Cambridge studying many of the new theories of electricity and magnetism, although he was not working directly under Maxwell his

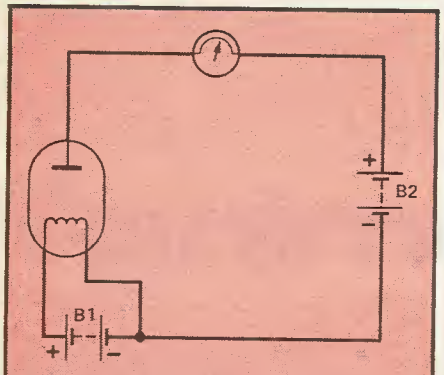


Fig. 1 An elementary diode circuit, the meter would only deflect when battery B2 was this way round.

influence meant that Fleming gained a tremendous amount of knowledge and experience.

It was not long before Fleming became a demonstrator at Cambridge, however this was short lived as he was chosen to be Professor of Mathematics and Physics at what is now Nottingham University. Although this was a good start to his career the attraction of London was very strong and he soon gave up this appointment and became a consultant to several companies, including the Edison Telephone Company.

Back at UCL

At this time the whole field of electrical engineering was very new and there were very few educational establishments which were able to teach it. However, one of the professors at University College London asked Fleming to give a series of lectures on the subject. The lectures were a great success and in 1885 Fleming was offered the position as the first Professor of Electrical Engineering at UCL, but also one of the first in the country.

He greatly enjoyed his time at the College, he was in London where he wanted to be and he was able to lecture as well as carrying on with his research. Much of his early work was taken up by investigating various aspects of AC transformers, the results of which led him to write a book on the subject as well as presenting papers to the Institution of Electrical Engineers.

Fleming did not confine his energies solely to transformers and he devoted some of his time to developing more accurate ways of making electrical measurements. Together with Crompton, Fleming developed instruments which were capable of measuring to an accuracy of .25%, which was a tremendous step forward for that time.

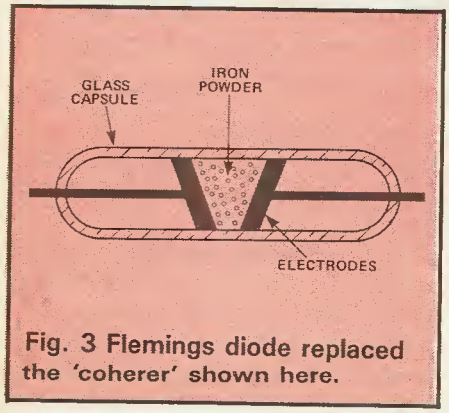


Fig. 3 Flemings diode replaced the 'coherer' shown here.

occasions.

It is in fact quite possible that he may have demonstrated the effect when Fleming visited America, because Fleming did some work on the idea, and presented a paper to the Physical Society on the subject. Fleming showed that it was possible to apply an alternating current to the heater and obtain a rectified signal on the anode. This discovery, although obvious now, represented the next stage in the full realisation of the diode valve. It was not long after this that Fleming became involved in some of the very early experiments with wireless. At the time the *coherer* was universally used as a detector, but it was both insensitive and unreliable (see Fig. 3). When a signal was received the iron powder would 'latch' the device into a conducting state which could only be reset by physically tapping the powder loose using an electric bell like arrangement — the 'decoherer'.

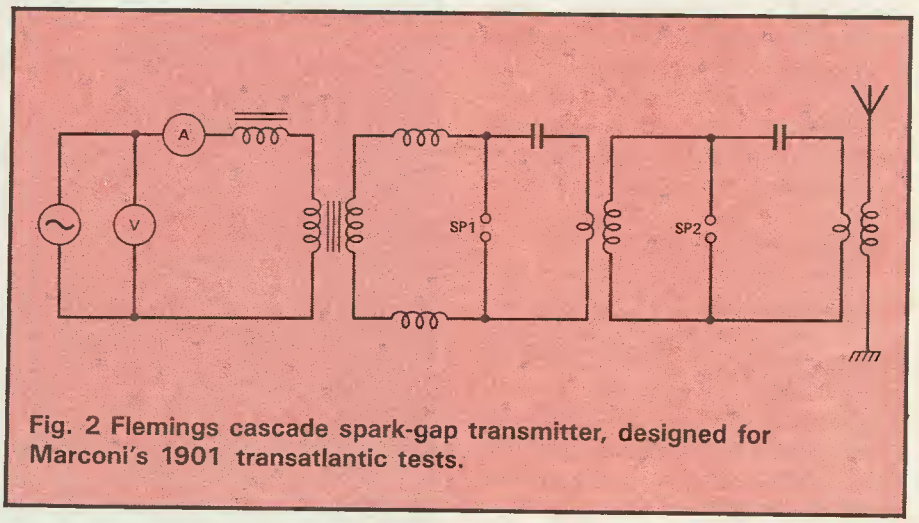


Fig. 2 Flemings cascade spark-gap transmitter, designed for Marconi's 1901 transatlantic tests.

Diode discovery

The invention of the diode took many years from the initital discovery of some of the mechanisms involved. The basic effect used in the diode was discovered by the famous American inventor Edison, and was first demonstrated some twenty years before Flemings final invention of the valve. At this time Edison was experimenting with different types of filament for his electric bulbs and he was trying to find ways of reducing the blackening which occurred on the inside of the glass. In one experiment he happened to evacuate the bulb and place a second electrode in it; Edison noticed that current would only flow in one direction, but he made no use of the discovery despite demonstrating it to people on several

It was with this background that Fleming had the idea of using a diode to detect radio waves. He had already proved the device could be used up to 100Hz but he had to find out whether it would operate at the much higher frequences used for wireless. Fleming set his assistant to work on the new idea and shortly afterwards they were able to prove that it worked. So on the 18th of November 1904, less than a month after Fleming first thought of the idea, he was able to patent the invention. He called it his 'oscillation valve' because of its one-way or valve-like action of rectification.

The valve had a great impact on the newly developing wireless tech-

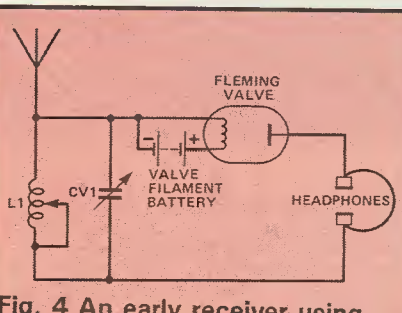


Fig. 4 An early receiver using the Fleming valve diode detector.

nology giving a far more reliable and sensitive method of detecting signals and becoming the springboard for more important developments in America.

Fleming and the Poldhu story

Fleming had held a number of consultative posts before he joined University College. Then in 1899, fourteen years after he had joined UCL, he was appointed as the Scientific Adviser to Marconi's new wireless company, a post which he held for 30 years. During this time his most memorable work was done in conjunction with the transatlantic tests of 1901 when he designed the transmitter for the Poldhu site. This design was novel because it used two spark gaps operating in cascade, powered by a 25kW alternator which was in turn driven by a 32 horse power oil engine. After many setbacks, caused mainly by poor mechanical design of the aerials at both sites, the letter 'S' was finally transmitted across the Atlantic. This was the first time that the ocean had been spanned by wireless. In spite of this great achievement the transmitter still needed further development as it could not reliably send dashes hence the reason why the letter 'S' was chosen!

Allied to his involvement with the Marconi company and his general interest with wireless, Fleming held one of the first 'amateur' or experimental transmitting licences issued under the Wireless Telegraphy Act 1904. Flemings name appeared in the first list of licences issued in 1906, showing that he was authorised to operate from University College itself as well as his Hampstead home. So Fleming has the distinction of being one of the very first radio amateurs!

Later life

Fleming remained at UCL as Professor of Electrical Engineering until he retired in 1926 at the age of 77, when he was knighted in recognition of his great services to the fields of electrical and electronic engineering.

On his retirement Fleming moved to the seaside town of Sidmouth in Devon yet he still remained active in the scientific community. He became particularly interested in the developments which were taking place in television and supported John Logie Baird in his experiments with early TV systems. Fleming also became President of the Television Society and despite his age he frequently addressed their meetings, even though this meant travelling considerable distances from Devon to London. Fleming died in Sidmouth on the 18th of April 1945 at the age of 95, leaving behind him a legacy of discovery and innovation which gave birth to the radio technology of today.

HRT 2/87

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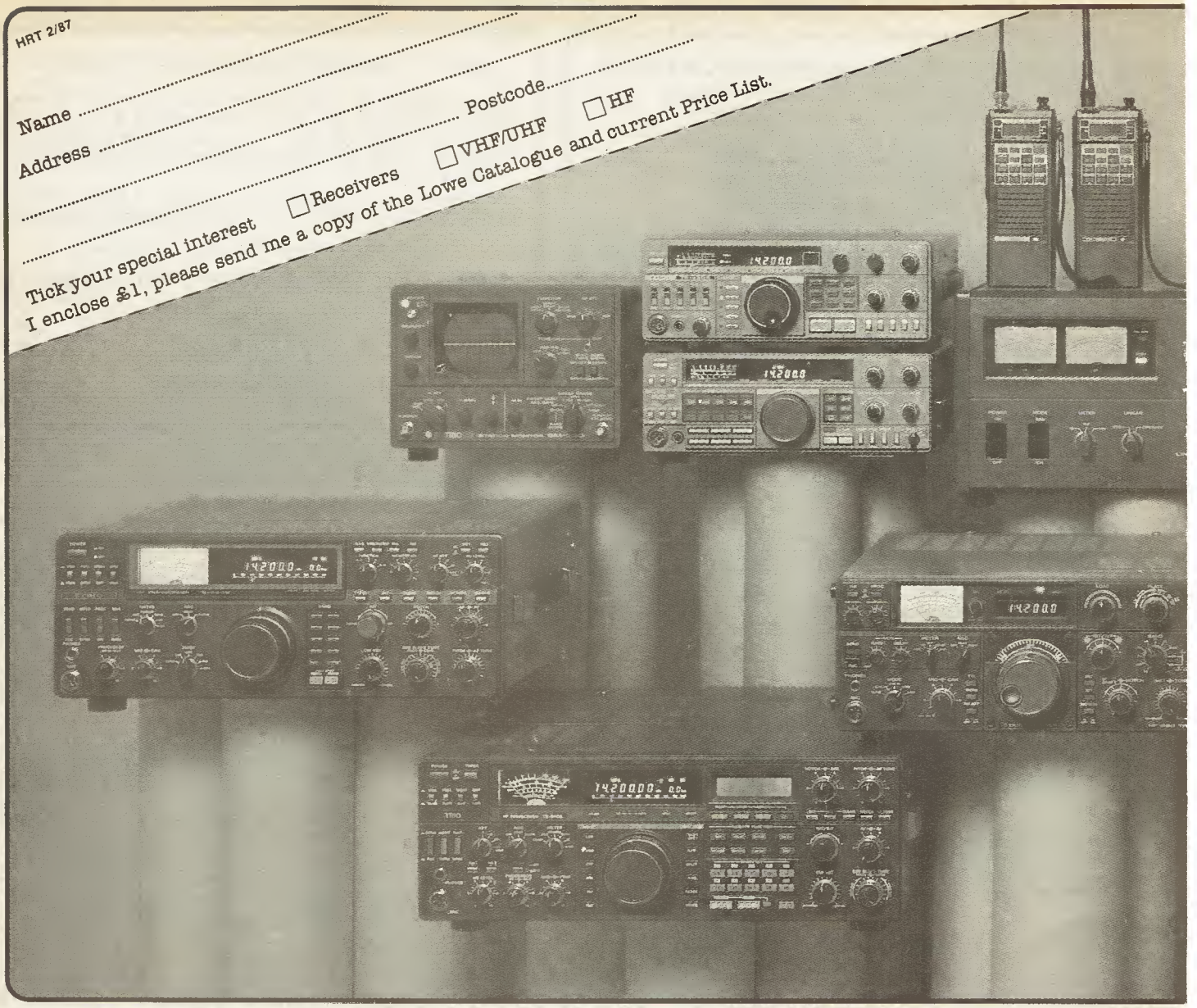


1 TS940S HF transceiver. Modes › USB, LSB, CW, FSK, FM, AM. Frequency range› transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input› 250 watts PEP, AM 140 watts. Power supply› internal psu, 240 VAC. Features› 40 memories, 2 VFOs, provision for internal ATU, keyboard frequency entry, SSB IF slope tuning, CW variable band width, CW full break-in, IF notch filter, Audio filter, variable CW pitch, optional voice synthesizer etc.

2 TS930S HF transceiver. Modes› USB, LSB, CW, FSK, AM. Frequency range› transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input› 250 watts, AM 80 watts DC. Power supply› internal psu, 240 VAC. Features› 8 memories, 2 VFOs, optional internal ATU, CW full break-in, SSB IF slope tuning, CW variable band width, IF notch filter, audio filter etc.

3 TS440S HF transceiver. Modes› USB, LSB, CW, FSK, FM, AM. Frequency range› transceive 160 to 10 metres, receive 100 kHz to 30 MHz. Power input›200 watts PEP, AM 110 watts DC. Power requirement› 13.8 VDC, transmit 20 amps. Features› 100% duty cycle, optional internal ATU, CW full break-in, IF shift, notch filter, 100 memories, keyboard frequency entry, manual or automatic bandwidth selection optional voice synthesizer etc.

4 TS430S HF transceiver. Modes›USB, LSB, CW, AM and optional FM. Frequency range›transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input›SSB 250 watts PEP, CW 200 watts DC, FM 120 watts, AM 60 watts. Power requirement› 13.8 VDC, transmit 20 amps. Features›8 memories, 2 VFOs, memory and programmable band scan, IF shift, notch filter etc.

5 TS830S HF transceiver. Modes› USB, LSB, CW. Frequency range› 160 to 10 metres. Power input› 220 watts PEP, CW 180 watts DC. Power requirement› 240 VAC. Features› pair of 6146B valves in PA, variable band width tuning, notch filter, IF shift, RF speech processor etc.

6 TS530SP HF transceiver. Modes› USB, LSB, CW. Frequency range› 160 to 10 metres. Power input› 220 watts PEP, CW 180 watts DC. Power requirement› 240 VAC. Features› pair of 6146B valves in PA, IF shift, notch filter etc.

7 SM220 station monitor. Features› TX and RX waveform monitoring, trapezoid linearity check, two tone test generator, wide band oscilloscope, panoramic display (band scan) with optional BS8 unit having 40 kHz/200 kHz sweep width. Versatile and invaluable station accessory.

8 TL922 HF linear amplifier. Modes› SSB, CW, RTTY. Frequency range› 160 to 10 metres. Power input› SSB 2000 watts PEP, CW 1000 watts DC. Drive› 80 watts or more for full output. Power requirement› 240 VAC, 14 amps. Features› class AB2 grounded grid amplifier using a pair of EIMAC 3-500Z valves.

9 TS670 Quad band transceiver. Modes› USB, LSB, CW, AM and optional FM. Frequency range› 40, 15, 10, 6 metres. Power output› USB, LSB, CW, FM 10 watts, AM 4 watts. Power requirement› 13.8 VDC, 4 amps. Features› 80 memories, 2 VFOs, keypad frequency selection, optional general coverage receive board etc.

10 TM201A two metre mobile. Mode› FM. Frequency› 144 to 146 MHz. Power output› 25 watts. Power requirement› 13.8 VDC, 5.5 amps. Features› compact, 2 VFOs, 5 memories, priority alert, memory and programmable band scan, full repeater facilities, includes external speaker, mobile mount and up/down microphone.

11 TM411E seventy centimetre mobile transceiver. Mode› FM. Frequency› 430 to 440 MHz. Power output› 25 watts. Power requirement› 13.8 VDC, 6.9 amps. Features› digital code squelch, tilting front panel, 2 VFOs, 5 memories, priority alert, memory and programmable band scan, full repeater facilities, includes external speaker, mobile mount and up/down microphone.

12 TM211E two metre version of TM411E mobile transceiver.

13 TM2550E two metre mobile transceiver. Mode› FM. Frequency range› 144 to 146 MHz. Power output› 45 watts. Power requirement› 13.8 VDC, 9.5 amps. Features› large display, illuminated keypad, optional digital channel link, high output power, optional voice synthesizer etc.

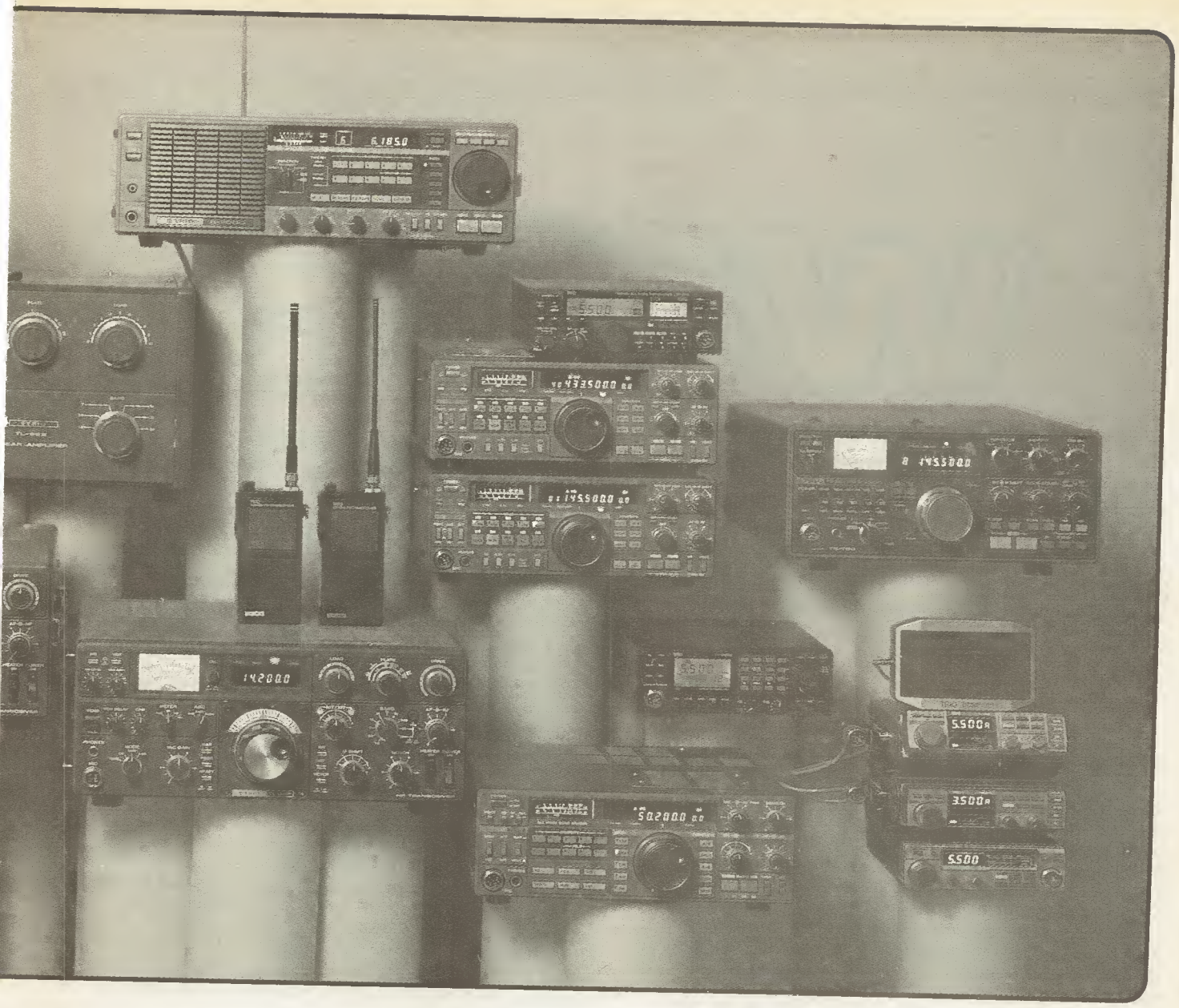
14 TH41E seventy centimetre handheld transceiver. Mode› FM. Frequency range› 430 to 440 MHz. Power output› 1 watt or 150 mW. Power requirement› 7.2 VDC from supplied nicad pack. Features› compact, slim and lightweight, thumbwheel switch frequency selection, full repeater facilities etc.

15 TH21E Two metre version of TH41E.

16 TR2600E two metre handheld transceiver. Mode› FM. Frequency range› 144 to 146 MHz. Power output› 2.5 watts or 0.3 watts in low power position. Power requirement› 8.4 VDC from supplied nicad pack. Features› compact and lightweight, 10 memories, memory scan, programmable band scan, keyboard frequency selection, digital code squelch, full repeater facilities etc.

17 TR3600E Seventy centimetre version of TR2600E. Note, does not include nicad or mains charger.

18 TS711E two metre base station transceiver. Modes› USB, LSB, CW, FM. Frequency range› 144 to 146 MHz. Power output› 25 watts. Power requirement› internal



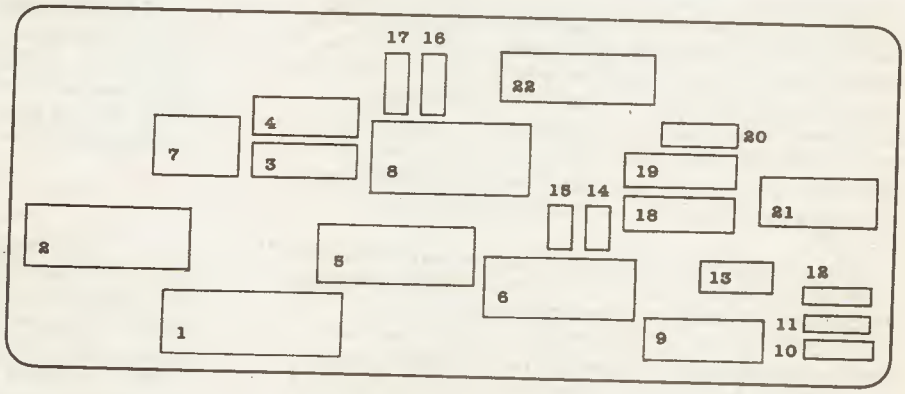
power supply 240 VAC or 13.8 VDC at 6.5 amps. Features› 10 Hz step dual VFOs, IF shift, auto mode selection, 40 memories retaining frequency, mode, simplex or repeater shift, tone burst. Programmable band scan, memory scan, free running or stepping VFO, digital code squelch etc.

19 TS811E seventy centimetre version of TS711E.

20 TR751E two metre mobile/base station transceiver. Modes› USB, LSB, CW, FM. Frequency range› 144 to 146 MHz. Power output› 25 watts. Power requirement› 13.8 VDC at 6 amps. Features› auto mode selection according to band plan, excellent receive performance, 2 VFOs, 12.5 kHz steps on FM, alert channel, all mode squelch, memory frequencies can be transferred to VFO, optional digital channel link, optional voice synthesizer, full repeater facilities etc.

21 TS780 dual band base station transceiver. Modes› USB, LSB, CW, FM. Frequency range› 144 to 146 and 430 to 440 MHz. Power output› 10 watts. Power requirement› 240 VAC or 13.8 VDC at 5 amps. Features› full coverage of two metres and seventy centimetres in one transceiver, 10 memory channels, 2 VFOs, memory scan, band scan, IF shift, full repeater facilities, VOX operation, free running or click stop VFO etc.

22 R2000 general coverage receiver. Modes› USB, LSB, CW, FM, AM. Frequency range› 150 kHz to 30 MHz. Power requirement› 240 VAC or 13.8 VDC. Features› optional internal VHF converter covering from 118 to 174 MHz, 10 memories storing frequency, band and mode. Memory scan, programmable band scan, all mode squelch, tone control, slow or fast AGC, high and low impedance aerial terminals, remote switching from internal clock (tape recorder), receiver muting etc.



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Metre wave

Looking back on what was said in this space just a twelvemonth ago in the G5UM retrospect of 1985 it was clear that the three alliterative activities of Six , CW and Seventy Cms bulked large. They did so again in 1986 but so did several other factors that made the year just past a significant one in metrewave terms.

Taking his customary annual "look-back at last year", Jack Hum, G5UM, comments on some of the highlights of the VHF scene in 1986.

First, then, a quick look at 6 metres, at CW, and at 70cms. This time last year the British ham movement was eagerly awaiting the general release of the 50MHz band due to take place on February 1st, 1986. Now, at this moment of writing, it is equally eagerly awaiting what fiat will come forth on February 1st of 1987 in respect of 6 metres. Will power levels and aerial restrictions be eased? Will Class B operators be allowed access to this fascinating band? Rumour has been rife these last many months: realisation is quite another matter.

What can be said of Six during 1986 is that the curbs placed on UK operators had the desired effect of nullifying interference to overseas services. Right from the beginning it had been made plain by the national society when it negotiated the release of the band that the surest way to lose it would be to clobber our Continental neighbours. Even during the exceptional lifts which occurred during 1986 — an auroral one early on and a mighty sporadic-E one (or indeed two or three) late in the year — no such clobbering was evident.

More than one 6m user has pointed out wryly that if the QRO television services which formerly occupied the 50MHz spectrum caused little trouble to the Continentals under lift conditions, surely the flea-power emanations from amateur radio stations were unlikely to do so. Sadly, no one could rightly claim that during 1986 the 6m band was a hive of activity. It wasn't. There were too many deterrents. On the one hand there were the antenna and power restrictions; on the other, the uncertainty that prevailed about whether indeed British hams would be allowed to use the band at all after February 1st, 1987. No wonder people were dissuaded from putting much investment into it!

The result (as one of G5UM's locals put it) was ". . .a criminal under-use of an excellent band". Or, in the words of G4AJJ in an eloquent article here (HRT, October, 1986), ". . .why spend cash on what is initially a one year allocation?"

Yet if you didn't want to spend cash there was another approach to the economic problem of getting on to Six and that was to do it on the cheap. Many spares boxes in many ham shacks would contain enough bits and pieces to build the G5UM converter described here in July 1984 or the cheap and cheerful "Simple Sender for Six" of November 1985. Or you could follow the approach suggested by GW3ARP (HRT, October and November 1986) and adapt ex-PMR gear for the band, involving minimal loss if everything had to be thrown away should the band be cancelled.

Linked with all this uncertainty there remained in many hams' minds the lurking question: "Is the band being used properly? Has it not become too DX-orientated? Isn't it after all a local-range VHF band and shouldn't we all use it as one rather than wait for the DX to occur, which it will do only sporadically (almost literally)?".

Use of Six as a quasi-local band, rather as Four is used, suggests that FM should play a much greater part than it has done to date. Hands thrown up in horror was the effect produced by any suggestion of using F3E on Six . But why not? The band is wide enough to encompass all modes, and there is a strong case that it should complement Ten FM . Nobody objects to the use of F3E on 29MHz when the band is local in character for most of the time. Nobody should object to similar usage of Six .

If 1987 brings into action many FM nets at the top end of "Six" this will at least rejuvenate the band. Meanwhile, don't forget to put out a call on the hour, as advocated in this column and always press the "Send" switch on the newly founded Friday Night Activity Night on Fifty. And so to. . .

Seventy in ascendant

. . .Monday Night Activity Night on Seventy : meaning the so-called alphabetical competition in which you needed to work 26 Class B stations each with a different terminal letter to the callsign, and 26 Class A similars, and you could earn yourself a certificate. The project, launched in 1985/6, proved so popular that it was initiated again for the winter of 1986/7.

The desired result was achieved: a significant increase in activity on a band which is quite as good as Two (so long as you use an adequate aerial), three times the frequency of Two , and in the opinion of many, three times as interesting.

Even on 70cm the "Six Metre Syndrome" appeared to prevail for much of the time in 1986. People failed to appear at the SSB/DX end of the band unless an opening was obviously imminent, with the result that occupancy of this area was lamentably low for much of the time. Happily, the Monday Night Activity concept,

plus the always popular RSGB Cumulatives, persuaded on to the band many people who otherwise wouldn't have bothered.

Up at the FM end of Seventy things have been very different. More and more operators, new and less new, have succumbed to its charms and have invested in transceivers for it both to talk through its 100-plus repeaters and also to enjoy the simplex contacts which repeater exchanges often spark off. The advice consistently urged in this column to get yourself a small but gainy (and almost invisible) Yagi for the band seems to have been followed by increasing numbers of operators keen to maximise their enjoyment of it.

The other enormous advantage of investing in 70cm — and it became very apparent during 1986 — is that it provides channels for duplex contacts back to Two, and, with immediate talk-back, a highly efficient means of communication.

There is no need to rehearse yet again the limitations to cross-band operation which have so often been stressed on this page except to say the you *must* announce callsigns frequently, you *must* say which bands you are employing, you *must* prevent your QSO-partner's callsign from being emitted on the band he is not using, and you *must* keep overs short to avoid irritation to people eavesdropping on you; and you *must* check both duplex frequencies in use lest others should wish to use them. Many frequencies are available above 144.5 and 432.5MHz where crossband operation may be initiated without occupying the congested S and SU channels.

All of which will not be new to HRT readers who follow this column; but it *will* be new to the many thousands of more recent licensees. And so to. . .

Welcome, new friends

. . .a welcome to all new licensees of 1986 and new readers of HRT, a majority of them doubtless from Citizens' Band and therefore experienced in communication techniques. Many of these "new chums" betray their CB origins by the use of CB terms on the ham bands, and nothing wrong in that so long as the jejune and facetious types of CB talk are avoided. It has been suggested that some of the more sensible CB terms may usefully fertilise the style of traditional ham conversation. After all, what is objectionable about "the personal"? It is much to be preferred to "the handle" — and it was the hams who invented *that* one!

Which brings us by easy stages to the third alliterative aspect of amateur radio mentioned in the opening paragraph, and that is CW. Many of the newcomers and the ex-CBers, were heard during 1986 constantly to voice the wish over 2m and 70cms to make themselves proficient at CW. "I want to get on to the HF bands" was the expressed wish, with the learning of CW as an apparently necessary evil to achieve that desirable state. But wait a minute. . .

Remember that telegraphy is a valuable tool to have to hand for working DX on the metrewaves. You don't need to throw away the facility once you have passed the test: it will give you a lifetime of pleasure if you stay in practice.

Secondly, have you really thought through the results of getting on to the HF bands! You will exchange the marvellous signal-to-noise ratio you enjoy on metrewave for a clattering noise to signal ratio down on those so-called DX bands. You will indeed be able to talk with many new overseas friends but you will find that "formula QSOs predominate. And if you thought there was an inordinate number of "long winded old gas bags" on 2m, wait till you get on Eighty !

But back to the CW mode. Facilities for learning it and for taking the test enormously multiplied in 1986 thanks largely to the initiatives launched by the national society. To go for the Class A licence has probably never been made easier. Once obtained, it can be used to extend your range at metrewave on the key under virtually QRM-free conditions for most of the time.

One thing leads to another: mention of QRM poses the question . . .

Too many contests?

. . .are there too many contests in the metrewave spectrum? Trends of thought during 1986 suggested that there are. "Hardly a week goes past without some contest or other making life unbearable on the band" was a comment heard with increasing insistence last year.

A related point of view is that many of the portables which hit the hills at contest times not only bring to themselves the advantages which high sites confer, but also tend to use far more power than is justified either by the superior site or the comfort of other users of the band, many of whom may not be interested in contests at all but simply ask to be allowed to go about their normal business in peace.

It is legitimate to argue that contests "improve the breed" both of operators and equipment submitted to intensive use over periods of many hours. But it is equally legitimate to say that if power restrictions were stringently imposed, operator skills would be tested even more than they are when all you have to do from a prime site is to "blast through", often with more ERP than is justified. There is more merit in working the length of the land on VHF QRP than there is on QRO — and it would exercise that CW facility a great deal more!

Perhaps little can be done to improve matters for 1987: most of the year's metrewave contests are already scheduled. Maybe some radical re-thinking of the contest ethic for 1988 would be no bad thing.

Assisted communication

What of the repeater scene during '86, an area of immense and increasing importance to a large proportion of the users of the metrewave spectrum? The proportion of repeaters represents "the biggest collective technical effort ever to be put forth by the British amateur radio movement". Remember?

It became evident as 1986 progressed, and thousands flocked to the metrewave allocations, that a considerable job of work needed to be done to persuade them — or at least some of them — into the proper use of repeaters. The tendency grew to treat repeaters as vehicles for cosy local chats when a little "checking of the input" would have revealed that simplex communication was possible for much of the time. There was often a failure to realise that a repeater is intended for the disadvantaged, notable the operator in a car fitted with a necessarily exiguous antenna almost at ground level and unlikely to provide much coverage for him. The repeater enables him to talk to others: without it he couldn't. Always his needs should be borne in mind by fixed station users who have cause — and quite justifiably — to communicate via the box . Hundreds do give way to the mobiles: a minority don't, some of them with callsigns "old enough to know better". Maybe local repeater groups through their individual news-sheets (and these are many) can do the necessary job of education — and it will need saying many times.

A GENUINE VHF/UHF WAVEMETER

Could you be caught short with horrendous harmonics? Peter Metcalfe, BSc, considers the G4ONF cavity wavemeter.

When was the last time that you read the back page of your license? You know the one which goes on about the frequency checking of your equipment. If I may, I'll remind you of what is said. Basically you must have access to some means of verifying that *'transmissions are within the authorised frequency band'* and you must be able to *'ensure that transmissions do not contain unwanted frequencies'*, ie harmonics and spurious frequencies. Now I know that nowhere does it say that an operator must *own* such a device, but Section 2 does state that *'the licensee will be expected to demonstrate that he can conform with the requirements.'*

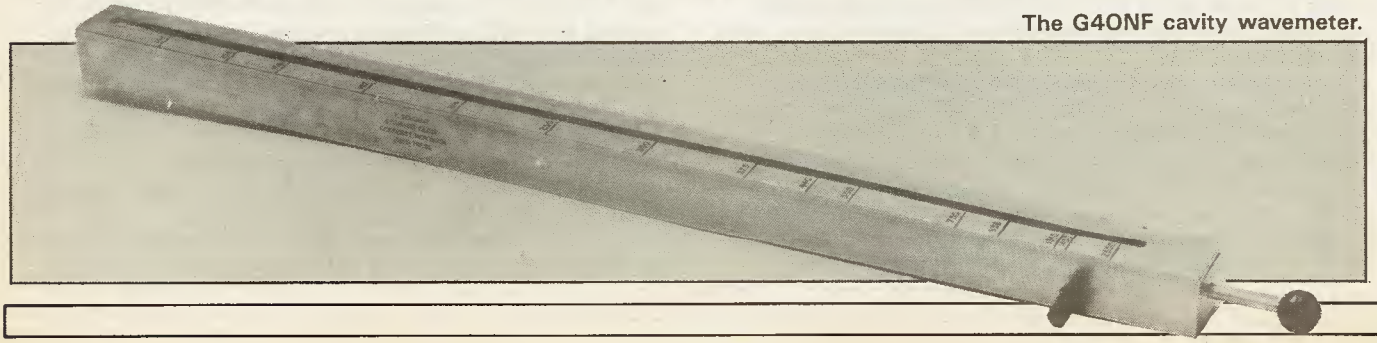
Now, hands on hearts — how many of you can honestly say that you can comply with the regulations? To my mind, the only way you can satisfy the inspectors is if you actually own a suitable piece of gear, have used it regularly and have got to know its own particular peculiarities. It also goes a long way to appeasing the neighbours if you can demonstrate professional competence in checking your gear in case of complaint. Much better than a fumbling 'well look, I think you connect this here and then . . . oh . . . I don't think that's right . . . etc' which would be inevitable with a piece of newly borrowed equipment.

So what sort of equipment is required? Here again the license is quite helpful and two broad categories are defined. These are:

1. Accurate frequency measuring gear — essential for the 'home-brewer' or inveterate 'twiddler'.
2. Wavemeters — used to indicate approximate frequencies and more to the point, harmonics and other frequency bands.

With most commercial gear nowadays being crystal controlled, the second category is going to be the most useful (also the cheapest!). With regard to wavemeters, the guidelines given in the license are *'. . . scale length and accuracy should be suitable for measurements of the required accuracy and the frequency coverage must extend up to the second, and preferably the third harmonic so that unwanted frequencies may be detected . . .'* For HF, and possibly 2m transmissions, these requirements can easily be met by using a standard FET and meter wavemeter, such as the type appearing in the RSGB Handbook and in radio magazines. If you don't fancy the construction and calibration hassles, there are many commercial devices available for less than £50. However when it comes to the ever more popular 70cm and frequencies above, the trouble starts! Here I would like to take to task advertisers who, somewhat misleadingly, quote 'VHF/UHF wavemeter — frequency coverage 120-450MHz'. Now while I agree that they do cover the *fundamental* on 70cm and as such can be considered UHF, they do *not* comply with the '. second, and preferably the third, harmonic .' requirements and so, strictly speaking, should be labelled as VHF wavemeters. Incidentally, it's not just the advertisers who fall into this trap, I've seen articles elsewhere on VHF/UHF wavemeter construction which even after very careful construction would be hard pushed to top 600MHz!

All of the above was prompted by the receipt of the Paul Sergent (G4ONF) 144-2500MHz cavity wavemeter. If the claimed 2500MHz is true then this is indeed a genuine VHF/UHF wavemeter. By definition a cavity wavemeter is a very simple device, ie there is very little to go wrong and this version is no exception. Its appearance is somewhat like an overgrown swanee whistle and the allusion is heightened by the peculiar noise when the inner element is pulled out! The device is essentially a square section aluminium tube about 60cm long, an inner element (which can be adjusted for resonance) and a calibrated scale. Connections are made via a pair of N-type sockets (BNC can be supplied if requested) and metering is taken from a 2.5mm jack socket. All that you need to supply are a simple meter and a calculator

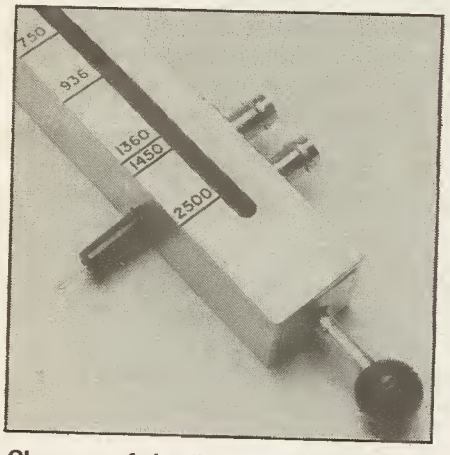


The G4ONF cavity wavemeter.

(see later) and you have a very useful piece of gear. If there is one problem with this type of device it is that you will need lots of space, for when extended it is over a metre in length.

To operate the wavemeter you simply connect the rig to one socket and a dummy load or aerial to the other. A suitable microammeter is connected to the jack plug and while transmitting the inner element is adjusted slowly until the meter reads a maximum. This should give the fundamental frequency. I found a 50uA meter adequate when 'sprog hunting' or when using very low power (mW's) but for higher output powers and for measuring the fundamental a less sensitive meter would be required (eg anything up to 10mA for 10W). So a meter, switchable over a range of currents, would be the most suitable.

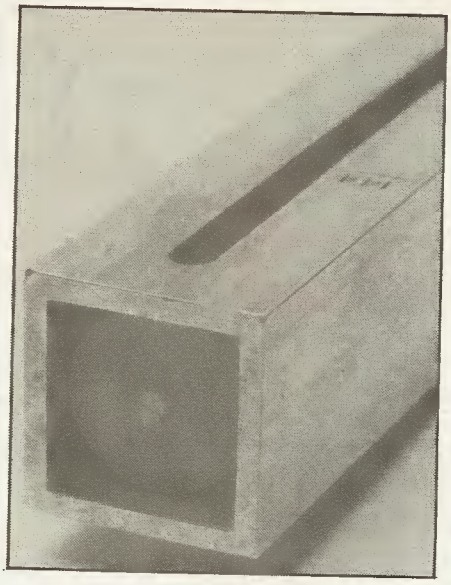
It was also noted that readings could be slightly confused by RF pickup in the meter and leads — so keep them short and screened. *Don't* use digital meters for this device as the higher input resistance makes



Close up of the 'business end' of the device. You can opt for N type or BNC connectors.

them more prone to RF pickup and the relatively long settling time of the display makes it impossible to note the tiny peaks associated with harmonics or spurious signals.

In fact I did find that the meter could be dispensed with altogether if you connect an SWR meter in line between the rig and wavemeter. Using this method you will note that as you tune the wavemeter there is a very sharp dip in SWR followed by a sudden rise, the highest SWR corresponding closely to the tuned frequency. However if you value your output stage, especially at higher powers, you should use the mini-



A PTFE washer is used to guide the inner element inside the tube — but this has to be removed when working at UHF.

mum SWR point. This gives a reading only about 1-2% away from the actual value for quick 'sprog hunting' and is certainly the easiest method.

The scale of the wavemeter is etched into the metal on the upper surface and there is a PFTE disc attached to the end of the inner element which helps guide the rod inside the cavity, this can also be used as an indication of length. However, the disc needs to be removed when working above 1GHz, or it fouls the sockets. Having found the length, this is where the calculator comes in, for the wavemeter comes supplied with an equation for converting the length of the inner element into MHz, but strangely the equation is quoted for inches! To assist in rough positioning of the inner element fifteen calibration points from 144 to 2500MHz are inscribed on the other side of the slot. In use readings at 433MHz were found to be only 2% out, and the 'best attempt' produced 0.5% accuracy.

The regulations call for adequate scale length to provide necessary accuracy; now the worst case that I can see with this device would be when measuring 1296MHz and its harmonics. With the supplied scale this would mean (assuming a 1mm error in length reading) a 3-4% error at 2500MHz — more than adequate I would think! The current version of the wavemeter incorporates some modifications whereby a plastic millimetre rule is no longer fitted to the top surface and a lock nut for the inner element is now absent. Although the frequency scale etching is much cleared than the earlier version the choice of frequencies also has been changed. I personally think that this is a retrograde step as the marked frequencies are not particularly useful ie, they are not harmonically related. Also, since the scale is not linear, interpolation between the marked frequencies is a little difficult. Perhaps a good compromise would be to retain the original millimetre scale on one side and fit some form of 'write on' label on the other — so that you can write in your own 'favourite' frequencies for future reference.

I had found the lock-nut on the earlier version to be very useful while working in a cramped space, as it is easy to knock the inner element while reading the scale. I also found that the quality control for the second version had faltered slightly and the milling of the slot had left a considerable amount of burr which fouled the PTFE washer. However, once I had cleaned this out, the second version performed just as well as the original. One final thing that I must mention, which is inevitable when handling aluminium, is that the wavemeter leaves your hands a bit mucky — perhaps a coating of polyurathane would help here.

I am sure that you will agree that all of the above gripes are minor points. For its price, Paul Sergent has come up with a superb piece of gear, plugging a very important hole in the market. He can also supply a shortened version which caters for 430-2500MHz. So now all you 'black box' operators have got no excuse for not complying with the regulations — just get in touch with G4ONF!

Prices, including VAT and p&p are:
144-2500MHz cavity wavemeter £33.30
Shortened 430-2500MHz version £27.50

From:
Paul Sergent, G4ONF,
6 Gurney Close,
Costessey,
Norwich NR5 0HB
Tel: (0603) 747782

Practicalities

"This is what amateur radio is all about," a friend of mine said to me as the signal of the shuttle faded into the noise as it went over the horizon. About half an hour before the three of us had talked of trying to see if we could talk to the shuttle. As there was no time to set up anything

Simpler speech processing and coil winding, amongst other items from Ian Poole, G3YWX

elaborate we had to see what equipment we had with us there and then. Somehow or other we managed to put together a system using a very 'Heath Robinson' dipole taped to a pole for transmitting on 70cms which was fed from a 70cms mobile transmitter, and a handie talkie for listening on 2 metres. This was all strung together using a mass of available leads.

The system was switched on just in time to hear the shuttle callsign DP0SL coming out of the noise. We made a couple of calls to the shuttle which was recording what it heard on tape. As it turned out we were not heard but that did not matter too much. The main thing was that it was an enjoyable half an hour or so and we had proved again what can be accomplished with limited resources and time.

The SL6270

Plessey produce a very wide range of ICs which are particularly useful in amateur radio. The SL6270, a VOGAD or Voice Operated Gain

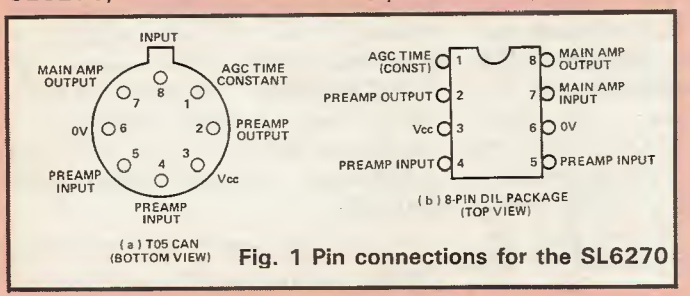


Fig. 1 Pin connections for the SL6270

Adjusting Device, is very useful in speech processors because it requires only a few external components around it. Essentially the '6270 is an audio AGC circuit providing a constant output level over a very wide range of inputs, and can be used on its own to give a constant audio level into a transmitter. Alternatively it can be used as part of a speech clipper so that the amount of clipping can be kept constant regardless of the input level.

A basic circuit using an SL6270 is shown in Figure 2; the two capacitors C1 and C2 are used

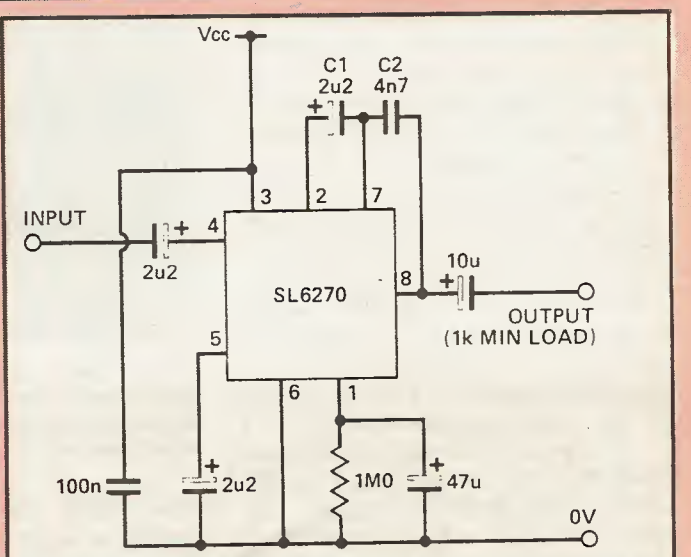


Fig. 2 Basic SL6270 circuit.

to determine the frequency response. C1 in series with an internal 680ohm resistor is used to determine the low frequency break-point whilst C2 in parallel with an internal 10k resistor sets the high frequency one. Although the data book states that the values shown give roll off points of 300Hz and 3kHz a few simple calculations (see Figure 3) reveal some different figures. In fact with the values shown the low frequency response will extend well below 300Hz and the high frequency response above 3kHz. The reason for this is that a wider calculated bandwidth must be used to allow for component tolerances, particularly within the IC. So the circuit will give the required response even if some component values are particularly 'over' or 'under'.

Although this is a perfectly good design philosophy there may be occasions where the frequency of the lower breakpoint needs to be higher. One example of this is in audio, or baseband clippers in which it is often useful to

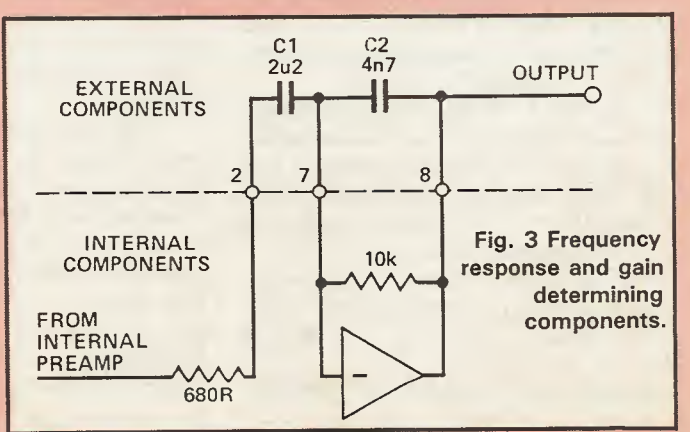


Fig. 3 Frequency response and gain determining components.

pre-emphasise the higher frequencies and reduce the lower ones. Often a low frequency breakpoint around 1kHz or sometimes even higher can be useful. There are two reasons for this: firstly it makes the audio sound more 'punchy' because the higher frequencies are accentuated; and secondly it reduces the low frequencies which add little to the intelligibility but cause un-removable in-band harmonics during clipping.

With this in mind it would be quite possible to decrease the value of C1 to 1uF or even less. If the internal 680ohm resistor and the capacitor used were exactly at their nominal values, then a value of 220n would be quite in order. This was the value which I settled on for my processor and it gave an audio quality which was described over the air by several stations as being punchy and intelligible. However, in view of the tolerance problems it is possibly safer settling on a larger value such as 470n or at least experimenting.

The other point which is worth mentioning on the '6270 is its low input impedance. If it is used in a differential configuration, ie with the microphone connected between the two inputs, then its input impedance is 300ohms. Alternatively it can be used in a single-ended configuration with one input grounded and the other connected to the microphone, and in this case its input impedance is only 150ohms. As most microphones have a higher impedance than this (though they will operate to some extent into 150ohms) it is advisable to place a simple transistor emitter follower or FET source follower between the microphone and the SL6270.

If such an input buffer is used together with a higher impedance microphone then it is quite likely that the microphone output will be larger. Unfortunately this may cause the background noise in speech pauses to rise to unacceptable levels. This can be overcome by reducing the gain of the SL6270 by placing an external resistor in parallel with the internal 10k resistor. The value of C2 will have to be recalculated to keep the same high frequency breakpoint.

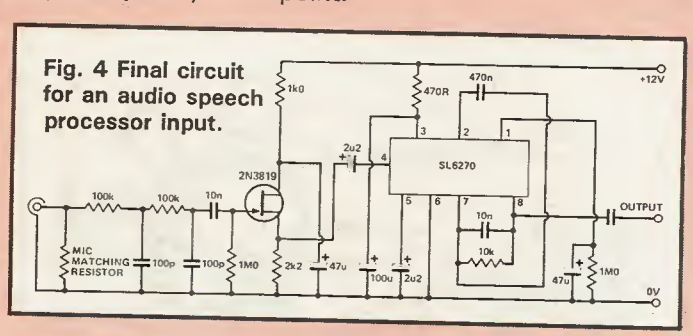


Fig. 4 Final circuit for an audio speech processor input.

One possibile solution is shown in Figure 4. It has a high input impedance FET source follower driving the modified SL6270 circuit. The input to the FET follower has a low value resistor to match the microphone and also a simple RC network to remove any stray RF which is picked up on the microphone lead. This filtering should be sufficient for most cases but if necessary it could be changed to give more filtering.

Coil winding

Coil winding is often more difficult than it seems. Wire being what it is, it tends to spring out of place given only half an opportunity. This often means starting the winding all over again. Whilst many coil formers have terminals to anchor the start of the wire during winding, some do not and these are the most difficult.

When I was building a QRP transmitter I had to devise a means of holding the wire in place whilst winding the VXO coil. The former to be used had no terminals and the wires were to be anchored to terminal pins on the board.

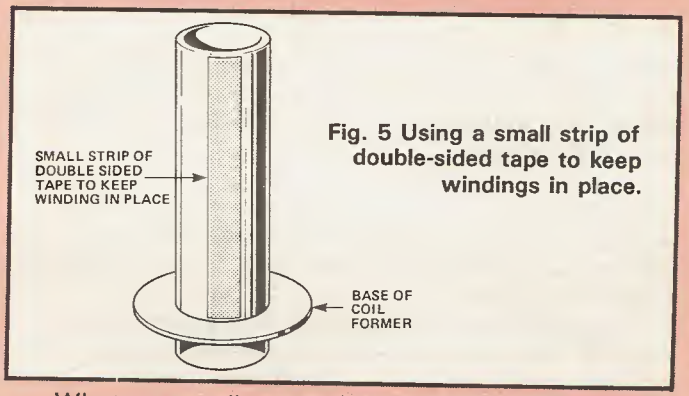


Fig. 5 Using a small strip of double-sided tape to keep windings in place.

What was really needed was a small strip of double-sided sticky tape to stick onto the former as shown in Figure 5. However, there was none to hand and so an equivalent had to be made from a small piece of masking tape or something similar. Just over a quarter of an inch of tape was cut and folded back on itself to form an "O" (Figure 6). When this was stuck onto the former it produced the equivalent of a strip of double-sided tape about one-eighth of an inch wide. This should be adequate for most small formers and it is sufficient to hold the wire during winding.

If a small amount of tape is left uncovered by the winding at either end, then another strip of tape can be stuck down over this to hold it in place more permanently. This idea worked well for the VXO coil, and it could be extended further for use on other formers without terminals, like toroids.

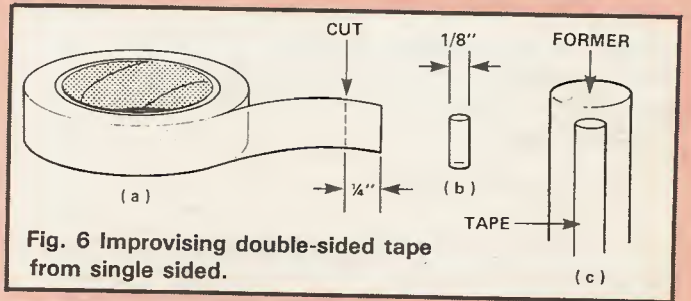


Fig. 6 Improvising double-sided tape from single sided.

Oscillating Power Supplies

With the wide range of regulator ICs which are available it is now an easy matter to design and build a voltage regulator. Probably the most popular of these ICs has been the 78xx and 78Hxx series of three-terminal regulators. Not only do these chips provide a well-regulated output, but they also have features such as short circuit

protection and thermal shutdown.

In spite of all these features and the simplicity of the circuit it is still possible to come across problems. The most likely problem to be encountered is that under some circumstances it is possible for these ICs to oscillate. Although the oscillation does not normally exceed around a volt peak-to-peak it can be more than sufficient to cause some funny noises at the loudspeaker!

The problem is almost invariably caused by the regulator IC being located too far away from the smoothing capacitor. In order to prevent this happening the capacitor should be moved closer to the regulator. Unfortunately this is not always possible and in order to stop the regulator oscillating a smaller capacitor, between about 100n and 1uF can be connected between the input and earth terminals of the regulator close to the IC itself; C2 in Figure 7.

In addition to this capacitor sometimes one is seen connected across the output. This is not necessary to keep the regulator stable, but it does improve the transient response, and it may help if there is RF around.

Two quick final points on IC regulators: don't forget to work out the power dissipation in the regulator, and heat-sink it accordingly. And do make sure that even with the ripple, the voltage

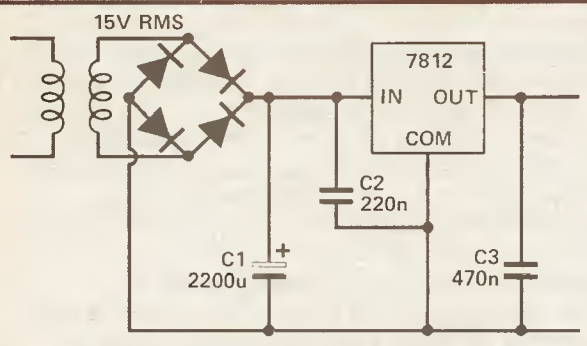


Fig. 7 Typical example of a PSU using a 78xx series regulator.

supplied to the regulator is always 2V (3V for 78Hxx) above the required output voltage, otherwise you'll get nasties on the supposedly 'regulated' output.

Any Comments?

It is now some time since this column first appeared in the August '83 issue of HRT. A large number of ideas have gone into it covering a wide range of topics associated with the sort of amateur radio I enjoy, but if there are any other topics you would like covered, or if you would like to make some comments about the column I would very much like to hear from you.

The address to write to is: *Ian Poole, c/o The Editor, Ham Radio Today, Argus Specialist Publications, 1 Golden Square, London W1R 3AB.*

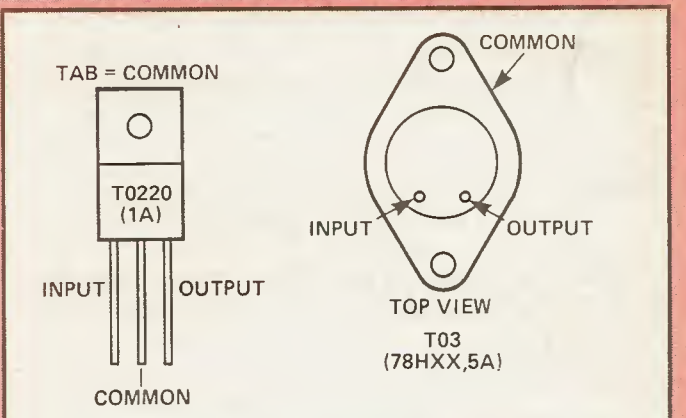
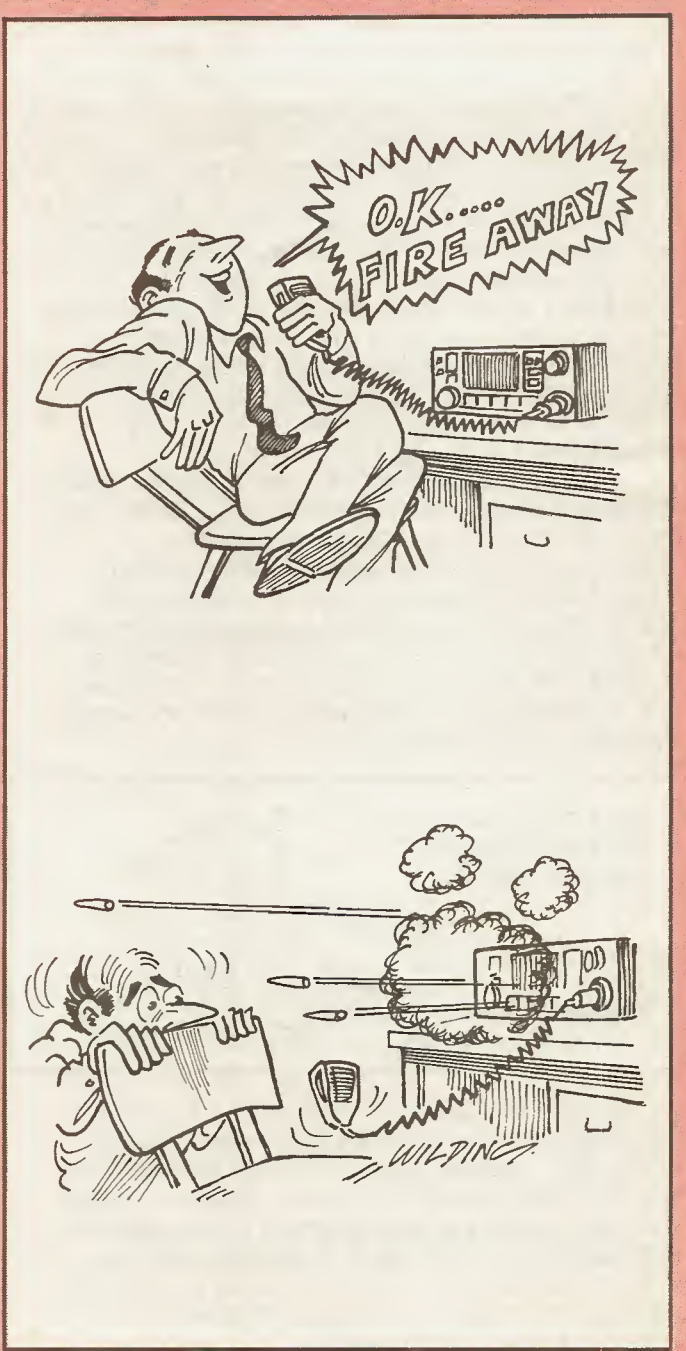


Fig. 8 Pin connections for 78xx series regulators (note that the 79xx series negative regulators are different).



Controlling your rig REMOTELY

It's surprising how often the ability to control your rig over a pair of wires can come in handy. Perhaps your 'shack' is in the loft, or down the garden and on a cold winters night it is hard to find the inclination to join in the nightly local net — unless you are interested in gaining points for the 'Brass Monkey' award.

You can work VHF/UHF from the comfort of your lounge, without a rig in sight and save money on the feeder cable. Graham Packer, G3UUS, pats his wallet and pulls up an armchair.

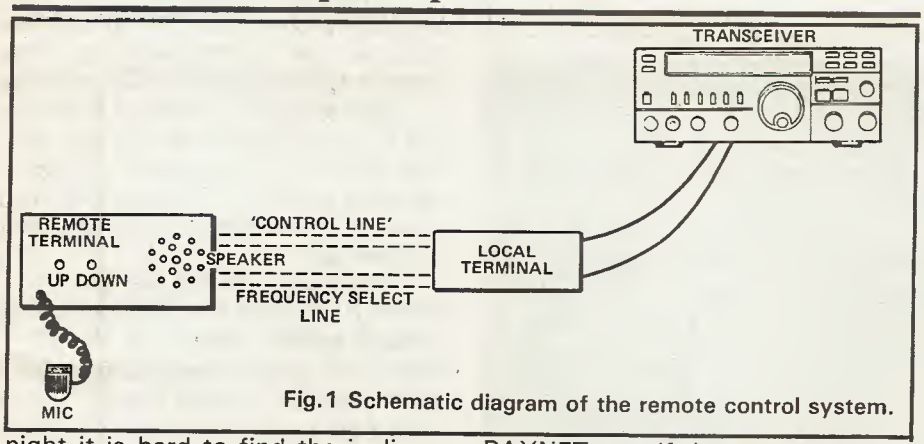


Fig.1 Schematic diagram of the remote control system.

This article was originally prompted by the need to operate a second 2m radio for RAYNET purposes at a County Control Centre. One coaxial cable had already been installed — at great expense, sweat and broken masonry — and the thought of putting in a second 150m length of RG67U, caused mild consternation amongst the emergency planning staff.

Running nice cheap twin flex — £4.95 per 100m reel — was an easier matter altogether, which, coupled with the desire to locate the second radio as far away as possible from the first on an adjacent roof top to minimise 'desensitising', made some form of remote control mandatory. Mounting the 2nd rig remotely on the roof also allowed the rig to be located very close to its antenna, thus minimising feeder loss.

The system just described did not have the ability to change channels remotely on the transceiver, as this was considered unnecessary for single channel RAYNET use. If the microphone on the rig you wish to control is equipped with an 'up/down' frequency button, a second piece of four wire cable can be used to give remote channel changing. Suitable circuitry is given in **Fig.4.**

Other applications for remote control of radio equipment, VHF/UHF in particular, spring to mind: perhaps you live at the bottom of a valley, but have access to a shed at the top; or maybe you are stuck in a basement bed-sit or flat, but can bribe the landlord to let you stick your rig in the loft and drop a length of flex down the drain pipe.

How The System Works

A block diagram of the control system is given in **Fig.1**. The remote terminal is mounted at the desired operating position and the local terminal mounted close to the transceiver.

The **remote terminal (Fig.2)** uses a CB style 'power mic'. These devices are responsible for the most revolting noises imaginable on CB, where they produce so much audio that the transmitters are driven into violent distortion, but here the microphone's facilities are put to good use. The mic used in the prototype, an RS Components 249-980, has all the necessary switching built-in that we require for this terminal, requiring a minimum of external components to complete the unit.

When the unit is in the *receive mode*, audio from the incoming line is decoupled by the filter formed by RFC1-2 and C1-2. This, and the corresponding filter in the local terminal, stops RF from interfering with the system when an HF communications link or in the case of a club station, say, an 80m SSB transceiver, is splashing out the power from the same site.

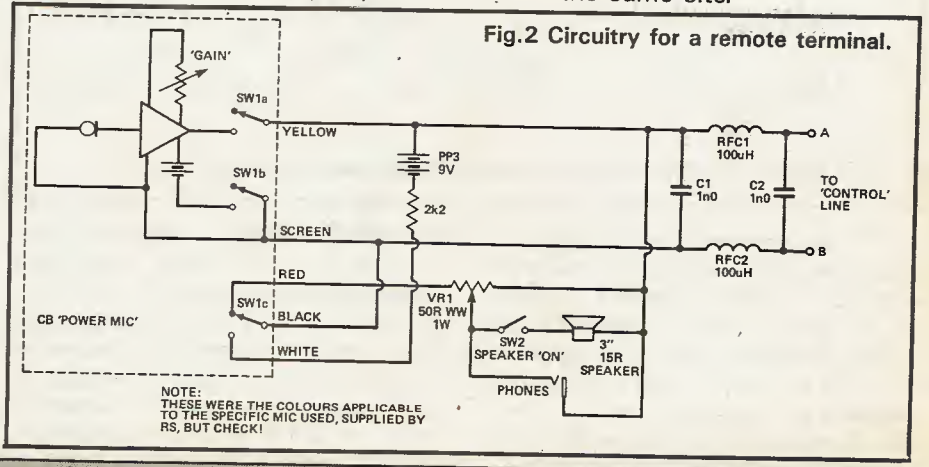


Fig.2 Circuitry for a remote terminal.

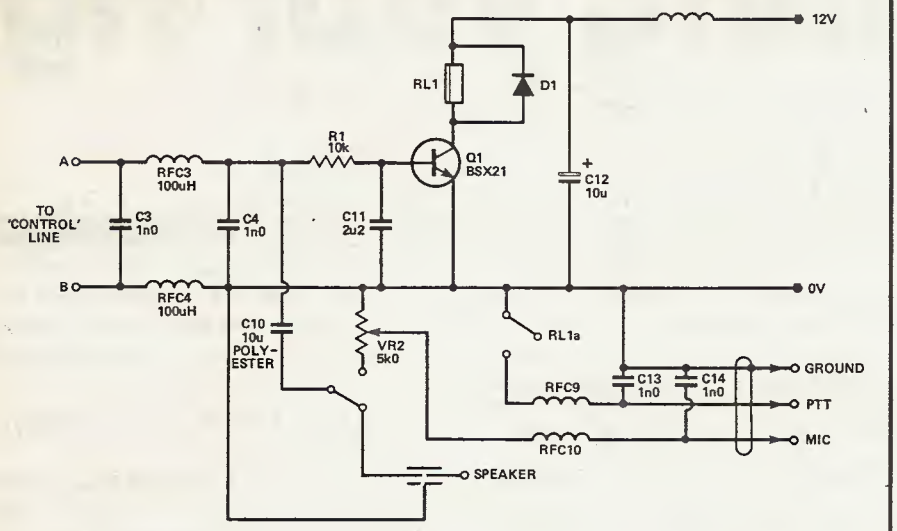


Fig.3 Circuit diagram for the local terminal.

SETTING UP THE SYSTEM

1. Select a station of known modulation depth, such as the local repeater.
2. Adjust the transceiver's volume control for a strong, undistorted, audio output (this usually occurs at about 1/3-2/3 max volume setting.
3. Set the squelch control so that it requires about an 'S2' signal (ie a noisy signal, but still Q5) to open the receiver.
4. Plug the local terminal into the speaker and microphone sockets on your transceiver.
5. Set the gain of the 'power mic' to midway. Check the deviation of your signal on a handportable and adjust VR2 for a *fully deviated undistorted signal.* The gain of the 'power mic' can be adjusted to suit different lengths of control line (twin flex).

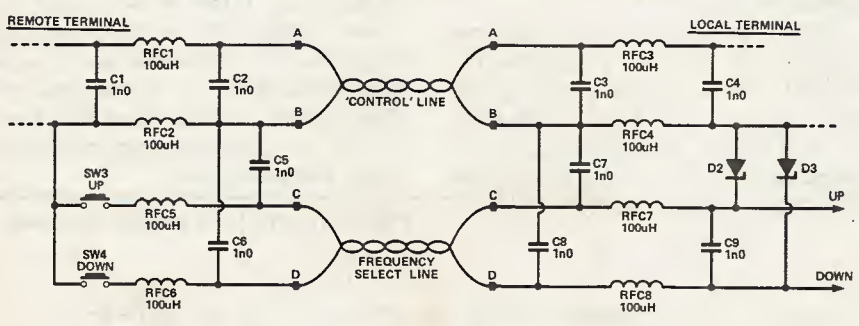


Fig.4 Circuitry of the remote control of the frequency selection.

The audio is routed via SW1c to a 50 ohm wirewound potentiometer, used as a passive volume control, to a small monitor speaker. The audio available from this speaker depends entirely on the length, and hence the resistance, of the line. The loss is negligible within the average domestic environment, but it could be appreciable when 250 metres of line are used 'in the field'.

For RAYNET use, it is expected that 'phones rather than a speaker would be the accepted method of injecting audio into an operators brain, as there would undoubtedly be other amateur stations and 'user services' radios blaring away in close proximity.

When the terminal is in the *transmit mode* and the PTT switch SW1 pressed, the speaker is disconnected from the line and a DC potential from a 9V PP3 battery applied (SW1c). The internal battery of the 'power mic' comes into operation (SW1b) and AF sent to line (SW1a).

When the **local terminal (Fig.3)** is in the receive mode the operation couldn't be simpler. Audio from the transceiver's loudspeaker is sent directly out to the control line via the RF filter (RFC3-4, C3-4). C3 blocks any DC component from entering the AF output circuitry of the radio.

When the terminal is in the transmit mode, the DC potential sent to the control line by the remote terminal causes Q1 to turn on, activating RL1, which switches the incoming audio to the mic input of the transceiver. Simultaneously, the PTT connection is 'grounded', causing the transceiver to transmit.

The Zener diodes D2 and D3 serve to protect the transceiver's logic if 'spikes' appear on the line. If you can obtain 4-wire (2 pair) BT-style '4 cable', a good idea is to use their wiring convention of A = blue, B = orange, C = green and D = brown.

COMPONENTS LISTING

Resistors	
R1	10K 0.25W
VR1	50 ohm wirewound 1W
VR2	5k carbon
Capacitors	
C1-9	1nF 500V cer
C10	10uF polyester
C11	2.2uF polyester
C12	10uF 25V electro
C13-14	1nF 500V cer
Inductors	
RFC1-10	100uH 100mA choke
Semiconductors	
D1	1N914 or similar
D2-3	9v1 Zener 400mW
Q1	BSX21 or similar

Miscellaneous

CB 'power mike' (RS 249-980); small 12V 200 ohm relay (double pole double throw, plugs and sockets to match transceiver and headphones used; press button switches for 'up-down' facility (if used); speaker to suit audio output of transceiver and two cases.

RADIO Tomorrow

2 Jan N. Bristol ARS: Xmas Party.
Maltby ARS: Activity night on air.
N. Bristol ARC: Xmas Party.
Axevale ARC: Packet Radio Demo by G1DII.
Maidstone YMCA ARS: Natter night & RAE & CW.
AMRAC: Meeting.

5 Jan Todmorden DARS: Construction Competition.
Welwyn/Hatfield ARC: CW practice night.
Burnham Beeches RC: Natter night.

6 Jan Fylde ARS: AGM.
Warrington ARC: Open Forum.
Chester DRS: AGM.
Chichester DARC: Computer Evening.
Harpenden ARC: Informal.
Loughborough DARC: Talk 'Cross Band working from home'.

7 Jan Trowbridge DARC: AGM.
Lincoln SWC: CW Activity night. Committee meeting.
Three Counties ARC: SEB Telecoms by G4VNM.
Fareham: Natter night.

8 Jan Pontefract DARS: AGM.
Bredhurst RTS: Talk "Antique Sound Recordings" by Colin Johnson of Radio Kent.
Horsham ARC: Homebrew Evening;
Edgware DRS: AGM.
Spen Valley ARS: Rifle Shooting.
Southgate ARC: Talk on Phase Locked Loops & Frequency Synthesis by G4AEZ.
Salop DRS: Video Night, Space Shuttle & Silicon Glen.

9 Jan N. Bristol ARS: Talk (to be arranged).
Coventry ARS: The (Indoor!) Direction Finding Game.
Maltby ARS: Building a multimode transmitter for top band.
Maidstone YMCA ARS: Testing with Spectrum Analysers.
Wimbledon DARC: Social Evening.

10 Jan **YL-OM 'Midwinter' Contest: CW Section** — See 'Radio Today' for details.

11 Jan **YL-OM 'Midwinter' Contest: Phone section** — see 'Radio Today' for details.

12 Jan Milton Keynes DARS: Talk 'Crime Prevention by G0DOW'.

13 Jan Loughborough DARS: Magazine reviews.
Worksop ARS: Duff Xmas Present Sale!
Warrington ARC: Talk "All at sea with electronics" by Jim Phillips GW3PRA.
Chester DRS: Talk by the winner of the construction contest.
Felixstowe DARC: Social.
Macclesfield DRS: Tal planning permission by G4XTO.

13 Jan Verulam ARC: Activity Evening.
Loughborough DARC: Magazine Reviews.

14 Jan Stockport RS: Natter Night.
Clacton ARS: Initial Meeting of the new club. 7.30pm at the Eldorado Club, The Broadway, Jaywick, Essex.
Lincoln SWC: Talk 'Fire & Smoke' by G1TSL.
Fareham DARC: Morst Testing by G3TZL.

15 Jan Pontefract DARS: Film 'The Electric Mountain'.
Salop ARS: Natter Night.

16 Jan Coventry ARS: Night on the air.
N. Bristol ARC: VHF Night in the morse room.
Maidstone YMCA ARS: Natter night & RAE & CW.
Loughton DARS: Film Show by G1DJI.

19 Jan Burnham Beeches RC: Lecture.

20 Jan Loughborough DARS: Forum — Computers in Ham Radio.
Chichester DARC: Project Alignment, Calibration evening.
Warrington ARC: Talk 'Morse Blankers' by G8HLZ.
Halifax DARS: Talk 'QRP by G4RAW'.
Harpenden ARC: Social Night.

21 Jan Hastings ERC: Talk on British Rail Traction Electronics by Brian Cornwall.
Fareham DARC: AGM.
Three Counties ARC: Treloar Hospital Radio by Paul Le Leuvre G0DBS.
Stockport RS: Natter Night.
Lincoln SWC: CW/RAE Activity Night.

22 Jan Spen Valley ARS: Talk — Development Sound Recording, by Tom Anderson G6DLA.
Pontefract DARS: Annual Junk Sale.
Bredhurst RTS: Junk Sale.
Southgate ARC: Informal.
Edgware DRS: Informal.
Salop ARS: Talk 'Weather Satellites' by G8ZWF.

23 Jan Coventry ARS: Annual Dinner.
Maltby ARS: Computers in Amateur Radio.
Maidstone YMCA ARS: RSGB Video.
Bredhurst RTS: Xmas Dinner & Dance.

26 Jan Felixstowe DARS: Visit to Hospital Radio Ipswich.

27 Jan Waterside SWC: TBA.
Verulam ARC: Talk 'Broadcasting Developments' by Mr. N. Davis.
Loughborough DARC: Construction Evening.
Worksop ARS: 'Solid State Homebrew' by G4SHU.

28 Jan Crawley ARC: AGM.
Stockport RS: Contest Operation.
Lincoln SWC: Talk 'Fibre Glass Techniques' by G4XFC.
Fareham DARC: 'Satellite Update' by G6XHR.

29 Jan	Pontefract DARS: Committee Meeting. Salop ARS: HF on Air.
30 Jan	N. Bristol ARS: AGM. Coventry ARS: Night on the Air. Maltby ARS: A simple absorption wavemeter for 144MHz & higher. N. Bristol ARC: AGM. Maidstone YMCA ARS: Natter, RAE & CW. Loughton DARS: Informal Wimbledon DARS: Talk 'Crime Prevention' by Metropolitan Police.
2 Feb	Welwyn/Hatfield ARC: Computer Programming. Todmorden DARS: AGM. Burnham Beeches RC: 2nd Surplus equipment sale.
3 Feb	Loughborough DARS: Night on the air. Harpenden ARC: Talk 'AX25 on a BBC B' by G4OAV.
4 Feb	Trowbridge DARC: Main meeting. Lincoln SWC: CW Activity Night, Committee Meeting. Three Counties ARC: Talk 'Weather satellites' by Boyce Jefferies. Fareham DARC: Natter.
5 Feb	Spen Valley ARS: Talk 'Satellite TV' by Mike Cox G8HUA. Pontefract DARS: VZDEO 'DXpedition to Lord Howe Isles'. Salop ARS: Packet Radio Demo. Bredhurst RTS: Talk 'Amateur Radio in the Soviet Union' by G3FXB.
6 Feb	Coventry ARS: Quiz night. Reading DAR: Regular meeting. Maidstone YMCA ARS: EMC Interference. AMRAC: Meeting.
8 Feb	Bury RS: Hamfeast at Mosses Youth & Community Centre, Cecil Street, Bury, Lancs. Tel. G1PKO for details on 061 764 5018.
9 Feb	Milton Keynes DARS: Talk 'Technical aspects of Electronics Organs' by Chappell of Bond Street.
10 Feb	Loughborough DARS: Magazine reviews. Worksop ARS: Night on air (club contest) using G3RCW. Macclesfield DRS: Talk 'The Lowdown on Hi-Fi' by G0DMU.
11 Feb	Stockport SWC: Talk '10GHz TV' by G0BTA G6IGM. Fareham DARC: Talk 'Interpretation of RX Specs'.
12 Feb	Pontefract DARS: Natter Night. Salop ARS: Natter Night.
13 Feb	Coventry ARS: Night on the air. Maidstone YMCA ARS: Natter, RAE & CW. Loughton DARS: Talk 'Electrical Safety' by G6FWT. Wimbledon DARS: Mini-Lecture & Natter Night.
16 Feb	Felixstowe DARS: Visit to RAYNET Communications Centre, Ipswich Police HQ. Welwyn/Hatfield ARC: Club Project (Informal). Todmorden DARS: Chat Night. Burnham Beeches RC: Lecture 'Weather Satellites'.
17 Feb	Halifax DARS: Junk Sale. Harpenden ARC: Practical AX25 night.
18 Feb	Stockport RS: Natter Night. Lincoln SWC: CW/RAE Activity Night. Fareham DARC: Natter Night.
19 Feb	Spen Valley ARS: Talk: 'Beekeeping' by Tim Clough, G4PHR. Pontefract DARS: Raynet AGM. Salop ARS: Talk 'Safe Mobile Operation by Inst. of Advanced Motoring'. Bredhurst RTS: Antique Radio Demo by Tony Skinner.
20 Feb	Coventry ARS: Mini Lectures. Maidstone YMCA ARS: RSGB Video.
21 Feb	Fareham DARC: AGM. Lincoln SWC: Special Event Station GBORAG for College Rag Week 21st to 28th Feb.
24 Feb	Worksop ARS: Talk on power supplies by Mike, G8VHB. Waterside SWC: TBA.
25 Feb	Lincoln SWC: Junk Sale. Fareham DARC: 'Telecoms within Electricity Supply' by G4VNN.
26 Feb	Salop ARS: HF on air.
27 Feb	Coventry ARS: Night on air. Maidstone YMCA ARS: Natter RAE & CW. Loughton DARS: Films from RSGB. Wimbledon DARS: Talk 'IBA TV Broadcasting by G3VA'.
28 Feb	Bredhurst RTS: Rainham Radio Rally.

Will club secretaries please note that the deadline for the April 1987 segment of Radio Tomorrow (covering radio activities from 1st March to 1st May 1987) is 22nd January.

Contacts

Aberdeen ARS	Don	04676251
Abergavenny & NH ARC	GW4XQH	0873 4655
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Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bristol (Shirehampton) ARC	Ron Ford	0272 770504
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BT (Reading) ARC	G4MUT	0734 693766
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Darenth Valley RC	Sec	0322 63368
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Derwentside ARC	G1AAJ	0207 520477
Donegal ARC	EI3BOB	074 57155
Dorking DRS	John	0306 77236
Droitwich DARC	G4HFP	0299 33818
Dudley ARC	John	0384 278300
Dunfermline RS	GM0DYD	0383 413440
Dunstable Downs RC	Phill Morris	0582 607623
Eastbourne EARC	G1BRC	0323 29913
East Kent ARS	Stuart	0227 68913
East Lancashire ARC	Stuart	0254 887385
Edgware DRS	John	0707 64342
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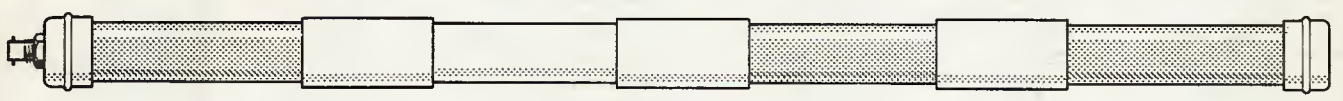
Gt. Lumley ARES	G4MSF	091 4693955
G. Peterborough ARC	Frank	0733 231848
Halifax DARS	D. Moss	0422 202306
Harpenden ARC	G1BJC	05827 2455
Harrow RS	Tony	01 861 0419
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Havering DARC	G0BOI	04024 41532
Hillingdon ARC	Howard, G6SII	01 561 2917
Hornsea ARC	Richard	0401 62498
Horsham ARC	Paul, G4YFY	0403 87 404
Inverness ARC	Brian	0463 242463
Keighley ARS	G1IGH	0274 496222
Kidderminster DARS	Tony	0562 751584
Kingston DARS	G3ODH	Epsom 26005
Lagan Valley ARS	Jim, GI4TCS	0846 682474
Leeds DARS	G1EBS	0274 665355
Leighton Linslade RC	Pete Brazier	052 523 270
Lincoln SWC	Pam, G4STO	0427 788356
Lothians RS	Robin	0506 890177
Louth DARC	G1IZB	047286 595
Loughborough ARC	Philip	0509 412043
Loughton DARC	G4FKI	0525 714591
Macclesfield DRS	G1NUS	0625 24534
Maidenhead DARC	John	0628 28463
Maidstone YMCA ARS	G0BUW	0622 30544
Maltby ARS	Keith, G1PQW	0709 814135
Medway ARTS	Tony	0634 578647
Midland ARS	G8BHE	021 422 9787
Mid Sussex ARS	G1FRF	0791 82937
Mid Ulster ARC	Sam	0762 22855
Mid Warwickshire ARS	G4TIL	Southam 4765
Milton Keynes DARS	Mike, Q0ERE	0234 750629
Morecambe Bay ARS	G3PER	Heysham 52659
N. Bristol ARC	Alan Booth	0272 690404
N. Cornwall RS	J. West	0288 4916
N. Staffs ARS	G6MLI	0782 332657
N. Wakefield RC	Steve	0532 536633
Newbury DARS	G3VOW	0635 43048
Newport ARS	GW6ZUQ	02912 6867
Norfolk ARC	Andy	Norwich 610874
Oswestry DARC	Brian	0691 831023
Peterborough RES	Peter	G4PNW QTHR
Plymouth ARC	G4SCA	0752 337980
Pontefract DARS	Colin, G0AAO	0977 43101
Poole ARS	G0EQV	0202 674802
Preston ARS	George	0772 718175
Reading DARC	Steve, G3YFB	QTHR
Rhyl DARC	GW1AKT	Nantglyn 469
Salisbury RES	Neil	0980 22809
Salop ARS	Simon	0743 67799
Sheffield ARC	John	Sheffield 581766
Shefford DARS	Alan, G4PSO	Hitchin 57946
S. Bristol ARS	Len Baker	0272 834282
S. Cheshire	Chris	07816 73185
S. Lakeland ARS	G4VKE	0229 65359
S. Manchester RC	Dave Holland	061 973 1837
S. Tyneside ARS	G4XWR	S. Shields 543955
S. E. Kent (YMCA) ARC	John	0304 211638
Southdown ARS	P. Henly	0323 763123
Southampton: See Waterside.		
Southgate ARC	Dave	0992 30051
Spen Valley ARS	G4MLW	0924 409739
Stevenage DARS	G6EDA	0438 724991
Stockton DARS	John Walker	0642 582578
Stockport RS	Mel	061 224 7880
Stourbridge DARS	G3ZOM	K/ford 288900
Stowmarket DARS	M. Goodrum	0449 676288
St Helens DARC	A. Riley	051 430 9227
Surrey RCC	John	01 657 0454
Swale ARC	B. Hancock	0795 873147
Telford DARS	Tom Crosbie	0952 597506
Three Counties ARC	Keith, G0BTU	0730 66489
Tiverton SWRC	Alan	0392 881569
Todmorden DARS	G1GZB	070 681 7572
Trowbridge DARC	G4WLG	02214 4532
V White Horse ARS	Ian White	Abingdon 31559
Verulam ARC	Gerry	St Albans 52003
WACRAL	G4NPM	0795 873147
Wakefield DRS	G4VRY	0532 820198
Warrington ARC	Paul, G0CBN	0925 814005
Waterside SWC	Bernie Lyford	0703 893937
Welland Valley ARS	J. Day	0858 32109
Welwyn Hatfield ARC	Kevin, G4WLG	0707 335162
West Kent ARS	B. Guinnessy	0892 32877
Westmorland RS	G. Chapman	0539 28491
White Rose ARS	G4ATZ	0937 842790
Willenhall ARS	G4LWI	0902 782036
Wimbledon DARS	George	01 540 2180
Winchester ARC	Gordon	0703 772191
Wirral DARC	Peter	051 677 7376
Wolverhampton ARS	Keith	0902 24870
Worcester DARC	D. Batchelor	0905 641733
Worksop ARS	G4ZUN	0909 486614
Wythall RC	G1MEE	0546 824705
Yeovil ARC	Eric Godfrey	Yeovil 75533
308 ARC (Surbiton)	Bob	01 391 0788

COAXIAL SLEEVE ANTENNAS



The completed unit.

The need arose for some good solid 70cm antennas for RAYNET repeater use, not elaborate flimsy co-linears of doubtful published gain, but antennas which were easy to construct and duplicate and did not need elaborate test gear to set up.

Graham Packer, G3UUS, describes an easily constructed but robust antenna, suitable for 2m, 70cm, UHF CB and even 23cm.

Coaxial dipoles

Dipoles themselves are balanced radiators requiring both feeding and mechanical support from the centre which is not always a convenient arrangement. It was decided to investigate the co-axial sleeve dipole which, although very popular in the early days of private mobile radio, seems to have fallen from grace of late. Initial work was performed at 433MHz, but models have been constructed for 145, 433, 934 and 1300MHz and all have performed well.

The top assembly constitutes a normal centre fed dipole. The lower the length-to-width ratio of a dipole, the wider the bandwidth and the 22mm copper water pipe used for the radiating elements helps here. The bottom section acts as a 'Pawsey stub' and serves to decouple, or reflect, the energy travelling on the outside of the coaxial feeder. It may be of interest to note that the Japanese are using a similar arrangement to this for their 450 and 900MHz mobile radio telephone systems.

Buying the bits

The design requirement was for an easily duplicated antenna constructed from readily available parts, so all necessary bits and pieces can be obtained from Woolworths, B&Q or your local friendly neighbourhood DIY shop — all, that is, except a short length of RG43/58 and a BNC/N connector. Do check the prices of all the fittings, though. End caps for pipes can cost from 45p to 97p, joiners from 35p to 75p and copper pipe from £2.99 to £4.99 per 2m length.

Selection of the coaxial connector can be difficult. Use of a single-hole nut-fixing cable-mounted BNC or N connector is preferable, but with care (and especially if you use the optional mounting method described later) any suitable BNC/N can be used.

Construction

Make up the coaxial connector with a suitable length of RG43 or 58 or the PTFE equivalent. The latter will stand soldering temperatures without the insulation melting and is occasionally available at rallies, as are short lengths already terminated in the correct style of single hole mounting BNCs. Before continuing with construction, the style of mounting must be chosen. The 'standard' design as shown in Figure 1 can be clamped just above the coax connector, and then attached to the car roof rack or an existing base-station mast, at least 70cm away from any other mast or antenna.

Alternatively, an extra piece of plastic overflow pipe and a plastic joiner can be used to mount the antenna, as shown in Figure 2. Here, the 'Pawsey stub' is joined to the extra piece of plastic pipe, and the stub is connected to the coax braid by a short length of 22 SWG wire. The copper cap with the connector is glued to the base of the extra length of pipe, and the whole antenna can be supported by clamping at the bottom, so a mast may not be needed. How long a piece can be used will depend on how exposed to winds the antenna will be.

Once you have decided on what style to construct, you can proceed as follows:

1. Cut three lengths of 22mm copper water pipe off square. Clean the internal burrs with a round file and chamfer the outside to ensure easy fitting later.

2. Cut an appropriate length of plastic overflow pipe and again clean inside and outside for easy fitting; if using the alternative mounting method, an additional length of plastic pipe will be needed.

3. Drill one end cap to take the BNC or N type connector, again deburring the hole.

4. Remove the internal ribs from the plastic water pipe connectors as follows: 1 × both ends and middle;

2 × one end rib only (3 for alternative mounting).

5. For the 'standard' mounting version, fit one length of pipe into the drilled end cap and solder. Set aside to cool, then slide the water pipe connector that has been completely cleared over the pipe. Place a crinkle washer onto the BNC or N connector with coax and offer up through the pipe so that it protrudes through the end cap. Fit the nut and tighten.

6. Mix a small quantity of epoxy resin (warming the two parts before mixing, so that it will flow easily) and pour into the pipe. Leave to set. This is to ensure a water-proof seal.

7. For the alternative version, offer up the BNC connector to the end cap alone, fit and tighten; then pour in the epoxy resin and leave to set. Assemble the end cap onto the extra length of coax, feeding the coax through the pipe.

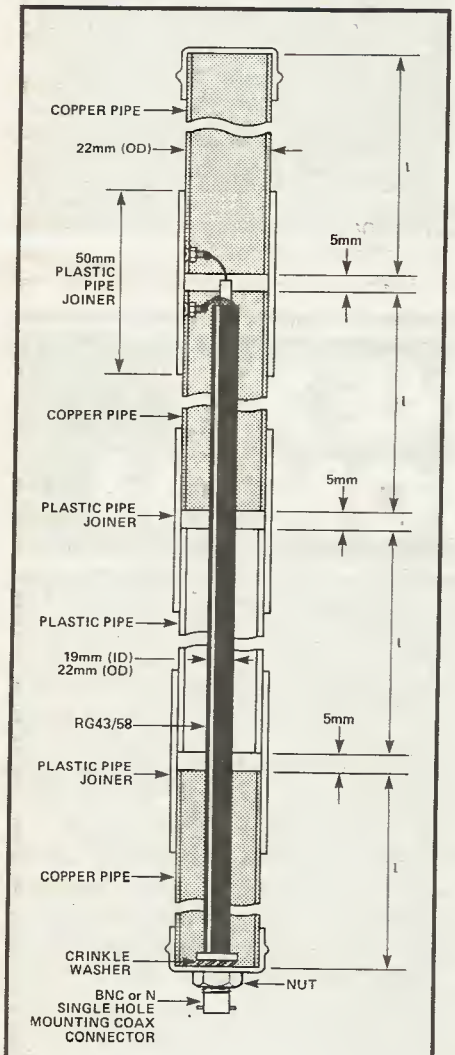


Fig. 1 Construction of the standard antenna.

8. Drill a 3mm hole close to the ends of each of the elements (and the 'Pawsey stub' if the alternative mounting method is used). Countersink deeply. Install 10mm countersunk brass M3 bolts and nuts. Heat the pipes with a gas torch and touch solder to the bolt, nut and pipe both sides. Allow to cool. File off surplus solder and the top of the bolt if protruding from the contour of the copper pipe.

9. Fit plastic pipe joiners to each end of the plastic pipe using the joiners which have had just one end rib removed (and fit to the top of the extra length too).

10. Make a trial assembly of the antenna using all the pipe sections except the top dipole section, as shown in Figures 1 and (if appropriate) 2, feeding the coax through.

11. Carefully mark the coax outer level with the top of the lower dipole element, and, as the antenna is disassembled, level with the bottom of the stub element (for alternative mounting method). Prepare the top of the coax as shown in Figure 4 and strip away the outer insulation sufficiently to solder to the braid for the alternative method at the stub bottom.

12. Reassemble the lower sections of the antenna and solder the braid to the screw on the lower dipole half (also solder the braid to the screw on the bottom of the stub, using a short length of wire to join them up just before assembling the stub to the extra pipe). Do this with a high wattage iron or with a small gas flame. If the latter is used, shield the coax with a small piece of damp cardboard and grip the braid with a pair of long nose pliers to act as a heat sink.

13. Position the pipe joiner with the ribs completely removed on the top section, then offer up this section to the rest of the antenna and solder the coax inner to the screw. Use long nose pliers to wrap the inner conductor around the screw. Heat sink the wire as in 12.

14. Slide the joiner to cover the gap between the top and bottom of the dipole and position centrally, with a 5mm gap between the elements. This may be achieved by working in front of a powerful desk light and seeing the shadow through the plastic joint, or by lightly scribing the elements before assembly at half the length of the joiner, minus 2.5mm.

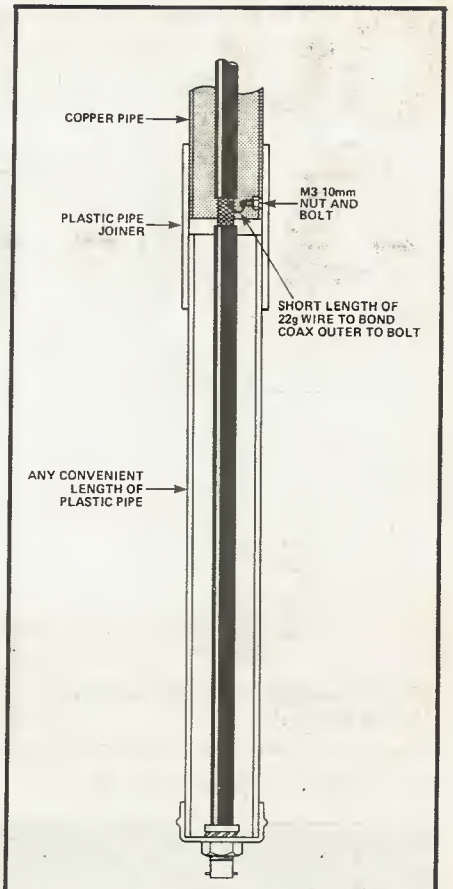


Fig. 2 Alternative lower section detail.

15. Run a drop of cyanoacrylate adhesive (superglue) around all the joints (both soldered and push fit joints) to be sure of a rigid water-proof job.

16. For external use, clean the antenna thoroughly with fine emery paper, wipe clean with a rag dampened in white spirit and when dry spray to the colour of your choice with car touch-up paint. Matt green for the military, grey or black to get lost in a domestic environment, or dayglow orange to stand out in cluster of other antennas at a repeater site.

Testing

There's not a lot you can do. Either you built it correctly and it works, or you mucked it up and it doesn't!

Naturally DC tests should show open circuit between coax centre and outer and continuity between centre and top section and outer and lower and stub sections respectively.

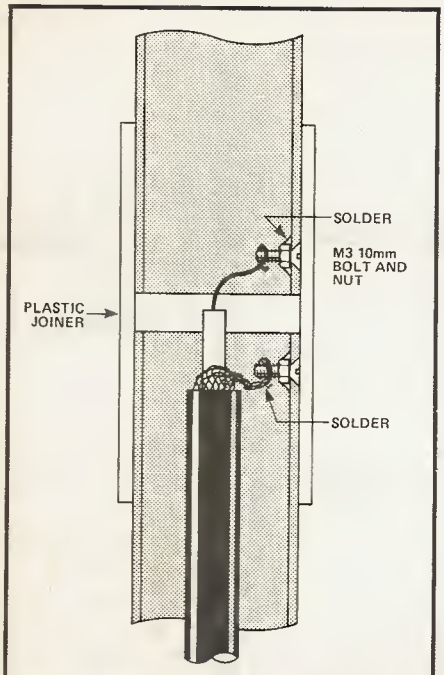


Fig. 3 Method of joining coax to driven elements.

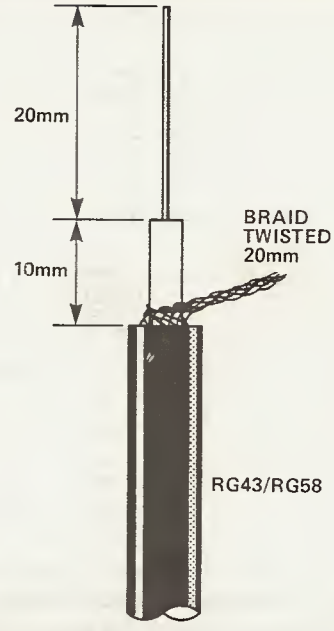


Fig. 4 Coax preparation.

Table of dimensions

Waveband	145MHz/2m	433MHz/70cm	934MHz/UHF CB	1300MHz/23cm
Dimension l	450mm	145mm	65mm	50mm

If it doesn't pass that test you have probably been a little careless with the flame thrower and liquified the RG58.

RF testing of the 70cm version (with a good UHF VSWR meter) should show a VSWR of better than 1.8:1 from 420 to 460MHz and 1.5:1 within the 70cm band. Mind you, with more than a few metres of all but the best coax connected to your rig you'll see a good match at UHF whether the antenna is connected or not.

This is a 'standard dipole' and comparative gain measurements with expensive commercial collinears should prove educational and entertaining!

Components list

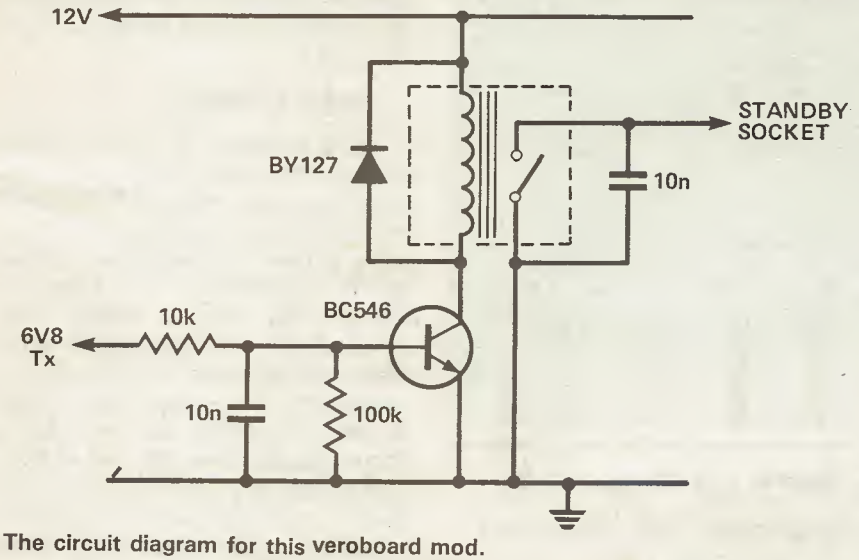
22mm OD copper water pipe (3 × 'l' + allowance for cutting).
19mm ID plastic overflow pipe ('l' + extra for alternative mount).
3 or 4 plastic waterpipe joiners
BNC or N single hole mount cable terminated connector
Flux and solder
Cyanoacrylate adhesive (superglue)
Can of spray paint

A Mod For Your FT290

I recently acquired a BNOS linear for use with my FT290. I found that using the RF sense for FM was fine, but on SSB, the 'hang time' was far too short to prevent the linear dropping out during a pause in speech.

I decided, therefore, to hardwire the PTT connection to my FT 290, using the standby socket on the side of the rig. This is wired in parallel with the mic PTT switch. Unfortunately, although the linear would Tx, the rig would not!

Do you have problems with your FT290 plus amp system dropping out on SSB? Well if the amp has a standing voltage on its PTT line, this mod from G6MKC, could solve the problem.



The circuit diagram for this veroboard mod.

Upon investigation, I found that there is a standing voltage on the linear's PTT line, which was sufficient to prevent the rig's transmit relay driver transistor Q2011 switching on. I decided to add an additional relay, driven from the 6.8V transmit line, via a BC546 transistor, to provide an independent short on the standby socket.

Construction of the additional board is made on Veroboard and as small as possible, as shown in the photo nearby. If you already have a pre-amp (like the Mutek one) installed, it is still possible to fit the panel in the space underneath the switch unit. Otherwise, there is plenty of room.

The 12V supply to the relay should be taken direct from the fuse. The 6.8V transmit is taken from the standoff near the transmit relay which has two orange wires attached. The standby socket earthing via the new relay is by the existing white/green lead which is cut and attached to the new board. Earthing is achieved by connecting to any convenient point.

This modification has been in use for some months now, and has proved very successful.

Free Readers' ADS!

COLLECTORS ITEM. RCA AR-77E communication receiver, 6 bands, 5KO to 31,000KHz, calibrated band spread, instruction manual and circuit diagram. £40. 01 778 6490, evenings.

FDK 700E 2M FM 0-25W mobile transceiver, manual, M/bracket, good condition. £140. Belcom LS102 10M a/mode, mobile transceiver, 26-30MHz up/down scan, Yaesu mike, nicad memory backup, built in charger, c/w MM144/28 converter for SWL, £210. Evenings, Brian, G1UWY, 0425 615860.

ICOM IC240 2 meter transceiver, SWR25 SWR/power meter, 3.5-150MHz, Zetagi stabilised PSU 31V 6A. All very little used, mint condition. Ideal for the newly licenced. First offer over £75 accepted. Phone Burgess G8VTB, Ghelwood Gate 463.

YAESU FT726R ×2m card, boxed, very little use on TX. Best offer, Richard G6RDD, Luton 0582 599873, after 6pm, weekdays.

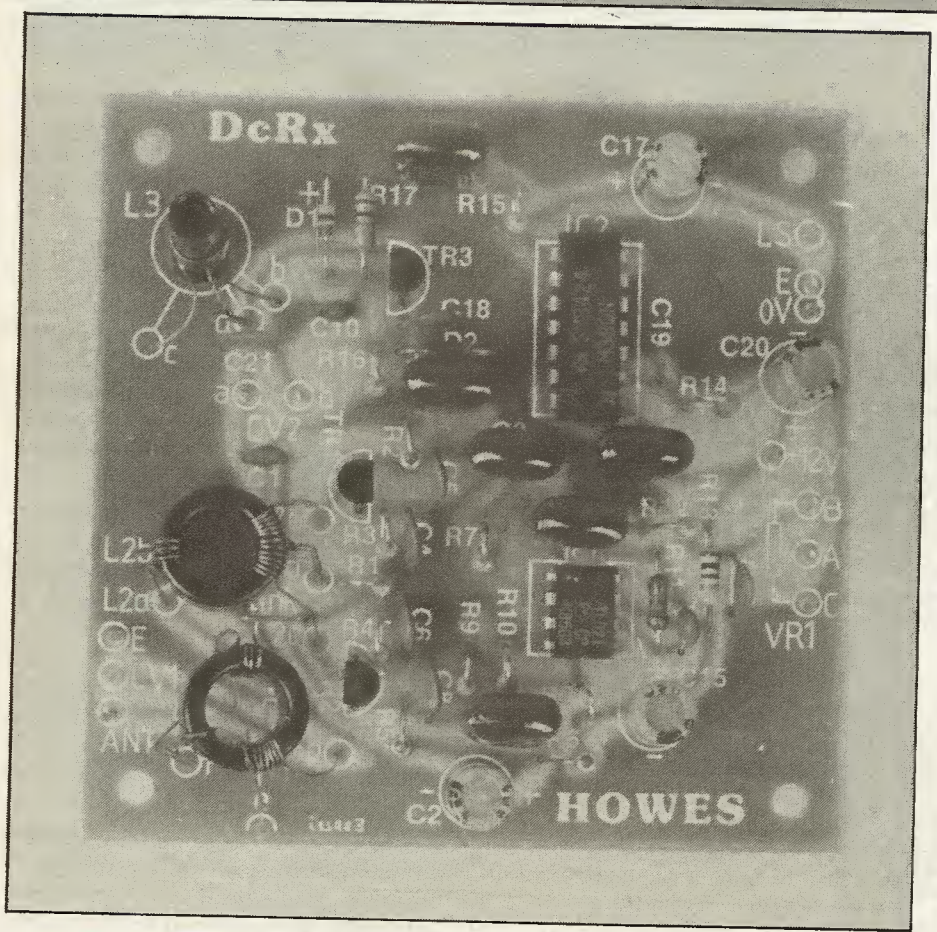
TWO WAY die-cast coaxial switches, Toyo meter SA450 with SO239 sockets, 3.5-500MHz max 2.5Kw, £5. Also SA450 with N type sockets and two N type plugs, ultra low loss! £8. Both £10 plus post. Phone 01 274 6097, daytime only, thanks.

STOP PRESS!

There's a small error on the Microchip Morse Decoder (Jan 1987 issue). On the PCB, the output from the terminal unit IC5 should go to bit D1 on Port A of the PIO, not D0. Later versions of the PCB will be corrected but on earlier versions just wire the TU output to the D1 input.

KIT REVIEW

Howes 20m DcRx



Are you a born again kit builder? Ian Poole looks at the Howes DcRx unit and concludes that there's a lot to be said for direct conversion!

Kit construction is becoming increasingly popular. More and more people are climbing on the bandwagon and discovering that they can build their own equipment. This can be great fun, and bring a whole new realm of enjoyment to the hobby as well as teaching oneself more about the equipment being used. In addition to all of this it can often make amateur radio cheaper which can be a great advantage in these days of expensive equipment and rising prices.

This rise in popularity of construction can be set against the background of a few years ago when home construction seemed to be on the decline and everyone was buying and using black boxes. However, despite the fact that black boxes are still popular, rising prices are causing people to become more interested in home construction. This can be seen by the number of kits which are becoming available from an increasing number of companies.

One kit which recently caught my eye was a direct conversion receiver from C.M. Howes. This seemed to be particularly attractive because it could be ideal for a QRP station. With this in mind I set out to take a further look.

What are They?

The DcRx direct conversion receiver kits have been available from C.M. Howes Communications for some time; they are single band receivers, and versions are available to cover the 160, 80, 40, 30 and 20 metre bands. In addition to the basic kit two tuning capacitors are required which can be obtained from Howes, the units can also be supplied ready built.

For this review the 20 metre version was used, but the comments should apply to all versions of the receiver.

How it Works

The principle of direct conversion can be traced back to the very early days of radio. In fact, direct conversion receivers were in use even before the superhet system was discovered. However, in spite of its age the idea of using direct conversion in a receiver still offers many advantages in today's high technology radio scene. Factors such as cost, simplicity, size and lack of image signals make the idea of direct conversion very attractive. Using this idea a relatively high performance receiver can be made fairly easily.

A block diagram of a direct conversion receiver is shown in Figure 1. From this it can be seen that it consists of five major sections: RF filter; mixer; local oscillator; audio filter; and audio amplifier. Essentially the receiver operates by mixing the incoming signal with a local oscillator and converting it directly down to audio frequencies. When the signal enters the receiver it first passes into the RF filter. This is used to broadly tune the input so that very strong signals such as broadcast stations are attenuated and do not break through the mixer and appear on the output. It also prevents any signals entering the

mixer which may mix with harmonics of the oscillator.

The signal then passes into the mixer. In many designs an active mixer will be used so that some gain can be achieved. Whether the mixer is active or passive it should have a low noise figure as all the receiver gain follows it. Having converted the signal to audio it is then passed through a filter. This stage gives the receiver its selectivity. As the selectivity is in the audio stages there is an *audio image* ie., when tuning through a signal a beat note will be heard either side of the signal. This is the major disadvantage of direct conversion receivers, although it is easy to get used to and does not cause too much annoyance, especially on CW.

The Circuit

The circuit of the DcRx itself conforms exactly to the block diagram. The signal from the aerial passes straight into a filter circuit. This is a fairly conventional tuned circuit which is peaked by a variable capacitor mounted externally to the board. Then the signal passes into an active balanced mixer which uses two JFET's. These mixers work well giving a useful amount of gain whilst also retaining a fairly high dynamic range and low distortion. The other input to the mixer is from the local oscillator. It uses another JFET, so that its output is free from drift and pulling. The oscillator is tuned by a variable capacitor which is again mounted off the board.

From the mixer the signal passes into an operational amplifer. This stage is used not only to provide a significant amount of gain, but also to act as a low pass filter to remove unwanted high frequencies. The filter cut off is just below 3kHz, which is about optimum for resolving both SSB and CW. After the low pass filter the signal is fed through a variable resistor acting as a volume control and into the output stage. This consists of an LM380 which is capable of delivering sufficient audio to drive either headphones or a loudspeaker.

The Kit

The kit consisted of the PCB components and a set of instructions, the PCB being single sided and silk screen printed on the component side. This meant component placement was made much easier and would lead to fewer mistakes.

The kit includes everything required to make a working receiver with the exception of the two variable capacitors and components not located on the board, such as plugs and sockets. It is possible to obtain suitable variable capacitors for all but the 160 metre version from C.M. Howes for £1.50, but stocks are limited.

The instructions were found to be particularly comprehensive, consisting of six sheets in all. Firstly there was the parts list detailing each component, its value, colour code or description and two columns to tick when each component had been fitted and then checked. This struck me as a particularly useful idea as it provided a means of ensuring that each component has been correctly installed. A sheet of written instructions is also included. This outlines everything anyone should want to know about constructing the kit from the best way to solder right through to the final alignment of the whole receiver.

The other sheets include a circuit diagram, interconnection diagrams and component details. The overall quality of the documentation was very good. It should mean that there are no questions which are left unanswered, and it should also mean that few, if any, problems should be encountered when building the receiver.

Construction

The kit was very easy to build. The components were inserted and then soldered as suggested in the instructions: first the resistors, then the capacitors and finally the semiconductors and coils. All the components fitted into their holes with adequate space around them and when one was discovered which appeared to have insufficient space it turned out that it had been put in the wrong place. This proved that it pays to use the check list.

The kit was assembled far more quickly and easily than had been anticipated. In fact the most difficult part was wiring up the external components, such as the loudspeaker, variable capacitors and so forth. However, the kit took less than an evening to complete, so even for less experienced constructors it should not prove to become a long project.

Switch on

Having built the receiver and wired up all the external components it was ready to switch on. A 12v supply was used to power it, although it would have been possible to use batteries as its current consumption was fairly small. The capacitors were set to mid position and the receiver switched on. As mentioned in the alignment instructions a hiss was heard from the loudspeaker and the oscillator coil was tuned so that its signal was heard in a nearby receiver set to 20 metres. This only took a matter of a few seconds, after which the RF tuning capacitor was peaked and signals from all over Europe were heard using just a short piece of wire. The oscillator coil was finally set so that the receiver was able to cover all of the band and calibration was complete.

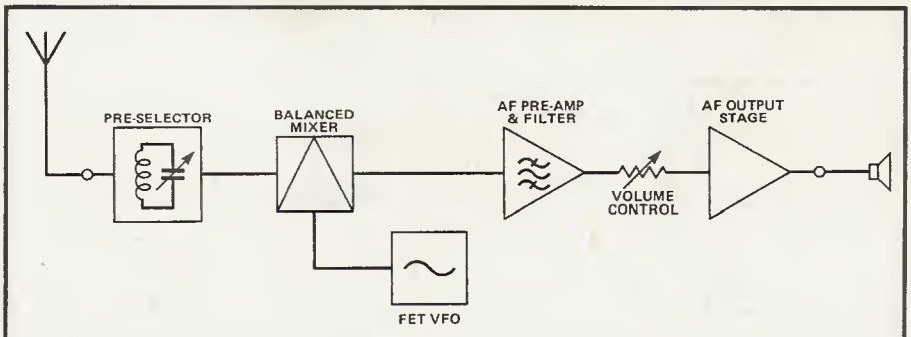
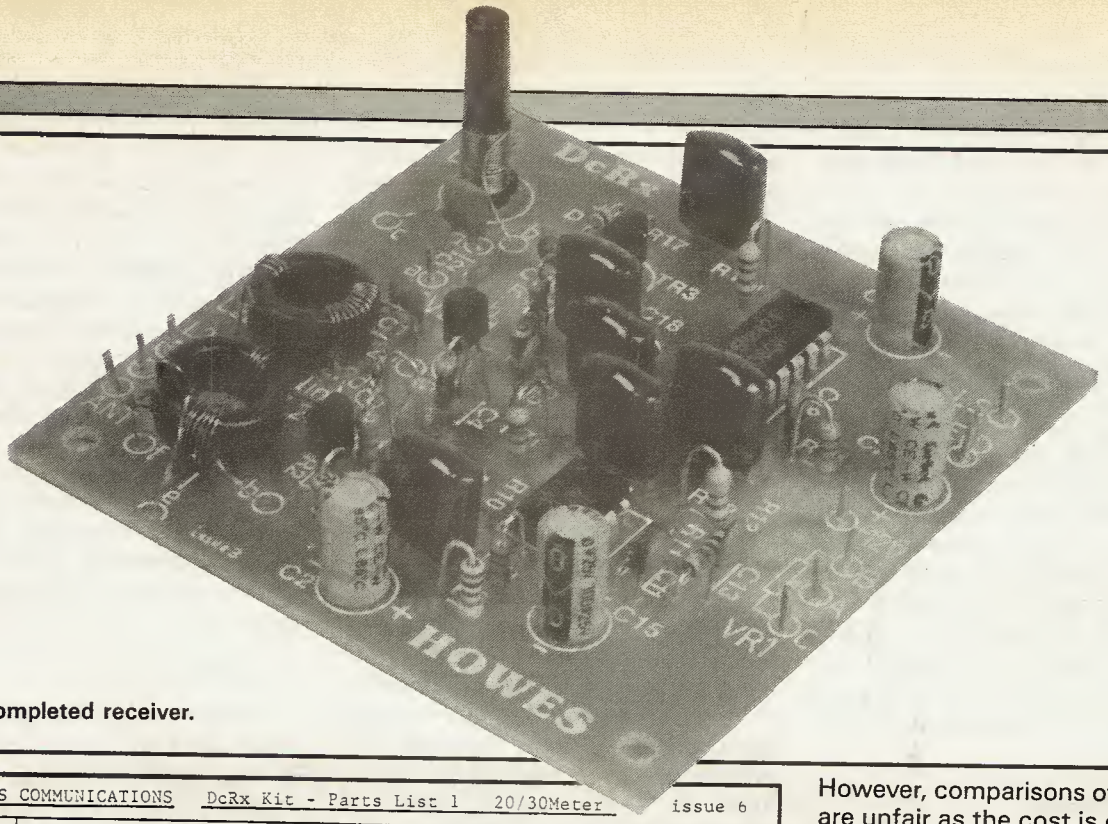


Fig. 1 Block diagram of the receiver.

In Use

The DcRx performed remarkably well, proving to be a very lively little receiver. The sensitivity was quite reasonable, although naturally it would not be as sensitive as a high cost communications receiver.

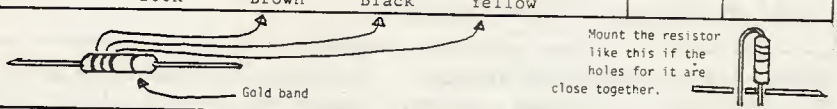


The completed receiver.

C.M.HOWES COMMUNICATIONS DcRx Kit - Parts List 1 20/30Meter issue 6

RESISTORS

Part No.	Value	Colour Code 1st band	2nd band	3rd band	✓ Fitted	✓ Checked
R1	33k	Orange	Orange	Orange		
R2	1k0	Brown	Black	Red		
R3	470R	Yellow	Violet	Brown		
R4	470R	"	"	"		
R5	1k0	Brown	Black	Red		
R6	100R	Brown	Black	Brown		
R7	270R	Red	Violet	Brown		
R8	100k	Brown	Black	Yellow		
R9	270R	Red	Violet	Brown		
R10	100k	Brown	Black	Yellow		
R11	1M5	Brown	Green	Green		
R12	4k7	Yellow	Violet	Red		
R13	100R	Brown	Black	Brown		
R14	22k	Red	Red	Orange		
R15	2R2	Red	Red	Gold		
R16	270R	Red	Violet	Brown		
R17	100k	Brown	Black	Yellow		



Mount the resistor like this if the holes for it are close together.

CAPACITORS

Part No.	Value	Description of component marking	✓ Fitted	✓ Checked
C1	10pF	marked 10		
C2*	100µF	" 100µF 25V		
C3	.1µF	" 104K		
C4	.01µF	" 103Z		
C5	.01µF	" 103Z		
C6	.01µF	marked 103Z		
C7	.1µF	" 104K		
C8	.01µF	" 103Z		
C9	.1µF	" 104K		
C10	22pF	" 22		
C11	47pF	marked 47		
C12	.1µF	" 104K		
C13	.01	" 103Z		
C14	.1	" 104K		
C15*	100µF	" 100µF 25V		
C16	.1µF	marked 104K		
C17*	100µF	" 100µF 25V		
C18	.01µF	" 103Z		
C19	1nF	" 102		
C20*	100µF	" 100µF 25V		
C21	100pF	" 100 or N10		

*WARNING C2,C15,C17&C20 MUST be put in the correct way round. The longer component lead goes to the hole marked "+", the lead indicated by a "-" on the side of the component goes to the hole marked "-".

Easy to follow construction notes include component check lists.

However, comparisons of this nature are unfair as the cost is only a small fraction of any commercially made receiver.

The point which was most impressive was its stability. Despite the fact that the receiver was initially wired up on the bench it was able to copy sideband signals for a considerable time without any retuning. In addition to this it was also quite resilient to mechanical vibration, especially when the lead to the tuning capacitor was shortened — this would no doubt have been further improved if it had been built into a metal box.

The audio output was found to be quite sufficient to drive either a loudspeaker or headphones, and the output IC remained quite cool under normal operating conditions.

Summing up

Overall this kit was impressive. It was easy to build and worked well, so it would be ideal for anyone with little experience in construction who wanted to build a useful receiver. Alternatively it would be ideal for the more experienced constructor who is building up a QRP station. At £16.20 for the kit or £21.80 for the PCB module (including VAT and p&p) ready made this represents good value for money.

The DcRx is available from: Howes Communications, 139 High View, Vigo, Meopham, Kent. DA13 0UT. Tel: (0732) 823129.

I would like to thank C.M. Howes Communications for providing the kit.

Free Readers' ADS!

ICOM IC240 2m FM mobile transceiver, 10 watts with PSU for base use and manual, also ⅞ mobile aerial with gutter mount, SWR, power meter, £65. Phone St. Albans (0727) 63726.

SLOW SCAN TV transmit and receive program for Sinclair Spectrum Computer,no hardware needed, £5. Paul Goodrum, 9 Royston Close, Downham Market, Norfolk PE38 9BD. Tel. (0366) 388615.

FOR SALE, Philips D2999 World Radio 150kHz, no gaps, FM digital readout, BFO, AM gain, two bandwidths, push button and search tuning, clock, two speakers, 3in, 7in, batt mains, manuals, £200 ono. Tyneside 091 5267902.

CONTEST ACCOMMODATION, AJC Nevada Trailer Tent, 4-8 berth, kitted out for six, unladen weight 3½ cwt, undersealed from new, garage stored, best sensible offer. Dave G1JUF, 061 483 4288.

YAESU FT77, top band and FM fitted, FP700 PSU, FC7700 ATU, FTV707, Transv, Mainframe, all in excellent cond, £650 ovno, will split if reasonable offer made. Wanted Yaesu FT101 ZD FM MkII and FL902. G4YMC, Tel. (091) 2674881.

YAESU FT101E MkIII, mint 160-10m, G3LLL FM unit, new PA valves, speech processor, fan, etc, £400 ovno, or P/Ex for FT290R. Tel. G1ULV 0209 714342, after 6pm.

FT101 160 METRES fitted, £200. Tel. 021 747 8489.

FOR SALE, Tektronix type 545A Oscilloscope working but no information or leads, very heavy and large so buyer collects or can deliver within reasonable distance from Croydon. First reasonable offer secures. Ian G0BGH, QTHR 01-668 4990.

CLEARANCE! PYE A200 69MHz £35; FM Westminster Bootmount £42; AM Bootmount £12; Dashmount £10; F30AM base; Lowband Olympic £55; VHF/UHF signal generator £100; exchanges, WHY? Wanted faulty transistorized HF mobile rig, also VHF or UHF. G3KDA QTHR, 0775 66533.

FOR SALE, Bearcat 220FB, scanner, 240V/12V, box/packing, £150. Tel. 0708 47998.

MUSTANG 1kw HF beam, 10-20m, £25; 50ft Telomast £20; plus various other aluminium poles for antenna construction. Offers. Tel. 0272 851145.

YAESU FT209RH, 2m FM handheld 5W/.5W output, keypad programmable, ten memories, built in Vox, 6 months old with case. Offers around £225; also selling Global 1000 ATU, mint condition. Offers? Phone 01 845 4008 (Ruislip).

AMATEUR TELEVISION testcard program for Sinclair Spectrum Computer £5 Paul Goodrum, 9 Ryston Close, Downham Market, Norfolk PE38 9BD. Tel. (0366) 388615.

L.F. TEST set CT373, oscillator range 0-170kHz with wide range attenuator, tuned filter and valve voltmeter for measurement of harmonics, only few hours use from brand new, complete with manual, £30. Buyer collects or pays carriage. Ring 0823-75776, between 6-7pm.

GLOBAL AT-1000 SWL antenna coupler £20 + post; Tonna 9 ele 144MHz antenna, used but in good condition, £10; Tonna 19 ele 432MHz antenna, new and unused, £16. Tel. 0926 498388.

AR2001 SCANNER, factory service manual, circuits, alignment data, etc, £25. Phone 0392 833286, C/o 2 Spicer Road, Exeter EX1 1SX, Devon.

TRIO TR9000 2m Multimode, excellent condition, original packing, 10W, base station or mobile, ⅝ whip with mag mount, Welz power/SWR meter, £250. Witham (0376) 520966.

FOR SALE, close circuit TV system, C-type camera, cost £623.30, Monitor £224.06; size 12 inch, Sharp AMZ 80K computer, programs, books, require £250 for CCTV; £150 for Computer. No offers. 27 Alder Avenue, Worsley Hall Est, Wigan WN5 9PY.

ICOM 751 PLUS extras, cost £1460; NRD525, extras, cost £1200. unused MMS2, cost £169; Trio CD10, cost £119; AD370, cost £64; Hansen FS603M, cost £62. All mint, offers? M100M G/C receiver, digital readout, 10kHz/30MHz, large heavy, offers. Telephone Dronfield 413413.

YAESU FT290RB Multimode, unmodified, Nicads charger, case, antenna, original packing, £260; dual beam scope, Telequipment D31R, good working order, £40; also mags, components, buyer collects. 0202 477763.

AERIAL TUNER, Howes CTU30 for wire or co-ax fed aerials, fitted Balun for balanced feeders, £20. G4AQZ, Clacton-on-Sea 435700, evenings.

FOR SALE, Yaesu FT480R 2 metre Multimode TCVR, as new, boxed, £265. Phone 01-961 6800, after 6pm.

HEATH HR-1680 SSB/CW RX, 80-10m amateur bands, £150; Sony ICF2001, £80; Leader Dipmeter £35; all as new; HW101 manual. Write to Mr N. Cameron, 16 St. Mary's Crescent, Westport, Co. Mayo, Eire.

REALISTIC DX160 general coverage receiver, excellent performance, £65; Superstar converted 28-30MHz, top end requres stabilizing £65 ono; DNT converted 10FM £35; Densai desk mike, £20; 70cm 3 chan pocketphone; Xtalled RB14 £30. G0BHQ. Phone Tamworth (Staffs) 250038.

VINTAGE 1935 People's Set GWO, vg appearance; 1920s Brownie Crystal set, coil phones, BBC marked L/S; 1920s amplifier, needs restoring; RSGB world call book, 1928, one lot, collect, £120, bring Portsmouth £130. Charles, G0CNX QTHR. Phone IOW 404702, evenings please.

YAESU MD1 desk microphone £50; Yeasu SP980 speaker with filters £50; morse trainer MMS2, new, £169. Sell for £75. G.Whip 80m £15. Bath 0761-415746.

STANDARD C58 2m multimode complete with two Nicad packs and charger, £180; also 300ft of LDF4-50A Heliax co-ax, very low loss, complete with connectors. Offers or exchange for Sony ICF range RX. G3KLV, Northampton 0604 48091.

DATONG SRB2 'Woodpecker' blanker unit £60 ono; Jaybeam D15/23 23cms Yagi, brand new, £42; VHF comms, 2 metre switchable antenna polarisation unit £40. Paul, G4XHF (0293) 515201.

SONY ICF2001 £85, including mains power unit; Datong active antenna (indoor) £30; Panasonic DR28 £50; Zenith Trans Oceanic 3000-1, collectors item, as new, manuals, etc, £90. Phone (Reading area) 0491-874400.

COLOUR GENIE Computer terminal unit, handbooks, tapes, RTTY/GW, split screen type in advance, cables, switches, used once, original packing; brand new recorder; B/W TV, ready to go on air, £140 ono; buyer collects. Ring Ipswich 49139, Noel, G3ZLN.

TRIO TS130S, as new, £450; Drae 30A PSU, as new, £100; G2ZDM dipole masting guys, cost £400, accept £200; other items for white stick operator. Telephone Bruce Taylor G6KPI, Salisbury 780396.

QRO! The ultimate 70cms linear tempo 2004-A hand built by Henry Radio in USA; cruises at 400W but lots more available where legal, £1150. Phone 0905 620041, and speak to Charles.

BRAUN T1000CD Receiver, mint condition, ARE air band receiver 110-140MHz, Datong D70 morse tutor, Rotel RVC230 CB transceiver. Phone 01-840 6665, Ealing.

TRIO TR2600E, 2m FM TCVR DCS system, soft case, straps, battery case, includes 6 x AA Nicads, £200. Dave, GM4UGF QTHR 0382 65205, evenings.

TV JVC 5", 3040, DX405 + 625 lines, £65; Philips

portable 12" 405 + 625, £60 or vno; for sale, Nato 200 perfect, not a mark on it, £120; checked by Rodger D. Phone 0283 221870.

PYE PF70 Transceivers pocket fones, speaker, mikes, aerials, batts, £20 each; rotator CDE AR40, good cond, fault in cont box, £50. 061 653 7525.

DRAKE R7 4/2.3/1.8/.5/.3 kHz filters, NB, service manual, superb condition, £250; Codemaster CWR610E RTTY/ Morse telereader, as new, £100; MMC 144/25HP convertor, as new, £25. Lichfield 264563.

SALE, KENWOOD TS520SE HF SSB/CW TCVR plus external VFO and MC50 microphone, spare PA and driver valves; all in excellent condition; £385. Carriage extra. Bob, G4IXL QTHR. Tel. 01-200 6117.

TRIO TR-9000 two meter multimode scaning mic, mobile mount, etc, power suply, eight element beam for sale, £300 ono. Phone 021 449 6274, after 4pm.

FOR SALE, R1132/A receiver, one valve missing, otherwise working, plus power supply, working also; MW, LW, SW receiver, working, £40 the lot or will split. Phone 061 941 4021.

FT221R MUTEK £300; TS120V VFO120 PS20 £325; IC202 £110; 2-way splitter 2m £10; 2-way splitter 70cm H-frame splitter, offers; 60A-12V supply £40; Omega, complete QRP rig, offers, consider FT780 P-ex. Work 051-342 6441, home 051-428 2448, Mike.

YAESU FRG7700 for sale, excellent condition, as new, £240 ono. Phone 0672 54331 and ask for Richard, after 5pm on working days.

SX200N AM/FM scanning receiver, with MPU, vgc, £195; 680R super tester, AVM, unused, still boxed, £35; Advance SG62B A/M signal generator, 150kHz-220MHZ £40. Tel. (01) 390 2650.

TRIO TS430S fitted with FM YK88A, YK88S, YK88SN and YK88CN filters, £700; 2 metre 80 watt linear amplifier £80; Jaybeam VR3 10-15-20 vertical aerial £25; Wanted Trio TS930S. Telephone Leicester 773908.

MUST SELL, HF VHF UHF multi mode FM hand helds, base mobile plus bits and pieces for above sets; HF VHF beams; ATV PSU RTTY CW Amtor computor, etc. Full information, Ron, G3BKL QTHR, phone, after 1800, 0980 862489, Salisbury.

FOR SALE, surplus amateur radio units, 2m TRX 60W output modulator; 60W power packs; 600- 0-600 550 0-500 350 0-350 plus lower volts Xtals, mike, meters, valves, QQV 6-40, QQV 3-20, 832A, QQV 3-10, 5763, ECC 81-83 807 power transformers. Offers to clear, G3RHT QTHR, evening, 021-421 5495.

ICOM IC751E mike, ICPS20 power supply/speaker, RC10 frequency controller; FL70 wide filter; EX310 voice synthesiser, £1195; ICOM 2KL 500W HF all-band linear plus IC2KLPS attendent power supply £1200; ICOM ICAT-500 HF automatic all-band 500W ATU £375. All boxed, immaculate. G4IOF, tel. 01-722 7040.

REALISTIC PRO-2003 programmable AM/FM scanning receiver, VHF 68-174MHz, UHF 410-512MHz. Box with instructions, £190. Telephone Bristol (0272) 659394.

SPECTRUM 48K original tapes, 15 assorted lightpen-artist, etc, sell £1 each/swap Ham programmes; also wanted, good quality RX upgrading, from DX100. Postage paid my end. Cash waiting, digital readout. Phone 041 (Glasgow) 770 8740, Steve.

THANDAR 600MHz TF200 freq counter plus TP600 prescaler plus case, service manual and X1-X10 probe, £150 + p&p; TRS80 model 100 software, £10 each; HP22 programmable calculator and charger, etc, £20 + p&p. Ring 04738 5526.

KENWOOD TS820, matching SP820, spare PAS £420; HQ-1 minibeam £80 SEM transmatch 160m-10m £70. Tel 08894 78981, G4PWO QTHR.

FT790R MULTIMODE, 70cm transceiver, good condition, with Nicads and 5 element MET antenna, £240 ono. Phone Halifax 54395, after 6pm.

FOR SALE, Yaesu FT757EX transceiver £550; MH1B8 scan mic, £10; G.Whip triband mobile antenna for 10, 15, 20 metres, £20; all in good condition. Reading, Berks, 0734 411501.

BREMI LINEAR BRL-200 200 watt linear amplifier for sale, vgc, suitable for 10 metres, £65 ono. Phone Brian 051-645 9132, after 6pm, buyer collects.

TRIO 930S HF TX/RX general coverage receiver with automatic antenna tuner and AM filter, mint condition, £110 ono. Telephone 061 865 7896.

ALTRON AQ6/203E mini beam 6-20m, immaculate condition, used for two weeks only, planning permission now granted for full sized beam so must sell, £95 no. Andy G0CCX QTHR. Tel. 0273 516517, evenings.

FT290R with case, Nicads charger, Yaesu mobile mount, ⅞ antenna, 25W linear/ preamp, like new, £320, disc drive for Spectrum (Opus) with printer interface, power supply, etc. All in one case, £100; VTX5000 modem £25. Phone 0908 79630.

TH3JNR 3 ELEMENT beam with new Balun AR40 rotator and control box, Altron slimline mast, wind up to 30' with reducer tube, wall mount, almost new, no split. The lot only £250. Buyer collects. Taylor, Bournemouth 528140.

STATION GONE QRT, 2m linear 25W £29; MET 2m crossed beam 10dB gain £25; full length G5RV £12; 10 ele television aerial for 70cm £6; various poles, telescopic mast, wall brackets, clamps. Open to offers. Prices ono. Telephone Dave 01-460 6785.

FOR SALE, Tektronix type 585A 30MHz oscilloscope, dual trace, delayed sweep, instruction manual, good working order, £85 ono. Telephone 061 740 4369. Buyer collects.

FT200 FP200 for sale, also SWR meter and 24m of RG58C/U military spec 50 ohm co-ax trasceiver, realigned and revalved mid 1985. Little used since. Buyer collects. £150. Field, 38 Victory Road, Whiteshill, Stroud, Glos.

REALISTIC DX4302 digital communications receiver £175; two metre MM converter 28MHz IF, £16.60; ZX81, new, £15; Sony ICF2110 digital portable communications receiver, £75; Spectrum 48K £40 Datacorder £15. Mike, 14 Doverfield Road, Brixton, London SW2. 01-674 0513.

SHACK CLEARANCE of all valves. Most boxed, new, many CV types to suit all ex Govt receivers, 1939-1970; also Eddystone, Racal, Marconi, same time span, i.e. CV187, CV138, CV140, CV329, CV233, CV248, CV1076, CV1219, many more up to CV4000 series; others A2599, A2900, A2426, 931A, 829, G1/371K, GTIC, GR10M, QQVO2-6, QQVO3/ 12A, QQVO3-20A, QQVO 6-40A. Too many to include here. All at quarter to half any list price. R.J. Shaw, 86 High Street, Poole, Dorset BH15 1OB.

FOR SALE, Eddystone 840C communications receiver, good condition, £80; also man signal generators AF/HF/UHF, dual trace oscilloscope, oscilloscope calibrator, high voltage power supplies, lots of mainly old test meters, meggors, etc. Very cheap; also AVO MkIV valve tester £85. Paul 01-733 0665.

FT790R with Nicads, boxed, excellent condition, £260; FT290R with Nicads, boxed, excellent condition; repeater access via PTT, professional mod, £230; MM 144/30 LS with pre-amp, mint, £50; Alinco ELH 730G, mint, £45. Bolton (0204) 852786.

RACAL RA17 communications receiver, 0.5 to 30MHz, complete with operating and maintenance instructions. Very good condition, only £100. Paul Goodrum, 9 Ryston Clos, Downham Market, Norfolk PE38 9BD. Tel (0366) 388615,

FOR SALE, Fidelity CB2000 FM CB transceiver, £25 ono; JIC SX200 scanner receiver, £150 ono. Both with mains PSUs. Jeffery 01-529 0553.

SELLING TWO Pye Vanguards, one complete with speaker control unit, mic, GWO, one for spares, both good condition, with paperwork; ie manual and convert lit, two 2 metre plus ant, built on. Both 6 chan, AM, FM, auto squelch, £40 pair or WHY! ie 10 metre PSU, 2 metres or WHY?. Please phone me on Brighton (0273) 559373, ask for Brian, MSGG. Also some more Pye EQT for sale. Wessie Olympus PH5's UHF.

FOR SALE, Thorn EMI oscilloscope, type WM16 with differential amp type 7/6; also wideband amp tyupe 7/1. Any offers. Tel Buxton (0298) 71834, ask for Nigel.

EXPERIMENTERS! I have several 50 watt audio valve amps. Ideal for making linears, transverters, etc. possible 100W pep, contains heavy duty power supply, KT 66's, etc, £12 each; wanted, good old valve receiver, working or not. Please phone Derek, evenings 01-657 0716.

FOR SALE, Uniace 200, ideal for 10mtr conversion, 13.8V PSU, SWR meter Tunderpole Mk2 antenna, 200W linear amplifier HRO communications receiver, pre-WW2, £150. Will split. MR Jeffry, Truro 573373.

TS530S MIC, Handbook, speaker, L/P filter, BC221, QRG meter, SEM Z-match ATU; 2kw PEP H/B ATU, 1.8Mc/s, H/B ATU: 9R59DS RX + speaker; Toko key, SWR bridge. All leads etc for above plus box of junk, £600 no. Not to split. Buyer collects. Peter, 0642 456327, days. Move forces sale.

RECEIVER, REALISTIC DX302 £125; Alinco ELH-730G 70cm linear, slight fault; PA, good; £35. Both with instruction booklet. 01-697 8407, up to 10pm.

YAESU FT757GX transceiver, complete with Amtech 300 ATU, BNOS, PSU (25 amp), Drae three way antenna switch, G2RV half size wire antenna. Manufacturers guarantee until 13/11/86. Mint used SWL. £625. Tel. Dunstable (0582) 606046.

ICOM IC-251E transceiver, boxed with manual, vgc, £425; Yaesu FT209RH, 5 watts, 1 hours use only with charger and manual, boxed, £200; Yaesu SP102 speaker with filters, £25; Regency HX2000E, VHF/UHF scanner £95; Astatic D104 mike £25. G4TGN QTHR. Tel 897 3794.

YEASU CPU-2500R FM transceiver, 144-148MHz. Frequency range, digital readout, scanning for busy or clear frequencies. 5KHz steps, repeater shifts, memories, Hi/Lo outputs (25/3) watts. Keyboarad mic, £125 ono. Telephone Tim, G1CMI, Cheltenham (0242) 576411, or on Westbury-on-Sea (045276) 467.

FT209/RH with speaker, mike, not mint, works fine, £165. Trio 2500 hard/soft cases, speaker, mike, ming £160; realistic DX200, perfect £65. Teleton TF181 multiband receiver, 150kHz-174MHz, BFO etc, £55. Wanted Axden PCS4000. Ring Bill, 01-534 3460, evenings; 01-5537308.

EDDYSTONE 770R Rx, good condition, £60, HW7 QRP Rx/Tx. Phone 0242 37613.

RADCOM and RSGB bulletins, 1946 to 1975 inclusive. Mostly complete volumes, £10 the lot. Buyer collects. G2AIH QTHR 07373 50995.

DX33 THREE element triband beam for sale. Partly assembled. Offers to G3DRN QTHR 01-947 3914.

AR2002 VHF/UHF scanner, brand new, boxed, £380. Toshiba RP-FiiL 11 band dual conversion portable £65. Grundig Yacht Boy 100 9 band portable £30. Both with AC supplies, manuals and short wave books. Yamaha A320 40w RMS. Amplifier £75. Yamaha T320 FM/AM/LW tuner £75. Latest models. acoustic research AR8S speakers, £50. Phone Wayne (01) 759-9994.

FOR SALE, Marconi HF receiver 260kHz 18.5MHz model AD108d, airborne Rx £35 ono. Two 27MHz FM tcvrs Audioline £20; Midland £10. Hygain V suit 10 metre conversion (details available) £45. K40 speech processor Mil £15. Tel Mark (0865) 53037, after 6pm.

FOR SALE, JVC TV 3040, DX bargain £60 ovno. Phone 0283 221870.

WANTED, amplifier for E1 Continental television or any other equipment. Phone 0283 221870.

COMMUNICATION receiver DX200, realistic solid state 015 to 30MHz AM SSB CW, good condition, instruction manual £60 ono. Buyer collects. Tel 061 865 6987.

BARLOW-WADLEY xtal controlled portable general coverage receiver. 0.5-30MHz in 1MHz bands, AM and SSB. Very good reception, using in-built telescopic antenna. Also has FM, VHF broadcast band, excellent condition £95 ono. Phone Alan, Basildon (0268) 45573, after 6pm.

YAESU FT290R for sale, Mutek fitted, complete with ni-cards, charger, soft carry case, recently serviced by importers, £265 ovno. Phone Eric, G1IYN QTHR on 01-874 7553, Wandsworth SW, London.

HEATHKIT SB100 HF transceiver, needs attention, with mike, PSV and handbook, £100. Racal receiver, covers amateur bands, £75. Collins, 360 channel aircraft transceiver, £125. Phone (0639) 820356.

YAESU FRG7000 HF receiver, digital read out £165. Commtel NPR934, vgc, £275. Home base 934 colinear £40. Mobile 934 colinear £25. Ring Tony, 0945 581372.

ICOM 271H 2 metre high power version complete with dedicated Icom mast head pre-amp, three months old, under warrantee, mint condition. Harry G6ZBQ £800. No offers. Whitstable, Kent, 0227 264983, evenings.

YAESU FT301 transceiver, solid state, digital, 160-10m, AM, SSB, CW, FSK. Speech processor, noise blanker, notch, all filters, marker, frequency standard, RIT, on Rx/Tx. VOX, MOX; variable, AGC, £350 ono. Spectrum plus computer, unused, unwanted gift, £70. Phone St Albans 39333.

FOR SALE, ITT 2020 (Apple II) computer, two disc drives, DOS 3.3, printer, intgerface, Eprom programmer, music synthesiser, green screen display, applewriter, word processor, joysticks, microline 80 printer, ROM card. Also storno viscount 2 metre transceiver, 8 channel preamp, tuneburst complete. Offers 0253-823522.

TRIODAC 240v input 0-270v output 2.5a £15; ATV converter MMC 435/600 plus TV for amateurs, booklet, £20. Two ceramic coil formers, 7" x 2½" 8TPI £2 each. (Heavy) low pass filtr, 1kw pep, £6. G4WOX QTHR. Tel. 0670-815587 (Northumberland).

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EXCHANGE professional Ferrograph, model 4A, reel to reel tape recorder, in excellent condition and working order, with manual and spare tapes for a general coverage communication receiver, must be in good condition and working order. Telephone Preston, Lancashire 0772 28051.

EXCHANGE TR10 TR2500 h/held with DC-DC converter for VHF/UHF scanner-like Bearcat or ICF7600 Sony HF receiver, etc, or sell for any reasonable offer. J. Young, 22 Hallmeadow Place, Annan DG12 6BZ.

EXCHANGE Ham Inter Concord II, low, mid, high, AM, FM, USB, LSB, CW, easy to convert to 10m for scanner. 104 Everill Gate Lane, Broomhill, Wombwell, Barnsley.

EXCHANGE Sony ICF2001 with PSU, excellent condition, for Icom 1C2E in similar condition. Other handhelds considered, G6TFC, QTHR. Tel 0204 651183.

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This is a complete modification board designed to fit all CB radios that incorporate modification board designed to fit all CB radios that have the SANYO LC7137 series of sythesizer chip, the unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the currnet upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10mtr amateur band.

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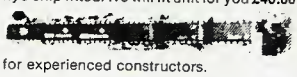
Works excellent in Cybernet, Binatone Lowe TX40G etc. *Check if your radio has the Sanyo chip fitted. We will fit unit for you **£40.00** inclusive. P & P.



* Only suitable for experienced constructors.

KIT OF PARTS AVAILABLE **£17.50 × £1 p&p.**
*Only available from RWC see R&EW March 1985 for full circuit description etc.

New Storno CQM713/P3 2mtr Modification Kit

NEW

This new kit of parts enables conversion of the Storno 55ch Radiophone to the amateur 2mtr band. The end result is a 80ch 25Khz steps 25W transceiver with repeater shift and option of local or remote control BCD or B. ary channels. The unit renders the ideal basis for a cost-effective mobile or Packet Radio transceiver or even Raynet emergency repeater! The kit comprises of two pcbs 2× adder chips, components (excluding external switches and pots) and 2× 7th overtone crystals and instructions and should present the average amateur with some constructional experience the minimum of difficulty. Why not have a go! Many parts available. Storno Mod Kit. **£29.50** Inc post.

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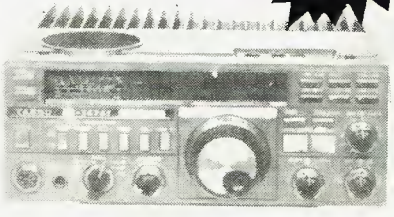
RWC Best seller £499 — with mod & carriage

The FRG9600 Scanning receiver was first modified by RWC and now has coverage up to 950Mhz and improved receiver performance and S meter. We fit an additional BNC socket for frequencies above 460Mhz and are able to supply optional antennas to cover this range. This has been our most successful mod to date with many delighted customers, to our competition who copy the mod we say "Immitation is the best form of flattery!"

Again we improve a fine HF transceiver by fitting our FAST TUNE FACILITY. The mod is "free of charge" at normal retail price, or send your rig, carriage paid and payment of £34.50 and we'll fit it for you. Can be fitted by experienced constructors. Built and tested kit at £20 Inc p&p.

INSIST THAT YOUR NEW 757 HAS OUR "FAST TUNE" MOD.....



FT-757 GX-RWC **£925.00** with MOD fitted carriage inc.

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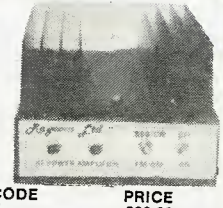
All 1-3 Watts input SSB & FM options (FM only can be used for CW)



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