JULY 1984 90p

Amateur RADIO

For all two-way radio enthusiasts

Russian CW

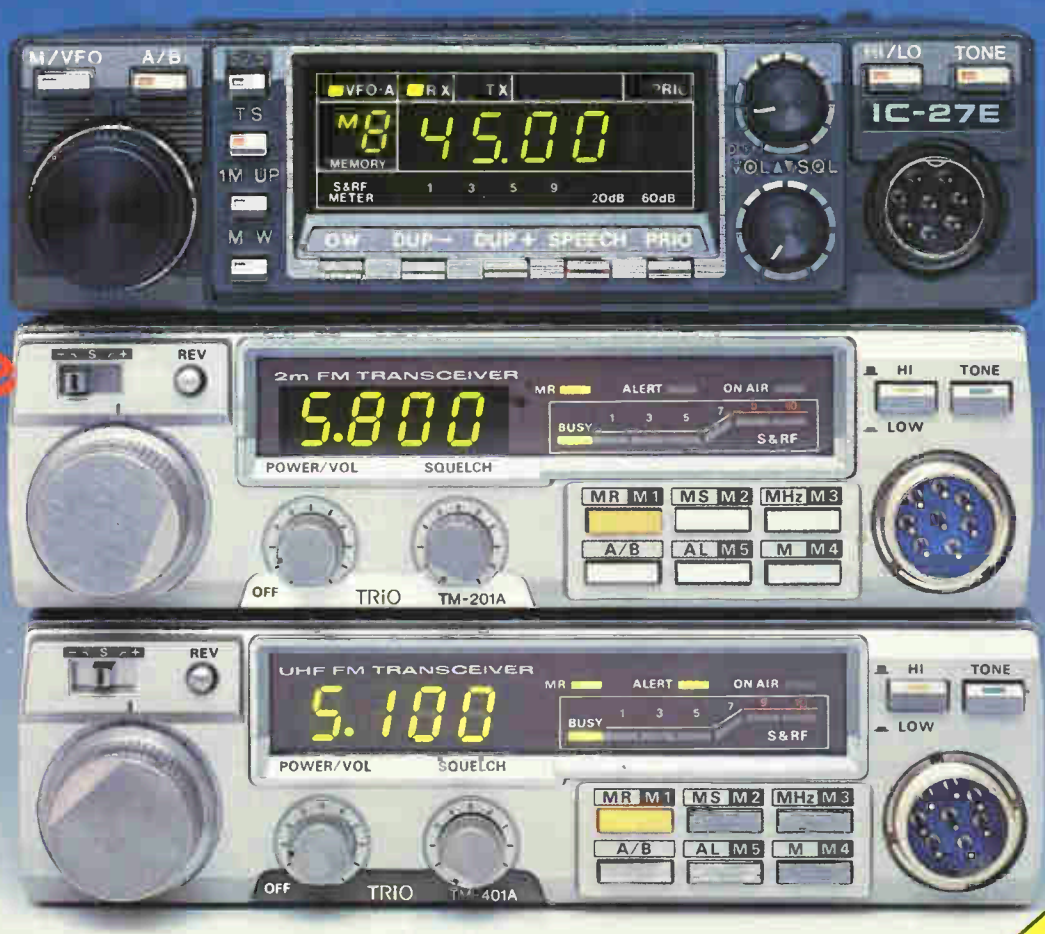
Project Big Ear - 40m Beacon

10m FM - The Forgotten VHF band

Collinear Aerials

Inexpensive paddle key

Parabolics explained



Trio TM201 and Icom IC27E Reviewed

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IC-27E, £299.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H × 144mm W × 177mm D. IT has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:– 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5 Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price 299.00 and 39.00 for the optional speech synthesizer.

IC-745, £839.

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Amateur RADIO

For all two-way radio enthusiasts

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DODSON AT RANDOM

PARABOLICS EXPLAINED

The first in a new series of unrelated topics. This month, Peter Dodson looks at an antenna system born of the space-age

If the communications satellite is one symbol of the electronic times in which we live, then the parabolic aerial must, surely, be another, because the two are inexorably linked. Unlike other systems, 'dish' aerials fire the imagination – even of those completely ignorant of the complex technology of communications: with robot-like obedience, these monster saucers turn through whatever azimuth and elevation is demanded of them, to probe the heavens in search of, or to transmit, their signals.

Perhaps the best known of its kind is the parabolic antenna at Goonhilly in Cornwall, with a diameter of 97 feet, capable of handling 5000 simultaneous speech, or twelve television channels; at the other end of the scale are the one metre mini-dishes used by radio amateurs and foreign broadcast enthusiasts the world over.

Firstly however, for the reception of satellite communications of any kind, it is necessary to know the position of the 'bird' in space in terms of direction and height. In the case of orbiting satellites (such as Oscar 10), this data will change constantly, requiring dish adjustment every ten minutes, and even geostationary satellites will stray marginally from their set positions.

The first problem associated with satellite reception is that the need for accuracy is directly proportional to dish diameter: a fifteen foot parabolic aerial will have a beamwidth of 15° at 3GHz, but a 40-footer on the same frequency will have a beamwidth of only .2°. It follows, therefore, that the amateur, usually with his small dish and often rudimentary tracking equipment, will gain in 'tolerant' beamwidth, but lose in gain. The formula for calculating beamwidth is:

$$b/w = \frac{70\lambda}{D}$$

where λ is wavelength in centimetres and D is dish diameter in metres. As a rough guide, beamwidth is 21/GD where G is the frequency in GHz and D is the diameter of the dish in metres.

Satellites can be geosynchronous/geostationary, in which case they orbit at a constant height/speed such that they appear stationary over a given point on earth. To achieve the required orbit (zero degrees of inclination) they must be launched on or near the equator, thus maintaining a pool of illumination over a fixed area. Orbiting satellites travel slower at their apogee (the most distant point from earth) than they do at their perigree (the point nearest to earth). To quote Kepler's second law – 'the radius vector of a planet (or, in this case, a satellite) sweeps out equal areas in equal time' (see diagram).

A parabola, being the word from which 'parabolic' is derived, is a geometric curve, the properties of which are similar to a perfect mirror. Beams of light emanating from the focal point of the 'mirror' will be reflected as parallel rays along the axis of the parabola. Furthermore, the path-length of all rays from the focal point to the parabola and out to a plane in front of it will always be constant. It follows that, in radio, the action of a parabolic antenna will convert spherical wave-fronts emanating from the focal point into a plane wave-front at the 'mouth' of the antenna. Radiation from the focal point which does not strike the parabola continues on a direct path as a spherical wave, diverging from the main beam.

If a parabola is rotated about its axis, it generates a paraboloid, which would produce a beam with a circular cross-section something like a car headlight. At RF level, the wavelength is negligible by comparison to the dimensions of the mouth of the dish, so a point-source is not realisable. The beam, therefore, will diverge, allowing a main lobe and two attendant side-lobes to go forward in the direction of the axis of the parabola. Furthermore, if the aperture is evenly illuminated (that is, the field amplitude and phases are constant over the operational area) then the dB gain can be calculated by the formula –

$$G = \frac{6D^2}{\lambda^2}$$

where D is the diameter of the aperture. This, of course, is provided that the diameter of the dish is reasonably large by comparison to the wavelength: a parabola ten wavelengths in diameter has a gain of 600 (or nearly 28dB) over a half-wave dipole.

As communications by satellite are conducted in the GHz frequency-range, they pass straight through any ionized layers as 'line-of-sight' transmissions.

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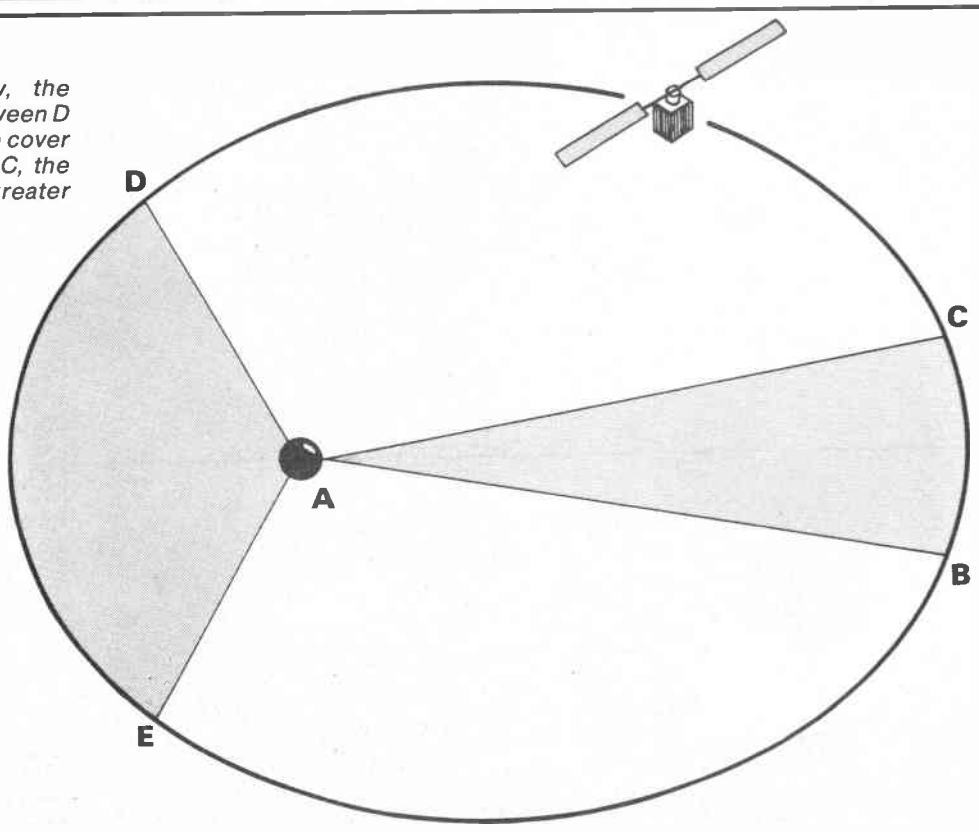
Front cover: The two new 2m mobiles on test this month (page 17), plus the Trio 70cm mobile to be reviewed next month. Picture by Jay Moss-Powell, G6XIB

PARABOLICS EXPLAINED

SATELLITE ORBIT PATH
Area ABC = area ADE
Under Kepler's second law, the satellite covers the distance between D and E in the same time it takes to cover BC. Since DE is greater than BC, the speed of the satellite must be greater between DE than between BC.



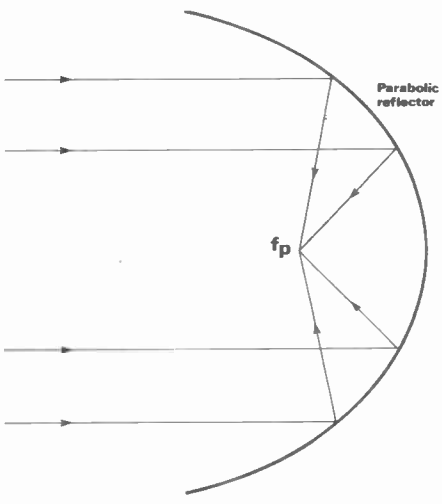
Understandably, the losses incurred in throwing signals 22,400 miles into space and the same again on the way down, are phenomenal – something in the order of 200 to 300dB. It can be seen that satellite communications involve very weak signals indeed.

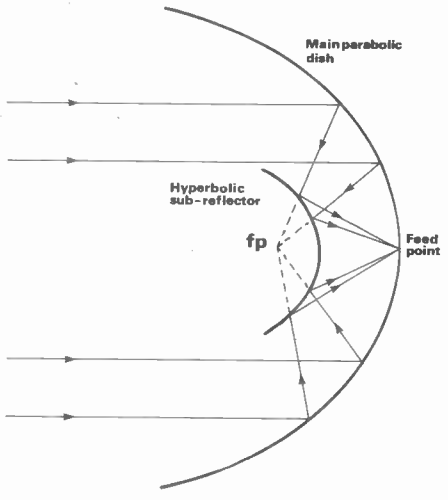
Basically, there are three main types of feed that are used on parabolic antenna. Firstly, there is the Prime or Newtonian type, where the feed (or collector) point is supported by superstructure at the focal point of the parabola. For obvious reasons, any physical hinderance to the arrival of radio waves is a disadvantage, and this system does incur 'aperture blockage'.

Secondly, there is the Cassegrain feed, which has a second reflector – a hyperbolic – situated just in front of the focal point of the main parabolic reflector. Arriving radio waves are first reflected by the main parabola towards the focal point, then re-reflected by the sub-reflector back to the feed/collection point on the main dish.

Thirdly, there is the Gregorian feed. This consists of a parabolic sub-reflector, this time situated just beyond the focal point of the main parabola. Its effect is to converge the radio waves that have already been reflected by the main parabolic reflector and pass them through its focal point back to the collection point – again situated on the main dish. The principal advantage of the Gregorian system is the suppression of side-lobe radiation.

With most antenna systems other than a parabolic, the reception of signals from satellites would be unacceptable: the signals themselves are extremely weak

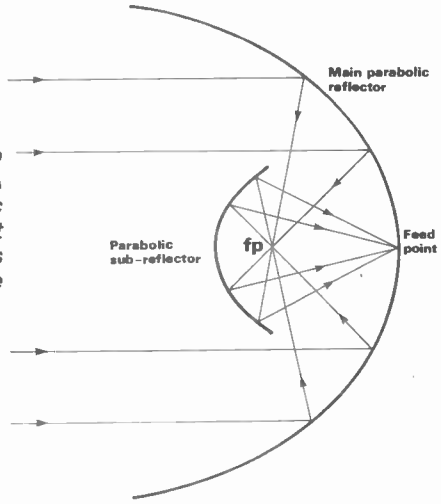




PRIME OR NEWTONIAN FEED
Parabolic reflector (dish) focusses arriving radio waves at the focal point (fp) where the feed is located.

CASSEGRAIN FEED (TOP RIGHT)
Parabolic dish reflects arriving radio waves towards the focal point. A second 'sub-reflector' of a hyperbolic nature placed just inside the focal point of the main dish further reflects waves to the feed located at the centre of the main dish.

GREGORIAN FEED (RIGHT)
A parabolic sub-reflector placed just beyond the focal point of the main dish concentrates radio waves at the centre of that dish after they have passed through its focal point.



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The **TELEREADER CWR685E** has many out... CW. Baudot and ASCII receive and trans... RTTY at 45-300 bauds ... transmission/reception of both uppe... Built-in 5" green phosphor sc... brightness that I have not see...

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***Simple to operate ...** Simplicity of operation is a special feature of this rig and many optional accessories are available. Of major interest is the matching headset SH-2 having built-in vox, this convenient accessory provides simple and safe operation whilst cycling, walking etc.

LS 20XE

£139.00 inc VAT carriage £2.50

Before I buy, I carefully consider the purchase. If the item is not expensive, then probably consideration will not take long, but if the cost is for example, two or three hundred pounds or more, then there are several questions which I would want answering.

what to buy,

...first is whether to buy ICOM, YAESU or TRIO. Obviously, we are ...ced that TRIO equipment is the best. Since we import the ...ent, you could accuse us of being biased in this view. However, ...ction is based on many years' experience, and the simple fact ...lume of TRIO sales in the UK is extremely high. **Many ... to be found using TRIO equipment, and we are confident ...g is its own best advertisement. Why not ask an owner?**

where to buy it,

The second question is where to buy your rig or accessory. Ever since the company began, some twenty years ago, our policy has been one of service. No matter how careful a manufacturer may be, equipment can go faulty and it would be wrong to say otherwise. Having said this, a high priority on your shopping list must be the quality of after sales service that you can expect from the company that supplied the goods. Service that can be asked for with confidence and result in your favourite piece of gear being rapidly repaired. Service of this calibre can only be given if sufficient money has been invested by the company in the necessary test equipment and spare parts. A point worth remembering is that test equipment by itself is useless: the company must also have technically able staff. How many amateur radio shops do you know that have eight engineers whose sole job is the repair of your equipment? **Who other than LOWE ELECTRONICS have sufficient pride in their facilities and expertise to hold an "OPEN DAY" once a year?**

help,

Informative and helpful service is also of major importance. Both the newcomer and the experienced amateur may want to discuss their requirements before making a purchase. They may be seeking advice. They will certainly want to check that the piece of equipment they have chosen does what they want it to do. What a customer does not want is pressure sales. **At a LOWE ELECTRONICS shop you will receive advice and courtesy: the service on which we and all members of the staff pride ourselves.**

LOWE ELECTRONICS accept the fact that everyone cannot travel to Matlock. To make purchase of equipment easy, we have opened our own shops, all with the same high standards, in Glasgow, Darlington, London and soon in Cardiff - the managers of the shops being hand picked for their abilities. For those who are still too far from a LOWE ELECTRONICS shop, then we have the fastest in mail order. Remember, we are the importers of the majority of the equipment we sell - we don't have to take your order and then obtain the goods. In addition to all these facilities, there are selected approved TRIO dealers who offer the same direct link with the TRIO factory as ourselves. A list of these approved dealers is published regularly by TRIO. Please ring us here at any time for information on your nearest approved dealer.

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Yes, we don't give discount. Our price is the price, and takes into account the above services which have to be paid for. **But it is much better than getting 5% off "LOWE'S PRICE" and then finding when you have a problem that you may have bought from a rogue.**

Not everyone can afford a new piece of equipment. To cater for this need, we prepare a weekly list of what is available both here in Matlock and also at the LOWE SHOPS. This list is sent out with all correspondence and to those who request it. Regarding the SECOND HAND LIST, please contact Matlock for your copy.

Credit is also available. We have for your convenience, the LOWE CARD which not only makes purchasing easy, but each quarter along with your statement are details of the "SPECIAL OFFERS." **Ring for a LOWE CARD application form.**

So that's it; simple questions which should receive answers before making a purchase, be it an SWR meter or a new HF rig.

TR9130 TWO METRE ALL MODE TRANSCEIVER

This rig is proof if one needed it, that TRIO do not bring out new models just for the sake of it. The TR9000 is remembered as a classic rig and today people are still asking for second hand ones, even they are a rarity on our S/H shelf. The TR9130 incorporates the improvements that all amateurs asked for: green display, reverse repeater, tune whilst transmitting, higher power, more memories and of course memory scan, TRIO's answer, the TR9130.

TR9130..... £458.72 inc. VAT

TS780 DUAL BAND BASE STATION TRANSCEIVER

The TS780 is the perfect base station VHF/UHF transceiver for the enthusiastic operator. The rig has all the necessary control functions essential for operating on both today's busy two metre band and the wide spaces of seventy centimetres. Full repeater facilities plus reverse repeater are included and the transceiver has the usual memory channels (10), two VFO's, up/down frequency shift microphone. IF shift, two priority channels, memory and band scan etc. A superb rig. I have one myself. Ring for a full enthuse!

TS780 ..... £850.00 inc. VAT

TR7930 TWO METRE FM MOBILE TRANSCEIVER

Those who have used or owned a Trio TR7800 will know what I mean when I say that Trio, with the introduction of the TR7930 have improved on the unimprovable. The Trio TR7930 improves on the TR7800 by giving a green floodlit liquid crystal display, extra memory channels, both timed and carrier scan hold, selectable priority frequency and correct mode selection (simplex or repeater). The most significant change is the liquid crystal display, but closely following this must be the ability to omit specific memory channels when scanning and the programmable scan between user designated frequencies.

TR7930..... £323.30 inc VAT

R2000 GENERAL COVERAGE RECEIVER

The amateur bands are only a very small part of the radio spectrum, many other transmissions are available for the short wave listener. Broadcast stations provide an alternative source of current information both political and regarding the life style of the country. Fitted with the internal VHF converter (option) the R2000 covers continuously frequencies from 118 to 174MHz giving access to amateur two metre transmissions (am, fm, ssb and cw) plus a lot more. Having 10 memories, memory scan and programmable scan the R2000 provides in one rig the perfect receiver.

R2000 ..... £436.75 inc. VAT

TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE FACILITIES

Much has been said about the TS930S transceiver and it now has a place high in the affection of those amateurs fortunate enough to own one. Indeed it has become the 'flagship' of the TRIO range. Providing full amateur bands plus a general coverage receiver (150KHz to 30 MHz) the TS930S has every conceivable operating feature for today's crowded frequencies.

TS930S..... £1,195.00 inc. VAT

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TR2500/TR3500 HANDHELD TRANSCEIVERS

Two first class hand held transceivers,one for two metres and the other for seventy centimetres. Ten memory channels, band and memory scan, repeater shift, reverse repeater and a low power position make the rigs extremely useful for the radio amateur who wishes to keep in touch with his local scene. A comprehensive range of accessories, base station charger, speaker microphone, mobile mount, etc. can be added to enhance operation. Accessories used with one rig being compatible with the other.

TR2500 ..... £246.36 inc. VAT
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CURRENT COMMENT

THE NOVICE LICENCE, CB, AMATEUR RADIO AND YOU

For what seems like too many years now, the 'dispute' between CB and amateur radio has swung around and around like a deranged claymore, with heavy casualties on both sides and what would appear to be little in the way of constructive results.

The *Letters* page of this magazine has all too frequently been used as a venue for yet another showdown between the two sides. Indeed, perhaps fifty per cent of the letters which you've written to us complain about 'senseless bickering'; the other fifty per cent, of course, are writing in to complain about CB.

I've often thought that if the people who attack and counter-attack on both sides every month were to actually get together, something constructive *might* come out of it. More realistically, however, I suppose that after 15 minutes the meeting place would resemble Bannockburn.

Recently the rift seems to have intensified, pervading all proposed changes to amateur or CB status or licensing arrangements, whether or not they affect the 'other side' or not.

A case in point is third party operation. Many amateurs in favour of this point to its use in CB and ask why the amateur cannot be given the same benefits as those in what they see as the lower echelons of the hobby. Those against any form of third party operation also point to its use in CB and cite the experience there as symptomatic of the malaise which infests that undesirable and chaotic poor relation to amateur radio, namely Citizen's Band.

A novice licence?

Another focal point for the CB versus amateur radio argument, and one where perhaps the conflict can become closer to being resolved, in the proposal for a novice licence.

Straightaway upon mentioning that term the problems start. Many amateurs resent any idea that newcomers to the hobby, particularly those from CB, should get in 'through the back door', and go further to suggest that in order to prevent the kind of people who a novice licence would encourage getting near the amateur bands, the licence standard and requirements should be made stiffer. In response to such people it is easy to sympathise with those serious CBers who offer the thought that, judging by the standard sometimes heard on the amateur bands, were the RAE made any more difficult, many existing licensee's would never have passed in the first place.

At the same time it is presumed that a novice licence will be of great interest to the CB fraternity – but is this necessarily true? We have all heard the views of those CBers with a profound and serious interest in radio, who for any one of a number of reasons do not want to take the exam. Indeed, many such people believe that they have found their niche on the 934MHz band.

Equally, it would seem unlikely that the average CB 'wally', of whose existence everyone is aware, will want to spend any time with novice licences or exams simply to do what he quite happily and irresponsibly does at the moment.

Those in favour of a novice licence see it as a considered first step for those serious in their intention to become fully licenced amateurs, and as such, an opportunity to instill into newcomers some of the basics of procedure and theory that seem to be missing in many of those who are currently passing the RAE by a technique derived from the parrot and then going on to operate in a way which lacks even the limited instinctive intelligence of the aforementioned bird. Not a bad idea perhaps!

In the light of all this, it was interesting to receive proposals from the Amateur Radio Novice Licence Campaign. The accompanying letter from Ian Abel, G3ZHI, reads as follows:

'A mistaken impression is being given of the proposed UK novice licence and the reasons why it is now necessary. I hope you will allow me to clarify the position of the ARNLC.

Firstly the idea of a novice licence is not new. I have been pursuing it for 15 years, as has the RSGB for some 37 years, so for people to now say that the aim of the novice licence is to pamper to 'CBers' is a false argument. A novice licence has nothing to do with CB. Its aim is to put back into the hobby of radio what was there when I started: an apprenticeship in radio, learning by doing.

At the moment the airwaves are full of 'black box' operators, a lot of whom do not stay, because they have never had a true 'feel' for the hobby. The present route into the hobby from the chaos of CB is unacceptable. Those who think that this route will not in time damage our hobby are not being realistic.

The fact is that to attract people into our hobby we must offer an alternative to CB, and that must be a lower class of amateur radio licence. It would be easier but *very* restricted – but what is wrong with that, given its aim?

Let us not have the class A versus class B argument all over again. After all, when the class B licence was introduced it could have been said that the class B's were being 'molly-coddled' etc. Now, there are more class B than class A licensees.

The novice licence would put the self-training back into the hobby. How many new G4s have had their first QSOs on CW with American novice licensees? A novice licence would have no age requirement, 10 watts maximum power, be CW only on the CW parts of 28, 21, 7 and 3.5MHz amateur bands. The licence would be valid for 2 years, and if you did not upgrade in that time then the licence would be lost for 1 year.

The novice licence has proven extremely popular in the 28 countries that have already introduced one.'

Here then are the proposals:

1. Morse would be the method of communication; speed 5wpm.
2. The technical examinaton would essay the following objectives: a) an understanding of radio theory, including methods of propagation, transmitter interference; b) technical operations and operating procedures; c) appropriate regulations.
3. The examination would be set by City & Guilds, or by the RSGB.
4. Morse would be examined by appointed amateurs, such appointments being made by the RSGB or local Radio Interference Officer.
5. Examinations would be sufficiently simple to attract and maintain interest, yet ensure that the operator has some idea of what he/she is doing.
6. In terms of a model for working discussion, the American system in current operation would be considered.
7. Equipment; this would be low power, possibly type-approved, 10W output.

Reasoning

The reasoning behind their proposals is that those currently coming from CB are in many cases 'too far gone' to become serious amateurs, and that thus by pointing potential licence holders in the direction of the RSGB, etc, rather than CB, standards might more effectively be maintained. Equally they suggest that 'learning by doing' is more profitable than merely learning for the sake of passing the exams.

They also state that 'stations would be both licensed and disciplined; therefore it will be seen that 'CB' in no way fulfils this role.' They then say, *'In fact, CB has nothing to do with the concept of a novice licence.'*

So it is that we appear to have come back to where we started. It would seem quite possible to argue that the novice licence and CB are very closely linked, since the former might well be of considerable interst to those currently involved in the latter.

Certainly any proposal for a novice licence should not pander exclusively to those coming from CB; it should be even-handed, sensible, practical and open to all. 'But in no way should any proposal gratuitously insult or ignore CB.

Believe it or not, this started out as an attempt to sooth the the situation so evident on the *Letters* page, and in the hobby as a whole. As such it has backfired. But if it gives direction to some of the more futile flak currently flying between camps, then maybe it will achieve something. The novice licence affects everyone, licensed or unlicensed, CB or not.

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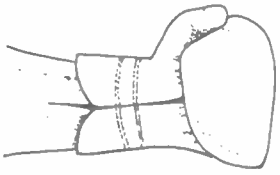

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73, Dave, G4KQH, Technical Manager

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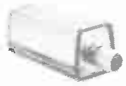

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BREAK THE HABIT...

I would like to comment on the letter by Ivan Chidwick of Wakefield (***AR*** Letters, June).

I am 64 next September, became an SWL in September 1981 and took the RAE in May 1982. I did not attend classes but studied at home using the *RAE Exam Manual, Guide to Amateur Radio, Amateur Radio Operating Manual* plus the *RSGB Radio Communication Handbook* from my local library.

I passed the exam at the first attempt with a credit in Part I and a pass in Part II, although I had not taken an exam of any kind since 1944, and I actually needed help filling in the heading of the exam paper.

I knew nothing about radio or electronics before beginning my studies.

So it is that I feel Mr. Chidwick would be well advised to join our ranks, as the standards I've heard when listening to illegal CB on my HF Rx are diabolical – even worse than the standards of some licensed operators.

The W5LFL fiasco was proof of all this (although I have now had two of the very attractive W5LFL QSLs).

By the way, if you can come up with a foolproof scheme to help me with the CW I shall be very happy indeed.

Stan Clark G6NUO, Birmingham.

...NOT THE RULES!

Mr. Chidwick writes in your June issue taking G3URA to task for his comments.

As with all problems, there are at least two ways of looking at the situation; nobody, and I mean nobody, would deny that there is a lot of silly drivel talked on some CB channels, but almost invariably by obviously immature persons, who, it is hoped, will grow up eventually, and in any case are best ignored!

There is, however, a hard-core of CB operators who are keenly interested in the social and technical aspects that being 'on the air' affords; some, like Mr Chidwick, for perfectly good reasons of their own, do not wish to seek amateur status. Fair enough!

But those responsible types who do wish to expand their horizons should be given every encouragement!

The Darent Valley Radio Society, down here in Kent, specifically caters for *all* 'radio interested' individuals – the club has a mixed membership, several long-established fully-licensed amateurs, some 'B' licence holders, plus a group of mature, well-balanced, CB operators. We all live in complete harmony and club nights (twice a month) are held in a local village hall and are eagerly awaited by all!

It is true that a normal rational interchange of news, views and ideas should take place – after all, the first clause in the 'Ham's Charter' as published by the ARRL some years back, was:

'A radio amateur is a gentleman'.

This implies a reasonable standard of behaviour towards all and sundry; an amateur licence is not a charter to 'look down the nose' at anyone else!

An apt note on which to conclude might be the battle-cry from another notable organisation (some may have met it!) 'Come and join us, come and join us'.

G2WI, Orpington.

BLAME THE RECEIVER

Regarding Mr Trower's letter in your May issue, may I say that I too, as an amateur and army radio operator from 1932-55, blame the receiver.

However, he forgot to mention FM! In my day, Armstrong FM had a method of providing a noise-free hi-fi system by severe AM limiting.

This system incorporated high level detectors with no response to AM followed by LF stages of low gain per stage to give absolute silence. What a contrast to modern design!

What manufacturer will resurrect a two-valve tuned pre-amp to save modern sets? He will make a fortune.

HW Hayne G6PFW, Hampshire

BLAME THE MAGAZINE?

I have just read your latest edition of ***Amateur Radio,*** and I must congratulate you on the content. I particularly liked the letters page, just the right balance between controversy and comment, without a plethora of sideswipes.

The letter from Mr Trower I agreed with almost one hundred per cent. Not many people have commented on this relatively poor performance of modern day receivers, least of all the ham magazines; they know upon which side their bread is buttered.

Can a magazine review be as critical as they could (in all honesty) hope to be? I well remember a review in a well respected magazine which is almost totally dependant on advertising revenue, on the Heathkit HW7. This rig when it first appeared was abominable. Yet the review made some 'gentle hints' about certain aspects of the rig perhaps being not quite as good as other rigs, instead of saying that using the rig could possibly cost you your licence, so bad were the 'sproggies' from the Tx.

To get back to the receivers, I have recently been directly converted to Direct Conversion receivers (if you will pardon the pun). My preferred band is 40 metres. On this band a receiver cannot bluff. It either can, or it cannot. There is no maybe. I have found that DC receivers can and do give me consistently good results. Now, I will not use any other type of Rx. Direct Conversion receivers are cheap and simple to make, but giving performance out of all proportion to the cost of the Rx.

Kevin Fox G4MDQ, Sheffield

NOW FIX THIS

May I thank G3OSS for his article on 'Fix It': it is so refreshing for me, as a beginner in amateur radio, to know there *are* some amateurs out there willing to give friendly, helpful advice instead of, like another ex-editor, calling us 'Baboons'.

One other point however; if, and I believe it was, the contents of this article *needed* to be said, then how would people on a novice licence be treated?

People coming from our existing 'novice licence' of 27MHz are treated poorly and receive little help, so what would happen to people coming from a new official novice licence without passing the RAE (or is that different)?

DA Hewson, Sittingbourne

GETTING GOING

Recently there has been a lot of comment on licence requirements and the RAE.

My problem is radio theory. I'm lazy and lack spare time to study. *However*, I fail to see why I cannot operate a modern low powered shortwave radio as long as:

1. I pass a simple test to prove I know the reasons for causing interference;
2. a simple test to prove I know where to transmit;
3. a simple test to prove I can keep the machine operating correctly.

Some of us don't have time for stripping the guts out of old radio's etc; indeed there is a lot to be said for modern radio's since if anything goes wrong, you just send it to an expert.

I think the 27MHz CB band should have part of it turned over to CW practice, where people who can prove they are not going to cause key clicks can learn morse by calling on others. Limit power to, say, half a watt.

Finally, can someone do something about CB causing interference on or between 4.500MHz and 12.00MHz in the South Wales area?

W Ellis, Cwmbran

STANDARD C110

Having seen the review of the C110 and IC02E handhelds in ***Amateur Radio***, and since I have been using a C110 for the last 5 months, I feel I must bring to your attention one or two points that you did not comment on, or which were not entirely correct.

Firstly, on page 27 you state 'the rig has a maximum recommended input voltage of 9.6 volts.' This is not entirely true as the handbook states that the 'operating voltage is 5.5 to 11 volts'.

I agree that Standard 'set

L·E·T·T·E·R·S

up' these rigs at 9.6 volts and this voltage would be the ideal one for operation. When quoting the RF Output watts, you do not state at what voltage this was based, but one assumes it was 9.6 volts. However you do not mention the fact that with 6 AA Nicads in the standard battery case the RF output is 2 watts or slightly less. The nominal voltage with these nicads is 7.2 volts.

With regards to the small squelch control, I find that owing to the excellent voltage regulator circuit maintaining the Rx at 6 volts, that once the squelch control has been set it requires no further operation over a period of months (unless of course one wishes to turn it off to hear if there are any S½ signals on the band!). In fact I rarely use mine, due to the stability. Maybe this is why Standard saw fit to use such an insignificant control knob for this position!

Again on page 27 you state that 'on the front is the loudspeaker/mike', giving the impression that this is the type of microphone used, whereas the type used is of course an electret, being a separate component to the speaker, and capable of far superior results to the speaker used as a mike.

I trust Angus will accept these comments in the nicest way as intended, as I and my neighbouring hams really do enjoy reviews which pull no punches and are completely unbiased.

Incidently, in view of there not being a power supply to operate mobile from the car battery I have made my own unit to clip on in place of the battery case, (a spare case could be used), and this incorporates a 7808 regulator. I run at 8 volts, but this could be lifted to 9.6 volts if desired, and protected with the usual crowbar thyristor triggered by an 11 volt zener if the latter voltage is exceeded.

Trevor Talboys, G2ATK, Worcs

SPRING SURPRISE

With regard to the article in the June issue entitled 'Getting the best from roofspace aerials' (p47), it would be a difficult task to measure the aerial current with the antenna in situ using the device described, as it means threading the ferrite ring along the aerial to the point you wish to measure: an impossible task if the antenna is held in place with stand-off insulators.

I should like to suggest a different idea suitable for measuring the currents in wires and open line feeders:

The basis is identical to that published with the ferrite ring *carefully* cut in half. Each half is then bonded to a clothes peg (of the spring variety) and the pick-up wire then attached. Using this idea and a long pick-up wire the antenna can be measured at its operational height.

I hope this may be of use.

Martyn Bolt G4SUI, W Yorks

MORSE READER

I read with great interest the article by Trevor Morgan GW4OXB, on CW/RTTY readers *(SWL, **AR** June)*.

I purchased my 'Code Master' in June of last year, and it has opened a whole new world of SWLing for me. I find it fairly simple to tune my FRG7700 to RTTY which can be found on most HF Bands, although many are in a code form probably scrambled for security.

CW is another kettle of fish entirely; tuning the received signal must be spot on, or the Monitor LED will not function. Once you have the signal and the LED starts to flicker, care has to be taken to remain 'on station', for should the signal start to drift, nimble fingers with a feather-like touch are necessary to follow it before it is lost.

US Coast Guard was heard last winter (CW) telling shipping that a listening watch was maintained on certain HF Bands for shipping requiring medical aid and advice.

I consider the £189 well spent, as I have never been able to assimilate Morse, no matter how many times I've tried to learn. Living as I do in a basement flat, I solved the antenna problem after many experiments by purchasing a Datong Active Antenna AD370. This can be quickly erected via a portable telescopic mast in the garden.

One problem remains to which I have yet to find an answer: exactly what is ASCII? It seems to have RTTY associations as it has a Baud rate. I have made inquiries at many radio shops, and my friends have said they would like to know too, and they are licensed amateurs, but no one seems to know, so perhaps you can help by giving short explanations of the various initials so often banded about by our peers, but which are profound mysteries to us lesser mortals.

Ted Rickett, Hampstead

ASCII stands for American Standard Code for Information Interchange, and is a seven-bit code (as opposed to the five which are standard in RTTY). It is a formalised computer code used within programs themselves, and converted to BASIC or other computer languages for user-access.

An over-simplified explanation of its use in data transmission is that the translation into a user-language is kept entirely outside the bounds of its transmission, thus avoiding two translation stages involved in transmission of computer-stored data by RTTY.

It is hoped soon to run a series on the various forms of data transmission and their application and interest for the radio amateur.

OLD TIMES

I have been interested in radio since 1922, at a time when the only crystal sets available were under Marconi licence or patent.

I had a radio ham neighbour, Mr Parry, whose aerial array consisted of three 100 foot long lengths of 7/22 copper wire, on nine foot spreaders. In addition to his valve set he also had a pre-war spark rig with a huge coil, two WC copper ball floats for his spark gap and a coherer detector! I believe it was confiscated by the War Office at the outbreak of the 1914-18 war and returned to him later. I never knew his callsign, if he had one, but he lived in *Bury New Road, Sedgley Park, Prestwich, Manchester.*

I built my own crystal set under his guidance and progressed to one, and then two valve amplification of the same, until eventually I built a four valve rig, RF detector and two LF stages to drive a cone speaker mounted on a three foot by three foot sheet of 5-ply wood! What a set! I secured many orders for similar sets!

I have now 'descended' to a black box DX302 and experiment with different antennae, indoors and out, with acknowledgements from Peking, Helsinki, Ecuador, and lots of contacts with North and South America – but no QSLs.

Apart from that I have two CB sets and a lot of good friends on 27MHz. I also have a G3 ham friend close by who has just put up a magnificent three spreader beam, rotating, on a lattice mast.

I wonder whether any of your old readers remembers Mr Parry of Sedgley Park?

J L Harrison, Chester

CB AGAIN

You seem to bend over backwards so as not to ruffle the feathers of the CBers.

With what I have heard on CB in terms of foul language, infantile behaviour and just so much 'codswallop' and technical misinformation, I am amazed that CBers *can* be insulted.

Granted there *are* some intelligent people on CB, but any intelligent QSO heard on 27MHz is very soon disrupted and the frustration of these people is very apparent.

I grant that there are times on HF when tempers flare but nine times out of ten the cause of these is niggly, ie splatter or whatever. This is usually unintentional and if one is calm, patient and understanding one usually ends up with a new friend in the world of amateur radio.

Let's give good constructive help to those who want it, and let the rest of the CB world go their own sweet way (they seem to be quite happy).

Bob Frame

STRAIGHT & LEVEL

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

SAY AGAIN CALLSIGN?

Paul Dobie GM1AYD from Ayrshire in Scotland has written to us regarding comments made by G4WUB in *Straight and Level* for May on the subject of giving callsigns. He says:

'It cannot be denied that many people find certain aspects of our licence regulations unsatisfactory. I feel that more freedom is needed because the present regulations are over-restrictive without reasonable justification.

I wish to concentrate on the use of the callsign. I think it is clear that our licence requires us to give our call at the beginning and end of each over etc. This is unreasonable. When people talk to each other in person, they tend to share the speaking, taking turns to speak frequently for short lengths of time. People communicate best with fairly short overs except perhaps when explaining technical matters.

For best communications, overs should be short. Hence the callsigns will be repeated a lot, thus hindering the object of genuine communication. To take an extreme case, I am asked,

'Did you go out last night Paul? GM1XXX'

'GM1AYD. No GM1AYD'.

I think this sums it all up, and it has to be said that many amateurs don't have real conversations as such because their overs are too long.

I suggest that instead of moaning about the licence, people should try to make it more practical. How about giving callsigns every five minutes?

Incidentally, I'm in favour of a novice licence. We should put them on the quieter bands and since they *are* novices, it seems reasonable to limit their range. Perhaps QRP on top band AM (equipment is cheap here) and 70cm would be suitable.

Either way, someone should get their shoes on and get to work'.

I doubt whether Paul's view will be shared by all of you, and I'm sure that his offering will generate more comment. Many amateurs, call them purists if you like, see each transmission as a unique and to an extent sacred entity, which as such must be classified for posterity by the use of a callsign.

Fair enough, but as Paul points out, simple communications treated as such often fall short in their primary function – to simply communicate.

Another letter on the same topic, with a version of the official reply to this question, comes from Kenneth Parker G3PKR, who writes as follows:

'I was interested to see the letters from GJ4ICD and G4WUB on the use of one's callsign for identification purposes, as I too have sought clarification of the regulation relating to this point. I wrote to the Home Office and specificially asked whether the words 'each period of sending' could be interpreted as meaning a complete QSO with another station ... or should one's callsign be sent at the beginning and end of every individual transmission however brief. The reply I received was as follows:

'With reference to your letter, Clause 9(c) of the amateur radio licence is quite explicit in stating that the allocated callsign must be sent at the beginning and end of each and every transmission irrespective of the time factor involved. The only exception to this is in the case where transmissions exceed 15 minutes duration. In these cases the callsign must be sent at the beginning of the transmission, at the 15 minute interval and at the end of the transmission. Trust that all is now clear.'

Surely it *is* quite clear from this that VOX and break-in operation are not exempt from this rule as is widely believed. A final point that is perhaps not always realised, is that the licensee is not required at any time to send the callsign of a station being worked, and to do so at the beginning and end of every over is unnecessary and time wasting, especially in a multi-station QSO. I hope this is of interest.'

So where exactly does this leave us? Probably back where we started.

TALKING DFM

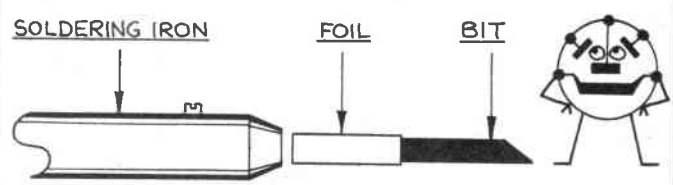
WPO Communications announce the re-introduction of their Talking Frequency Meter for the visually handicapped amateur. This is designed to assist blind amateurs in determining their transmit frequency, although the unit can be used for any of the applications that a normal frequency counter could be put to, including frequency readout under difficult operating conditions. It covers 500KHz to 150MHz (minimum) in two ranges, with a resolution of 100Hz between 500KHz and 40MHz, and 1KHz between 20MHz and 150MHz.

Speech is of good quality from a unique circuit, through its own built-in speaker, and the meter features either manual or automatic repeat operation, with selectable 2, 4 or 6 digit groups of figures spoken. The new unit has inproved sensitivity at HF, and reverse polarity plus input protection. It operates from a 12V external supply and is supplied ready built and tested. It costs £179.

They are also now making many of their designs available as ready built and aligned PCB modules, leaving only the external components to be wired in by the constructor. As an example, the popular DSB80 and 160 series QRP transceivers can now be purchased as ready built and aligned modules for £56.45 inclusive, and their new Audio Speech Processor for £18.50 inc. Also available will be their range of PLL synthesised VFOs, including a new 2 metre design, and their 2 metre FM transceiver, plus 6 metre converter. This new service will meet the requirements of those people who want to have some element of home construction in their station, but lack the confidence to build from kits.

For further information contact: WPO Communications, 20 Farnham Ave, Hassocks, W Sussex, BN6 8NS. Tel: (07918) 6149.

ANDY TIPS by Deejay



Andy says:
'To prevent bits from becoming jammed in soldering irons due to corrosion, simply wrap a strip of aluminium foil around the part of the bit which fits into the iron. One or two turns of foil around the bit is quite sufficient'

STRAIGHT & LEVEL

NEW USSR CALLSIGNS

Further details of the charges outlined in last month's *DX Diary* have been sent in by Jack Blenkey G4CPU.

The new system came into force on May 1, 1984. From that date the first letter of any callsign will be U or R irrespective of the station's licence class. Novice calls (160 metre band) with EZ and EY prefixes will also be changed to those beginning with U or R.

Special event stations, plus Arctic and Antarctic stations can use prefixes allocated for the USSR which begin with other letters, for example EN, EK, 4K, YL etc. The second letter in the call sign will indicate the republic of the USSR in which the station is located.

The oblast (region) in every republic, except Russia, is determined by the letter following the prefix. For example: UB4LAA, RB0LBW, UT3LCD are all from the same oblast, (the Kharkov Region in the Ukraine).

In Russia, an oblast is determined by the combination of the prefix figure and the letter following it. For example:

UZ4WZA – obl 095, Udmurtia, Russia

RA0WBD – obl 104, Khakassia, Russia

UA3WEA – obl 135, the Kursk Region, Russia.

All the calls of club stations (formerly UK prefixes) will be changed so that their prefixes clearly indicate their republic, while their suffixes will always consist of three letters with their status as a club station being indicated by the second letter of the suffix being: W/X/Y/Z. If there is another letter in the second place of the suffix, it means that it is an individual station.

It must be stated that all hams now having two-letter suffix calls do have the right *not* to change their calls even if the latter do not correspond to the new callsign system. Those amateurs who have first class licence three-letter suffix calls can change their calls into some new two-letter suffix ones.

Because of the new callsign system, beginning with the 1st May 1984, the R-10-R Award is abolished. However, some new oblasts for cities have been added to the list for the R-100-O Award: Kiev (186), Sevastopol (187), Minsk (188), Tashkent (189), Alma Ata (190), Ashkhabad (191). These cities are all now so large that they are considered oblasts in their own right.

In addition, two oblasts are no longer on the R-100-O list: 171 (the Arctic) and 172 (the Antarctic).

USSR REPUBLIC INDICATORS

A, N, V, W, Z – Russia
B, T, Y – the Ukraine
C – Byelorussia
D – Azerbaijan
F – Georgia
G – Armenia
H – Turkmenistan
I – Uzbekistan
J – Tajikistan
L – Kazakhstan
M – Kirghizia
O – Moldavia
P – Lithuania
Q – Latvia
R – Estonia

COMPUTERS AND RTTY?

The following was available at the RSGB Convention from BARTG, and is reproduced with their kind permission as a guide to anyone interested in setting up in RTTY.

One of the most popular uses for a computer is in connection with radio teleprinter telegraphy, (RTTY). What is RTTY? This is a well established system where messages are typed at one end of a radio link and appear 'printed' at the other end. You will of course need a radio receiver, then you will be able to tune across the radio bands, and 'print' many interesting stations such as foreign radio amateurs, for which you do not need a licence, on your screen.

If you are also interested in transmitting signals, then you must be in possession of an Amateur licence. This allows you to type on your keyboard and automatically transmit the outgoing messages over your own transmitter.

Contacts made on RTTY are usually much more personalised, as the RTTY Groups are like family groups and a lot more information is exchanged compared to speech or morse code contacts.

Well, how do you start turning your home computer into an RTTY station?

The first thing to do is to stop and think. If you are of the opinion that by simply paying out £7 or £8 for an RTTY program, you are going to become active on RTTY, then forget it and simply use your computer for playing games. On the other hand if you are serious about RTTY, then there are a number of steps you must take.

You need to find out just where you are going to connect the incoming signals to your computer, and where the outgoing signals will appear. You must know whether it is necessary to extend the memory, or provide INPUT/OUTPUT facilities. You need to consider what is going to convert the audio signals from the radio, into the TTL level pulses suitable for the computer, and likewise do this in reverse when transmitting.

Now you come to the program. Buy a cheap one and don't be surprised if the display is the size of a postcard in the centre of the screen. On the other hand, there are some very fine RTTY programs around that give split-screen facilities so displaying both incoming and outgoing messages at the same time, and a number of memories for holding CQ calls, station description, test calls, etc.

Lastly there is the problem of interference that your computer will cause to your radio. The fast rise-time of its' pulses make the computer a serious replacement for the old motor bikes that played havoc with TV reception.

There are many makes of computer, and not only do these use a variety of connectors, but often sockets are called plugs by computer people. Sometimes input/output boards are called interfaces, yet you will still need another interface for it to work.

There is no 'tradition' in the computer field. Neither have they learned anything from 80 years of telecommunications, or 35 years of suffering interference. They all work in their own little fields, and all goes well as long as you use the products of just one manufacturer (although sometimes even the products of the same make will not work together, and then you must stick to a particular 'family type' of computer).

Don't make the mistake of thinking that just because a program is written in BASIC it will run on computers using BASIC. There are different types of BASIC. There are also many different ways of using what appears to be a simple type of cassette recorder with a computer. Just in case you thought these were interchangeable, the manufacturers go to a lot of trouble to ensure that they are not.

Computer people are notorious for working alone and thinking that all their achievements are 'trade secrets' not to be communicated to others.

But a few of these enthusiasts experienced in both hardware and software problems, are in a group, with many others experienced in radio communications, and the problems of RTTY. This group has been helping other radio amateurs for over 25 years, and they can also help you. The Group is called the British Radio Amateur Teleprinter Group (BARTG).

In the past it was usual to take a commercial machine, that originally cost over £2,000, and make it work on amateur RTTY. What you are thinking of doing now is to take a home computer, which putting it bluntly is very little more than a toy, and make it work as a professionl piece of equipment on RTTY.

By joining BARTG, you will receive a quarterly magazine called DATACOM, which is packed with over 100 pages of items of interest to both machine and computer users. But you will at once have the state of the art on particular computers, where to find the information that you need, and also what parts are available and where to obtain them.

Furthermore, BARTG stocks those useful publications and parts that you will need as you extend your activities into RTTY, and all these are available at a discount to members. To join BARTG please send £5 and your details to *Pat & John Beedie, G6MOJ/G6MOK, 161, Tudor Road, Hayes, Middlesex, UB3 2QG.*

STRAIGHT & LEVEL

A FAMILY AFFAIR?

Mention radio rallies in our humble abode and one reaction is guaranteed: instant XYL silence followed by exit to kitchen, slammed door and the perennial Cliff Richard blasting out from the portable cassette. Within an hour or so the serving-hatch doors usually fly open so the first barrage can be fired in my direction:

'I suppose it's not enough to have that screech box killing family life every night of the week, *now* we have to be dragged off at weekends to admire other people's junk!' (Bring and buy stalls). 'At least when you were into CB you could understand what they said and it was a *family affair*'.

Now I have to admit, the long suffering lady does have a point. Rallies are great fun for all in amateur radio, from the home-brewer through satellites to the black box freaks; in fact, fun for all except wives and families who up to now either stay at home or are dragged from stall to stall complaining every inch of the way. My XYL is never going to handle the jargon. She made a valiant attempt at CB slang, but Q-codes and gigahertz leave her cold. Well each to their own, but she is right; when our local CB club organises a 'do', they think in terms of something for everyone. Amusements for the kids and general displays for the uninitiated, so the old man can pursue his interests knowing that his kin are not being bored to death. Rally organisers please take note, the more generally entertaining a rally is, the more the hobby will be tolerated by those who have to live with a radio nut.

This is a trend which is growing, but not fast enough; a couple of exceptions last year were the Woburn Rally and the McMichael Rally.

Woburn was great for families, having the stately home and magnificent grounds. While the old man was ferreting through the surplus-bins for goodies, the rest of the brood were sight-seeing or just enjoying the sun that day.

McMichael were not so lucky with the weather, which kept people away and only cleared at closing time. My heart went out to the organisers; they had worked so hard laying on not only radio displays but a Model Corner, Kiddies Fun-Fair and Playground, real ale tent and museum of vintage domestic McMichael equipment and more.

This was their first rally and they had something for everyone – shame the rain kept the gate down. This year I'm told that even more will be catered for and full weather precautions are being taken, whatever that means . . .

Having seen the effort the McMichael team put in to make a family day out I wish them every success this year.

A parting shot for rally organisers, *please* signpost your rally well. Not everyone has a rig, or is a licenced amateur, so talk is not enough. If I persuade XYL and kids to go to a nice family rally and then end up lost in the middle of nowhere . . . well, I think the shack will be reposessed and turned into a Granny flat. Wouldn't that be nice?

BOOKS

How to Design Electronic Projects has recently been published by Babani. According to the author, R A Penfold, the aim of the book is to help the amateur hobbyist construct complete working projects from standard circuit building blocks with the minimum of trial and error and without the need for advanced mathematics. There is also advice on designing your own circuit blocks to meet particular requirements.

The book comprises a series of practical examples, analysing what each circuit must do, exploring methods of achieving each circuit action and then working out practical designs including component values.

Hence several useful circuits are provided as well as a comprehensive guide to project design. The book costs £2.25.

Peter Bubb's new book, *Understanding Radio Waves,* aims to give the reader an insight into the nature of radio waves and to show how they are made to work in virtually every aspect of everyday life from communication to cooking. There is also constructive advice for the novice amateur radio enthusiast on how to obtain a transmitting licence and on operational procedures.

The eighteen chapters are short, well written and illustrated with photographs and clear diagrams. Obviously the book cannot cover every element of radio waves within its 176 pages but it does give a comprehensive introduction to the subject. Published by Lutterworth Press, it costs £8.50.

SWL CONTEST

The Cray Valley Radio Society SWL Contest 1984 is to be held between 1800 GMT on September 8th and 1800 GMT on September 9th. Up to 18h logging may be done during this period and a continuous rest period must be clearly shown.

Multi-operator stations may log during the entire contest.

The contest is open to anyone in the world and there will be two sections (phone and CW) each with two categories (single-operator and multi-operator). The second category is open to two or more listeners or to clubs and more than one receiver can be used.

The contest is held on all bands from 10 to 160m. Scores are compiled as follows: one point for each station heard multiplied by the number of different countries heard on each band. A list of countries heard must be furnished and a separate log must be submitted for each band. Illegible logs will not be accepted.

The call areas of the USA and Canada and Australia will each count as a separate country. All other countries will be determined by the official RSGB/ARRL Countries List.

Log sheets are available from Owen Cross G4DF1, 28 Garden Ave, Bexleyheath, Kent DA7 4LF, who must be sent a large sae. It is desirable that entrants use official log sheets but entries on home-made log sheets will be accepted if the following information is given: date, time, band, station heard, station being worked, report at SWL's QTH. Points may be claimed only for stations actually heard and the call-sign must be shown in full.

If points are claimed for both sides of QSO, the call-sign of each must appear in the station heard column.

Entries should be sent to the contest manager, G4DF1, at the above address, to arrive not later than 29th October 1984.

GB4NEC/GB8NEC

PT Gaskin G8AYY has written with information on the special stations run at this year's RSGB Convention.

GB8NEC, the 2m talk-in, was operated by members of the Solihull and Chelmsley Wood Raynet Group.

Inside the NEC itself the Solihull Amateur Radio society operated two HF stations, GB4NEC. These were working mainly on 80m SSB and 20m CW.

Those who manned the station would like to thank Amateur Electronics UK and Dewsbury Electronics for the loan of Yaesu and Trio equipment, and Strumech Engineering for the Versatower which was positioned outside the hall.

Incidentally, the antennae used were a A3 10/15/20m three-element beam and a G5RV for 40 and 80m. Heavy duty UR67 and UR57 coax feeders were also used, with ATUs.

SPECIAL EVENT STATIONS

Here are some of the special event stations to look out for in the coming weeks:

To coincide with the 23rd Olympic Games being held in Los Angeles, and to celebrate the 20th anniversary of the gift of the Kennedy Memorial Site at Runnymede to the people of the USA by Act of the British Parliament, the Chiltern DX Club is pleased to announce the operation of a Special Event Amateur Radio Station from the site using the very special callsign: GK0JFK.

Two HF stations will provide continuous operation on 10-80m for about 60 hours over the period Friday 3rd August to Sunday 5th August, 1984. Operation will be on the usual DX frequencies using both SSB and CW with split frequency operation when necessary. Another station will operate on VHF.

The Memorial is approximately 20 miles West of London on the edge of Windsor Great Park beside the River Thames at Runnymede. The area surrounding the Memorial is steeped in history with the site of the sealing of the Magna Carta only yards away and Windsor Castle close by.

A previous operation from the site, to celebrate the American Bicentenary, took place in July, 1976, using the callsign WG1JFK. The prefix – WG – of that callsign, which was allocated by the FCC, was chosen to indicate W for the USA and G for the UK. This time the callsign has been issued by the United Kingdom and again indicates the link between the two Nations – G for Great Britain and K for the United States.

The Memorial Site does not constitue a separate DXCC Country but, as the prefix GK0 has only been issued on this occasion quite exceptionally it should provide great interest for prefix hunters.

QSLs should be sent (with stamped SAE) to: *Peter De La Mothe G3VIE, 35 Brookside, Wokingham, Berks, RG11 2ST.* Alternatively cards may be exchanged via the RSGB bureau.

The Nene Valley Radio Club will be operating club calls G4NWZ and G6GWZ on the VHF Field Day of July 7th. In addition, to coincide with the Wellingborough Charities Carnival on the same date, they will operate a special event station with the call GB4WCR.

The following weekend, the Barking Radio and Electronics Society will be operating the special event station GB2DTS at the Dagenham Town Show. Their displays at the show will include VHF, HF, RTTY, ATV and computers. In addition there will be a demonstration of Direct Broadcast Satellite TV.

One week later on Saturday 21st July at the Royal Victoria Hall, Southborough is the West Kent Amateur Radio Society Radio and Electronics Fair. Throughout the month leading up to the event, WKARS will be operating GB0WKS and GB2WKS. The latter will also operate as a demonstration and talk-in station on the day of the fair, which itself starts at 10.30am.

A number of licensed amateurs and SWLs are meeting in Market Harborough to start up the Welland Valley Amateur Radio Society. Those interested in helping/joining are advised to contact Alan Faint G4TZY, QTHR or on (0858) 62827.

It is hoped to start formal meetings in September at Welland Park Community College (the nucleus of membership having just completed an RAE course at the college). When frequency, day and time of meetings have been decided the details will appear in this magazine.

CIVIL SERVICE

The Civil Service Amateur Radio Society meets regularly on the first and third Monday of each month in the Civil Service recreation Centre, Monck St, Westminster, at 12.30pm. There is a net on the air each Tuesday evening at 7.30pm on 144.575MHz transferring to 3.720MHz at 8pm. The net controller is Peter Poole, G3ENV, using the callsign G3CSR/A. Further information and membership details from G4GFU, 01-632 3875.

RALLY CALENDAR

July 7-8: **VHF National Field Day** at Leek

July 15: **Sussex Mobile Rally**, Brighton Racecourse. Open 10.30am-5.00pm. Over 20,000 sq ft of exhibition area under cover. Large bring and buy stall plus trade stands.

July 21: **Radio & Electronics Fair** organised by the West Kent AR Society at the Royal Victoria Hall, Southborough (between Tonbridge and Tonbridge Wells). Open 9.30am-5pm.

July 22: **Home Counties Mobile Rally** at the McMichael Sports and Social Club, Bells Hill, Stoke Poges, Bucks. There will be trade stands, flea market and special event station GB2MRS amongst other things. Doors open 11am. Refreshments available.

July 29: **Scarborough ARS Rally** at the Spa, Scarborough. Talk-in on 2m and 70cm. Open 11am.

August 5: **RSGB Mobile Rally**, Woburn

August 26: **BARTG Rally**, Sandown Park Racecourse, Esher, Surrey. Details from Edward Batts, G8LWY, 27 Cranmer Court, Richmond Road, Kingston-upon-Thames, Surrey KT2 5PY

September 23: **Lincoln Hamfest**, Lincolnshire Showground (four miles north of Lincoln City on the A15). Opens 11am-5.30pm. More trade stands than in previous years.

DX DIARY

News for HF operators compiled by Don Field G3XTT

In previous columns I have given some hints and tips about DX operating and discussed the kind of station and antennae you will need to become a serious chaser of DX. At the end of it all though, there are few of us who can spend 24 hours a day at the radio scanning the bands. How then, should you ensure that as little as possible in the way of DX slips through your grasp? The key, of course, is to have access to up-to-the-minute information about who is on the air, particularly in the way of DXpeditions.

In monthly magazines such as this one, it is possible to publish a certain amount of information about DXpeditions and about the operating times and frequencies of various DX stations. Unfortunately, plans sometimes have to change at short notice and the lead times associated with a monthly magazine mean that the information which appears in print can be out of date. This is not to say, of course, that there is no place for the monthly column. However, there is also a demand for more timely information. Over the years radio amateurs have taken a number of steps to fill the vacuum.

Telephones and 2 metres

One useful method is telephone alerting. A group of enthusiasts agree to telephone each other when a wanted station is heard by one of them. In some cases a 2 metre link is used in place of the telephone. These alerting systems have their drawbacks, of course. It is necessary for each member of the group to have an up-to-date list of what every other member needs. This is to save being disturbed by the telephone at three in the morning, to be told about the VP8 station on 40 metres which you worked three nights ago. Lots of time can also be wasted trying to telephone people when they are out for the evening or the phone is engaged.

Another scheme is to use a DX net. A group of interested amateurs meet at a specified time on a specified frequency daily, weekly or whatever, and pool whatever information has come their way through the grapevine or by listening or working stations on the air. A number of such nets meet regularly, both in Europe and elsewhere in the world, and are a valuable way of disseminating information.

Modern technology offers us a number of other alternatives. The ARRL transmits a weekly bulletin of DX information using RTTY, and this can be copied by suitably equipped amateurs throughout the world. RTTY is also used in another scheme operated by the Italian Radio Society. This consists of an electronic 'mailbox' attached to a computer-controlled transceiver. RTTY messages transmitted on the correct frequency can be input to the mailbox, and RTTY-equipped amateurs can also remotely access the mailbox to read the latest news. Undoubtedly, we can expect to see many more such systems in the future.

Another form of electronic 'mailbox', this one able to record voice messages, is presently on trial by DXers in the UK. This uses a British Telecom voice mailbox. Messages can be left by dialling the input number, and can be heard by dialling the access number (01-725-7373). Messages are stored in the system for 24 hours.

DX newsletters

Having said all this, the most popular mechanism for the distribution of topical DX

information is the DX newsletter. The first such newsletter (DX News Sheet) was started over 20 years ago by Geoff Watts, a British short wave listener, and has run on a weekly basis ever since. In recent years the onerous task of printing the DX News Sheet and mailing it to several hundred amateurs and listeners in over 40 countries around the world, has been taken over by the RSGB.

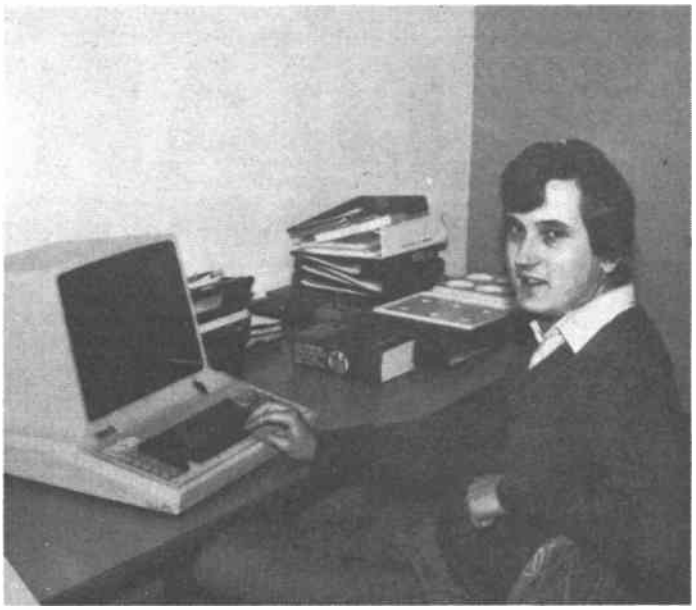
Since Geoff first started DX News Sheet others have sought to follow suit, and a number of such newsletters are now published in various countries, some on a weekly basis, some fortnightly. In Europe these include 'DX-NL' (published in Germany), 'DXpress' (Holland) and 'Les Nouvelles DX' (France). The 'Japan DX News' is, naturally, published in Japan. As far as I know, all the other principal newsletters are North American, including 'DX Report' (published by VE3FRA), 'Long Island DX Bulletin' (W21YX), 'QRZ DX' (W5KNE), 'The DX Bulletin' (K1TN), 'Long Skip' (VE3GCO), and 'The DXers Magazine' (W4BPD).

The kind of information included in DX newsletters varies, but let's take DX News Sheet as an example. It includes reports of stations which have been active in the week gone by, news of forthcoming operations, prefix changes, awards and contest information, QSL managers and addresses, background information relating to DXpeditions, to licensing and to other HF-related topics, propagation data and predictions, and much more. Sometimes I wonder how any HF operator can possibly manage without it . . .

In addition to all the above, there are a number of specialist newsletters catering, for instance, for 160 metre enthusiasts. Many local DX groups, such as the Chiltern DX Club in the London area, also publish weekly or monthly newsletters which include DX information as part of their regular fare.

4U1 . .

There are three rather interesting stations in the world using callsigns with the 4U1 prefix. These are 4U1ITU, 4U1UN and 4U1VIC. Of these 4U1ITU, located in the headquarters building of the International Telecommunications Union in Geneva is the oldest established. For amateur radio purposes it counts as a separate DXCC 'country' because the ITU building falls under international rather than Swiss jurisdiction. The station is often put on the air by visiting amateurs (by prior arrangement with the station manager), and has an extensive shack with equipment donated by the leading manufacturers. At present the equipment includes a TS820, FT-902DM and TS930S. There are antennae for all nine HF bands, and there is also gear and antennae for the VHF bands.



Martin, G3ZAY compiling DX News Sheet

During May the station used the special callsign 4U9ITU to celebrate the 119th anniversary of the founding of the ITU. 4U1ITU QSLs all contacts via the bureau. If you can't wait for a card, then you will have to find out who the operator is when you work the station, and send a card to him direct.

The second 4U1 station to be licensed was 4U1UN, located in the United Nations building in New York City. Again, the building is not under the direct jurisdiction of the host country, and the station counts as a separate DXCC country. Unfortunately, the location of the station is such that access is possible only at certain times outside normal working hours. Most of the operating is undertaken by amateurs who work in the building. W2MZV acts as the station's QSL manager. There are also problems in locating antennae, and LF operation from 4U1UN has been limited, especially on 80 and 160 metres.

4U1VIC, at the Vienna International Centre, is the most recent of the 4U1 stations, having first appeared on the air in 1982. The Vienna International Centre is a single-site complex on the banks of the river Danube where some 13 UN bodies are located. DXCC rules have changed since the previous 4U1 stations came on the air and, despite strenuous efforts by amateurs at 4U1VIC, DXCC country status looks very unlikely. The station has, however, been recognised by the German national society and counts as a multiplier in the Worked All Europe and CQ-WW contests. Equipment includes an FT-101E and FL-2100, together with a triband beam on top of the highest building on the site. Wire antennae for 40, 80 and 160 can be put up on a temporary basis, for instance, during contests. QSL cards go via the Austrian bureau or direct to Vienna International Amateur Radio Club, PO Box 200, A-1400 Vienna, Austria.

As a final note, if you hear someone signing his own call portable 4U, he will not be located at one of the three places I have described above. Instead, he is likely to be with the UN peace-keeping force in Syria, the Lebanon, or some other part of the globe. In this case, for awards purposes, a contact with him will count as the country from which he is operating at the time.

News

Following the problems which beset the proposed Clipperton Island expedition, I understand that some of the US amateurs who were involved are now looking at an alternative scheme. The idea would be to charter a seaplane to ferry the group, a few at a time, direct from the US. If this comes off, it will have to be between mid-May and early-July to avoid the hurricane season. It is just possible then that by the time you read this, an expedition may have taken place.

The Spratly Islands continue to feature in the news. KE6PU/DU1 has applied for permission to operate from one of the Philippine controlled islands. If successful, he plans to be operational for 10 days in August. As far as he is aware, all other proposed 1S operations have been called off. Unfortunately, many of those who worked the 1S1CK expedition last year are still (myself included) waiting for the QSL.

DJ4IJ/XZ is now operational from Rangoon. He works for the local broadcasting station and will be there for 18 months. He is often to be found on 21200KHz from 1200 GMT. The QSL chores are being handled by DJ5IO. DJ4IJ presently has verbal permission to operate, but hopes to get written permission to satisfy the ARRL. DF8MP, who also operated from Burma in recent years, has been unable to obtain a written permit and, because of this, his operation does not count for ARRL awards.

ZK1CT, Archibald, is a Scot, now resident on Mauke Island in the South Cook group. He runs the local clinic and hopes to find plenty of time to operate. He has already made a number of contacts with the UK on 14185KHz between 0700 and 0730 GMT, and says this will be his regular frequency.

The BV0AA operation by PA0GAM, OH2BH and JA1MIN during April, netted 12500 contacts and went a long way to meeting the demand for Taiwan. However, the Japanese group who had also planned to operate from the island have not been put off and hoped to go there in mid-June.

For the island-chasers

among you, one for the diary is a forthcoming trip by the Madeira DX Group to the Selvagens (between Madeira and the Canaries) from 9-16 August. The callsign will be CS9IS.

LA9PCA writes that JW5QAA is active daily from Hopen Island between 1100 and 1300 GMT around 14310KHz. LA5VAA will replace him on the island in July and will be there for a year. He will use the call JW5VAA. JW5IJ was due to arrive on Bear Island in June.

WB6GFJ is expecting to activate his FO0FB callsign once again during July. He will be especially active during the Tiurai celebrations (July 14-21).

Award

The Yeovil Amateur Radio Club offers an award to amateurs or SWLs who work/hear 22 British stations, the last letters of whose calls make up the phrase 'Yeovil Amateur Radio Club.'

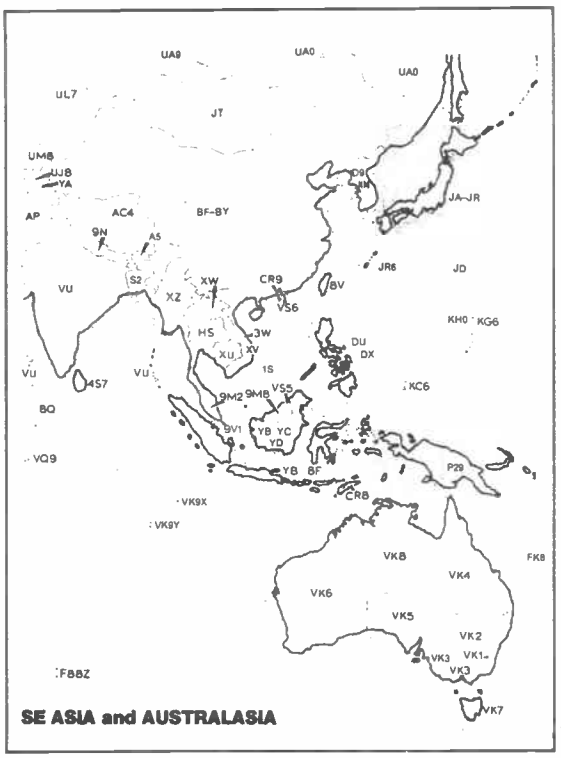
All loggings must be made after June 30th 1983, and applications, consisting of a certified log entry (certified by a club official or two active amateurs) and £1, should go to Awards Manager, F Parkhurst, 56 Cromwell Road, Somerset BA21 5AW.

The main contest during July is the IARU Radiosport which takes place over the weekend of 14/15 July. The contest runs for 48 hours and categories of entry include SSB only, CW only, and mixed mode. In recent years there have been few, if any, SSB and mixed-mode entries from the UK so you could well be in line for a certificate just by sending in an entry. Logs go to the ARRL who administer the contest on behalf of the IARU.

I have sample log sheets and cover sheets for anyone who is interested (stamp-addressed envelope to my home address, please). I always find this contest an interesting one, because it takes place in midsummer and propagation is therefore quite different to that which prevails during the main 'contest season' from October to March.

Other July contests include the SEANET (South East Asia) CW contest on 21/22 July and the YO-DX (Roumanian) contest on 4/5 August. A little further ahead, but worth putting in the diary, is the Worked All Europe CW Contest on 11/12 August.

That's the lot for this month. Don't forget to take the rig with you on holiday. I'm sure the family won't mind . . .



SE ASIA and AUSTRALASIA

TRIO TM201A AND ICOM IC27E

Two New 2m FM Mobiles Reviewed

by Angus McKenzie G3OSS

Almost all the 2m FM mobile rigs that I have looked at in the past are at least moderately large, and I must admit to having somewhat of a shock when the Trio TM201A and Icom IC27E arrived for review. Both rigs are amazingly small, and yet can deliver over 25W output. You should be able to fit either of them very easily almost anywhere in the front of the car and they are unlikely to be obtrusive. Measurements show that they are both good, but there are some significant differences between them. Both rigs are easy to install and to remove, and ergonomics show a clear improvement over many earlier rigs.

Trio TM201A

Many readers will have seen my review of the Trio TW4000A FM mobile rig, which incorporates both 2m and 70cm with 25W available output on both bands. I have now been using one of these for nine months and I am as happy with it now as I was originally, for it has been really excellent under mobile and fixed operation. The TM201A is rather like half a TW4000A in circuitry and performance, although the styling and facilities are a little different.

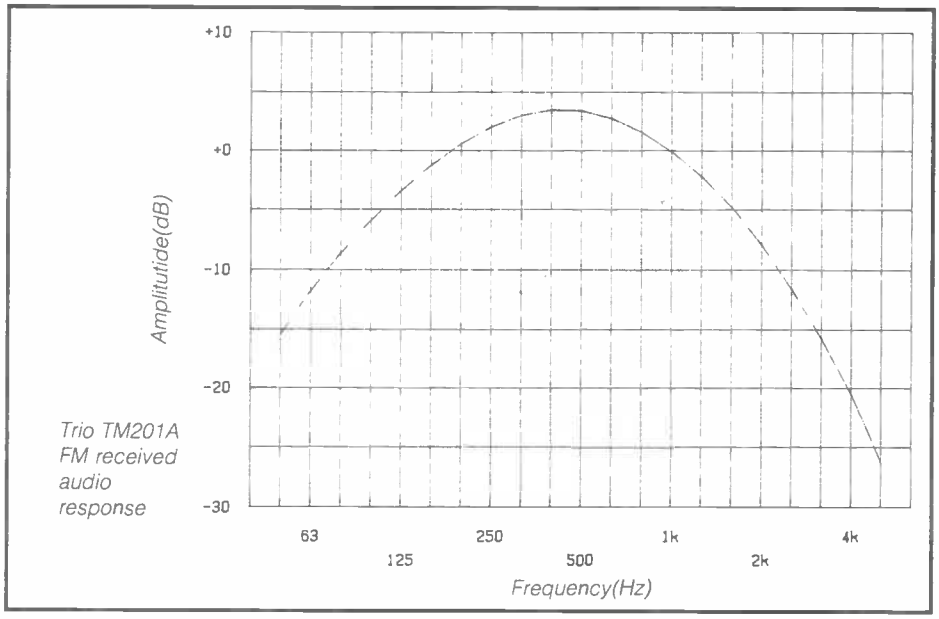
The model requires 13V dc nominal powering, a captive dc input lead being provided with a substantial fuse in the live only, with bullet connectors on positive and negative leads. This allows rapid disconnection from the car, with an extension lead provided with bullet connectors one end and bare wires the other, easily long enough to reach the battery if required. The aerial output connection is on a fairly short flying coax lead terminated in an in-line SO239 socket.

The rig has no internal speaker at all, but a high quality miniature speaker is provided for external mounting, together with its mounting bracket, which interconnects with the rig via a long lead, just under 3m length, which plugs into the back with a miniature 3.5mm jack plug. Also supplied is a car mounting bracket for the rig, which allows easy withdrawal from underneath the bracket. The case is finished in metallic grey with a silver colour front panel, the large heat sink on the back being black and superbly finished, giving an overall impression of excellent styling.

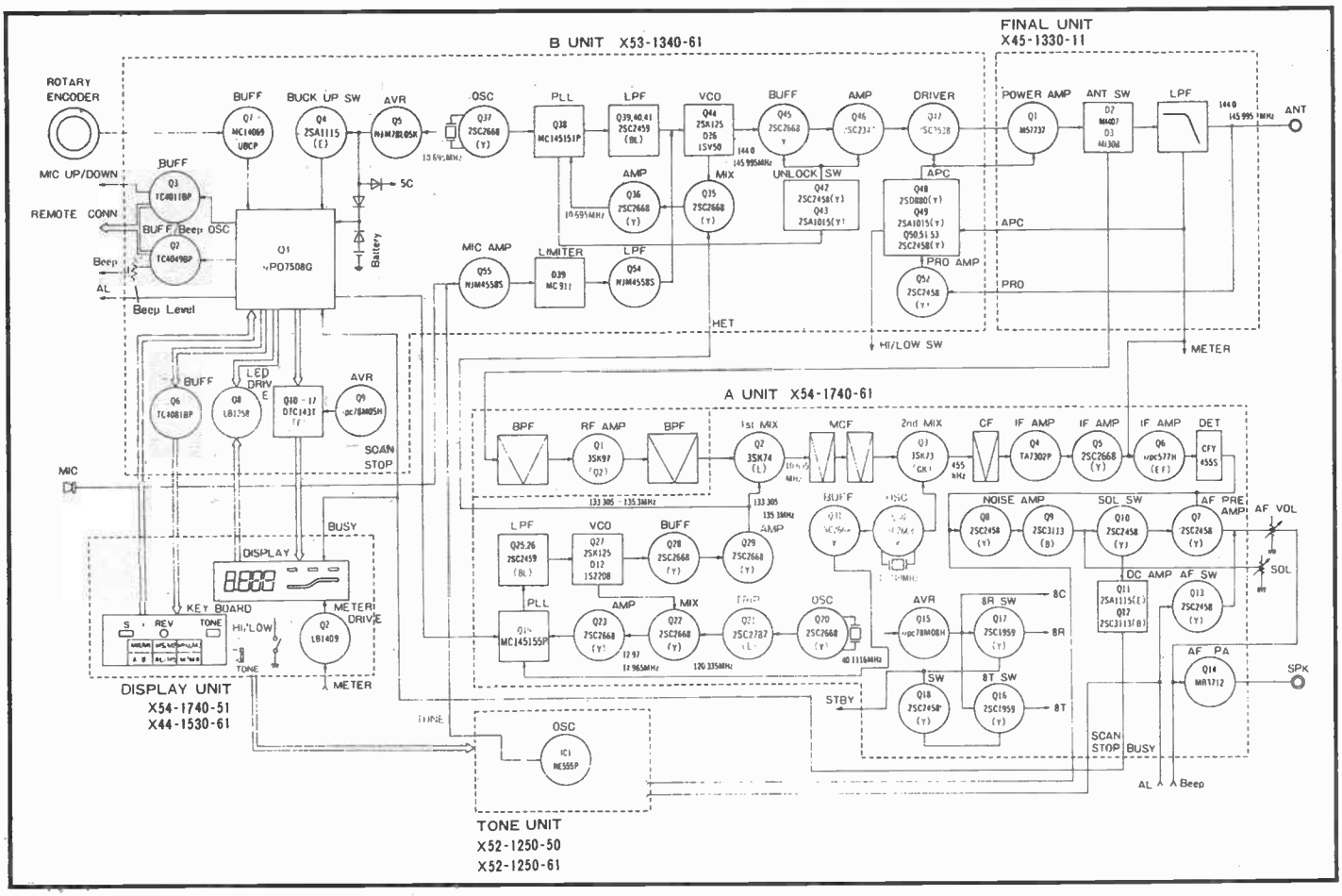
On the left hand side is the VFO knob with clearly defined click steps giving 25KHz jumps with VFO A or 5KHz ones with VFO B. Unfortunately 12.5KHz steps are excluded, which is an unfortunate snag. Above the tuning knob is a slide switch for simplex, negative or positive Tx repeater shifts and beside it is an in/out button to give normal or reverse repeater operation, this latter facility being extremely useful and missing from too many other rigs. Miniature rotaries are provided for Rx audio volume with built in on/off and squelch level.

Six push buttons have as their main functions memory recall, memory scan, 1MHz shift, memory write, priority and VFO A/B. When memory recall is pushed, the first five buttons mentioned select memories 1 to 5. Two push buttons above the mic socket on the right hand side select high or low power and 1750Hz PTT tone on/off for use with repeaters. This repeater tone is of a reasonably short duration as is normally required in the UK. Memories 4 and 5 can have separate frequencies inserted for Rx and Tx for strange off sets, but repeater shifts can be selected from memories in the normal way. The priority channel scans memory 1 briefly approximately every six seconds, and if a station comes up two loud pips can be heard.

The hand microphone incorporates a normal PTT switch which is easy to use, and two buttons on the top of the mic for scanning up or down. There is one strange thing, though, which is that if you hold one of the scanning buttons down for more than one second you can scan between the Rx and Tx memorised



Trio TM201A FM received audio response



frequencies in memory 5, provided you don't hold it down too long, when the scan goes beyond these limits. If you want to scan only a small part of the band, you'll have to be rather nifty, but you should get used to it. If memory 5 has the same Rx and Tx frequencies then scanning will be over the whole bands. Scanning can also be selected as memory scan only.

Various pipping sounds are produced when the function buttons are depressed. One pip indicates a normal function has been selected and the command has been executed; two pips occur when priority is in use and the priority channel is busy, or the squelch is off. Three pips indicate that you have made some idiotic mistake, eg trying to listen out of band with positive or negative repeater shift and reverse selected. Four pips occur when you are storing an odd split, five pips when you try to QSY on the mic with dial lock switched on (the reverse repeater switch becomes dial lock on simplex), and finally eight pips occur when your memory is ready to store after pressing memory write. You have to insert the required memory here without delay, as otherwise it will not be stored.

The display on the front panel is a green LED on black which is very easy to read as the LEDs are quite bright. The display reads either 4 or 5 followed by a decimal point, and the frequency to the nearest 5KHz point. An S-meter incorporates six LEDs, the top two being red. Additional LEDs indicate busy, alert, memory recall and on air.

On the right hand side is a socket for the remote control accessory providing a frequency display, up and down buttons, memory recall, MHz button and VFO A/B. This is a small unit supplied with an extension lead, which could be quite useful in some installations, allowing, for example, the main rig to be hidden away and a boom mic used, for example. The remote facility costs £41.20, the main rig costing £269, including VAT, mobile mounts, microphone and loudspeaker. The rig measures 141mm wide, 39.5mm high and 183mm deep, excluding the knobs, and weighs 1.25Kg, excluding microphone and speaker.

Laboratory tests

The RF input sensitivity measured very well for 12dB sinad, and the quieting at this point showed an improvement of 4.6dB, thus showing that much of the sinad noise was harmonic distortion and crackling. The reciprocal mixing performance was extremely good for an FM rig, showing that very strong stations on the band should not really affect the reception of weak signals. The 60dB intercept point calculation gave an excellent intercept point for an FM mobile rig, showing that the performance for home station use would also be excellent. The 3dB limiting threshhold was substantially below that on the usable sensitivity point, showing that all signals should be reproduced at the same relative output level dependant on their deviation.

We looked at the selectivity of both rigs in two ways; the normal 1KHz tone method and the new white noise method described last month in ***Amateur Radio.*** Not only is the adjacent channel 12.5KHz selectivity very good indeed, but alternate channel 25KHz selectivity is superb. The S-meter usual with FM rigs, is perhaps useful for indicating the presence of a signal, which you can hear for yourself anyway, for there is almost no difference between the first LED lighting up and the third one 13dB difference), although there is 15dB difference between the first and last. The capture ratio at 3.9dB is good, showing that if two stations are of unequal strength, the rig will reasonably allow the stronger station to mask the weaker one.

The squelch range covers a difference of 17dB, exceptionally weak signals actually opening it if required. The discriminator typically gives an average degree of distortion at high deviations, which falls quite reasonably at lower deviations. The maximum attainable signal-to-noise ratio was extremely good, both unweighted and weighted. The rig can give plenty of audio power into an 8ohm speaker, and substantially more into a 4ohm load, although 8ohms is recommended. I have always found that I prefer slightly more HF to be reproduced

under mobile conditions than at home, and the received response seems about ideal for a well optimised mobile system, the response falling steeply below 150Hz and above 3KHz.

The current drawn on receive when squelched is acceptable, whilst the current rises to 730mA at 10% output THD. The received frequency calibration was virtually perfect as the best performance was gained bang on channel.

The transmitting section gave at least 26.5W high power at 13.8V dc into a 50ohm load, the low power measurement being around 4.2W across the band. The rig does not allow you to change frequency whilst you are transmitting, which is, I feel, more a good than a bad point. A very slight synthesiser whine including some fairly high order harmonics, was audible on the transmitted carrier at a level of approximately 42dB below 3KHz deviation. We checked for spurii and harmonic emissions, and all these were below the noise floor of the analyser, which was at -70dB ref carrier level, and this is really excellent. The transmitted frequency was only very slightly high, and there was only a very marginal drift of 20Hz or so whilst the PA etc was warming up. The repeater shift was very accurate, and no problems were encountered during measurement.

Typical loud speech produced around 5KHz deviation, and when provoked to the extreme we managed to produce an instantaneous 5.7KHz which seems reasonable. The tone burst deviated 4.8KHz, which is just slightly on the high side, although it should not cause a problem. The toneburst frequency was within 1Hz, which is excellent. The transmitted response was checked at the onset of limiting, and at -10dB, and can be seen to be very flat into 750uS de-emphasis from 500Hz to 3KHz, so the response is governed by the microphone, which gives a fairly rising HF response within the transmitted pass band, low frequencies being reasonably curtailed, which is useful in a mobile installation. The rig was quite efficient at full power output, as only 4.4 amps were drawn when high power was selected.

Subjective tests

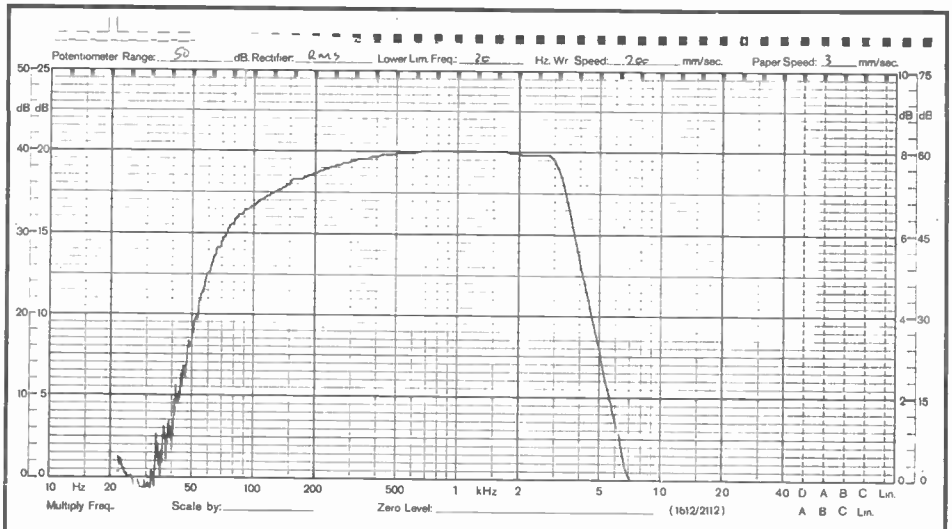
The receiver's sensitivity seemed adequate for normal needs and what was particularly useful was the absence of problems when very strong stations were transmitting on the band, even very close in frequency to a very weak one. The TM201 seemed to have the knack of knifing out weak stations so that they could be audible. Unfortunately, the lack of 12.5KHz channelling was tiresome, and in order to receive a station on say 144.837.5 one had to use 835 which thus gave an offset of 2.5KHz. Received distortion was much higher and sensitivity suffered on 12.5KHz channelled reception. The received audio was easily loud enough with supplied speaker and the response seemed fairly wide, and high frequencies were clear resulting in excellent intelligibility, very necessary on a mobile rig. The S-meter covered too small a range. I particularly liked the switchable duplex/simplex and reverse repeater switching, actually preferring this to the TW4000 cycling button mode, and keep pushing for reverse repeater function.

Memory insertion and recall were simple to use once I had got used to it, and one soon got used to the pips which were helpful, particularly when I did something idiotic! The VFO tuning knob was smooth to use and positive. The back of the set gets very warm on long overs but was not as hot as the heatsink became on the Icom.

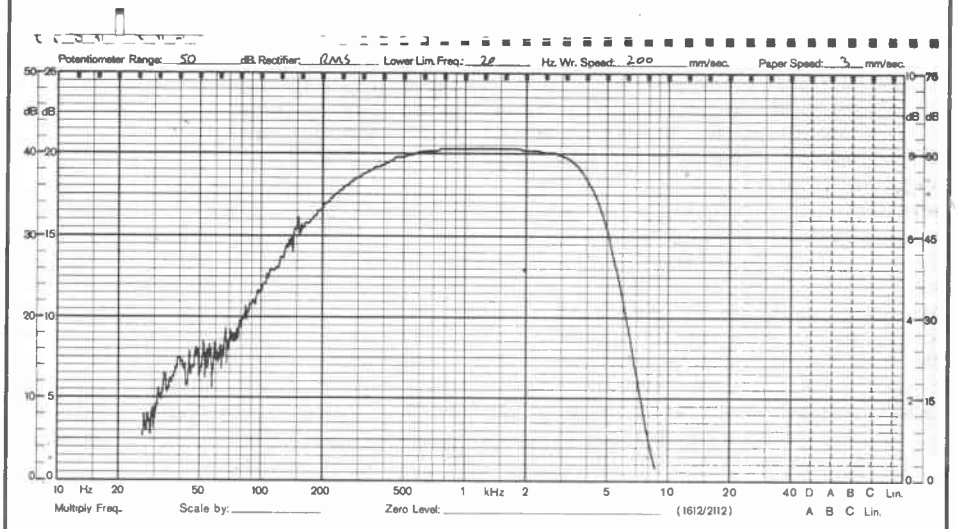
I missed a provision for relay operation of linears etc and this really should be provided in every rig. The remote control optional extra was not supplied so I cannot comment on its operation. The frequency readout was very clear and an improvement on much older Trio rigs, although the TW4000 readout is also excellent.

Many amateurs in North London were asked to give reports of modulation quality which was unanimously thought to be very good, not causing any spreading problems. When provoking the modulation by shouting and eating the microphone at the same time, limiting was reasonable although, of course, distortion was quite high. The overall response was thought ideal for a mobile rig although the 4000A had a warmer LF end and was smoother at HF.

Very slight synthesiser whine was audible to many stations but all reported that it was in no way a nuisance, and one had to turn up the volume control appreciably to hear the whine clearly, so it is worth pointing out, but clearly not a problem. The rig would be very easy to install in a car and is already becoming quite popular. A stocking frame is available which allows both the TM201 and 401 models to be slung below the dashboard, which allows operation on 2m and 70cm simultaneously.



Icom IC27E transmitted audio response with 750μs de-emphasis



Trio TM201A transmitted audio response with 750μs de-emphasis

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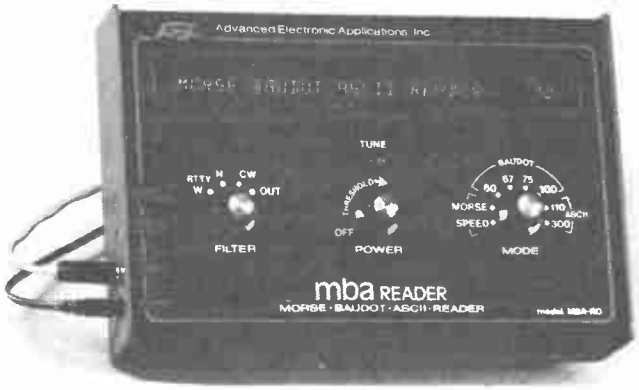

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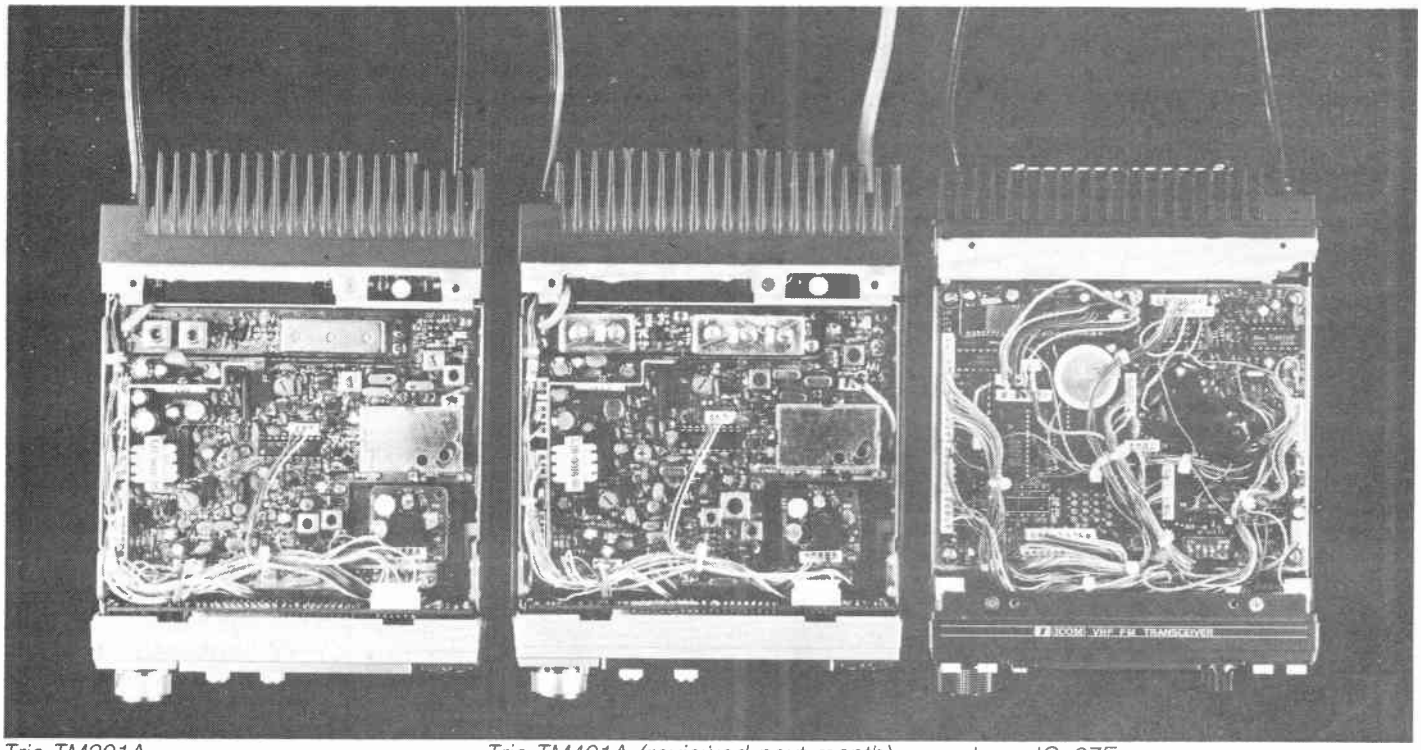


Trio TM201A *Trio TM401A (reviewed next month)* *Icom IC–27E*

Icom IC27E

This rig is even smaller than the TM201, for it measures 140mm wide, 38mm high and 177mm deep and weighs 1.2kg. Both the 13V dc powering lead and the antenna lead are captive, the latter being terminated in a neat in-line SO239 socket whilst the former is terminated in a non-standard double socket which feeds a supplied twin power lead which is 3.5m long, and most unusually fused in both positive and negative. Personally, I prefer only positive to be fused and it is possibly rather debatable whether the negative should be fused as well, for accidents could occur if the negative fuse blew first.

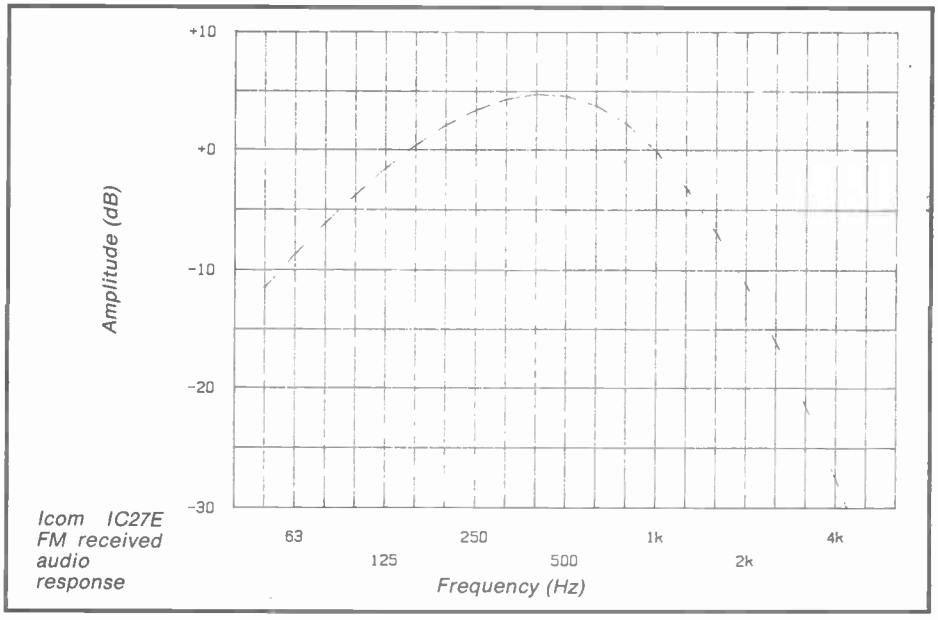
The front of the rig includes the tuning knob on the left which has very smooth click steps with fewer steps per rotation than the Trio, so that I feel this is even more positive and easy to use.

Above this are two buttons selecting memory/VFO and VFO A/B. In a vertical line are buttons for scan stop/start, 12.5KHz/25KHz channelling, 1MHz shift and memory write. Along the bottom are additional buttons which are very small for offset write (for selecting unusual offsets), repeater down or up shifts, speech synthesiser recall (very badly positioned and works only when optional speech frequency read out is fitted, which costs an additional £25), and priority. To the left of the recessed mic socket (rather swish) are the miniature rotary squelch and receive audio gain control/dc on/off. These are rather close together and were more awkward to use than those on the Trio rig. Above the mic socket are buttons for high/low power and auto toneburst on/off.

Underneath the rig is what I can only describe as a sub – miniature speaker which offers very poor quality thin audio (at least the set has a speaker). The frequency read out on the front panel is green LEDs on a black background, similar to the Trio, easy to see but perhaps not quite bright enough.

The S-meter incorporates 7 LEDs labelled 1,3,5,9, +20 and +60dB, the actual performance bearing no resemblance whatsoever to these markings, and perhaps somebody has got decibels and the elusive centibel mixed up! I suggest that 6dB over 9 could, therefore, be interpreted as 60 centibels over 9, and I will have to try using this unit on the air, for I have already confused people by telling them that they are 2 bels over 9! Additional LEDs indicate the operation of VFO A, priority, Tx, Rx and memory.

On the top of the rig is a small bug hatch cover under which are tiny DIL switches which are awkward to use for selecting scan hold time on/off, long/short hold, scan speed slow/fast (3 or 9 seconds hold), programme scan (between memories 0 and 1) or full scan, and scan for busy or clear channels. When memory is selected 9 channels are available by turning the tuning knob in click steps, the channel number being displayed. The mic supplied, type HM24, incorporates up and down buttons which alter VFO or memory channel, PTT and on the back a push button for 1750Hz toneburst. On the back of the rig is a small 3.5mm jack socket for feeding an extension speaker, and I strongly recommend one as the internal one is so poor. If you depress the up or down buttons on the mic slow scanning occurs but this stops when you release the button, and



Icom IC27E FM received audio response

the speed is not as fast as that given by the scan button on the rig itself.

Laboratory tests

The RF sensitivity was as good as I have ever noted on a 2m FM mobile rig as supplied by an importer. The RF intercept point is good although the Trio was 3dB better and the reciprocal mixing performance is better than that of many older rigs but again not as good as that of the Trio. The selectivitity is very good for 12.5KHz spacing and excellent at 25KHz, although the Trio was again better. The S-meter covered a range of 19dB from S1 to 9 +60dB and hence my earlier sarcasm.

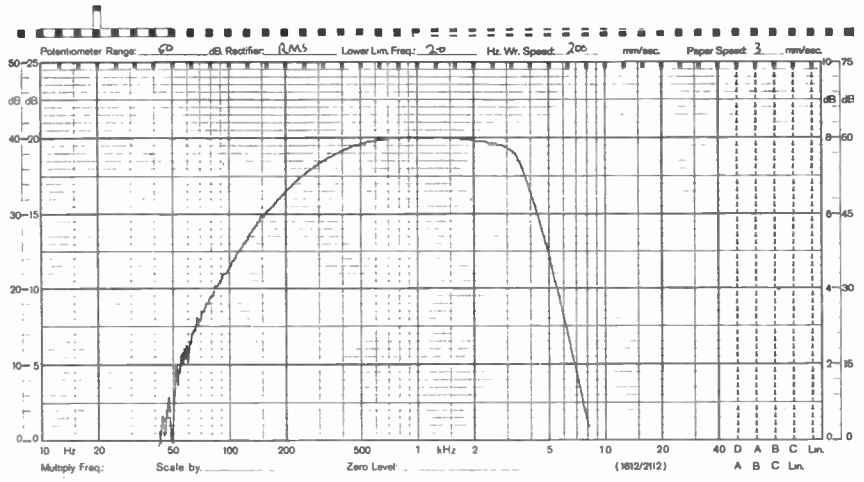
At the 12dB sinad sensitivity point the rig gave 14dB quieting and this shows the system to be extremely well aligned as there was only marginal distortion on extremely weak signals, and the crackling component was also minimal. This performance is particularly surprising in view of the good selectivity. The stunningly low distortion of the discriminator was amazing, as low as I have seen from an FM black box, resulting in very clean audio up to the point where the loudspeaker amplifier begins to clip. However, the audio output power was rather limited and since the internal speaker is very insensitive I found that there was inadequate volume for home use, let alone mobile, so it will be essential to have an extension speaker that is very sensitive. The receiver de-emphasis was rather fierce, and intelligibility suffered a bit.

The speech synthesiser gave a very muffled reproduction of the digitised voice, and I assume that its output is inserted into the main audio chain before, rather than after, de-emphasis, so Icom should improve on this feature. As supplied, the speech readout was too slow anyway, and this is apparently not adjustable, although the injection level is.

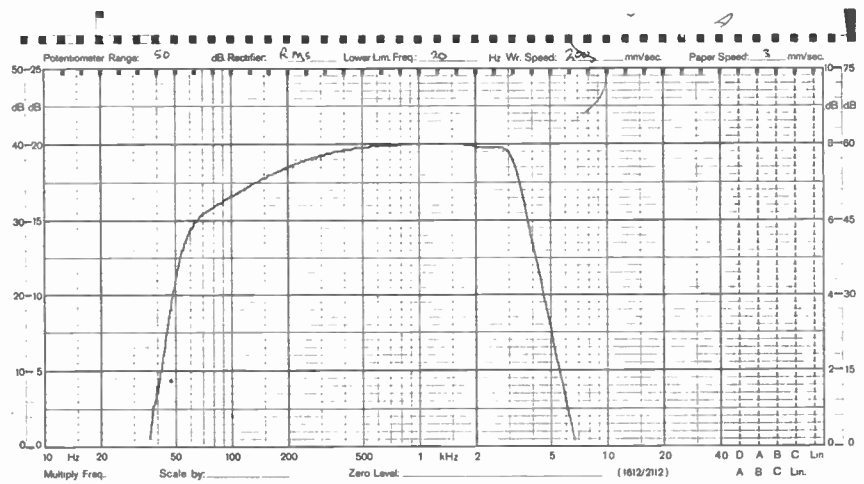
The capture ratio was amazingly good, better than I have ever noted on an amateur radio rig, so rejection of even a slightly weaker station is excellent in the presence of a stronger station. The squelch range covers 15dB, and the most sensitive point is way below the 12dB sinad sensitivity, so even a small trace of carrier can open the squelch. The FM limiting threshold was at an extremely low level which is excellent. The unweighted audio signal to noise on a strong carrier is not so good, and the weighted value was also not so hot, and whilst this is not too important, the Trio was audibly superior. The squelched receive current drawn was a little on the high side, although with maximum audio power (less than that of the Trio anyway) the maximum received current drawn was in the same ball park as that of the Trio.

The transmitter section gave around 27W on high power across the entire band, which reduced to an average of 4.9W on low power, which is about the right ratio. The maximum current drawn on Tx was a little high and the heat sink gets rather hot, so you will have to take care that adequate ventilation is provided when mounted in the car. No spurii or harmonic outputs were noted down to the noise floor of my spectrum analyser, and this is excellent. The carrier frequency on Tx averaged 240Hz low, and whilst this is not a problem it should have been a bit closer, the repeater shift also being 20Hz low, which is unusual in only 600KHz.

Normal peak speech deviation was set just slightly too high, but maximum deviation when provoked was a lot higher, particularly on sibilance, and this did cause a slight spitching sound. The tone burst deviation was, however, about optimum. Some synthesiser whine at a low pitch was noted on the carrier at 40dB below the nominal 3KHz deviation. No drift was noted whilst the rig was warming up. The transmitted frequency response from mic input socket to carrier was extremely flat from 500Hz to 3KHz (into 750uS de-emphasis), and LF was rolled off quite steeply, but HF was not sufficiently filtered above 3KHz which explains the spitching and tendency to overdeviation.



Icom IC27E Transmitted audio response with 750µs de-emphasis.Limiting response



Trio TM 201A transmitted audio response with 750µs de-emphasis. Limiting response

Subjective tests

I listened to, and used, this rig at the same time as the TM201 and the differences were fascinating. The IC27E was that little bit more sensitive, and again, it behaved extremely well when many strong signals were present on the back, although it was marginally inferior to the Trio. The selectivity was obviously excellent and 12.5KHz channelled stations knifed out beautifully from adjacent 25KHz ones with no problem at all. The audio reproduction quality was rather poor though, for it was on the muffled side, and yet with almost no LF present, even when using an external speaker.

Intelligibility suffered with the somewhat excessive de-emphasis, but the reproduction was extremely clean at

normal levels. It was irritating that there was insufficient power available before clipping to cope with transmissions in which different deviations were being used by the various participants in a net, louder voices clearly clipping, whereas quieter ones became almost inaudible. I found the push buttons slightly on the fiddly side and I don't think the layout is quite as good ergonomically as that of the Trio, although I preferred the VFO.

After very lengthy comparative tests, again with many, most helpful North London amateurs, it was unanimously felt that the transmission quality was thin and a bit nasal, and all stations preferred the Trio quality. Under limiting conditions (eating the mic and shouting etc) opinion was evenly divided as to the best readability, especially when signals were weak, and so the thin quality could actually be an advantage if your car is very noisy internally. The provision of 12.5KHz steps is a considerable advantage, but I rather baulk at the fact that the basic rig costs £50 more than the Trio, and there are many who would prefer to see fewer bells and whistles and a reduced price tag. The rig costs £319 including VAT, mic, dc leads, bracket etc, the speech module type UT16 costing £25 including VAT.

The synthesiser whine audibility varied from station to station, and on points it seemed only marginally inferior to that of the Trio as it is only low pitched, whereas the Trio's whine is lower in level but encompasses more harmonics.

Conclusions

I have had a deep think about the comparative qualities of these two rigs and I find it impossible to directly recommend one above the other because they both have excellent and poor points, both being strongly recommendable. The basic overall performances of both rigs are very good indeed compared with almost all older ones, showing significant improvements in RF an IF design. I am somewhat stunned by the miniaturisation involved together with the availability of higher power than usual. Both rigs have good ergonomics and Icom have, at last, got rid of some of their double function complications which I used to find very confusing.

I preferred the Icom memory selection, but the Trio repeater operation seemed easier, and its provision of reverse repeater operation is a plus point. The Trio's audio quality, both on Tx and Rx, is better but it must be remembered that the Icom is smaller, although its mobile mount is perhaps not quite so easy to use, but this is debatable. The remote facility on the Trio, together with its cheaper price, may well swing the balance, but some readers will like the availability of the speech synthesiser option on the Icom. The Icom's usual green styling is very smart but the Trio's appearance is perhaps even smarter. Both rigs have identical facilities on the rear so you pays your money and takes your choice!

TWO FM MOBILE TRANSCEIVERS – LABORATORY RESULTS

	TRIO TM-201A	ICOM IC-27E
Receiver Measurements		
Sensitivity for 12dB Sinad (3KHz modulation, 1KHz deviation)		
144.025MHz	-123dBm (0.16μV)	-124.5dBm (0.13μV)
144.950MHz	-122.5dBm (0.13μV)	-125dBm (0.12μV)
145.975MHz	-122dBm (0.18μV)	-124.5dBm (0.13μV)
Selectivity;		
blank carriers off channel to degrade Sinad by 3dB (ref 12dB Sinad)		
-/+ 12.5KHz spacing	53/69dB	39/38dB
-/+ 25KHz spacing	77/77dB	71/69dB
Selectivity: second method (see text)		
Carriers off channel modulated with filtered white noise (ref 12dB Sinad)		
-/+ 12.5KHz spacing	33/32dB	25/24dB
-/+ 25KHz spacing	80/80dB	61/59.5dB
-/+ 50KHz	82/83dB	69.5/69dB
RFIM Performance: carriers off channel for 12dB Sinad product (ref 12dB Sinad)		
50/100 KHz spacing	78dB	75dB
100/200 KHz spacing	78dB	75dB
Calculated RF intercept point:	-7dBm	-10dBm
Reciprocal Mixing Performance at 144.05MHz		
RF Levels required off channel to degrade Sinad by 3dB (ref noise floor)		
25KHz spacing	95dB	85dB
50KHz spacing	102dB	93dB
100KHz spacing	108dB	96dB
200KHz spacing	111dB	98dB
S-Meter;RF levels required to illuminate successive LED segments.		
1st LED	-106dBm (1.12μV)	-112dBm (0.56μV)
2nd LED	-105dBm (1.28μV)	-106dBm (1.12μV)
3rd LED	-103dBm (1.6μV)	-103dBm (1.6μV)
4th LED	-98dBm (2.9μV)	-100dBm (2.24μV)
5th LED	-96dBm (3.6μV)	-97dBm (3.2μV)
6th LED	-92dBm (5.7μV)	-95dBm (4.0μV)
7th LED	– None –	-92dBm (5.7μV)
Capture ratio	3.9dB	2.6dB
Audio Quieting at 12dB Sinad	16.6dB	14.1dB
3dB Limiting Point	-127dBm (0.1μV)	-129dBm (0.08μV)
Maximum Audio Output (10% THD into 8ohms)	2.8W	1.6W
Maximum Audio Output (10% THD into 4ohms)	4.4W	2.3W
Audio Distortion (125mW into 8ohms)		
1KHz deviation	0.7%	0.5%
3KHz deviation	2.6%	0.4%
Best Obtainable Signal-to-Noise Ratio		
Unweighted	62dB	53dB
CCIR/ARM weighted	55dB	51dB
Current drawn on standby	350mA	455mA
Current drawn at full AF output	735mA	700mA
Squelch sensitivities		
Minimum	-111dBm (0.64μV)	-116dBm (0.36μV)
Maximum	-128dBm (0.09μV)	-131dBm (0.06μV)
Transmitter Measurements		
RF output	High/Low	High/Low
144.050MHz	27/4.3W	27/4.8W
144.950MHz	26.5/4.3W	27/4.8W
145.950MHz	26.3/4.4W	26.9/5.2W
Carrier frequency accuracy at 144.95MHz	+50Hz	-240Hz
Peak deviation (typical speech)	5KHz	5.5KHz
Peak Deviation (loud shout)	5.7KHz	7KHz
Toneburst deviation	4.8KHz	4.6KHz
Toneburst frequency	1751Hz	1750Hz
Repeater shift accuracy	±0Hz	-20Hz
Current drawn on transmit	4.4A	5.4A
Transmitted noise (ref.3KHz)	-42dB	-40dB

If the Trio had incorporated 12.5KHz channelling on VFO B I would have recommended the Trio above the Icom, so this might be a lesson to Trio, for its absence could well detract from sales and divert people to the more expensive Icom. Both rigs are far better under mobile conditions than any hand held would be even when provided with a linear and this is an important point; for handhelds invariably have poor RFIM performances. Neither rig developed any fault conditions during testing and both require very adequate ventilation behind them, although the Trio did not get quite so hot. I would like to thank both Lowe Electronics and Thanet Electronics for their assistance in loaning the rigs for review, and my colleague Mike Hatch, G1DEW, for making all the measurements in the lab and assisting with the subjective trials.

What price

HP Equipment

IC-751	All band AM. FM. SSB. CW + Gen Cov Rx. 32 Memories	1099.00
PS35	Internal switched mode power supply	149.00
SM6	Desk microphone	34.50
HM12	Hand microphone with up/down scanning	16.50
EX310	Voice synthesizer module	39.00
RC10	Frequency controller unit	29.95
CR64	High stability xtal unit	49.95
FL32	9MHz CW/RTTY filter – 500Hz	39.00
FL63	9MHz CW/RTTY narow filter – 250Hz	39.00
FL33	9MHz AM filter – 6KHz	32.50
FL70	9MHz SSB wide filter – 2.8KHz	35.50
FL52a	455KHz CW/RTTY filter – 500Hz	79.00
FL53a	455KHz CW/RTTY narrow filter – 250Hz	79.00
IC-745	All band SSB. CW. AM (Rx only). Gen Cov Rx. 16 mems.	839.00
PS35	Internal switched mode power supply	149.00
SM6	Desk microphone	34.50
HM12	Hand microphone with up/down scanning	16.50
EX310	Voice synthesizer unit	39.00
EX242	FM unit Tx & Rx	32.50
EX241	Market unit	15.95
EX243	Curtis keyer unit	39.00
FL45	9MHz CW filter – 500Hz	45.00
FL44a	455KHz SSB narrow filter – 2.4KHz	79.00
FL52a	455KHz CW/RTTY filter – 500Hz	79.00
FL53a	455KHz CW/RTTY narrow filter – 250Hz	79.00
FL54	9MHz CW/RTTY narrow filter – 270Hz	39.00
IC-740	No longer available. Accs still in stock.	
PS740	Internal switched mode power supply	149.00
SM5	Desk microphone	34.50
EX241	Marker unit	15.95
EX242	FM unit	32.50
EX243	Curtis keyer	39.00
FL44	455KHz SSB filter – 2.4KHz	79.00
FL45	9MHz filter – 500Hz	45.00
FL52	455KHz CW/RTTY filter – 500Hz	79.00
FL53	455KHz CW/RTTY narrow filter – 250Hz	79.00
FL54	9MHz CW/RTTY narrow filter – 270Hz	39.00
IC-730	10-80 Mtrs compact transceiver	659.00
PS15	External power supply – 20 amps	119.00
PS20	External power supply with speaker – 20 amps	176.00
SM5	Desk microphone	34.50
HM7	Hand microphone with pre amp	14.95
EX202	LDA unit for use with AT 100/500	13.50
EX203	CW audio filter	14.50
EX205	Transvertor unit	14.00
EX195	Market unit	17.00
FL44	455KHz SSB filter – 2.4KHz	79.00
FL45	9MHz CW filter – 500Hz	45.00
FM04	FM unit Tx & Rx	49.00
IC-720A	No longer available. Accs still available.	
PS15	External power supply – 20 amps	119.00
PS20	External power supply with speaker 20 amp	176.00
CF1	Cooling fan for PS20	24.00
SM5	Desk microphone	34.50
FL32	CW narrow filter	39.00
FL34	AM xtal filter	34.00
BC10	Memory back up unit	5.95
FM03	FM unit Tx & Rx	89.00
IC-R70	General Coverage Receiver 0.1-30MHz	565.00
EX257	FM unit	32.50
FL63	CW narrow filter	39.00
FL44a	455KHz SSB filter	79.00
CK70	DC cable kit	5.75
7072	Interface unit to transceive with IC720A	97.50
IC-R71	All mode Gen Cov Rx. k pad entry. 32 memories	649.00
RC11	Remote control unit for above	49.00
IC-2KL	1KW PEP Linear, auto band switching. complete with –	
2KLPS	Power supply to run 2KL linear	1349.00
IC-AT100	100 Watt Automatic antenna tuner	285.00
IC-AT500	500 Watt Automatic antenna tuner	399.00
IC-PS30	Systems power supply, 25 amps continuous	235.80
IC-AH1	Mobile antenna, 3.5MHz-30MHz	199.00
VHF Equipment		
IC-271E	Multimode base statin, 25w, 32 memories	649.00
IC-271H/E	High power version of above, 100w	789.00
PS25	Internal switched mode power supply	89.00
EX310	Speech synthesizer unit	39.00
AG20	Internal receive pre-amp	49.00
SM6	Desk microphone	34.50
IC-290D	25W Multimode mobile, 5 memories scanning mic	499.00

IC-751, £1049.

The IC-751 now has an interesting and useful addition, a remote push-button frequency selector pad, so you can either twiddle knobs or press buttons.

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options. The 751 is fully compatible with ICOM auto units such as the AT- 500 and IC-2KL.

Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, direct feed mixer in the front end, full break-in on CW and AMTOR compatibility.

For more detailed information on this excellent set, please get in touch with us.

IC-R71E, £649.

The best has just been made better! The ICOM IC-R70 receiver has had some important additions made to its specifications and this model is named the IC- R71E. Here are some details:–

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70 MHz 9 MHz and 455 KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100 db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct entry keyboard into twin VFO's with 32 programmable memories. Auto squelch tape record function.

Options:– Synthesized voice readout, infra-red remote controller, 12V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

The IC-R70 will still be available at £549.00. Ask for a leaflet giving the full details of these two fine receivers.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Tha

perfection?

IC-27E	25W FM mobile, 9 memones, multi function display	319.00
UT16	Voice synthesize unit	25.00
IC-25H	45W FM mobile, high power version of old IC25E	359.00
BU1	Memory back up unit for mobiles	24.50
	DC leads (flat pin or square 6 pin)	4.50
	DC Plugs (flat 4 pin)	.30
	DC Sockets (flat 4 pin)	.30
IC-2E	Synthesized hand portable, 1.5 watts	179.00
IC-02E	Synthesized hand held, keypaid entry. LCD display	239.00
ML1	10 watt booster unit for 2E	69.00
BP3	Standard battery pack	25.00
BP2	Low volts high capacity (long life)	38.00
VP4	Empty battery pack, takes 6 x AA size cells	7.95
BP5	High volts high capacity (high power)	48.00
BP7	High volts high capacity (for use with 02E ONLY	59.00
BP8	Low volts high capacity	49.00
DC1	12v regulator pack (2E ONLY)	12.50
CP1	12v charger lead for cigar lighter	4.95
FA2	Helical antenna	7.50
LC1	Leatherette case (BP5)	5.00
LC2	Leatherette case (BP4)	5.00
LC3	Letherette case (BP3)	5.00
LC11	Case for 02E (BP3)	5.00
T/L1	Heavy duty leather case (all batt packs)	21.27
BC25E	240v wall charge for 2E	6.69
BC25U	110v wall charger for 2E (USA)	6.69
BC16E	240v wall charger for 02E (BP8/BP7)	9.95
BC30	Desk top drop in charger (fast and slow) old packs	56.35
BC35E	Desk charger all packs new & old (fast slow)	56.35
HM9	Speaker microphone	16.50
IC-202S	SSB Portable — CW 3 watt output	199.00
BC 15E	AC Charger 240v	41.80
BC20	DC Charger 13.8v	41.80
	DC lead	1.75
	Telescope antenna	1.50
LC25	Leatherette carrying case	8.25
FA1	Helical screw in antenna	7.50
UHF Equipment		
IC-471E	Multimode base station 25 watts, 32 memories	735.00
PS25	Internal switched mode power supply	89.00
EX310	Voice synthesized unit	39.00
SM6	Desk microphone	34.50
IC-490E	Multimode mobile, 10 watts 5 memories	549.48
IC-45E	FM mobile 10 watts 5 memories	345.00
BU1	Memory back up unit for mobiles	24.50
	Spare DC leads (flat 4 pin or square 6 pin)	4.50
	DC plugs & sockets (flat 4 pin)	.30
AG1	Mast head pre-amp for 471/451/490	49.00
IC-4E	Synthesized hand portable 1.5 watts	229.00
IC-04E	Synthesized hand held k pad entry LCD display	T.B.A.
FA3	Flexi 1/4 wave antenna	7.50
	Accessories same as IC2E/02E	
IC-402	SSB portable — CW 3 watts output	257.00
BC15E	AC charger 240v	41.80
BC20	DC charger 13.8v	41.80
	DC lead	1.75
LC25	Carrying case	8.25
1.2 GHz Equipment		
IC-120	FM mobile 1 watt output 40MHz coverage mems	455.65
BT23E	Bit Zero 23e, 1296 MHz linear twin — 7/8w out	179.00
50 MHz Equipment		
IC-551	Multimode base station supplied SSB/CW only	379.00
EX106	FM unit	112.00
EX107	VOX unit	49.00
EX108	Pass band tune unit	97.50
IC-505	Multimode portable 3.10watt. supplied SSB only	382.00
EX282	FM unit	28.50
BP10	Nicad pack	59.00
BC15	Charger unit	6.50
LC10	Carrying case	22.50
Mobile Mounting Brackets		
MMB5	Mount for 251E, 451E, 720A, 730	12.50
MMB6	Mount for 240	12.50
MMB7	Mount for 245E	12.50
MMB8	Mount for 255E, 260E	12.50
MMB9	Mount for 290E, 490E	12.50
MMB10	Mount for 25E, 45E, 120	12.50
MMB11	Mount for 22U 24G	12.50

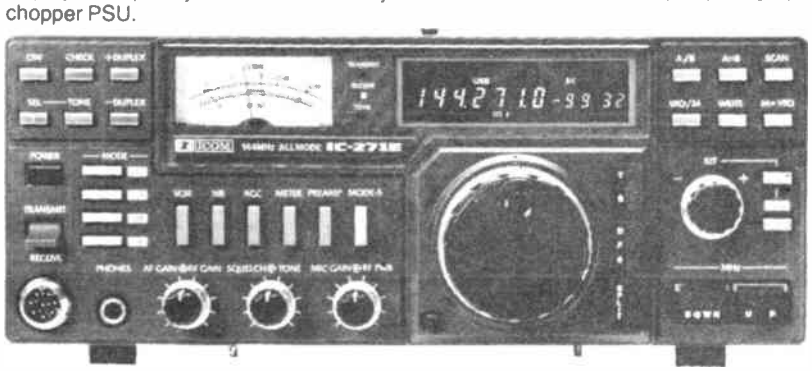
IC-02E, £229.

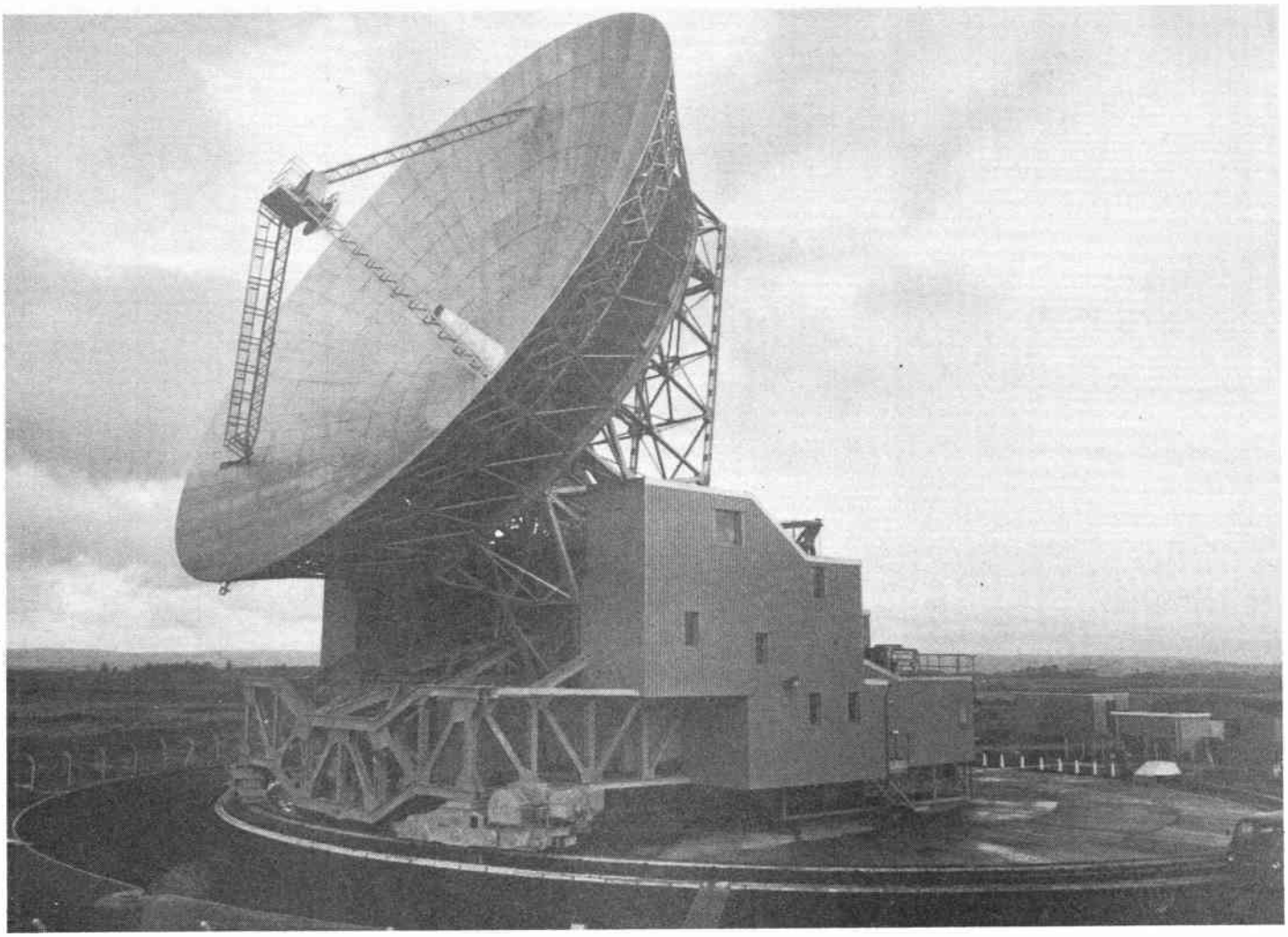
ICOM introduces the new top-of-the-line IC-02E to compliment its existing line of popular handheld transceivers and accessories. The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these features include: scanning, 10 memories, duplex offset storage in memory & odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:– HS10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay.

IC-271E, £629.

The IC-271E,2 meter VHF and IC-471E,430-450 MHz are the 'terrific twins' in Base multimodes at the moment. The design is based upon a new CPU chip that is easy to operate and offers the maximum number of functions available. Power can be adjusted up to 25W on all modes, squelch works on all modes and a listen-input facility has been added for repeater work. RIT shift is shown on the multicolour fluorescent display. 10Hz tuning facilities are included on both machines. Options for the 271E and 471E include - switchable front-end pre-amp, SM6 desk microphone, speech synthesizer announcing displayed frequency, 22 channel memory extension with scan facilities and an internal chopper PSU.





and the degree of galactic (and other) noise is high. With line-of-sight transmissions, there are no intervening media, which means that there will be no polarity change. Signals arrive from a satellite rotating in a clock-wise direction – which (short of rotating the entire system!) entails the use of a helically-wound reflector. The feed at the focus can consist of a dipole with an integral reflector to ensure one-way operation. On the other hand, another variation is to have a slotted metal sheet of similar material to the dipole, which is made directional by a resonant cavity to form a reflector. On Cassegrain and Gregorian systems a horn waveguide of suitable dimensions to provide a resonant cavity is used.

At one time it was thought that the only way of reducing the signal-to-noise ratio of a satellite transmission was by cooling the amplifier to a temperature of 15K (-258°C), heat being closely associated, in radio terms, with noise. This theory, however, has been superceded, and it is generally now accepted that a suitable environment can be realised at any temperature outside the ambient temperature range, provided that it is constant. Further improvements in waveguide efficiency have been obtained by pressurizing them to eradicate the effects of moisture.

Going 'live by satellite' is, in many respects, very similar to using a repeater system. Signals are transmitted to the 'bird' on one frequency and then re-transmitted by the satellite after undergoing a frequency change, and are known as 'up' and 'down' channels. Those currently in use on the Oscar 10 amateur bands are:

Mode 'B'
'Up' 70 cms (435 MHz)
'Down' 2 metres (145 MHz)

Mode 'L'
'Up' 24 cms (1269 MHz)
'Down' 70 cms (436 MHz)

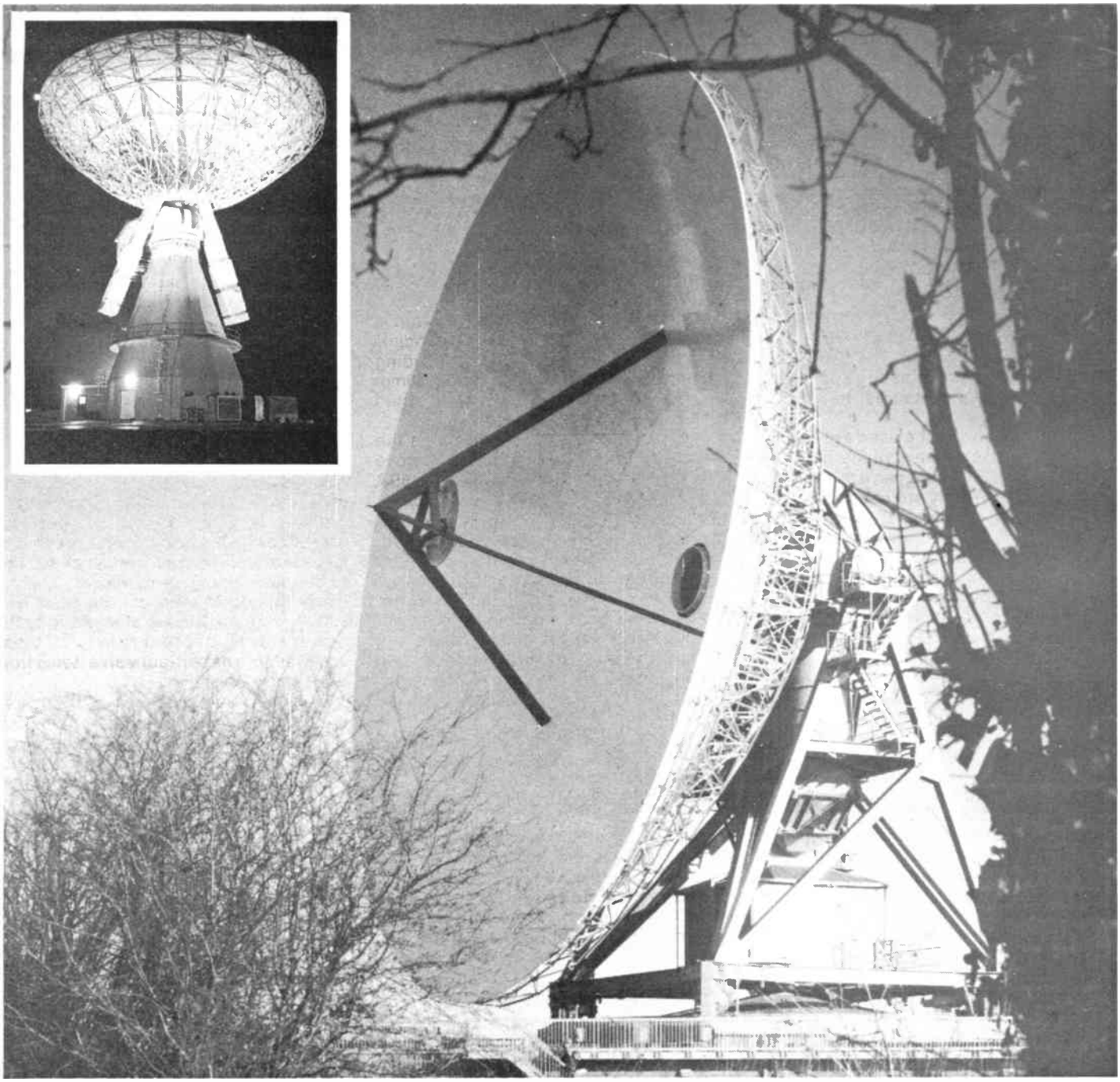
Although every advantage is to be gained by the use of dish aerials for amateur communications by satellite, it *is* possible to listen using a two-dimension steerable array such as a crossed-Yagi, for even though Oscar 10 is an orbiting satellite, it is 'in view' of any particular point on earth for six hours at a time. Transmitting, on the other hand, presents additional problems due to the power requirements. Having said that, an aerial array giving 13dB gain represents a gain-factor of 20, so a 25W transmitter has an effective radiation value of 25 x 20, or 500W.

It must be remembered that, unlike others, parabolic reflectors are not frequency-conscious: the diameter of a dish for a given frequency merely determines the gain and beamwidth that can be derived from it. The gain of a parabolic is directly proportional to its diameter, but inversely proportional to wavelength.

A brief history of the parabolic systems as used on the site at Goonhilly shows that the first antenna was erected in 1962 to receive signals from Telstar. After April 1965, it operated to the first commercial communications satellite Early Bird (or Intelsat 1). Two years later, signals were being received from Intelsat 2, the basic design of the aerial unit comprising an 85 foot diameter dish made with a stainless steel surface. The unit rotated in azimuth on roller bearings some 42 feet in diameter, using a vertical screw for adjustment to elevation: the total weight – 1085 tons.

Dish number two was completed in 1968 and took over the duties of dish one on Atlantic circuits. This time the dish diameter was no less than 90 feet, again of stainless steel, but employing a sub-reflector seven feet in diameter using a Cassegrain system. The unit rotated in azimuth on a central pivot with two bogies running on a track at ground level. It weighed in at 937 tons.

Aerial three came into operation in 1972 and was designed for tracking satellites in synchronous orbit and to provide diversity in the Atlantic opera-



tion. This time made of aluminium, the dish measured 97 feet in diameter, and worked on the Cassegrain principle as did its predecessor. The unit moved in azimuth and elevation on bearings mounted at the top of a reinforced concrete tower six feet tall. The use of aluminium gave a further weight-reduction of the system to 331 tons.

As a sister station to Goonhilly, some five parabolic antennae will soon be in operation at Madley, near Hereford to link Britain with 80 countries: together with the Cornish site, around 40 million calls a year are handled. Additionally, small dish (3 to 5 metre) customer-systems are available on portable base-units in British Telecom's Satstream organisations. The London antenna for Satstream North America at Ealing Switching Centre is claimed to be the world's first in commercial small dish satellite service. A similar service is planned to handle European communications.

Not for one moment would anyone suggest that radio amateurs should erect parabolic systems on the Goonhilly scale: the backlash from neighbours (not to mention the local council) doesn't bear contemplation, and neither do the electricity bills! It is surprising what a little ingenuity with simple geometric aids such as protractors can achieve. For those blessed with home computers, the AMSAT organisation can supply a program which will give time/azimuth/elevation data for specific areas, membership being one condition of supply!

Satellite communication is not everybody's bag – traditionalists among the ranks of amateur radio enthusiasts still (and probably always will) determine to do it the hard way. What should be borne in mind, with regard to all forms of radio communications, is that the entire HF frequency spectrum is rapidly getting overcrowded, with the number of people wishing to communicate by far exceeding the air-space available: a single 4 KHz voice channel at 4MHz represents 0.1% of the frequency spectrum. The same 4KHz 'slot' at 4GHz represents only 0.0001%.

Using satellites in many ways is like going back to the basic principles of amateur radio – to build and experiment. It adds a new and exciting dimension – a chance for constructors to create remote-control dish-orientation systems, computer-motivated or even computer-controlled units. There remains only one question – just how many letters we are going to get from people who have already done it!

Photos courtesy of British Telecom

A SIMPLE INEXPENSIVE PADDLE KEY

by Stuart Line G3XYO

A sensitive paddle keying device can be made from an old 15A plug top and would work well with the electronic key described in ***Amateur Radio*** (April 1984 p58-61), or a similar unit. The paddle key uses a hacksaw blade as the spring and the pins of the plug top as the contact pillars.

The plug cover can be used as the base and attached to a heavy piece of metal. Alternatively, the cover can be discarded and the plug directly attached to a piece of wood with channels cut to suit the pin terminals (*Figure 1*). The earth pin is removed from the plug and a slit cut with a thin-bladed hacksaw in line with the centre line of the plug, to provide anchorage for a short piece of 13mm wide hacksaw blade which forms the spring. It is made from a piece of old, blunt hacksaw blade 75mm long.

The easiest method of cutting the blade is to grind a nick in the appropriate place and bend in a vice. The blade should snap cleanly, but goggles should be worn as protection against flying pieces. Round off the blade with a stone to smooth the cut end and remove the teeth. This piece of blade is then inserted into the earth pin slot with a suitable adhesive to give a strong anchor point. The length of blade protruding from the earth pin should be about 60mm (*Figure 2*). The earth pin is then reattached to the plug top.

Mark on each of the smaller pins the centre of the adjacent blade. Remove these pins and drill each with a 6BA tapping hole at right angles to the blade (*Figure 2*). Tape the holes with a 6BA thread and insert 6BA plated screws with locking nuts. These screws need to be long enough to reach the blade when remounted. Remount the small pins onto the plug top and thread in the contact screws. Mark on the blade where the contact screws touch. Remove two contacts from an old relay and solder onto each a thin flexible wire at least 100mm long. Stick the relay contacts onto the blade so the metal blip matches up with the screw on each side of the blade.

The paddle can be made of any suitable plastic material that is at least 4mm thick. Perspex has proved very satisfactory for this purpose. Cut the plastic to the design shown, or similar. Cut a thin slot in the paddle as illustrated – this will allow mounting onto the blade with a suitable adhesive – and position for comfortable use.

The keyer can be mounted in a box on its own, or together with the electronics. The unit will require weighing down to give stable operation and prevent it 'walking' all over the table. A convenient way of doing this is to mount a number of large nuts on a long screw and attach this to the base giving extra weight. Alternatively pieces of lead can be used in a similar manner. To assist in stability the use of soft rubber feet is helpful; these are available as self-adhesive items from most radio retailers.

The paddle key described has given good service and provides a 'feel' that compares well with commercial units. The only servicing needed is an occasional cleaning of the contacts with fluffless paper.

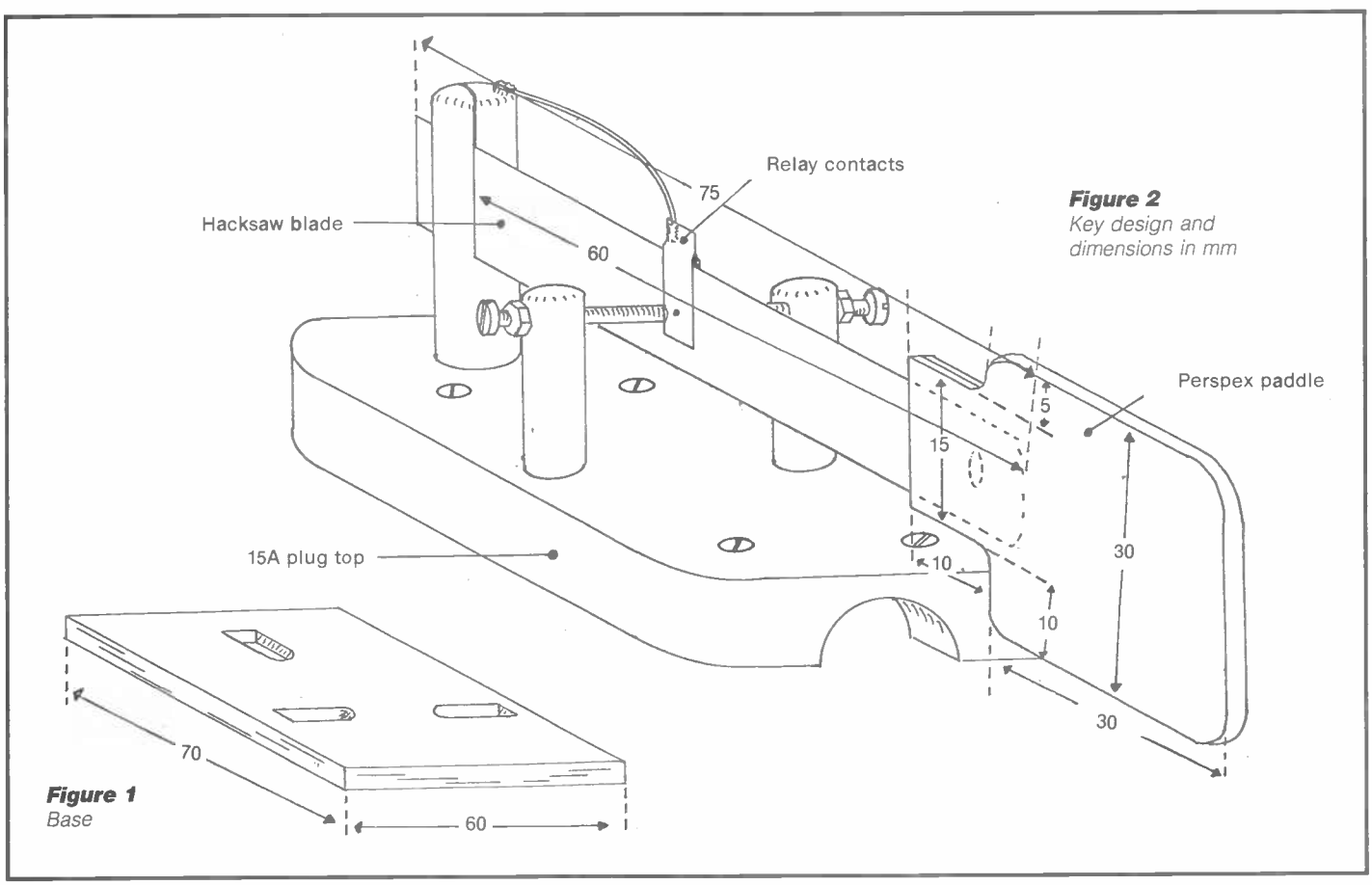


Figure 2
Key design and dimensions in mm

Figure 1
Base

The Vertical Antenna for DX working

by Alan Malcher G4TPM

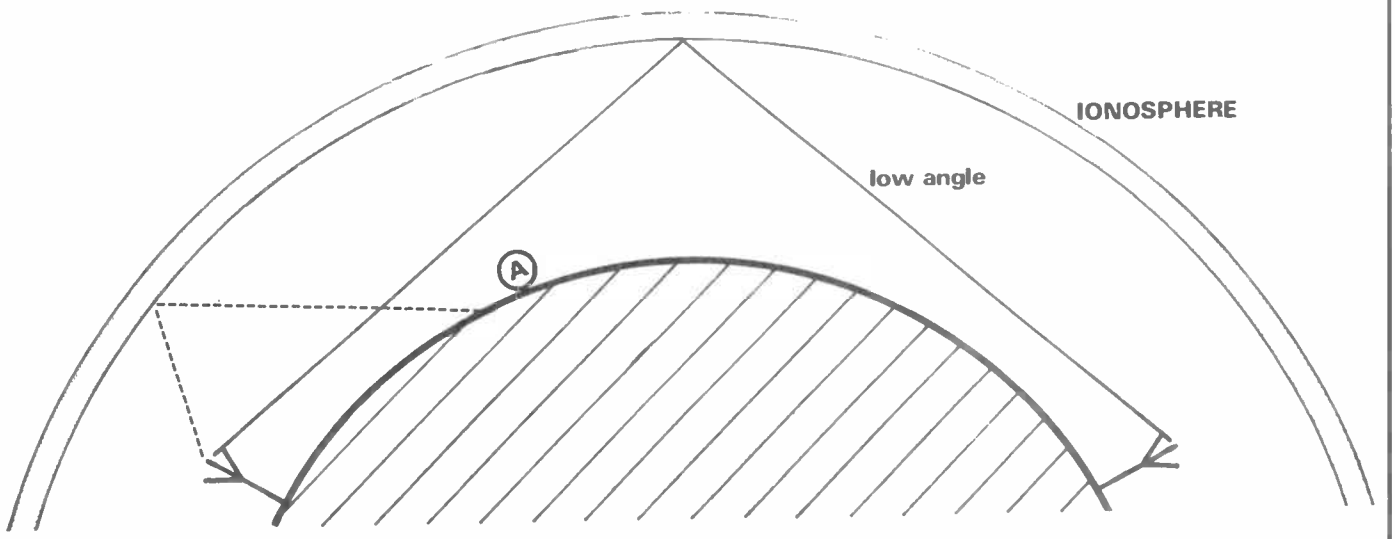


Figure 1 *High and low angles of radiation*

The vertical antenna offers the attraction of low angle radiation which is necessary if you intend working long distance stations (DX) on the amateur high frequency bands, 1.8 to 30MHz.

Theory

Before we discuss how to make this angle as low as possible, I think, for the benefit of readers with little or no knowledge of high frequency propagation, it is necessary first to basically see why low angle radiation is important. Radio waves on the very high frequencies (VHF) and ultra high frequencies (UHF), for instance the amateur 2 metre and 70 cm bands respectively, travel horizontally with the face of the earth. Unless special tropospheric conditions occur, these waves are unable to follow the curvature of the earth, thus limiting the distance at which any successful two-way communication can be accomplished.

However, radio waves in the HF band behave in an entirely different way. These waves travel skywards until they hit a layer of ionised particles called the ionosphere, which is at an altitude of between 60 and 400 miles above the earth's surface. As soon as the radio wave hits the ionosphere it bounces back to earth, landing many miles away from where it first originated. This may occur once or several times, with the result that the wave lands at the other side of the world. If you look at *Figure 1*, you will see why a low angle of radiation will make the wave travel a greater distance than one of a higher angle.

Looking at point A in *Figure 1*, you will notice that the radio waves do not go near this point. Therefore, a person at point A would not be able to receive any transmissions. That is why, if you are listening to the HF bands, you may often hear a station on the other side of the world whilst you are unable to hear the station he is talking to, although that station may only be a few miles away from your location.

For the lowest angle of radiation, the antenna should be mounted on an earthed pipe at ground level, with the base of the antenna about one foot above the ground. Remember, we are dealing with HF and height is of no importance due to the behaviour of the waves.

For good results you require the best ground plane possible. The best and most natural ground plane is the sea, so if you live on a beach or on a boat, the world is your oyster. However, if like me you live in a house with a modest size garden, you will have to lay as much conductive material, in the form of earth stakes and uninsulated copper wire under the ground, as possible

Obstructions

The other considerations to be taken into account are the presence of nearby metallic or conductive objects, including trees. These can seriously effect the signal strength. Assuming there are no such obstructions, the most importaint part of the system will be the earthing.I have read numerous articles on how to

lay cable and earthing stakes for the purpose of obtaining a good earth but, although they are efficient, these methods always seem to necessitate extremely hard work.

The system I have used comprises four copper plumbing pipes, ¾in in diameter and 6ft 2in in length. These are sunk into the ground to a depth of 6ft with 30in of uninsulated copper wire attached to the 2ins of pipe above the ground and secured with a jubilee clip. The wire is then run to the remaining three pipes *and* the pole securing the antenna and 'jubilee-clipped' in the same manner. The wire need not be laid deep into the ground. I found it was only necessary to place the wire below the turf. To finish off, spray the jubilee clip securing the wire to the pipe with spray paint to prevent corrosion and maintain a good electrical connection. The result is very low angle radiation.

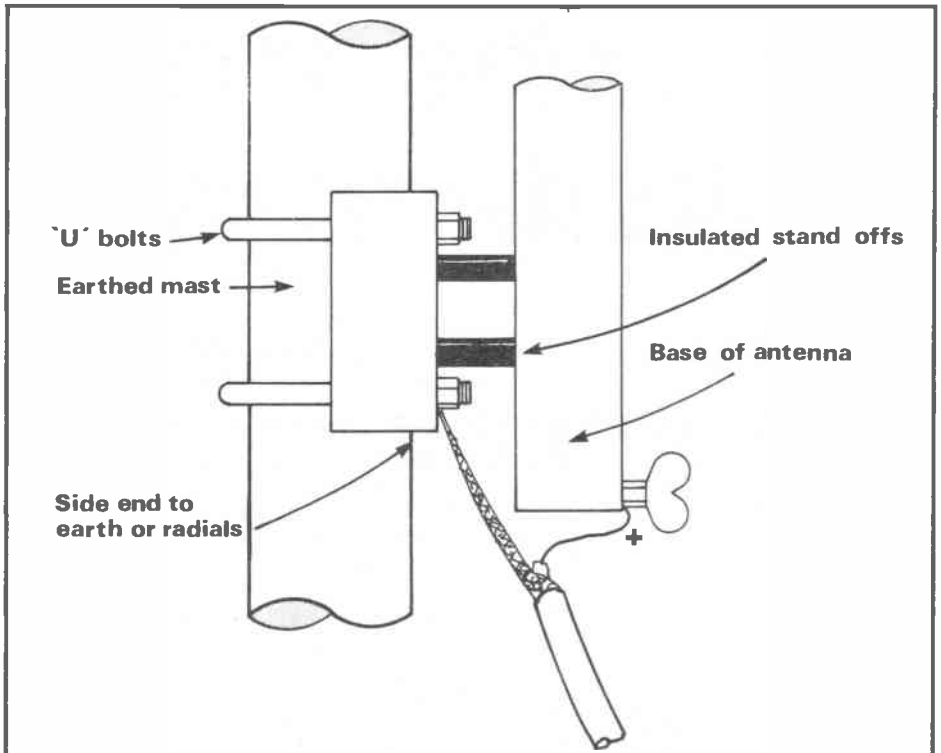


Figure 3 *Coax base connection on a vertical antenna*

Sinking earth stakes

You may be thinking that sinking a copper pipe into soil, and possibly clay, to a depth of 6ft sounds like hard work. Obviously, you cannot hammer a copper pipe into the ground without it buckling. The solution, however, is easy.

First, using a small hacksaw, cut a row of teeth at one end of the pipe. These should be at least 1in in depth and each tooth spaced at about ½in intervals (see *Figure 2*). With the aid of a 6in cold chisel, or any other suitable implement, dig a hole in the garden approximately 6in in depth, the diameter of which should be a little larger than the diameter of the pipe. Push a hosepipe over the other end of the copper pipe and secure with a jubilee clip. The other end of the hosepipe should, if possible, be connected to the bath tap as this gives a far higher pressure of water than the sink or garden tap. Stand your copper pipe in the hole you have prepared and get someone to turn the bath tap full on.

The principle behind this is as follows: you are forcing high pressure water down the pipe and the only place the water can escape to is through the teeth you have cut in the pipe and out through the hole onto your beautifully mown lawn. The water is, naturally, turning the soil into mud which is also being forced through the hole by the water. With a small amount of downward pressure, swivel the pipe from side to side and, like magic, it will slowly sink into the ground. On average, it will take about 20 minutes to sink each pipe into the garden and this method is also suitable for boring through clay. One word of caution: wear suitable clothes. You will get soaking wet and covered from head to foot in mud. However, after a much needed bath and change of clothes, turn on the rig and I feel sure you will be pleased and surprised with the result.

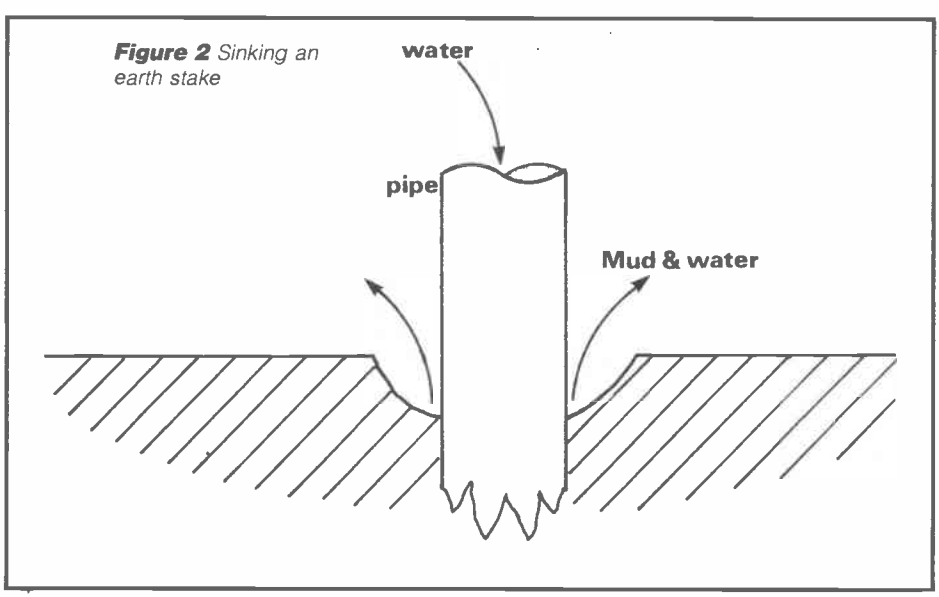


Figure 2 *Sinking an earth stake*

Erecting the antenna

The popular way of erecting a vertical antenna is to have the antenna on a mast or on the side of a building with radials, in place of an earthing system, coming from the base of the antenna. These radials are normally made of copper and, in the case of a multi-band vertical, there would be one radial for each band you intend to work. These radials are cut to resonate on their respective bands, ie 14MHz $= {}^{468}/_{14} =$ 33.42 ft. An insulator is put at the end of the radial and a guy is attached to the other end of the insulator. This will help prevent the antenna swaying in heavy winds.

The second most popular method is to mount the antenna at ground level but, once again, instead of having an earthing system, radials identical to those described above are laid straight under the garden turf.

Although reasonable results can be obtained by using these two latter methods, the angle of radiation is far higher than when the same antenna is attached to a good earthing system. If it is DX you want, use the earthing system.

Performance

I have compared a vertical antenna, namely the TET MV 5BH and the earthing system, with dipoles, including trap dipoles on 10 to 80 metres, and have found the vertical to be far superior in receiving weak stations, while on transmit the rejection of harmonics also appeared better (harmonics are liable to cause interference to televisions, videos, etc). I have worked very good DX stations with my vertical, including VK-land (Australia), and thus feel confident in recommending this alternative to all.

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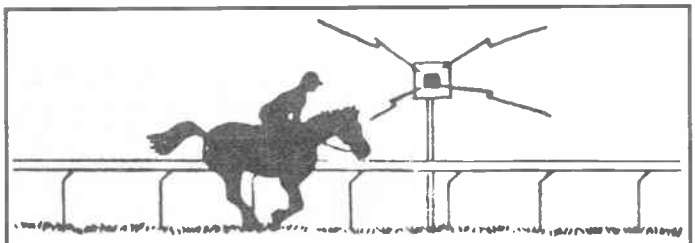

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COMING NEXT MONTH

RUSSIAN CW

by Steven Pocock MA, G4GTU

The thought of speaking, or attempting to speak, Russian fills most people with horror and the widely held view is that it is one of those 'impossible' languages. Well, quite simply, it is not; it's just a little tricky that's all!

An initial thought was to produce a 'Russian QSO' course, like articles which have appeared for other languages, but this would be impractical, as the Russian language, with its pronunciation, takes a considerable time to get used to. So CW was the answer.

This article will enable the reader to talk fluently to 'Alex' in his own language, with the advantage that absolutely no knowledge of Russian is required and no dictionary is needed.

You will be pleasantly surprised at the response from UA stations. They do appreciate your effort in trying to converse in their language (as do most countries) and very often an extremely pleasant QSO will result, as opposed to the usual exchange of RST, Name, QTH, type of contact.

Very few amateurs outside the USSR speak Russian, and if you reply in their tongue, you are likely to have a 'pile up' of UA stations wanting to contact you. This is always a good ego booster and it is hard at times to go QRT!

There are two points worth remembering. The first is to keep your 'overs' short and concise and do not overdo the use of the phrases described; merely intersperse them in your normal QSO style making full use of 'Q' codes which are internationally understood. Secondly, the other Republics such as UP, UQ, UH etc, although able to converse in Russian, have their own languages and dialects and sometimes prefer not to use it.

Bearing this in mind, you can gain great satisfaction from doing something you may never have seriously contemplated before. You will certainly be pleased after a QSO with a Russian station.

How to send Russian

The format used is straightforward.

THE RUSSIAN ALPHABET

Capital	CW Character	Approx Pronunciation of Name
А	• —	(ah)
Б	— • • •	(bĕ)
В	• — —	(vĕ)
Г	— — •	(gĕ)
Д	— • •	(dĕ)
Е/Ё	•	(yĕ)(yŏ)
Ж	• • • —	(zhĕ)
З	— — • •	(zĕ)
И	• •	(ĕ)
Й	• — — —	(ekră 'tkŏyĕ)
К	— • —	(kah)
Л	• — • •	(ĕl)
М	— —	(ĕm)
Н	— •	(ĕn)
О	— — —	(ŏ)
П	• — — •	(pĕ)
Р	• — •	(ĕr)
С	• • •	(ĕs)
Т	—	(tĕ)
У	• • —	(oo)
Ф	• • — •	(ĕf)
Х	• • • •	(kh)
Ц	— • — •	(tsĕ)
Ч	— — — •	(chĕ)
Ш	— — — —	(shah)
Щ	— — • —	(shchah)
Ъ/ъ	— • • —	(tvyor 'dĭznahk)/ (myah 'k-kĭznahk)
Ы	— • — —	(ĭ)
Э	• • — • •	(ĕŏberŏ 'tnŏyĕ)
Ю	• • — —	(ŭ)
Я	• — • —	(yah)

Inspection of the alphabet will show that the majority of the Russian characters correspond to English CW characters.

In the 5 cases where there is no English morse character you will see from the phrases that two English characters have a line drawn *above* them. This means that the two characters are sent *without* a gap between the letters. For example, ŌĒ is sent as – – –·, ĪD sent as ··–··, and so on. This gets round the problem of the sender having to learn these foreign characters. *(See the alphabet for these 'new' letters if in doubt.)* Please note the last two phrases of the list – it is advisable to send these after the first over!!

Final word

If there is sufficient interest in this article, the author would be pleased to do a similar article for SSB, with the possibility of a cassette made to assist in pronunciation and practice.

Conversing in speech is great fun, and if you want a flavour of the language, have a listen on 15m SSB at the weekends where many inter-UA contacts take place.

There is at present one amateur QSO book on the market covering many languages, including Russian, but many of the Russian translations proffered are not colloquial and would sound a bit odd to a Russian.

The phrases I have used, have been used regularly and gained from many QSO's in CW and SSB and you will not find them in any language manual!

Any feedback on this article would be welcome, and all that remains to be said is have fun and enjoy yourselves with Russian CW.

Phrases

DOBROE UTRO	= Good Morning
DOBRYJ DENX	= Good afternoon
DOBRYJ WOŌĒER	= Good evening
DOBROJ NOŌĒI	= Good night
SPASIBO (BOLXMMOE) ZA WYZOW	= thanks (very much) for the call
OŌĒENX PRIĀĀTNO	= pleased to meet you
MENĀĀ ZOWUT . . .	= my name is . . .
NAHOVUSX W . . .	= my location is . . .
NE DALEKO OT (GORODA) . . .	= not far from (the town) . . .
GOROD	= town (is . . .)

KMOW (km) . . .

K SEWERU OT . . .	= km north of . . .
K ZAPADU OT . . .	= km west of . . .
K WOSTOKU OT . . .	= km east of . . .
K ĪMGU OT . . .	= km south of . . .

WSE POLUŌĒENNO	= all OK/100% copy
MNOGO (QRM, QSB etc)	= there is a lot of (QRM, QSQ etc)
U MENĀĀ SILXNYJ (QRM, QRN etc)	= I have a lot of (QRM, QRN etc)
ĀĀ -PRINĀĀL BOLXMMUIM OĒASTX	= most copied OK
ĀĀ NE WSE PONĀĀL	= I did not understand everything
IDTO (OŌĒENX) TRUDNO WAS POLUŌĒITX	= It's very hard to copy you
POLXZUĪMSX SAMODELXNAAA (TX,RX etc)	= I am using HB (Tx, Rx etc)
MOQNOSTX . . .W	= power is . . .watts
(NE) POLXZUIMSX USILITELX	= I am (not) using an amplifier
ANTENNA . . . . . M NAD ZEMLEJ	= Antenna is . . . . . m above ground
(MOVETE LI WY) PEREJTI NA SSB?	= Can you go to SSB?
(TEPERX) ĀĀ DOLVEH QRT	= I must now go QRT

Wx . . .(a) PREKRASNAĀĀ (b) OBLAŌĒNO (c) DOVDX IDET (d) DOVDX LET KAK IZ WEDRA (e) PASMURHYJ (f) OŌĒENX) VARKAĀĀ/HOLODHAĀĀ (g) BURNAA (h) GROM GREMIT (i) IDET GRAD (j) BUDET GROZA

Wx . . .(a) fine/glorious (b) cloudy (c) raining (d) pouring cats & dogs (e) dull/overcast (f) (very) warm/cold (g) stormy (h) thundering (i) hailing (j) thundery

	WESNA		Spring
	LETO		Summer
ĪDTO/NASTUPAET	OSENX	it is/setting in . . .	Autumn
	ZIMA		Winter

SWETIT (ĀĀRKOE) SOLHCE	= the sun is shining (brightly)
STOIT PREKRASNAĀĀ POGODA	= the weather is (keeping) fine
NASTUPAET MOROZY	= the frosts are setting in
NA NEBE TEMNO	= the sky is dark
SMERKAETSĀĀ/CWETAETSĀĀ	= it is getting dark/it is getting light
MESTNOE WREMĀĀ . . .	= local time is . . .

QSL STO PROCENTOW (ŌĒEREZ BĪMRO)	= QSL 100% (via bueau)
POV WAMMA QSL (ŌĒEREZ BĪMRO)	= please QSL (via bureau)
(VELAĪM WAM) WSEGO HOROMMEGO	= (I wish you) all the best
(VELAĪM WAM) USPEHOW, ZDOROWXĀĀ	= (I wish you) success, health
OTWEŌĒAJTE (POV) (TOLXKO) PO ANGLIJCKI	= (please) reply (only) in English
NE GOWORĪM NA RUSSKOM ĀĀZIKE	= I don't speak Russian

2OM CALLING

by 'Old Ham'

The more nostalgic reader will doubtless be able to indulge himself in visions of early 'wireless wizardry', whilst mulling over the following paragraphs. The venue, Brentford; the year, 1922

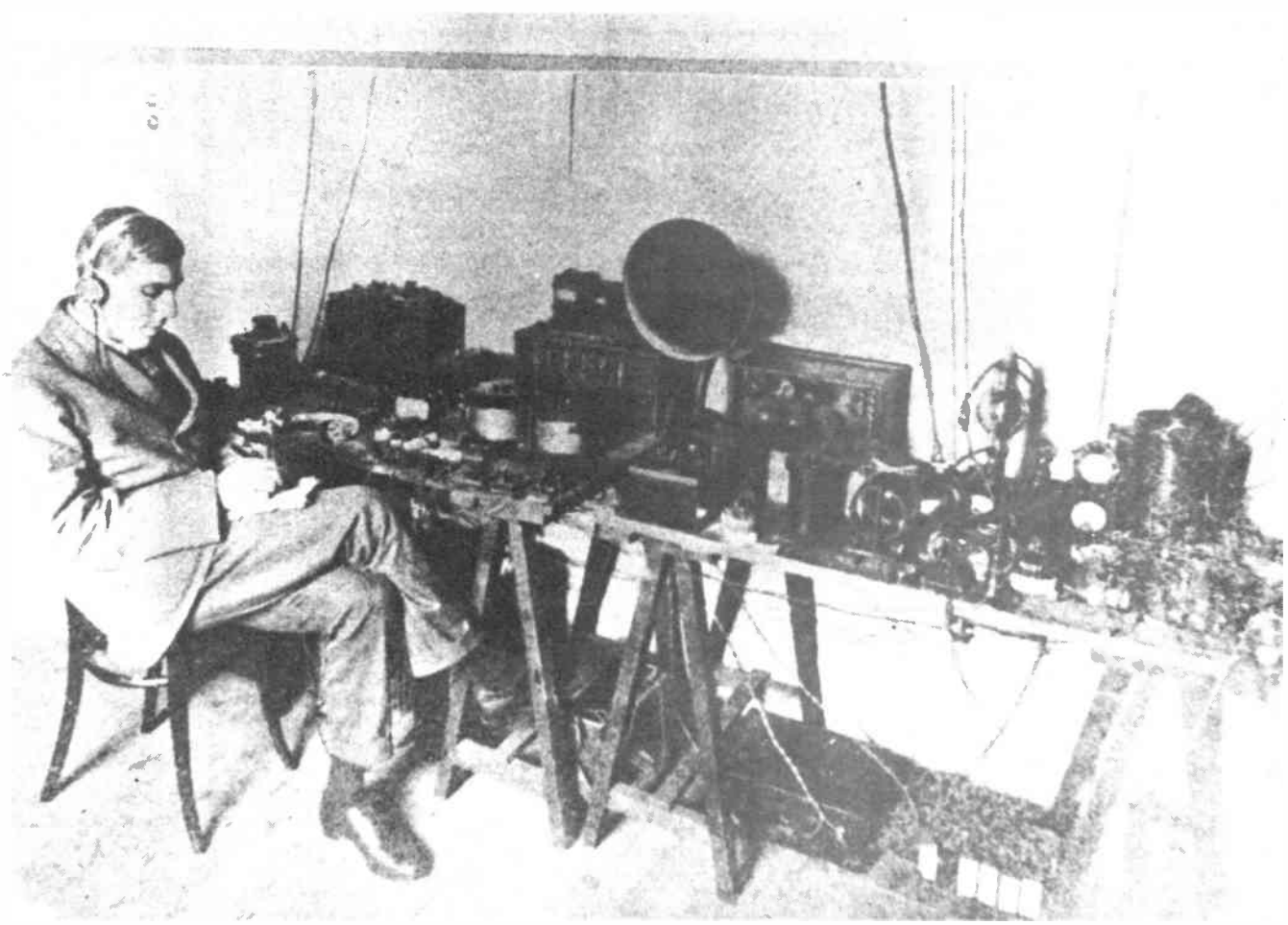
One of the most frequently heard amateur wireless transmitters of the early 1920's was 2OM, the experimental station of Wireless Equipment Ltd (WEL). The operator, Lieutenant HS Walker, himself a member of the Institute of Radio Engineers, did much to further the amateur cause, whilst bringing radio, at a reasonable price, into many ordinary homes.

Upon entering the station, we are confronted by a plethora of sophisticated wireless equipment laid out on a long trestle table.

To the left of it is the long wave receiving apparatus. There, on the extreme left, covering the range 2000 to 30000 metres, sits a 'continuous wave tuner'. To the front of this is the aerial tuning condenser, in close proximity to a 'fine tuner'. To the right, we can see a 'double note amplifier', whilst this two valve unit is followed by a six-stage 'high frequency' amplifier, also used in the reception of long wave transmissions.

Immediately to the front of this one can see two large cylinders standing side by side; these are the main tuning condensers. The receiver's switch gear, comprising brass-topped toggle switches, and double-pole double-throw knife switches, is along the bench front.

Beneath the bench are situated several large accumulators. These Hart cells are interconnected providing the power supply for the receiver. Electro acoustic



transducers take the form of two pairs of high resistance headphones and a 'Brown' swan-necked loudspeaker.

Short waves

Turning our attention to the right hand side of the operating bench, we can easily pick out the short wave transmitting and receiving gear. In the foreground and to the left, is a square box; this houses the short wave tuning condenser, with just behind it, its parent inductance. At the extreme rear is a most enviable piece of apparatus especially designed to amplify the high frequencies. This five valve circuit is said to be highly sensitive, and will effectively magnify even the weakest signal. Looking to the front of the short wave amplifier, and slightly to the right of the aerial tuning inductance, we have the fine tuning condenser, and next to that the medium wave inductance.

Now to the transmitter. The main transmitting valve, manufactured by Mullard, may be plainly envisaged. This large triode takes on a bulbous shape, with a neck at each end, the connecting wires emerging from pinch seals in the glass envelope. To the right of this are seen two bright emitters. These modulator valves are connected into special circuits, the patent of which was evolved and registered by the operator.

Immediately to the front we can see a large carbon microphone and by this, a filament rheostat, used to facilitate a variable control of the filament current, thus offering an effective emission control in the valve circuits. This is not only conservant of power, but assists greatly in performing experiments over long distances whilst varying the output from the transmitter. Sometimes minimal power outputs can achieve impressive results under the right conditions.

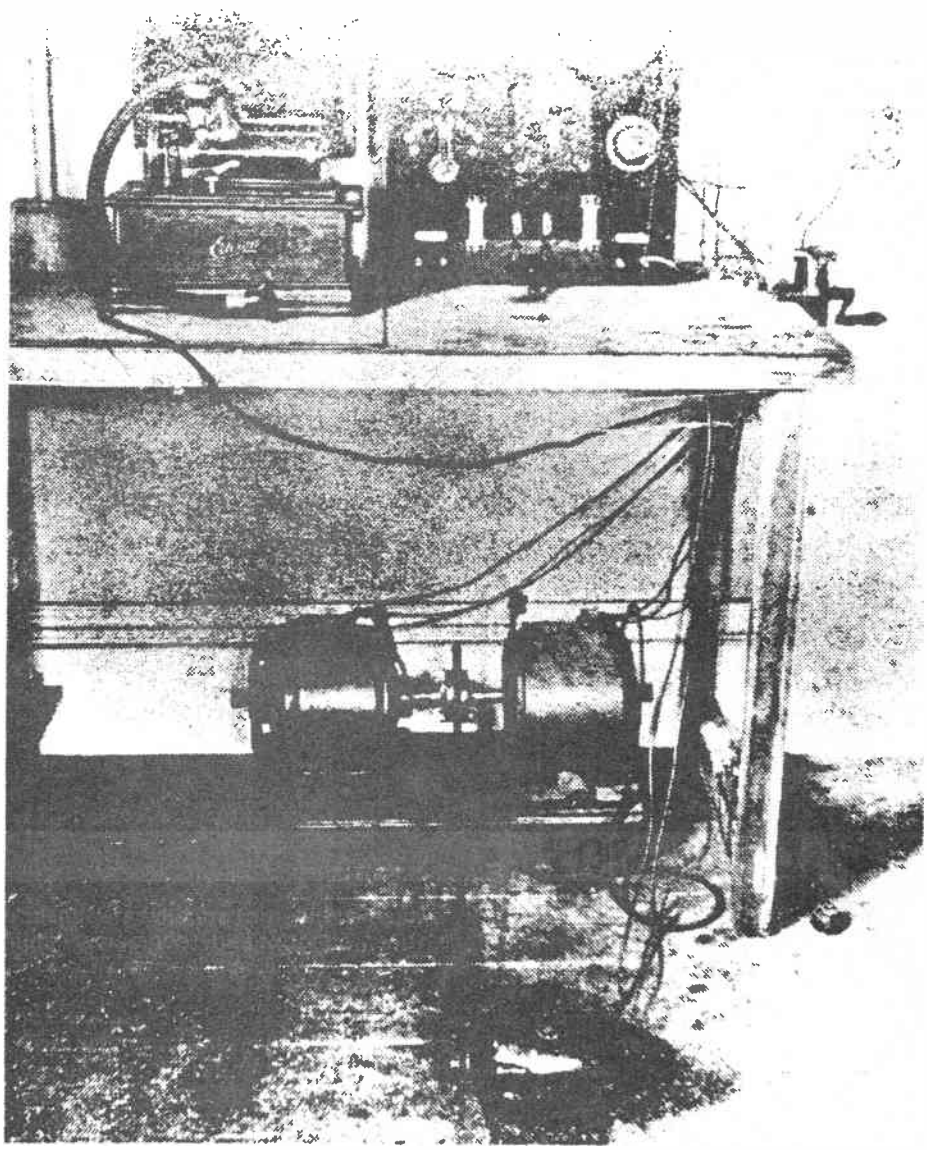
Adjacent to the large Mullard valve is the 1000 metre transmitting coil, with a large concentric inductance. This effects tight or loose coupling, employing the variometer principle. It also assists in preventing unwanted harmonics becoming radiated whilst transferring power from transmitter to aerial.

Left in the foreground, we notice two thermoammeters which are connected in the aerial feeders for HF current loading purposes. Two other inductances hang on the wall. These are for 200 and 440 metres respectively.

Main power supply

The third bench is against the end wall, and situated at right angles to the transmitter. Occupying this is a frame aerial, an Ericson Dictaphone and a GEC Power Switchboard. Just beneath the bench, and mounted on the floor, we see a one horse-power motor which is powered by 240volt ac single phase. Directly coupled to this, is a 25volt, 10amp dc generator. The same gear belt drives an ex-aircraft HT dynamo.

The dictaphone is used mainly in the reception of high speed telegraphy signals, and although speeds in excess of a hundred words per minute are received, they can be played back with the facility of slow morse, at 10 to 12wpm.



Transmissions

During 1922, the station has participated in many experiments. Notable among these are transmissions to the Pavilion Cinema at Marble Arch; also this year, broadcasting has taken place between 2OM and 8AB, a French station owned by M Leon Deloy, at Nice. This distinction was shared with the Blackheath station, 2FQ, which is owned by Mr Burnham, a director of the famous 'Burndept' wireless manufacturing company.

Mr Walker has frequently been in communication with a fellow amateur in Aberdeen and his signals have also been received with clarity at Newport in Monmouthshire.

This resourceful operator manufactures many of the components and instruments in his own workshop, and it has been said that approximately two years work went into the construction and perfection of his impressive station.

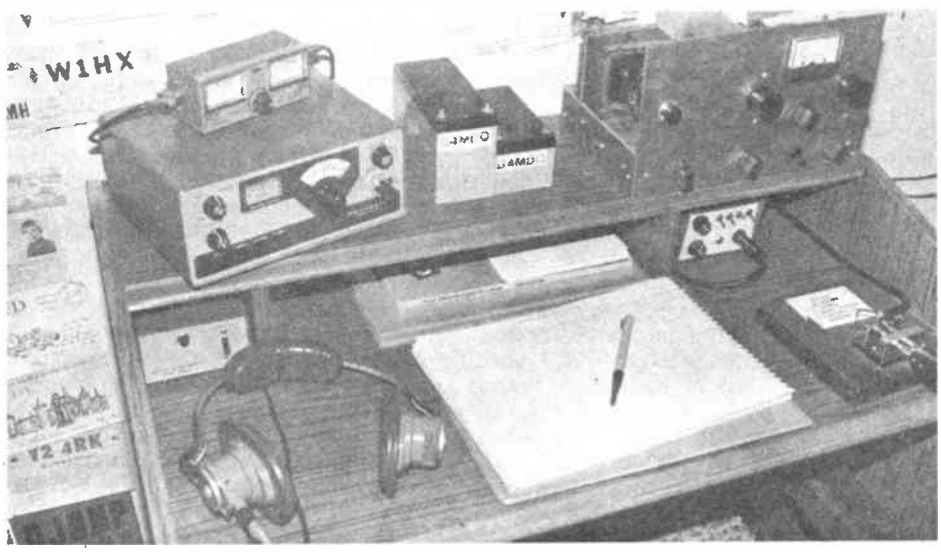
Aerials

Experiments have also been carried out using different aerials, this being due to the adverse siting of the station. The operator experiences much induced interference from electric trams, which continuously pass the premises. Even frame aerials have been tried out for directional properties, these yielding encouraging results in reception.

A great deal of imagination went into this large 'breadboard' construction, and it may be said, without fear of contradiction, that 2OM was far-and-away one of the most successful amateur stations that pioneered wireless in those regrettably distant days. 73s, Old Ham.

PROJECT BIG EAR

by Kevin Fox G4MDQ



The G4MDQ set-up

On the 4th of December 1982, at precisely 0000 UTC, Project Big Ear became operational. The idea was a simple one: take a QRP transmitter, throw the RF into the air and then ask people where it came back down. Being an avid HF beacon listener and QRP fanatic, coupled with the fact that 40 metres is my preferred band, I decided that a very low power beacon on 40 metres would possibly give some very interesting results, and be a way of learning more about the propagation on low frequency bands.

First hurdle

An approach was made to the Radio Regulatory Division to test the water, admittedly with much trepidation, as I fully expected lots of guffaws and a firm 'no'. However, I needn't have worried. The chap who answered the 'phone was very polite and helpful, asking me to put my request in writing. The RRD replied very quickly expressing interest and giving me the necessary permission to transmit for one week leaving the transmitter unattended. The first hurdle was over.

The next problem to be overcome was to let people know all about Project Big Ear, and arrange some pre-event publicity. I decided to write to all the major amateur radio societies worldwide, telling them of the project, and asking their members to listen out for the beacon and supply reception reports. The main problem I foresaw was getting access to the addresses of these societies. It was about this time that the project began to run into difficulty.

I wrote to the Radio Society of Great Britain telling them all about Big Ear and asking for their help. Specifically, I wanted the addresses of the ham societies worldwide. This letter was sent six months before the project was due to start. For weeks I heard nothing; a follow-up letter only solicited the reply that they had not got my original letter. Again, I sent full details but still heard nothing. Even GB2RS were contacted to no avail.

G-QRP

Time was now getting very tight indeed for any worldwide publicity. I seriously thought of cancelling the project, but friends who were helping with the idea insisted that it should go on. We decided to do for ourselves what little we could in the short time remaining. George Dobbs of the G-QRP Club was telephoned, and George (as ever) was very enthusiastic about the project, promising to do whatever he could (which subsequently was quite a lot).

Next people to be contacted were Geoff Watts' DX Newsheet. They promised to give whatever help *they* could, doing an excellent job (as always). They printed details about the project in the DX Newsheet which goes out worldwide.

All my friends working HF were urged to tell everyone they worked about Big Ear. Time had by now run out, and it was time to fire up the beacon. I was still worried about the lack of publicity, but we had all done everything possible to let people know about Big Ear.

Choosing the frequency

During the run up to the start of the project, I kept a watchful ear on the frequencies between 7.000 and 7.050 looking for one which stayed relatively clear. For those of you who have never heard 40 metres, this was very difficult. The band is so full of intruders that the 50 kilohertz CW sub-band is actually reduced to about 23 kilohertz of usable space. I wanted a frequency which stayed relatively clear, but out of the way of people wanting to use the band for CW communication. I finally chose 7.035, at which Mr Murphy and his dastardly law laughed their collective socks off.

Quartslab Ltd were approached for a crystal cut for this frequency, which they cut and sent to me in under a week totally free of charge. Thank you very much Quartslab Ltd.

Choosing the Tx

The actual transmitter itself consisted of a 1 watt solid-state design, crystal controlled. It was built by a good friend of mine, Phil G4JVF. We had an initial problem with getting it precisely onto frequency but with Phil's magic fingers and my sense of humour, it eventually surrendered. The choice of aerial preoccupied me for quite a while when I was thinking about the project. Originally I was going to use a dipole, but having heard stations using delta loops, I began an investigation into loops.

BIG EAR

Some of the Big Ear QSLs

The operator at the key

Choosing the aerial

I cut a full wave delta loop for 40 metres, and to my wife's disgust erected it onto my 27 foot mast in the back garden of MDQ Castle. The apex of the loop was at the top of the mast, giving a base line of 72 feet. I put the aerial up about six months before Big Ear was due to start so I could assess the likely performance of the aerial. The loop was vertically polarised.

After some four years constantly experimenting with different aerials and polarisations, I am convinced that for consistent low angle radiation, vertical polarisation at HF frequencies cannot be beaten. The testing of the aerial culminated with a 1 watt contact with South America. Have you ever woken your wife at 0330hrs to tell her that you have just worked Brazil? Don't, it's fatal.

The aerial was run NNE by SSW and was quite a revelation to listen to. I was hearing stuff I have never heard before, nor since (I had to take it down). During the six months run-up period to the test the aerial was constantly compared to a 40 metre dipole, flicking from one to the other whilst transmitting and receiving. It bore out what I thought should be the situation.

The loop performed much better than the dipole for both working and hearing stations at DX. It was quite a fascinating business demonstrating to various friends that low angle radiation is just as important in receiving as transmitting. Listening mid-morning on 40 on the dipole had G stations 10 and 20 over S9; flipping over to the loop dropped G signals down to S6/S7 whilst bringing up Western Europe stations over S9. Flipping back to the dipole reverted back to the previous signal levels. I was quite happy that the delta loop would do its stuff on the day.

The next thing to arrange was something to key the beacon with. Datong Electronics Ltd were approached for the loan of one of their excellent Morse keyboards. From my original letter of enquiry, to receiving the keyboard took a matter of days. There were now two days left before switching on the beacon. Again I checked everything, tightening up the loop, prodding the transmitter, and worrying about what I must have forgotten to do. But it was all too late now.

As the last peals of midnight were torn from the belfry of a local church by a biting winter wind precisely on 7.035 was heard 'VVV de G4MDQ BECON PSE QSL VVV'.

Two minutes later *I switched off the beacon, unplugged the dummy load and plugged in the aerial.* Apart from that mishap the beacon performed faultlessly 24 hours a day for the week of the test period, thanks to Phil's construction. Friends who had heard the beacon came around to tell me that all was well, and during the week's test I made several portable forays to listen to myself.

Interference

After the first two days, I knew that the beacon was being heard all over the United Kingdom in the daytime, *but* there was a problem at night. All my hours spent listening on 40 metres previous to the project went up the spout when a commercial intruding teleprinter set up business a few KHz away from my transmit frequency. Even using a direct conversion receiver, the teleprinter was splattering all over Big Ear for hours at a time. Needless to say that a few hours after Big Ear went QRT, so did the teleprinter.

Reports kept on coming in during the week, and I even had a report from a BT monitoring station (funny how most of the country heard Big Ear, but they couldn't hear it). Several checks were made during the course of the beacon's transmissions with VK-land, but nothing was heard over there.

Finally, at 0000 UTC on the 11th December 1982 the beacon was switched off, the test time being completed. Reports started to come in within a couple of days by mail. There where no surprises. All the countries that I knew I could reach QRP reported reception. There were no reports at that time from DX (and none subsequently). I had expected reports from W2-land which I find I work regularly at QRP levels on 40, but there were none.

Feedback

Reports were received from the following countries: G-GI-EI-GW-GM-ON-PA-F-DL-LA-OZ-OH-SM-OY-7X-YU-I-HB-EA-YO- UA1/2/3/4/5/8 -LZ-CT-OK and SV, making a total of 30 countries who had heard and reported reception of the beacon. The countries confirming reception nearly all fall in the first skip zone. Those outside could be explained by ducting or ionospheric scatter. However, the conclusion that I drew from the test was that the signal completely ran out of legs after the first skip.

Absorption from both the atmosphere and the ground removed all the remaining power from the signal, so that in the second skip zone, little or nothing remained of the original 1 watt. I did have one report from an OH station who said that the signal had an auroral note! Over all, I thought that the original 1 watt travelled quite well.

All the reception reports received were extremely valuable and useful and it wouldn't be fair to single out individual reports, however, three reports I received were so stunning in their detail they really deserve special mentions. These reports gave a day-by-day report on the beacon, and in one case, an hour-by-hour report! So many thanks indeed to OY7ML, GI3GTR and DJ6XG.

Some people expressed doubts about the power level chosen. I wanted to find out where the propagation paths lay naturally rather than try and force a path with more power. As said earlier, the idea was to launch the RF into the air and then ask where it landed.

In the light of the results from project Big Ear, it is hoped to run the project again sometime in the future, but this time running 10 watts. Watch out for 'Son of Big Ear'. You will be advised. Finally, there's just one question left to answer. Why was it called 'Big Ear'? Well, that's exactly what you needed to hear it!

Thanks

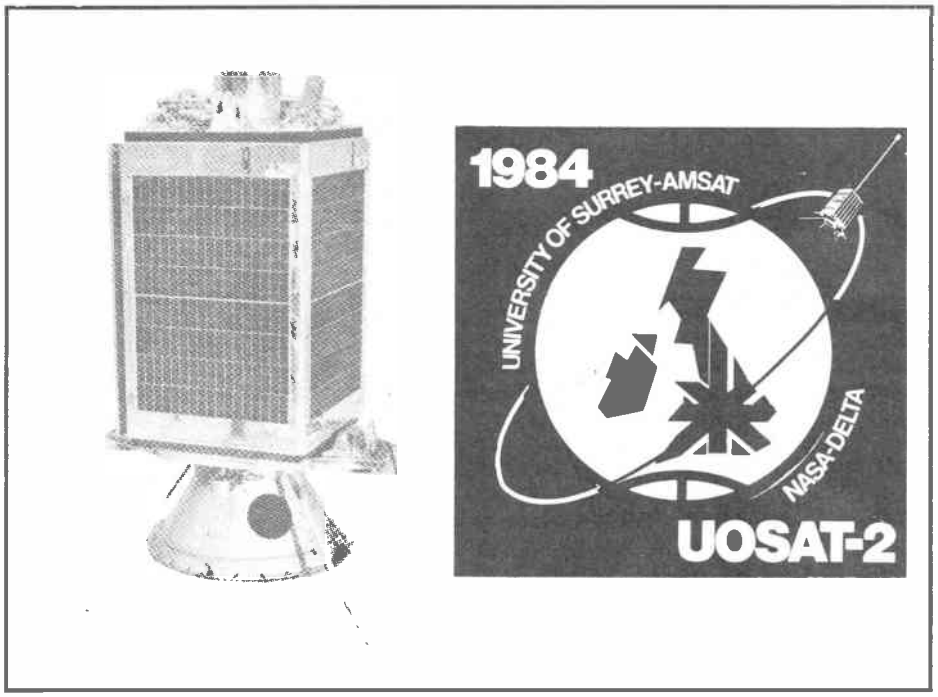
My grateful and sincere thanks to the following, without whom it wouldn't have happened:
To the Radio Regulatory Division, for the permission to proceed with the project.
To Datong Electronics Ltd and Quartslab Ltd for the free loan of equipment which performed faultlessly throughout.
To John G4MRB for the use of his telephone (and Diz's coffee).
To Phillip G4JVF who built the transmitter and gave me the inspiration to operate QRP in the first place, and for all his technical help on the project.
And finally, to all the people who sent in reception reports.

ON THE BEAM

VHF UHF MICROWAVE

News and topics of interest for the bands above 50MHz

by Glen Ross G8MWR



Return of UOSAT

UOSAT 2 has so far had an even more traumatic existence than UOSAT 1. When it was first launched very strong signals were received from it but after a few orbits these disappeared and all attempts to revitalise it seemed to have failed. Careful listening revealed no trace of any signals and the satellite was thought to be dead. However, over the weekend of 11th May amateurs at the Stanford Research Institute in California heard very weak signals coming from the satellite receivers, presumably radiation from the local oscillator system (that gives some idea of the sensitivity of the receivers used at Stanford). These signals indicated that the unit was not dead and at 10.24 GMT on 14th May an attempt was made to command the satellite using the 144MHz system. This attempt failed and at 11.01 activity was transferred to the 438MHz link.

After a stream of commands had been sent, the main beacon on 145.825MHz came on air at 11.05 GMT. The spacecraft is now transmitting data continuously and anyone in a position to do so is asked to send copies of the data received to the University of Surrey. Having reported on the good news about the satellite it should also be mentioned that there is a growing body of opinion which feels that the amateur bands are not the place to put educational satellites and that they only arrived there on the back of a large amateur radio interest amongst the builders, coupled with a desire on the part of the amateur radio authorities to be seen to be doing something very 'worthwhile', rather than just chatting, CB-style.

Just what was there of general amateur radio use on these units, as opposed to things which might be of technical interest? The answer must be very little. True, you could read the telemetry, but you can do this from other sources. You could take pictures from the camera system, but you can do that from the weather satellites. The 'Digitalker' was interesting for the first few times that you heard it but rapidly paled. Beacons which were supposed to be available on various bands either did not materialise or could not be relied upon to be there when you wanted to use them. You could not talk through it and, as far as the average operator was concerned, it might as well not have existed.

There is also the problem reported from around the Guildford area of serious interference to normal operation on 145MHz when the control station is in operation. All in all then to most people it is a piece of ironmongery, taking up space in an amateur band, and providing little of interest to the average operator. Any new proposals of this nature should be looked at in the light of the amateur radio content of the experiment rather than just providing a dedicated frequency for what amounts to private experiment.

Microwave matters

We commented some time ago on the desirability of moving the segment of the 10GHz band normally used for wideband FM operations from the currently used area around 10.1GHz to somewhere around 10.4GHz. The use of 10.1 is a relic of the early days when people were trying to move Klystrons up into the band. Now it is common practice to try to move intruder alarms etc down in frequency. These are normally set at around 10.7GHz and the less you have to move them the better your chance of success. Most of the beacons are already around 10.4GHz and it seems silly to set your gear up on one of these and then have to reset it 300MHz lower in frequency. Acting jointly, the RSGB and the Microwave Society have decided that, as from 1st January 1985, the WBFM section of the band will be from 10.37 to 10.4GHz. This will provide WB beacons as markers at the top end of the segment and NB beacons at the lower end. No changes to the narrow band section are envisaged at the present time. One other advantage of the change will be that NB and WB systems will now be adjacent and this will provide opportunities for mixed mode working.

Also from the same date the contest exchange will include the use of the 'Maidenhead' locator system instead of the current QRA locator requirement. This is in line with an IARU recommendation and will be implemented throughout Europe from the same date. It seems likely that the 'extended' Maidenhead system will be used so as to give greater accuracy to distance calculations.

Maidenhead revisited

For many years now we have used the well known QRA locator system to indicate just where we are located and to calculate bearings and distances between stations. This has worked fine as long as we were only interested in the details of stations within 1500 miles or so. The big limitation of the system was that it could not be extended to give worldwide coverage without ending up with some gaps or some overlapping of the squares.

Many new systems have been put forward to overcome this and the one that has gained final acceptance is the 'Maidenhead'. This has the great advantage of still using the current large squares, 'ZM' etc, as its basis so that all existing awards can continue in their present form. These squares are then used as the basis of larger fields to give a unique worldwide locator system. This new system will be introduced on all bands as from 1st January 1985 and will be used as the basis for all contest scoring etc from that date.

We shall have an article in next month's issue explaining the system more fully and giving a computer program in BASIC, (which is adaptable to most machines), for calculating the new locators from Latitude and Longitude.

The Falcon flies

The Falcon award is issued by the '9H' group of Malta for two metre operation between 0001 GMT on the 1st June and 2400 GMT on the 15th June. The information reached us too late to be included in the last issue but it is still worth bringing to your notice because of the rather nice prize that the winner will receive. This is no less than a week's holiday for two people in Malta, plus a trophy and a diploma! So how does the scoring work? Simply log all your contacts during that period and claim at the rate of one point for every kilometre. The only snag is that you must include a contact with at least one 9H station in that period. Your total score at the end of the contest is then multiplied by the number of Maltese stations that you have worked to give you your final score.

You may feel that the requirement to work into Malta is a bit stiff on two metres, but remember that the contest is timed to coincide with the peak of Sporadic-E activity. In any case you will know by now whether you are in with a chance, so if you managed to work 9H in the relevant period then great, if not, 'sorry', but keep it in mind for next year as it is an annual event. All logs must show date, time, call, *both* reports, and points claimed. They should be sent to the Contest Manager, PO Box 144, Valletta, Malta to arrive not later than the 15th July 1984. Good luck in the contest.

Nothing special

Several people have commented on the fact that we refer to activity on the more unusual bands, like 3.4 or 10GHz for example, as though it 'were nothing out of the ordinary'. The answer to that is that it isn't! All these bands are available for us to use and those people who are already on them do not feel that they are doing anything very special. They probably have a greater sense of having achieved something than the average black box operator, and they will certainly enjoy a greater spirit of enthusiasm and helpfulness from others on the bands. A lot of the problem seems to stem from the fact that most of the amateur radio press gives little publicity to these activities and it has therefore created a certain mystique and a cult image which is not deserved.

No one is going to pretend that there is a tremendous amount of activity on 5.6GHz, for example, but there are stations working up there on a regular basis. Whilst you may not want to venture that high, some careful thought about getting active on 70 or 23cms might not come amiss. There seems to be a widespread belief that all openings start on 144MHz and work up. Therefore, judging by the results obtained on two metres the higher bands must be rather dead. Nothing could be further from the truth, and it is frequently possible to work into the Continent on 23cms from central England when 2 and 70 are dead. Also, due to the fact that high gain aerials are much smaller on the higher bands, the ranges normally obtained on these frequencies are very similar to those obtained on two metres. If you live in a 'hole in the ground' then it will not be so easy, but the challenge of getting the results on the higher bands is what makes it so enjoyable. How about putting some of the pioneering spirit back into your amateur radio life?

The contest scene

Not a tremendous amount for the metre man to get involved in this month, probably due to the fact that the powers that be have taken pity on those of us who take part in the National VHF Field Day and feel that we have taken enough punishment for one month. This, of course, is the major contest in the calendar and takes place over the weekend of 7th to 8th of July with operation on just about every band known to the VHF/UHF enthusiast. This is a fine opportunity to up your county and squares score. Why not get involved with your local club's activities; a day in the country with plenty of amateur radio activity can't be bad.

Talking about a day in the country, how about adding a bit of hill-climbing to the agenda and taking part in the next 10GHz cumulative contest being held on Sunday 15th. Listen around 144.175MHz for talkback to find out where the local operators are, and pay them a visit.

Rather more to look forward to in August starting with the 10W power contests for 432MHz on the 4th and two metres on the 5th. More details of these next month. Some interesting figures can be gleaned about band occupancy from the results of last years VHF/SHF contest. The winners on each band made the following number of contacts: 144MHz – 1008 contacts; 432MHz – 659; 1.3GHz – 157; 2.3GHz – 39; 3.4GHz – 13; 10GHz – 32. These are very interesting figures, and they show how the higher bands, and in particular 10GHz, are growing in popularity.

Odds and ends

Saturday the 12th May saw an intrepid band of lads climb to the top of Ben Nevis to provide live amateur TV pictures on 70cms. We would like to get reports from anyone who managed to receive pictures from them.

The first European amateur in space may come from the Netherlands. One of the astronauts with the European Space Agency, Huber Occolls, is due to fly on one of the 1985 missions. The only snag is he does not yet hold a licence. It is thought that the Dutch national society VERON will make an official request to NASA for permission for him to operate if he gets a licence in time!

The bottom 25KHz of each band above 144MHz has been designated for moonbounce working. You may not be able to hear them coming down, but how about having a listen and see who is on the 'up' link. This really must be the most challenging of all metrewave activities and they are dealing with very weak signal levels. Please keep clear of these areas. Whilst on the subject of moonbounce it has also been decided to standardise 2.3GHz polarization as right hand circular. This in effect means no change and simply codifies existing practice.

The final word

There we have it for this month. A mention for most bands between 144MHz and 10GHz, from terrestial to satellite and moonbounce. What a range of activity this hobby covers!. Thanks for your letters, please keep them coming. The address, 81 Ringwood Highway, Coventry, CV2 2GT.

NEXT MONTH

In addition to his regular *On the Beam*, Glen Ross takes a look at the new 'Maidenhead' locator system.

TEN METRES — the forgotten VHF band

by John Petters G3YPZ

In my last article on the first five years of ten FM I discussed my own experiences on the band since the birth of the FM movement in 1978. The DX aspects of the band were dwelt upon at some length, whereas the methods of radiating an efficient signal, and the VHF characteristics of the band were not examined in any great detail.

First and foremost, the days of good DX openings are for the most part over for the next five years or so. The usual traffic to be encountered will be local G stations using 'space wave' propagation. This is the 'line-of-sight' propagation encountered on two metres, and should not be confused with the 'ground wave' mode which is the norm on top band. The 'space wave' mode is affected by tropospheric enhanced conditions which occur during the frequent 'lifts' on VHF, and displays the same characteristics. In addition to this, ten metre signals can also be affected by aircraft flutter, 'Sporadic-E', auroral, meteor scatter, and back scatter.

For the newcomer to the band it is often difficult to understand which mode of propagation a signal is arriving by. The normal DX traffic comes via the F2 layer, which being the highest, gives the longest skip. It is also the most unreliable, and can give drastic variations in signal strength within a matter of minutes.

Of all the HF bands ten metres is the most severely affected by the eleven year sunspot cycle. It is only useful for DX traffic for about five years of each cycle. The remainder of that time it behaves and sounds like any other VHF band.

Sporadic-E

During the late spring through to early autumn, ten metres displays many excellent opportunities to work near European countries on 'Sporadic-E'. These reflections from the 'E' layer, being considerably lower than the 'F' layers, cause the resultant skip distance to be much shorter than the normal mode. Distances between 400 and 2,000 miles can be spanned in this way. Although there are no set rules about the directions and skip distances that occur on ten metres, some trends observed over many years tend to favour a morning opening to the South, maybe to Italy or Greece, which gradually swings northwards through central Europe, into Scandinavia, ending in Scotland or Northern Ireland.

There are many variations to this, as I have worked stations in Italy, Israel and the USSR well into the early hours of the morning. The term 'sporadic' is certainly appropriate, for signals can appear and disappear within a matter of minutes. The skip can also be concentrated on one area only, with no sign of activity from any other direction. This does not only occur at the time of year already stated, but as the following example indicates, can occur late in the evening even in mid-winter. On 3rd January 1984, between 22.50 and 00.33 GMT, a restricted 'Sporadic-E' opening to Scotland took place quite unexpectedly. The following stations were worked by G3YPZ in Harlow Essex, using 80 watts to a ⅝ wave ground plane at 150 feet: GM4RIW, GM4TTD, GM4JML, GM4DHJ, GM4SKB, GM4OMT.

All signals had very deep QSB, peaking many dBs over S9 at times. Many other local stations using 4 watt converted CB rigs and ½ wave vertical aerials at considerably lower elevations than my own, got up to GM with very good reports.

In fact there were times when such stations were getting better reports than I, when the skip distance favoured them. It is interesting to note that the skip distance can be very sharp, with stations only a few miles apart hearing different incoming signals at different times. Because 'Sporadic-E' is not affected by the sunspot cycle, this mode of propagation will remain throughout the coming minimum years. The signals arriving via 'Sporadic-E' are skip signals which have undergone severe polarisation distortion at the ionosphere, so that antenna polarisation is not a critical factor.

At time of writing, the 'Sporadic-E' season has begun, with SM5HQN, OH2BAR, and OH2EK having been worked by G3YPZ on 24th April 1984.

Tropospheric propagation

'Tropospheric' propagation occurs mainly during the spring to autumn months, but as in the case of 'Sporadic-E' is often experienced at other times, usually when it is least expected. The phenomena of tropo or enhanced propagation at frequencies around 30MHz has received virtually no attention from the amateur radio operator. Many are unaware of its existence on the ten metre band. From my own experience, it would appear that distances of as little as 30 miles can be affected by enhancement due to temperature inversions.

Daily observations in 1981 between G3YPZ in Harlow, G3NID near St Ives, G5BRB in Bury St Edmunds and G3IAG in Newmarket found signals varying from fully quieting down to the noise threshold over a period of some minutes. Unlike the fading observed on 'F' layer or 'Sporadic-E' signals, the tropo QSB is of a very slow nature. The fact that the refractions vary between different locations was frequently apparent, ie, when signals from G3NID were peaking, G5BRB and G3IAG would be noisy. Differences in signal levels would be noted between G3IAG and G5BRB. Sometimes all three could peak or fade at the same time. I will add that all three stations were within the reliable 'space wave' range. These observations were made using the FM mode and vertically polarised aerials.

The early 70's

Back in the early 70s enhanced propagation was observed over a 90 mile path between Harlow and Kenilworth, Warwickshire. In this instance SSB was used with the late G3YHW sporting a 3 element beam, horizontally polarised, at about 70ft. At Harlow the aerial was a very modest rotatable ½ wave dipole only 15ft above the ground. G3YHW's signals were observed over a period of several years. The reliable 'space wave' signal was usually reading S5 on my Sommerkamp FR100B Rx. On certain occasions the signals would vary in strength from that level up to S9+30dBs, with a slow steady fade. At times when the band was open to 'F layer' skip, a flutter could be noticed on the signal. This was undoubtably caused by 'back scatter' which will be examined later.

In the latter half of 1983 a series of tests were carried out between G3IAG in Newmarket and G3MY in Sheffield. Over a path of 120 miles, G3IAG had been copied, on FM, at the Sheffield end at various different times of the day, over a period of several months. A nightly sked at 2300 GMT was set up during November

and December to examine the possible existence of a reliable path. Although two way contact was rarely achieved, due in part to a power difference, G3MY frequently heard G3IAG and several other stations in the Cambridge area. The signal strengths varied considerably, sometimes reaching S7 with fading in evidence. G3MY also reported the existence of what we must assume to be 'meteor scatter'.

On one occasion in December '83 G3MY heard some weak carriers running on 29.690, the frequency arranged for the tests. The signals were too weak to read any modulation, but a seven second burst enabled part of G3WFF's signal from Cambridge to be copied at S5. The set-up in Sheffield at the time was a converted Telecom TE9000 rig with a 5/8 wave antenna. The equipment at G3IAG was a converted Fidelity CB rig with improved front end sensitivity, and a ½ wave end fed CB vertical at about 20ft. Although he is sited at 600ft asl, G3MY is surrounded by hills of up to 1,350ft within a mile or so of his QTH. In the Newmarket direction he does however, have a window down the valley. Signals from my Harlow QTH using 80 watts and my high 5/8wave ground plane were copied during a very good lift on December 28th and 29th at good strength. A high local noise-level prevented a two-way contact from being possible.

During the lift at the end of December '83 a number of exceptional contacts were made. A QSO with G4RRN in Cromer, Norfolk, using 40 watts to a ½ wave end – fed vertical only 10ft high produced signals that varied from noisy to fully quieting. On 29th December the UHF Channel 4 signal was dropping out completely at times, while signals on ten metres from G4LBU, in Ipswich, G4VLR, in Norwich, and G4UJV, near Newmarket were real needle benders, but all having slow deep fading characteristics. Contacts with G4UXJ in Portsmouth and G4EMM on the Isle of Wight followed. G4EMM using 60 watts to a ½ wave end fed vertical at 60ft was particularly strong, giving a full-scale deflection on the S-meter of my Unicomm UX502. His good signal was not just a function of my antenna elevation, as G4UFN less than a mile from my QTH and using a DPA 11VR CB ½ wave at about 20ft also got a very good report.

'A damning indictment that our CB colleagues understand more about it than most radio amateurs'

Contacts with G4EMM have been regular during the latter part of April and up to the time of writing. Over the period of a week there has been a path between Harlow and West Cowes, sometimes fully quieting, sometimes noisy. Surprisingly, to date only G4UFN and G3YPZ in the London area have been able to QSO with him.

Easter Monday proved to be a day when not only tropo conditions were observed, but also 'Sporadic-E' and 'F – layer' propagation were present. Tropo contacts were had with G4OZL in Salisbury, Wilts running 80 watts to a 5/8 wave GP at 20ft, over a path of 80 miles, and G3RXL in Fleet, Hants. A QSO with G3IAG/M on 24th April while on route from Littleport to Newmarket found signals much stronger than usually expected over a range of between 35 and 45 miles, with hardly any mobile flutter in evidence. This again was due to a lift effect.

It is a damning indictment to state that our CB colleagues have experienced many more examples of this type of propagation, and understand more about it than most radio amateurs. There is a good case for the installation of several vertically polarised beacons to study the VHF tendencies of ten metres.

THE DECIBEL

An easily understood explanation of the commonly used gain/loss unit by Dr Arthur Gee, G2UK

For the radio enthusiast, the decibel is the term used for comparing levels of sound. However, it is also the term used for expressing the relationship between two power levels or between two voltages or electrical currents. It is thus the unit in common use for expressing gains or losses in amplifiers, attenuators, and other electronic equipment.

In this article, we propose confining our attention to the decibel as applied to radio reception. It is probably true to say that the majority of those radio listeners, be they radio amateurs or SWLs, who use the term continuously in their reports, have a very hazy idea of just what this term means.

It is usual to appraise radio signals in terms of relative loudness judged by ear. But here we run into difficulties. The ear cannot judge *absolute* loudness. It can only judge *differences* in loudness. If for example, one estimates that a radio signal has become twice as loud when the transmitter power is increased from 10W to 40W, one will also estimate that if the power had been increased from 100W to 400W, the signal was again twice as strong.

The human ear responds to sound in a logarithmic manner. The range of loudness of sounds, when expressed as a simple ratio, is so great that the figures necessary to indicate the extremes become inconveniently large. Thus the difference in power of the sound of a jet aircraft from that of the slightest noise which can only just be heard by the average ear is 1.000.000.000.000 to 1! On the decibel scale this represents a figure of 120 to 1 only.

On the decibel scale a ratio of:

1 to 1 = zero dB.
1 : 10 = 10 dB.
1 : 100 = 20 dB.
1 : 1000 = 30 dB.

. . . and so on.

Even though the decibel is a measure of relative power or relative 'noise', it is desirable to try and define what we might call a 'unit decibel'. The unit decibel, when used in relation to sound, has been defined as 'the quietest sound that can be heard'. This obviously depends on the hearing acuteness of the individual, so a further attempt to obtain a more accurate unit was made by averaging statistically the quietest sound heard by a large group of young adults. The result thus obtained is sometimes called the 'Clinical Zero' in sound measurements and is referred to as 'zero' on the dB sound scale.

Common sounds

Using such a zero, it is interesting to note the dB measurements of some common sounds. Taking the threshold of hearing as zero, the 'noise' in a quiet church or soundproof room averages out at about 10dB. A whisper, or the background noise in a public library, is around 20dB. Normal conversation is around 50dB; a radio set full on or the noise in a car, 70dB; busy street noise or that in an underground train, 90dB; pneumatic drills, 100dB; jet aircraft up to 120dB. But remember, these figures do not represent so many units, like pounds

of potatoes; they represent the relative power of each sound, compared with the minimal.

For the mathematically inclined, we can also define a decibel in the following manner. If we have two powers, P1 and P2, then the number of decibels representing the ratio P2 to P1 is ten times its common logarithm. Expressed as an equation this gives us:

$$dB = 10 \log 10 \frac{P2}{P1}$$

From the practical point of view, it so happens that a change of loudness just detectable by ear, is equal to 1db. A more scientifically orientated reference level is that internationally agreed in which the 'agreed reference level is that, for sound pressure in noise measurement, of 0.0002 dyne/cm², which is in the region of the threshold of audibility for a 1000Hz pure tone.

Ingenious

Standard sources of sound are available which, used under specified conditions, give a sound intensity of a known number of decibels. One such ingenious device consists of a small case, containing thousands of very small steel balls. On flipping the case over, the balls run down like sand in an hour-glass on to a small diaphragm, which emits the noise of the falling balls. The balls take a few minutes or so to run through, during which time their noise can be used as a reference sound source. The instrument is then flipped over again, whereupon the process can be repeated. Used under standard conditions as to distance from the microphone, background noise, etc, the instrument provides quite an accurate sound intensity reference source.

Universal

'S-Units' and dBs are used almost universally as signal strength indicators on shortwave receivers. No standard has been agreed between such receiver manufacturers, as the S-meter is a relative-reading instrument on most SW receivers. During the last war, one manufacturer did standardise 50μV for S9 and each S-unit below S9 was supposed to be equivalent to 6dB. Meter divisions above S9 were in dB. This is all right if the receiver is designed for a limited frequency coverage, but for multiband receivers the sensitivity varies for different bands, so that the S-meter is quite inaccurate except for the band on which calibration was made.

So, the next time someone tells you your signal is '30dB over 9', it's not quite such a simple matter to interpret as it may seem.

SELF-TUITION FOR THE RAE

Alan Grice G4PJG

with a call to arms for all those afraid to study for the RAE alone

Last year I completed my first twelve months as a holder of the class 'A' amateur transmitting licence. It has been a most absorbing period and the enjoyment and interest gained has, for me, fully justified the decision made a couple of years ago to take the Radio Amateurs Examination and move on from just short wave listening. My background is not one of electronics and I can remember no great schoolday skills in matters scientific or mathematical but I always had an enquiring mind into the subjects which made up the physics lessons.

Genuinely interested

The last technical examination taken prior to the RAE was in connection with my work and was ten years earlier. I mention this background because I know that there are many genuinely interested in the subject and theory of radio communications, who would very much like to obtain a full amateur licence with all the privileges that gives, but who feel they really could not pass the written test or the Morse examination. It may be because a few years have passed since schooldays and the mind has become 'rusty', or it may be due to a basic fear of examinations or whatever.

Certainly there are many keenly interested enthusiasts who have the necessary motivation to make good amateur band operators. With that in mind I have written this in the hope that encouragement can be given, and to pass on some of the methods which I used to achieve a full licence at the first attempt. The main criterion is a genuine interest, for whatever arguments are made for and against the present RAE, the syllabus is extensive and a half-hearted attempt will probably be a waste of time. However, if the ability to 'cross the globe' from your own front room is seen as a privilege to be earned then you should find, as I did, that the hurdles are not insurmountable.

As already mentioned, I had initially been a listener on the short wave bands. This interest which seems today to be almost an old-fashioned approach to obtaining a transmitting licence, grew for me out of a requirement for a pastime to while away certain evenings, and of a fascination with the theory of radio communication. In an age when the earth is rapidly 'shrinking' because of great developments in communication and electronics science and technology, it is so easy and only natural to take for granted the transmission of a human voice to the far side of the earth. For myself, originally with the short wave receiver and now with the transmitter, my personal involvement with communicaton helps to keep that fascination alive. To actually sit down in my home and communicate with, for example, a fellow amateur on an island in the Pacific, to send out a radio wave which in a second can span those thousands of miles, is to keep alive something which today is so easily lost.

After a couple of years spent listening to the amateur bands, that restlessness which has plagued so many before who themselves want to be on the transmitting side bit me, and I decided to make a concerted effort to get the full licence. The following is the method I used.

Avoidable error

In beginning my study (nine months before the RAE), I made a mistake which is worth mentioning if only to prevent others doing the same. My growing interest in the technical side led me to start reading manuals on radio theory which, with hindsight, were much too deep. They were fine books but with my relatively weak electronics background were too much, too soon. Once this was realised I got hold of the Amateurs Examination Manual and by combining this with the reading of basic theory books from the local library I was able to press on. My method was to study *every* day and I devoted about 15-20 minutes in the evenings after work and at weekends. I found that this, 'little but often' principle is much more useful in the retention of knowledge. The effects are cumulative and prevent the mental staleness which can result from too much effort in spasmodic sessions.

Small tests

Every weekend I would set myself small tests to check on the input of knowledge, and where any areas of uncertainty came to light I would clarify them before proceeding. I did 15 minutes study every day for about 6 months, and then for 2 months did some 30 minutes daily. The final month before the exam saw me doing about one hour per day.

There is certainly a technique to preparing for and sitting examinations and the RAE is no exception to this. This technique consists of:

a) finding out the syllabus,

b) estimating some of the likely questions

c) concentrating on one's weak points and not neglecting areas of little interest.

Looking at each point separately:

a) The syllabus can be found by reading the Examination Manual or by obtaining the Home Office booklet 'How to become a Radio Amateur'.

b) In an examination designed to test knowledge and procedures before being let loose on the airwaves, it follows that certain areas will always be the source of questions. Such areas will include the knowledge of licence conditions, but it is also logical to assume that questions relating to the cause, detection and suppression of transmitter interference will figure prominently. Operating practices will be tested and by intelligent guesswork one can reason the type of question likely in this and other sections.

c) It is most important to pay equal or more attention to those items of the

syllabus that are found to be the least interesting personally. It is fatal to neglect such areas, and to concentrate on the parts of the syllabus we enjoy most could result in vital marks being lost. In my own case I have never been greatly attracted to mathematical formulae and calculations so I ensured that I was capable of applying and understanding the basics of this section by increasing the study time here.

Visual memory alone?

As regards circuit diagrams I felt that I had to spend extra time really trying to come to terms with these schematic plans. For my own part I considered that to not do so was only cheating myself and that to learn them by visual memory alone was debasing the value of the examination. I would quickly point out, however, that I am well aware that many will not share my view and will be content to simply memorize the diagrams – as long as a pass results.

As already mentioned, it was my intention to go for the full licence straight away and as a consequence I bought a Morse code cassette-study course and practice key and oscillator. Following traditional advice I resisted the temptation to start sending characters on the key first and concentrated instead on learning to copy at a reasonable speed. Some 15 minutes per day were spent listening to the tapes and by combining this with listening to 'slow' QSOs and to the RSGB slow Morse transmissions, I managed to reach about 10wpm in some 8 weeks. I knew that if I passed the RAE there would be a delay before a Morse test could be arranged which would give me time to further increase my speed so I reduced the practice to three 30 minute sessions per week and concentrated on studying for the written exam.

Cramming

In the final weeks before the exam I 'crammed' on all the weak areas and consolidated my knowledge in the sections of the syllabus at which I was strongest. Although many people frown on any 'parrot fashion' type learning, I used this method to learn the licence conditions. This is an essential area of the exam and one in which I reasoned that the content learned in this way was useful, not only in gaining pass marks, but in increasing one's responsibility as an operator should the 'ticket' be gained.

On the day before the examination all books were closed to give the mind a rest – if you haven't got the knowledge in at this stage you never will anyway. On the evening that the test was scheduled I got to the centre in good time, not forgetting the exam slip, pen, pencil and calculator. After the usual preliminaries the exam was underway. As one whose work has involved the preparation of the objective or multiple choice type of question as used in the RAE a word about this method may be helpful to the would-be candidate.

It is no easy task to produce questions by this method which will really 'test' the examinee unless they are posed in a certain way. As a result, some candidates will complain that more than one answer appears right. This is a deliberate way to test the depth of your knowledge and if you really know your subject you will be in no doubt as to the correct box. To illustrate the point, an example:

When erecting an antenna the amateur should:-

a) ensure that someone holds the foot of the ladder

b) ensure that the antenna is not positioned where it could fall onto live cables

c) ensure the aerial is always a half wavelength above the ground

d) carry out the installation at night so as not to alarm the neighbours.

'there is no reason why pass marks cannot be achieved in the essential areas and in so doing one can obtain the 'key' to the door that leads to this unique and absorbing pastime'

The correct answer is, of course (b) even though it is wise to always have someone foot a ladder and theoretically to try to position horizontal antennae at least a half wave high. Answer (b) then is the one which in that situation is of the greatest priority as regards safety. Although this is not a perfect analogy I hope it serves to illustrate the point about multiple-choice questions and will make you alert to the need to study the point of the question closely and not tick the box that appears correct at the first glance.

Well the examination was completed, and like so many before me I awaited the result and that hoped-for pink pass slip. If you intend going straight for the Morse then this waiting period can be put to good use.

My copying speed at this stage was about 10wpm so I reasoned that the time was ripe to start practice in sending.

Firstly I practised sending individual characters and numbers and then would send five characters and numbers in sequence. I recorded these and it is here that one should be prepared for a shock when listening to the playback. This often bears little resemblence to 'good' Morse heard on the air or the practice tapes. However, with patience and further copying and sending practice I was able about one month later to send properly formed characters and numbers.

By now my copying speed was about 12wpm and for extra practice at bringing up my speed I adopted the following method. Using an old novel or reference book, I counted out a number of letters cum sentences which would approximate the 36 words in 3 minutes requirement of the Post Office test. These sentences would be sent and the sound recorded. After a few days (so that I had forgotten the text and could not fool myself by anticipating) I played back the recording and copied it down. By comparing it with the original marked-out sentences in the book, I could check at one go both my copying ability and my accuracy in sending. If several practice paragraphs are marked out in this way, one then has a somewhat crude but cheap and effective method of practice. With further periods spent listening to the RSGB slow practice sessions I polished up my speed to about 16wpm which allowed a margin for nerves during the actual test.

Success!

I am pleased to be able to report that this self-tuition worked and the combination of the method of practice described and the RSGB sessions enabled me to gain a pass first time.

Prior to taking the Morse I had received a result from the City and Guilds and to state that I was literally in the pink would be an understatement, especially as I had gained a distinction and credit. I was naturally 'over the moon' with the result which meant that I had now had the potential to realise the ambition of worldwide communication.

As remarked at the outset my main purpose in writing this is to show that if you really wish to work the amateur bands then it can be done, even with complete self-tuition in all aspects. It does, make no mistake, require a genuine interest, diligence, patience and discipline in regular systematic study in both the theory and the Morse. If this can be combined with some basic constructional work so much the better. Provided this is done, there is no reason why pass marks cannot be achieved in the essential areas and in so doing, one can obtain the 'key' to the door that leads to this unique and absorbing pastime. One in which I personally have been able, with largely secondhand equipment, simple homebrew wire aerials and low transmitter powers to contact many interesting countries during my first year. But that is another story.

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EB91	0.52
EBC33	2.50
EBC41	1.95
EBC81	1.50
EBC90	0.90
EBC91	0.90
EB91	0.60
EBF33	2.50
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	5.50
EC92	1.25
EC93	1.50
EC95	7.00
EC97	1.10
EC8010	12.00
ECC32	3.50
ECC33	3.50
ECC35	3.50
ECC81	1.15
ECC82	0.55
ECC82 Philips/Mullard	1.35
ECC82 Philips	1.10
ECC83	0.65
ECC83 Philips	1.95
ECC84	0.50
ECC85	0.60
ECC86	2.75
ECC88	0.85
ECC91	2.00
ECC180	0.72
ECC189	0.78
ECC801S	3.50
ECC803S	3.50
ECC804	0.60
ECC807	2.50
ECC2000	12.00
ECF80	0.85
ECF82	0.85
ECF86	1.70
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF804	6.00
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	2.15
ECH42	1.00
ECH81	0.65
ECH83	0.78
ECH84	0.69
ECH2000	1.50
ECL80	0.60
ECL82	0.65
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.80
ECL805	0.69
EF37A	2.00
EF39	1.10
EF41	3.50
EF42	3.50
EF50	2.50
EF55	4.95
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.50
EF85	0.50
EF86	1.25
EF86 Special quality	2.50
EF89	0.85
EF91	1.50
EF92	2.15
EF93	0.95
EF94	0.95

EF95	1.00
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
EF732	3.50
EB800	11.00
EF805S	13.50
EF806S	14.50
EF812	0.65
EFL200	1.50
EH90	0.72
EK90	0.72
EL32	0.95
EL33	4.00
EL34	2.25
EL34 Mullard	3.95
EL36	1.50
EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL84	0.75
EL85	4.50
EL86	0.85
EL90	1.50
EL91	6.00
EL95	0.70
EL153	12.15
EL183E	3.50
EL183P	3.50
EL360	6.75
EL500	1.40
EL504	1.40
EL509	5.25
EL519	6.95
EL802	3.65
EL821	8.50
EL822	12.95
EM1	9.00
EM4	9.00
EM80	0.70
EM81	0.70
EM84	1.65
EM85	3.95
EM87	2.50
EN10	8.00
EN32	13.50
EN91	1.10
EN92	4.50
ESU872	25.00
EY51	0.80
EY81	1.50
EY83	1.30
EY84	5.95
EY86/87	0.50
EY88	0.55
EY91	5.50
EY500A	1.50
EY802	0.70
EZ35	0.75
EZ40	2.75
EZ41	2.15
EZ80	0.75
EZ81	0.75
EZ90	1.50
F6064	2.95
FW4/800	2.95
G1/371K	30.00
G55/1K	9.00
G180/2M	9.00
G240/2D	9.00
G400/1K	14.00
GC10B	17.50
GC10D	17.50
GC10/4B	17.50
GC10/4E	17.50
GC12/4B	17.50
GD86W	6.00
GDT120M	5.00
GE10	9.00
GN4	6.00
GN10	15.00
GR10G	4.00
GR10J	4.00
GS10C	16.50
GS10H	12.00
GS12D	12.00
GT1C	14.00
GT1C S/S	13.00
GTE175M	8.00
GTR150W	1.00
GU20	35.00
GU20	70.00
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.20
GY802	1.00
GZ30	1.00
GZ31	1.00
GZ32	1.00
GZ33	4.50
GZ34	2.15
GZ37	4.50

HAA91	1.00
HABC80	0.90
HBC90	0.75
HBC91	0.80
HF93	0.75
HF94	1.50
HK90	1.06
HL2K	3.50
HL23DD	4.00
HL41	3.50
HL42DD	3.50
HL90	0.70
HL92	1.50
H133/DD	3.50
HR2	4.00
HY90	1.00
HVR2	3.00
K391A	95.00
K3118	86.00
KR6/3	45.00
KT8C	7.00
KT33C	3.50
KT36	2.00
KT44	4.00
KT45	4.00
KT61	4.00
KT63	2.00
KT66 OSRAM	10.50
KT66 USA	6.90
KT66 GEC	14.95
KT77 Gold Lion	9.50
KT81	7.00
KT88 USA	9.00
KT88 Gold Lion	15.95
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
L63	1.50
L102/2K	6.95
L120/2K	12.00
LB7-20	95.00
LS9B	6.95
M502A	60.00
M537A	60.00
M5143	155.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	5.50
M8161	6.50
M8162	5.50
M8163	5.50
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.50
ME1401	29.50
ME1402	29.50
ME1501	14.00
MH4	3.50
MHLD6	4.00
ML4	4.50
MS4B	5.50
MU14	1.50
N37	12.50
N78	9.85
N78	14.95
OA2	0.85
OA2WA	1.50
OA3	2.50
OB2	0.85
OB2WA	1.25
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65

PCF82	0.60
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL200	1.60
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN4DD	2.00
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PFL200	0.95
PL21	2.50
PL36	0.95
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802	5.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
Q13-110BA	47.50
QB3-300	30.50
QEO3-10	3.50
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEO3-12	6.50
QQEO3-20	27.00
QQEO6-40	39.50
QQVO2-6	16.50
QQVO3-10 Mullard	9.50
QQV03-10	5.50
QQVO3-20	18.50
QQVO3-20B	32.00
QQVO6-40A	19.50
QQVO7-50	63.50
QQZO3-20	42.50
QQZO6-40A	45.25
QS72/20	1.50
QS75/40	3.00
QS92/1D	6.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	2.00
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50

QU37	11.50
QVO3-12	4.95
QVO5-25	1.75
QVO6-20	29.50
QV2-250C	45.00
QVQ8-100	145.00
QY3-125	49.50
QY4-250	65.00
QY4-400	71.95
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RG4-1000	10.00
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	33.50
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/800	5.00
SC1/1200	5.00
SC1/2000	9.00
SD6000M	45.00
SP2	1.50
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2.5/300	85.00
TB2-300	45.00
TBL-2-300	275.00
TD1-100A	25.00
TD03-10D	35.00
TD03-10F	28.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TY2-1254A	60.00
TY4-400	70.00
TY7-6000A	365.00
TY8-600W	365.00
TYS2/250	375.00
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	2.95
UBC81	1.50
UBF89	0.60
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	1.20
UCH42	1.35
UCH81	0.65

UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.50
UL41	3.50
UL84	0.85
UU5	3.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP4B	4.50
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG2-6400	35.00
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XP1002	29.00
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y63	1.50
Y65	6.95
Y602	12.00
YD1100	75.00
YJ1060	265.00
YL1020	29.00
YL1070	115.00
YL1071	109.00
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.60
Z759	19.95
Z800U	3.00
Z803U	18.95
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1AC6	1.20
1B3GT	1.95
1B22	10.00
1B24	14.95
1B35A	29.50
1C1	2.50
1C5GT	2.50
1D5	2.50
1FD1	2.50
1G3GT	2.50
1L4	0.60
1L6	1.50
1LA6	1.00
1N5GT	2.50
1S2	0.55
1T4	0.70
1U5	1.00
1X2B	1.40
2C21	1.00
2C39A	23.50
2C39BA	39.50
2C40	37.00
2C40A	55.00
2C42	29.50
2C51	0.75
2C53	32.00
2CY5	1.50
2B7	1.50

2D21	[illegible]
2D21W	2.50
2E26	7.95
2J42	93.00
2K25	24.95
2K25 Ray	75.00
2K26	95.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3AW2	3.35
3B2	3.00
3B7	4.50
3B26	24.00
3B28	12.00
3C4	1.00
3C45	24.00
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3W4GT	2.50
4B32	19.50
4B551B	115.00
4BQ7A	1.75
4-65A	59.00
4-250A	65.00
4C27	25.00
4C28	25.00
4CX250B ITT	37.50
4CX250B EIMAC	49.00
4CX250B surplus ex-government	12.50
4CX250B tested ex-equipment	6.00
4CX250BM EIMAC	75.00
4CX250K EIMAC	95.00
4CX350A	71.50
4D26	75.00
4GS7	2.25
4GV7	2.25
4JC6A	2.95
4J52	75.00
4X150A	25.00
5A/102D	9.50
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-206K	10.00
5A-180M	9.00
4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
5B.110M	10.00
5B-254M	14.50
5B-255M	14.50
5B255M	19.50
5B/256M	9.00
5B-257M	9.00
5B-258M	14.50
5C22	69.00
5R4GB	2.80
5R4GY	2.80
5T4	5.95
5U4G	1.95
5U4GB	2.50
5V4G	1.25
5Y3GT	1.95
5Z4GT	0.85
6/30L2	0.70
6A/203K	9.00
6A8G	1.50
6AB8	0.66
6AC7	2.00
6AF4A	2.50
6AF9	4.15
6AG5	1.50
6AG7	1.95
6AH6	1.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.00
6AK6	2.00
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.50
6AN5	2.65
6AN8A	2.65
6AQ5	1.50
6AQ8	0.85
6AR8	3.95
6AS5	1.50
6AS6	1.50
6AS7G	4.50

[illegible]	[illegible]
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BD4	1.50
6BD6	1.00
6BE6	0.72
6BF5	1.60
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.20
6BK4	4.00
6BK7A	1.95
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	2.35
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	0.65
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BS8	2.50
6BW4	1.50
6BW6	5.35
5BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6B26	2.50
6BZ7	2.95
6C4	1.10
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C15	2.50
6C18	2.50
6CA4	3.50
6CA7	3.50
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CH6	6.95
6CL6	3.25
6CL8A	2.00
6CM5	1.60
6CS6	0.75
6CW4	6.50
6CY5	1.00
6DC6	2.35
6DK6	1.15
6DQ5	3.35
6DQ6B	2.50
6EA8	2.50
6EB8	1.75
6EU8	1.75
6EW6	1.50
6F1	2.00
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F22	0.70
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	17.00
6FG5	1.95
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GV7	2.50
6GW6	2.50
6H3N	1.10
6H6	1.95
6H6GT	1.95
6J4	1.10
6J4WA	3.15
6J5	2.50
6J6	0.65
6JB6A	3.95
6JE6C	4.95
6JS6C	4.95
6J7	4.15
6K7G	0.70
6K8Y	3.95
6KD6	5.50
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC (GE)	3.95
6L6GT	1.15
6L7G	0.75
6LD20	0.60
6LF6	4.50
6LQ6	4.95
6N7	2.50

6N7GT	[illegible]
6P15	1.50
6P25	4.00
6P28	2.00
6Q7	1.20
6Q7GT	1.20
6S4A	1.50
6S7	1.10
6SA7GT	1.00
6SC7	1.50
6SG7	1.20
6SH7	1.20
6SJ7GT	1.20
6SK7	0.80
6SK7GT	1.20
6SL7GT	0.85
6SN7GT	0.65
6SQ7	0.80
6SS7	1.95
6U4GT	1.75
6U5G	1.50
6U8	0.85
6U8A	1.50
6V6GT	0.85
6X2N	1.00
6X4	1.50
6X5GT	0.55
6X5GTY	1.00
6X8A	2.25
7A7	2.00
7AD7	1.75
7B7	2.50
7C6	2.50
7E7	2.50
7V7	4.15
7Y4	1.95
8B8	2.50
8EQ7	1.95
85A8	1.50
10D2	1.25
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD11	1.00
10LD12	0.65
11E2	16.50
11E3	55.00
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	0.95
12AT7	1.15
12AT7WA	2.50
12AU6	1.50
12AU7	0.55
12AV6	0.80
12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	3.50
12BA6	1.50
12BE6	1.05
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CX6	1.20
12E1	17.95
12E14	28.00
12GN7	4.50
12HG7A	4.50
12JGT	0.70
12K5	1.00
12K7GT	0.60
12K8	1.10
12Q7GT	0.50
12SA7GT	1.00
12SG7	4.75
12SH7	1.00
12SK7	1.00
12SJ7	0.60
12SN7GT	1.85
12SQ7GT	1.50
13D3	3.20
13D7	3.20
13DR7	2.95
13E1	115.00
14S7	1.00
17EW8	0.95
17JZ8	2.75
18D3	1.60
19G3	17.00
19H4	23.95
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
20P5	1.15
21LU8	2.50
24B1	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95

[illegible]	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
31JS6A	5.50
33A/158M	19.50
44A/158M	19.50
35A5	4.50
35L6GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
47	6.00
60B5	1.60
50C5	0.95
50CD6G	1.15
60JY6	2.96
52KU	2.00
61SPT	4.50
75B1	2.50
75C1	2.50
84	3.00
85A1	6.50
85A2	1.50
90AV	10.00
90C1	2.70
90CG	13.50
91AG	9.00
92AG	19.50
92AV	12.50
95A1	6.50
108C1	1.50
150B2	6.95
150C2	1.50
150C	2.15
155UG	26.00
274A	15.00
1858T	1.50
307	5.00
328A	15.00
388A	17.50
425A5	8.00
431U	2.00
572B	35.00
705A	8.00
708A	8.00
715A	6.00
715C	45.00
725A	275.00
803	14.95
805	39.00
807	1.60
810	45.00
811A	12.95
813	18.50
813 USA	45.00
829B	14.50
833A	60.00
866A	3.50
872A	19.00
873	60.00
884	5.50
930	9.95
931A	13.95
954	1.00
955	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
2050W	4.50
2050	2.75
3545	4.00
4313C	4.00
4328D	9.00
5642	9.50
5651	2.50
5654	1.95
5663	1.95
5670	3.25
5672	4.50
5687	4.50
5692	3.50
5696	2.75
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
5751	2.95
5763	4.95
5814A	3.25
5840	3.50
5842	11.00
5894	39.50
5899	4.50
5963	2.00
5965	2.25
6005	1.85
6012	10.00
6021	3.65
6057	2.50
6059	3.75
6060	2.25
6062	4.50
6063	2.00
6094	3.25
6067	1.95
6072	4.20
6080	4.75
6080WA	8.50
6096	2.85
6132	10.00
6136	2.50
6146B	7.50
6157	2.50
6201	6.45
6211	2.50
6267	1.50
6350	2.00
7025	2.50
7247	2.00
7360	8.9[illegible]

WIREWOUND RESISTORS PREFERRED VALUES

4 Watt	4R7-1K8	0.16
	2K2-6K8	0.18
7 Watt	R47-4K7	0.18
	5K6-12K	0.19
	15K-22K	0.20
11 Watt	1R-10K	0.20
	15K-22K	0.24
17 Watt	1R-10K	0.26
	15K-22K	0.28

BASES ETC.

B7G	0.15
B7G Skirted	0.30
B8G	0.70
89A	0.20
B9A Skirted	0.30
B108	0.16
B13B	0.50
8 Pin DIL	0.14
14 Pin DIL	0.15
14 Pin DIL/Q	0.30
16 Pin DIL	0.17
OCTAL	0.35
CANS	0.27
B9A PCB	0.15
B5	0.75
B9G	0.38

ZENER DIODES

BZX61 0.15

6V2 7V5 8V2 9V1 10V 11V 12V 13V 15V 16V 18V 20V 22V 24V 27V 30V 33V 36V 39V 47V 51V 56V 68V 75V

BZY88 0.07

2V7 3V 3V3 3V6 3V9 4V3 4V7 5V1 5V6 6V2 6V8 7V5 6V2 9V1 10V 11V *2V 13V 15V 18V 20V 24V 27V 30V

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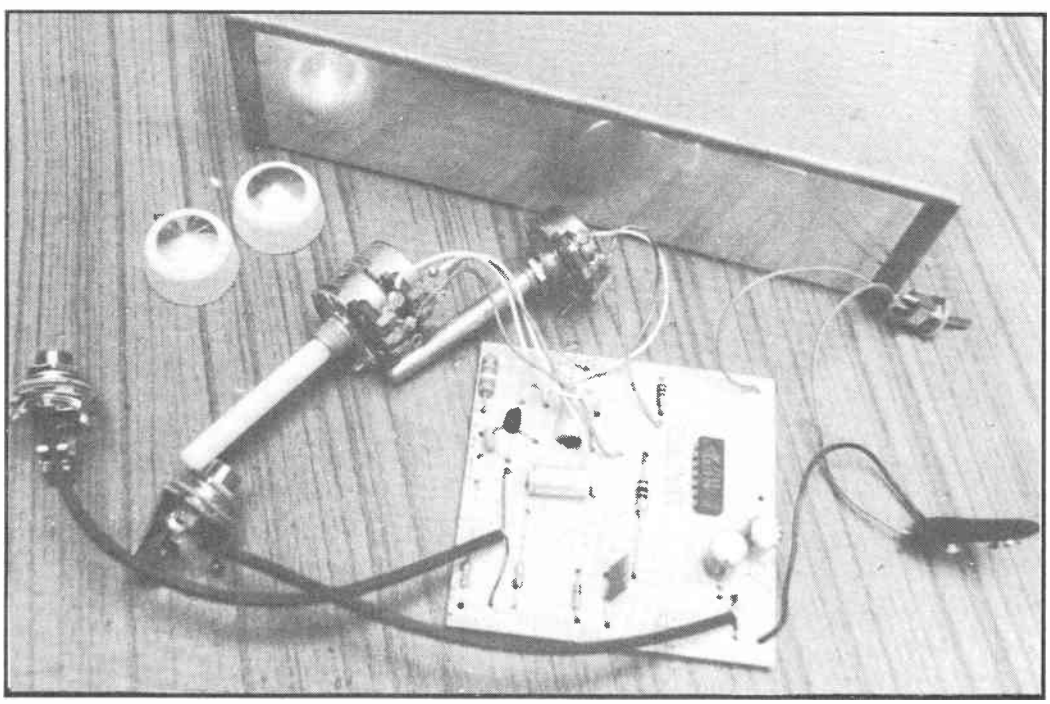
SHORT WAVE LISTENER

by Trevor Morgan, GW4OXB

Well here we are for another month. Firstly many thanks for your letters and personal comments (mostly favourable!). If you have asked my help with a problem and haven't had a reply within a week there's summat wrong somewhere along the line but I am currently turning letters round in about that time.

This month, by way of a change, we look at elementary construction. The circuit offered is an old but tried and tested one so I do not make any claims for the idea but it is a very useful piece of equipment for the listener and can also be useful to the licensed amateur.

However, before we get on to the actual construction, let's look at the equipment you will need and some of the basic principles of soldering.



Soldering

You will, naturally, need a soldering iron and one in the range of 15-25 watts will be ideal. Overheating can damage some components so don't use too large a power. If you will be using it in the shack you may find a 12 volt iron useful as it can be plugged into your base PSU. Also get one with a fairly small tip (around 3mm).

The next items on the list are heatsinks. These can be simple clips (X-acto make a pack of three) or surgical type (artery) clamps can be used and can be bought from good model shops. These will help absorb heat before it gets a chance to damage a component.

Sidecutters are usually already in the shack but you will find the investment in a pair of miniature type worthwhile , especially when working in confined spaces inside a project box. Always use a good quality resin cored solder.

Always allow the iron to heat up the work. Don't melt a glob of solder onto the iron tip. The work must always be at the same temperature as the applied solder to give a good joint. The appearance of the joint should be shiny and only sufficient solder to make the joint secure should be used so concave 'shoulders' should be evident. Always trim off any surplus leads just about the joint to help prevent any chance of a short circuit. Also ensure that no solder has seeped into a gap between the copper tracks (bridging).

Right, that's the basics out of the way, so let's have a look at this month's circuit.

Audio notch filter

The circuit is a conventional one with TR1 operating as a common emitter stage from the base to the collector and an emitter follower stage from the base to the emitter. Due to negative feedback introduced by R3 the two output signals are approximately the same. The collector signal amplitude can be adjusted by VR1.

A Wien network is formed by VR2, C2 and C3, and at a certain frequency there will be identical phase shifting through both sections of the bridge which cancel each other out. VR1 can be adjusted to make the cancelling precise at this frequency giving a narrow notch in the frequency response of the circuit.

VR2 is the tuning control and using this in combination with the VR1 control, most interfering whistles or heterodynes can be reduced to negligible proportions. Amplifier LM380N is used to match the impedance of the output from the Wien network to match speakers or headphones with R5 and R6 attenuating the output of IC1 and R5 boosting the input impedance.

The component layout should present no problems and the completed board will fit a small box (even a baccy tin!) but can be built into a reasonable sized project box and neatly finished with decent sized knobs etc.

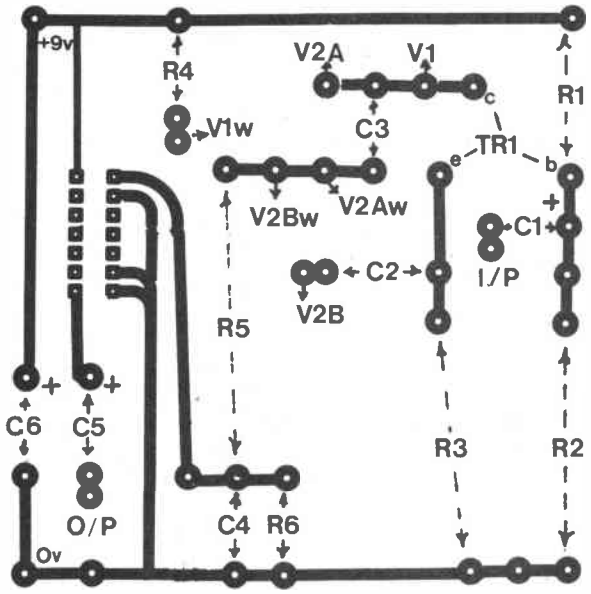
The printed circuit board

The board used was 80mm x 80mm and proved ideal for the job which was just as well as it was the only bit I had at the time! Making a printed circuit board for the first time can be a bit daunting but it is extremely easy once you have tackled the first one.

You can buy an etching kit from your local emporium as I did this time or make up the kit from separates. Anyway, you still need the basics and most made-up kits give you these and a few handy but non-essential accessories. My kit included copper etching fluid (ferric chloride), an etch resistant pen, cleaning pad, etch resist remover, stick-on shapes for circuits, and a 2mm drill bit. This was contained in a plastic box which doubled as an etching dish. Instructions were provided.

Making the board was easier than developing a photographic print although the process is very similar.

The circuit was drawn onto the copper surface using rub-on shapes and I used the same method to label the solder points as a memory aid. After checking the circuit the

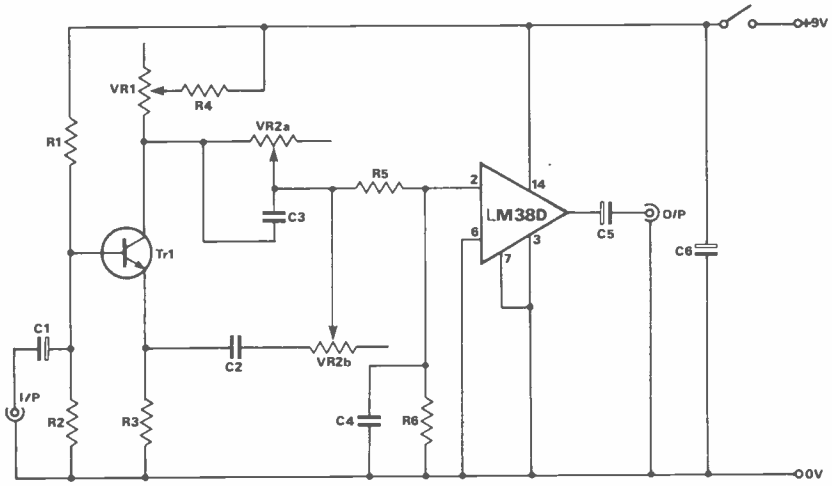


The PCB pattern

board was placed in the etching tray and the ferric chloride added with just sufficient to completely cover the board (about ¼inch). The tray was agitated occasionally and soon the copper began dissolving. The whole of the copper was gone in about 20 minutes leaving a neatly labelled circuit on the board. The rubbed-on circuit and letters were removed using the resist remover.

The next job was to drill the holes in the board with the bit provided in the kit which took about 15 minutes.

One thing to remember when plannng a project is to get all the components together before you start. There's nothing worse than getting half the job done only to find that the local emporium has run out of a part and won't have a delivery for a fortnight. Yes, it happened to me!



The circuit diagram

PARTS LIST

R1	39K
R2	33K
R3	4.7K
R4	1K
R5	1M
R6	100K
All ¼W 5%	
V1	4.7K linear carbon pot
V2	100/100K linear carbon pot
C1	1uF 10V
C2	15nF foil
C3	15nF foil
C4	150pF ceramic
C5	100uF 10V
C6	100uF 10V
IC1	LM 380 N
TR1	BC109

1 x 14 pin dil socket, 1 x SPST miniature toggle switch, PP3 battery connector, 2 x ¼ inch jack plugs and sockets, project box to choice.

Getting down to work

Take all resistors and solder into place. Next solder the capacitors into place taking care to get the polarity correct where necessary. Now solder the 14-pin dil socket into place followed by TR1 making sure that the legs of TR1 are located correctly.

Connect leads between point V1w and the wiper of V1, and point V1 and the track of V1. Repeat this procedure with V2A and V2B. Solder leads between I/P and one of the jack sockets' centre contact and from the screen to the OV line. Also repeat this with the O/P leads. The 9V feed is made via the SPST switch, the negative lead going to the OV point on the board. Finally insert the LM380N into the socket making sure the notch is in the correct position, ie at the top of the board in the diagram.

Your board is now ready to be put into it's box. Mounting the project into a box is straightforward and only requires three holes to be drilled to accept the SPST toggle and the two pots plus one for the headphone socket, although a speaker can be used here if required. The rear panel only requires one hole for the input jack.

Connect the input to the headphone or external speaker socket of your receiver and when you find a heterodyne or other interfering signal close to the signal you are listening for, careful adjustment of the controls of the filter should enable you to notch out the offender.

Well there you are. Simple wasn't it? If you have as much fun building this as I did then I'm sure you will be scouring the magazine for more projects. I'm not going to start a series of projects as others far more experienced in the field than I am have this end of the market well served (so Rev Dobbs et al can breathe a sigh of relief!).

So what have we for you next month? Well, while on sick leave, I've been able to nose around the local retailers looking at what's on offer in the high street for the listener. Meanwhile, *good listening!*

73, Trevor.

SIMPLE COLLINEAR AERIALS FOR THE HF BANDS

by John D Heys, G3BDQ

Collinear aerials are well known and widely used on our VHF bands, and despite some of the rather exaggerated gain claims for certain commercially-made versions they will provide good all-round radiation at lower angles than simple quarter-wave or ⅝-wave verticals. Newcomers to the hobby often do not realise that simple horizontal wire collinears can be easily and cheaply made for use on the HF bands and that such radiators will give useful gain. These antennae do not require towers or rotators and for 14MHz and above will fit easily into the average suburban garden. The writer has built and used two of the designs described and can vouch for their effectiveness.

What is a collinear?

It is hoped that everyone reading this article knows something about the basic half-wave dipole. This aerial is a resonant length of wire, half a wavelength long, and fed usually at its low impedance centre point with 72ohm twin or a coaxial feeder. It can also of course be centre-fed with an open wire line or with 300ohm ribbon when it may be used on just about any frequency from the fundamental upwards (such centre-fed wires were discussed in an earlier article).

Two identical half-wave dipoles are put end-to-end and spaced from each other, by a distance ranging from just the length of an insulator up to about half a wavelength. If they are then fed *in phase* they will both radiate at right angles to the line of the wires (like a dipole), but, they will also exhibit some gain and a narrowing of the horizontal radiation pattern. The gain will depend upon the distance between the ends of each dipole and at best can be about 3dBs.

If space was available for the running out of ten such dipoles and they were all fed in phase, a theoretical gain of about 8dBs could be achieved. This is a very considerable gain but unfortunately the aerial would be very long, be a single band device and would only radiate effectively in two directions. It would be perhaps ideal for the amateur wishing to have long term skeds with a friend in VK or ZL and who had little interest in working in other directions.

The term *in phase* means that each dipole element is oriented the same way and is fed in exactly the same manner. When the RF voltage is swinging positive at, say, the northern end of one dipole, exactly the same thing will be taking place at the northern ends of all the dipoles in the collinear system. With a long wire antenna all the end-to-end half-waves are out of phase and this results in the multiple lobe radiation patterns of such wires.

Two half-waves in phase

The antenna shown in *Figure 1* is the simplest of the collinears. It is just two half-wave wires, each one being end-fed from one wire of a twin open wire feeder. The impedance at the end of a resonant half-wavelength of wire is high (around 5,000ohms), and the feeder must be made of open wire or high quality 300ohm impedance ribbon. Such a feeder may be of almost any length so long as it is not an exact quarter wave long, or a multiple of this length. It must also be used with an ATU to allow proper matching to the transmitter or receiver. Fortunately it is now possible to buy the new BOFA GMP-6 slotted low-loss 300ohm ribbon which originates in Sweden. Such feeder is almost completely weather-proof and at 50MHz has an attenuation of only 2.1dBs per 100 metres. This means that at 14MHz, feed lines some hundreds of feet long would result in almost no power loss. For normal runs of 100 feet or so any losses can be ignored and the feeder will far surpass good coax cable.

Two half-waves in phase when up at a height of at least half a wavelength will provide a gain of just under 2dBs and a bonus (using the antenna illustrated) is that the antenna will also work as a centre fed long wire on the higher frequency bands and of course will be a half-wave on the next lower band. On 28MHz for example, an antenna which has been cut for 14MHz will give results similar to those obtained from an end-fed two wavelengths wire. Usual centre

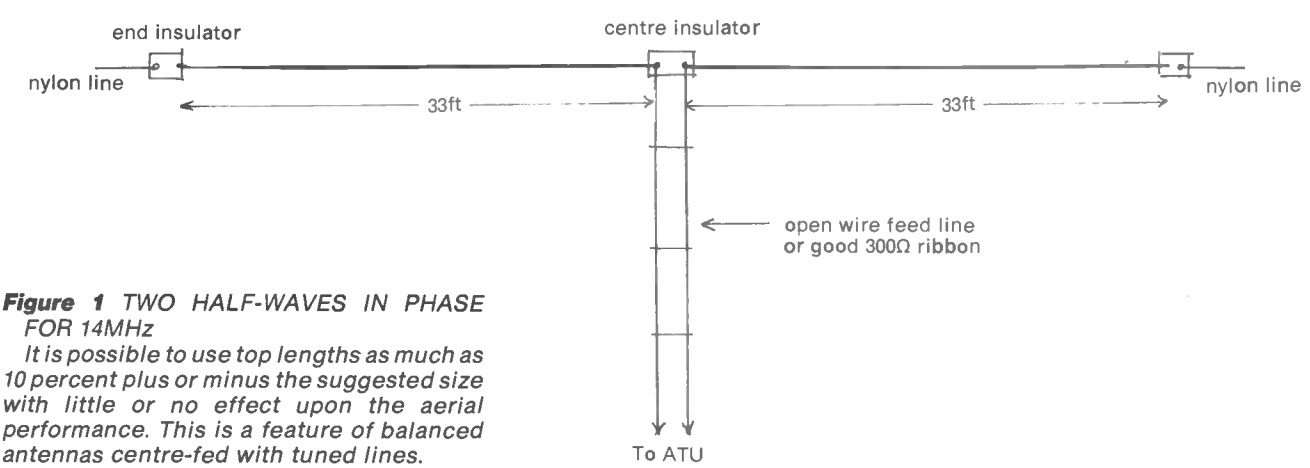


***Figure 1** TWO HALF-WAVES IN PHASE FOR 14MHz*
It is possible to use top lengths as much as 10 percent plus or minus the suggested size with little or no effect upon the aerial performance. This is a feature of balanced antennas centre-fed with tuned lines.

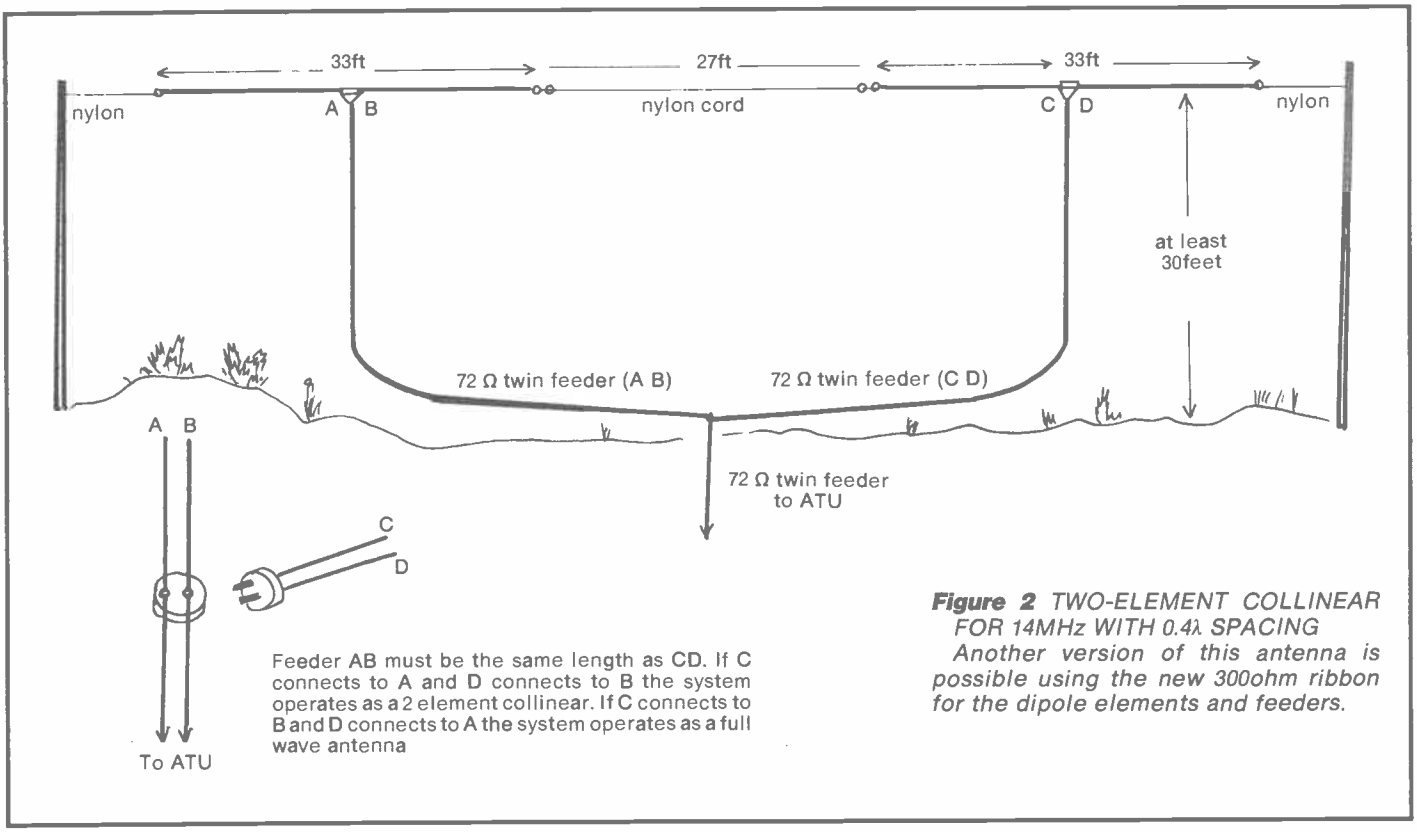


Figure 2 *TWO-ELEMENT COLLINEAR FOR 14MHz WITH 0.4λ SPACING*
Another version of this antenna is possible using the new 300ohm ribbon for the dipole elements and feeders.

feed rules will apply; the feed line must drop away vertically from the top for at least a quarter wavelength on the design frequency and if possible it should not run below one of the 'legs' of the antenna. Imbalance will distort the radiation pattern which might then be slewed from the expected position which is at right angles to the wire. I have used several versions of this simple collinear and they have always given good if not outstanding performances.

Spaced half-waves

In an earlier paragraph it has been mentioned that by spacing the half-wave elements the gain could be upped to about 3dBs, but the problem then is to feed both the wires! One of the first simple 'beam' aerials described in the amateur press before 1940 was a two element collinear with each element being a separate dipole, fed with its own low impedance line. The two feeders in this arrangement *(Figure 2)* must be exactly the same in length, joined at the ATU end so that the voltages and currents in each dipole are equal and in phase. Before the last war, ordinary twisted electric lighting-flex was used for such feeders and surprisingly the antennas worked well; that is, until the weather got to work on the absorbent outer covering of the flex. Coaxial feeder is not suitable for this design and low impedance 72 or 80ohm line is needed.

An end-to-end spacing of just under a half-wave, say 0.4 of a wavelength, will give the most gain; if the feed can be arranged (using a simple two-pin plug and socket arrangement) so that the dipoles can also be fed out of phase, the radiation pattern will then change to that of a full-wave wire with its characteristic four lobes each being about 40 degrees from the run of the wire top. In this way a useful multi-directional aerial can be made, but of course this antenna is strictly a one-band device and cannot be used on any of the harmonic frequencies. This may explain why it is so little used now by amateurs.

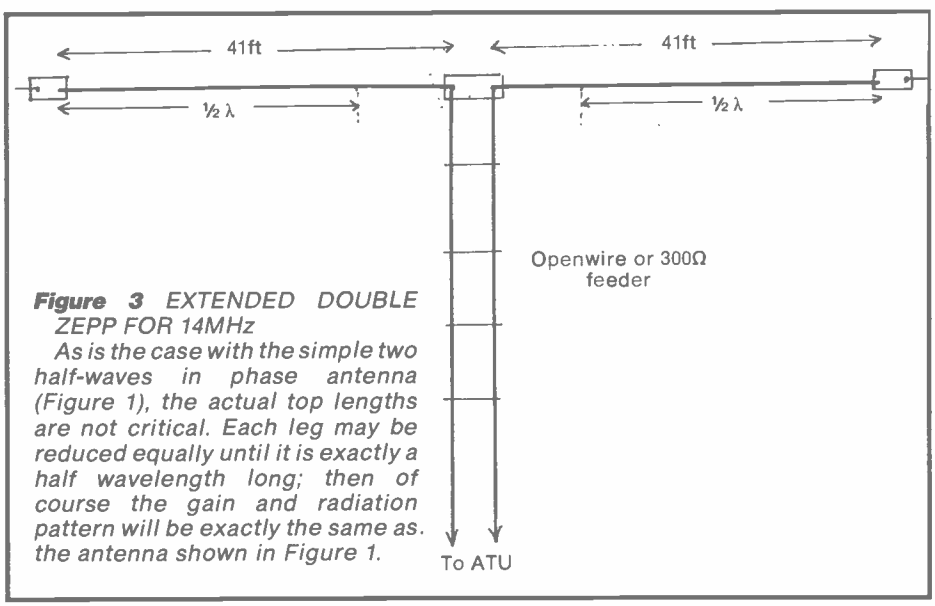


Figure 3 *EXTENDED DOUBLE ZEPP FOR 14MHz*
As is the case with the simple two half-waves in phase antenna (Figure 1), the actual top lengths are not critical. Each leg may be reduced equally until it is exactly a half wavelength long; then of course the gain and radiation pattern will be exactly the same as the antenna shown in Figure 1.

The extended double zepp

Another simple collinear antenna has been a favourite of mine for reasons of simplicity and versatility; this goes under its 'ancient' name of the 'extended double zepp' *(Figure 3)*. At first glance it seems to be just like the centre-fed two-element collinear of *Figure 1*, but an examination of the length of its two top sections shows that they are longer than a half wavelength at the design frequency. Each of the top lengths is arranged to be 0.64 wavelength which means that the two half-waves at their inner ends (actually their inner high voltage points) are separated by 0.28 wavelength. This spacing gives a gain of almost 3dB which is very useful. It means that your 100 watts of RF will behave as if they were 200 watts!

The additional lengths between the half-wave ends and the feeder connection points (the feeder must be open wire or 300ohm ribbon) carry RF currents, which are of opposite phase to the main currents in the two half-wave sections, and give rise to four tiny low powered lobes at about 35 degrees to the run of

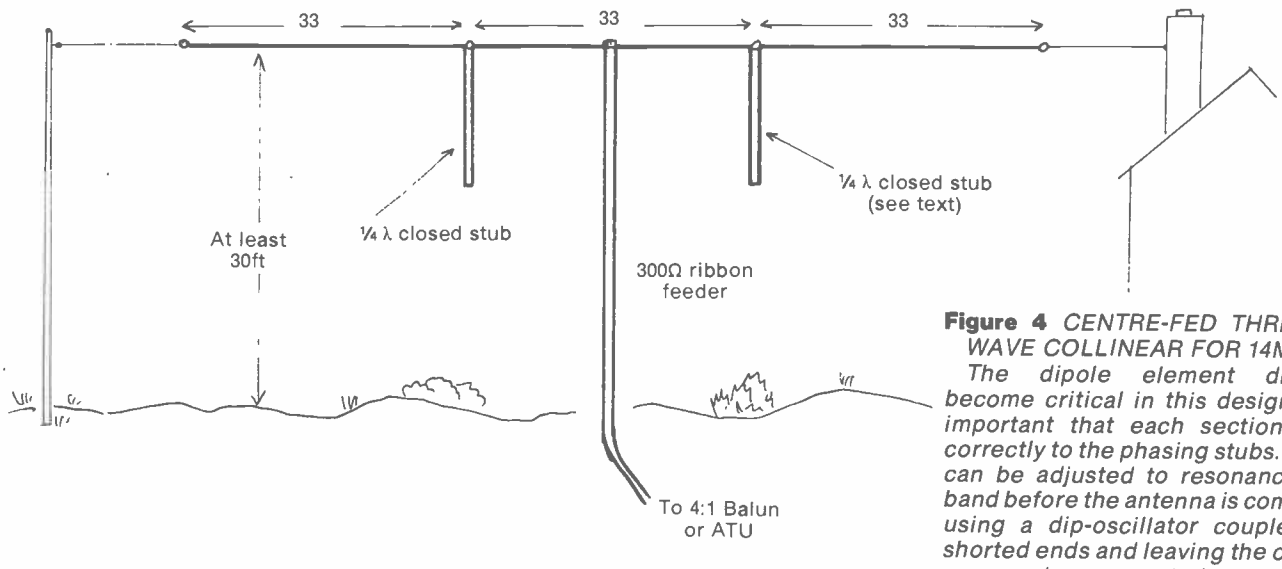


Figure 4 *CENTRE-FED THREE HALF-WAVE COLLINEAR FOR 14MHz*
The dipole element dimensions become critical in this design, for it is important that each section matches correctly to the phasing stubs. The stubs can be adjusted to resonance at mid-band before the antenna is completed by using a dip-oscillator coupled to the shorted ends and leaving the other ends open and unconnected.

the antenna. The gain is of course in the two major lobes which lie at right angles to the wires. For the best results the antenna must be up at least 30 to 40 feet when it is designed for 14MHz, for if lower the radiation will tend to be at high angles and will be useless for DX working.

The extended double zepp, being a centre-fed system can also be used on other frequencies. If cut for 14MHz it will have a total top length of about 82 feet which means that it will be useful on 10MHz (almost two half-waves in phase), and 7MHz (where it is longer than a half-wave), *and* it will give good results on 3.5MHz (although a little short for that particular band).

ATU

An ATU is again essential with this multi-purpose antenna and some experiments with feeder length may be necessary to allow easy matching on all bands. Should the feeder length come out at a quarter-wave or a multiple of this length on any of the bands contemplated the impedance presented to the ATU will be either too high or too low to enable a match; all ATUs have limits at each end of the impedance range and just cannot cope with very low or very high values. Beware of automatic ATUs by the way, for they often have a top impedance limit of about 200 or 300ohms, cannot be used with twin balanced feeders, and are really designed for use with coaxial lines from simple aerials and beams.

For the amateur having a maximum garden length of some 90 to 100 feet, an extended double zepp designed for the 14MHz band will additionally allow operation on all bands, even Top Band if the feeders are strapped and tuned against a good earth system. Such an antenna enabled the working of some quite elusive DX when G3BDQ was living at a QTH with a short garden. The antenna was strung from a chimney stack to a 30 footer fabricated from old iron gas piping clamped to the wall at the far end of the garden!

A three-element collinear

This antenna type has a little more gain than the extended double zepp (about 3.2dB in total) and will be about 100 feet long when cut for 14MHz. It has three half-wave sections all in phase, the middle section being centre fed with 300ohm ribbon feeder. The impedance at the feed point is around 300ohms so the ribbon feeder allows a good match and it means that a 4:1 step down balun in the shack will then provide a convenient unbalanced low impedance connection to the rig with not too much mismatch.

If the antenna is used on other bands outside the design frequency an ATU will be needed, for then the impedance up at the antenna feed point will be anything but 300ohms! Proper phasing is made possible by the use of quarter-wave stubs between the half-wave elements. These may be made from open wire line using the length formula 240/f where 'f' is in MHz and the length is in feet. If 300ohm ribbon is used its velocity factor must be taken into consideration and it will lie between 0.82 for the older type and about 0.87 for the Swedish variety. The given formula must be multiplied by the velocity factor to find the correct length when using other than open wire feeders.

Phasing stubs

The phasing stubs can hang down freely *(Figure 4)*, and these will also add to the total length of the antenna so that it will work quite well (but not as a collinear!) on the lower frequency bands with an ATU at the shack end of the feeder. A three element collinear cut for 14MHz will contain a total wire length of about 160 feet, be rather longer than a half-wave on the 3.5MHz band and could all be contained within the confines of a garden little more than 100 feet in length. The stubs would contribute nothing to the radiation on any band and would not have an adverse effect upon the antenna's performance.

Conclusion

Collinear arrays do not seem to be much in favour at present but I feel that they can offer both useful gain at their design frequency and, in the case of the centre-fed versions, also operate satisfactorily on a wide range of frequencies. Unlike the Yagi beams their element lengths are not at all critical. If they are not cut exactly to length the only detriment will be the radiation from some weak side lobes which may appear together with a small reduction of gain in the preferred directions broadside to the run of the antenna. By using either open wire or 300ohm feeder line matching becomes unimportant at the top and the only concern is to transform the impedance appearing at the bottom of the feeder to the 50ohms or so required for the rig using an ATU.

This winter's outstanding Top Band signals from ZL2BT demonstrate that he must have an effective aerial system for that band. In his letter to me he describes his 1.8MHz antenna which in late 1983 was a two-element collinear slung between a pair of 142 foot towers! He mentioned that he planned a further tower to enable the putting up of another collinear at right angles to the first one. Being a farmer out in the wilds of New Zealand certainly has its advantages where amateur radio is concerned, for few of us here in the UK could run out two 500 foot wires between such huge skyhooks!

In this article there has been an emphasis upon antennae designed for 14MHz. At the present time with poor propagation on the bands higher than 14MHz it is perhaps the best approach, but of course similar collinears may be scaled down for use on 28 or 21MHz or if space and high supports are available, scaled up for 7MHz use.

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1202	CSC-1A	Carrying Case	3.95
1210	MMB-11	Mobile Mount	25.50
1211	NC-11C	Charger	9.50
	FL-2010	2m 10W Linear Amplifier	60
1241	FT-720RU	70cm FM Mobile Transceiver, 10W	219
1242	FT-720RV	2m FM Mobile Transceiver, 10W	189
1217	E-72L	Extension cable, 4m	14.50
1218	S-72S	Switching box	37
1233	FT-208R	VHF Handie FM Transceiver	189
	FT-708R	UHF Handie FM Transceiver	199
1253	NC-8C	Fast Charger for FT-208/708	49
1258	NC-7C	Base Charger for FT-208/708	29
1260	FBA-2	Battery sleeve for NC-7/8	3
1261	MMB-10	Mobile Bracket	7.50
1262	NC-9C	Compact Trickle Charger	8
1263	FT-230R	2m FM Mobile Transceiver, 25W	249
1237	FT-726R	VHF/UHF Multiband, multimode Transceiver c/w 2m	699
1238	430/726	70cm module	239
1239	SAT726	Satellite Unit	90
1259	PA-3	Battery eliminator/charger for 12V	13

MICROPHONES/ACCESSORIES

1208	MH1B8	Hand mic., scanning	14
1214	YM-35	Hand mic., scanning, for FT-1/102/707 series	15.95
1215	YM-36	Noise cancelling mic., 4-pin, 50K	15.95
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1213	QTR-24D	24-hour quartz clock	32
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1219	YH-77	Lightweight headphones	11
1278		Battery Holder for FRG-7	

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1330	TS-930S + ATU	As above, with automatic ATU	1199
1329	SP-930	Speaker and filters	57
1313	MC-60A	Desk Top Microphone, scanning	54
1357	YK-88A1	6kHz AM filter	32
1356	YK-88C1	500Hz CW filter	32
1348	YG-455C-1	500Hz CW filter	75
1349	YG-455CN-1	270Hz CW filter	75
1324	TS-430S	Transceiver, HF, w. gen. cov. receiver	719
1310	PS-430S	DC power supply, de luxe cooled	113
1319	SP-430	External speaker	30.50
1334	FM-430	FM Unit	33.75
1321	MB-430	Mobile Mount	12.50
1322	AT-250	Automatic ATU	280
1313	MC-60A	Desk Top Microphone	54
1320	AT-130	Antenna Tuning Unit	
1354	YK-880	500Hz CW filter	
1315	YK-88CN	250Hz CW filter	36
1352	YK-88SN	1.8kHz SSB filter	
1353	YK-88A	6kHz AM filter	
1314	PS-30	DC PSU	
1326	TS-530S	Transceiver, HF	609
1327	SP-230	External Speaker	45
1325	AT-230	Antenna Tuning Unit	149
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1333	DCK-1	DC Operation Cable Kit	8.26
1332	R-1000	Receiver	299
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1355	YG-455C	500Hz CW filter	
1337	TR-2400	Transceiver, 1.5W FM, 10CH Mem.	195
1301	ST-1	Base Stand	45
1309	MC-30S	Hand Microphone	14
1338	TR-2500	2m FM Transceiver	219
1304	ST-2	Base Stand	52
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1361	BT-1	Manganese Battery Case	6.50
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1305	SC-4	Soft case	14
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1364	TU-35B	Programmable Tone Encoder	
1365	DC-25	DC Adaptor for 12VDC	
1366	RA-4	Rubber Antenna	
1367	RA-3	Telescoping Antenna	
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1339	TR-9130	2m All Mode Transceiver, 25W	419
1372	BP-9A	System Base	
1373	SP-120	External Speaker	
1374	PS-30	DC Power Supply	114
1370	BC-1	AC Adaptor for memory back-up	6.43
1371	MC-46	Touch-tone microphone	41.50
1313	MC-60A	Deluxe Desk Top Mic. + pre-amp.	52
1369	SP-40	Compact Mobile Speaker	
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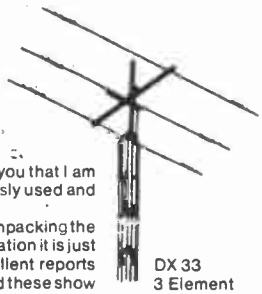

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1081	DX 31	Fipolr 10/15/20m 2Kw p.e.p.	81.65
1082	DX 32	2 element 10/15/20m 2Kw p.e.p.	125.35
1083	DX 33	3 element 10/15/20m 2Kw p.e.p.	182.85
1084	DX 34	4 element 10/15/20m 2Kw p.e.p.	258.45
1085	DX 31/32	Conversion Kit	50.80
1086	DX 32/33	Conversion Kit	63.25
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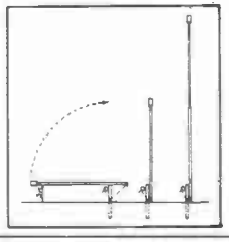

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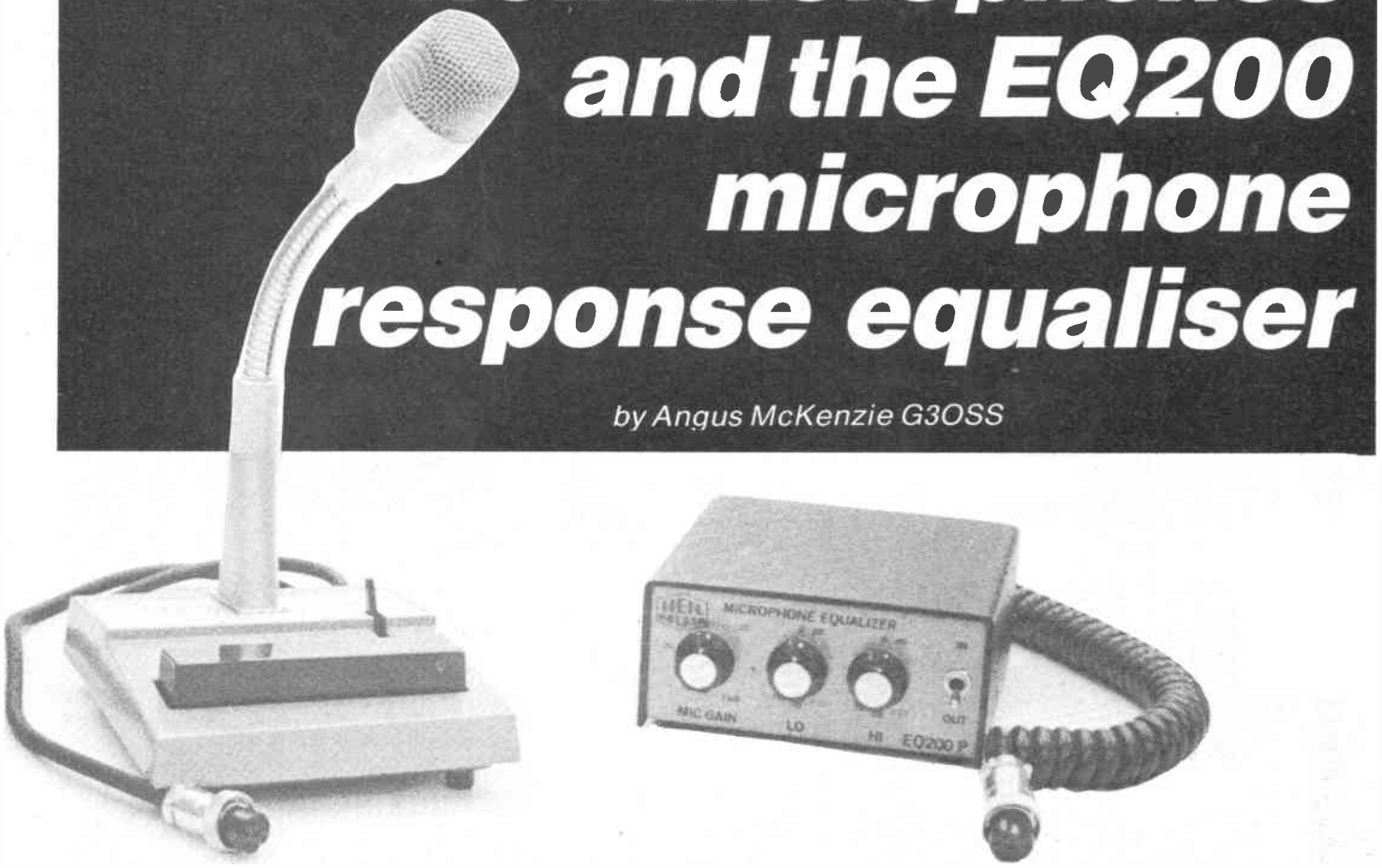
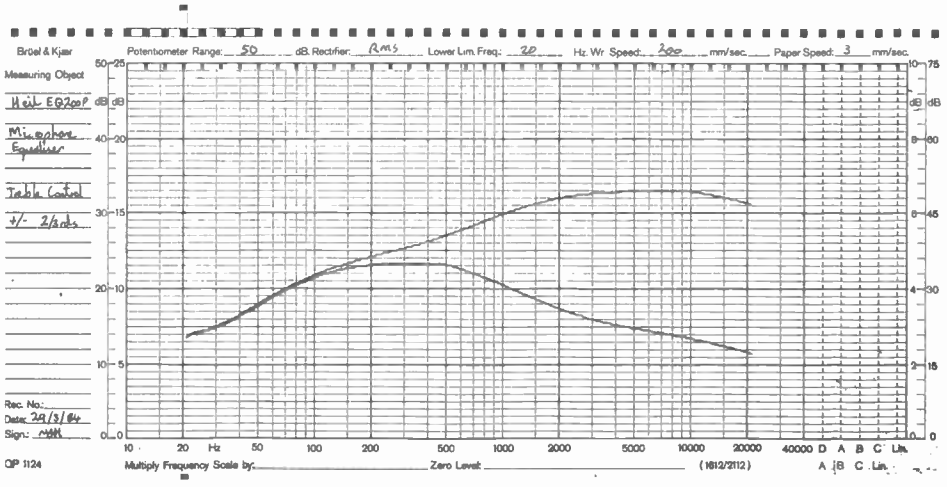
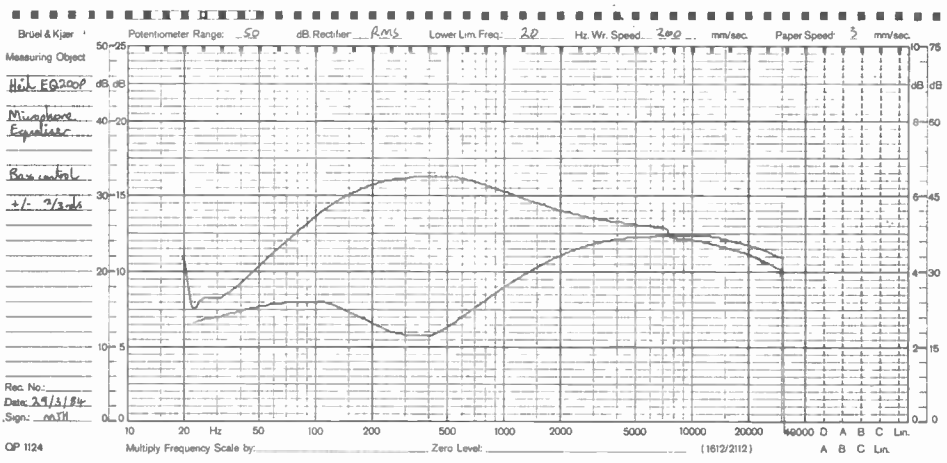
Heil Microphones and the EQ200 microphone response equaliser

by Angus McKenzie G3OSS







I have often written about microphones that have a built-in 'wellington boot' effect, namely, a quality of reproduction which one can imagine might be produced with a respectable microphone at the bottom of the inside of the boot, and the user talking into the top of it! Too many mics supplied gratis with rigs are in this category and Heil Sound, an American company, is one of many who have designed good microphones for use in communication systems which are specifically designed to give optimum readability of a transmitted SSB signal under difficult band conditions.

At the moment, there is only one basic Heil capsule available, with an impedance of around 2000ohms and with a reasonable output level. The capsule can be mounted inside many microphone bodies, so that it can be used to replace a typical wellington boot capsule, especially if you like the old mic's housing. A complete Heil microphone can be supplied with wiring and pin connections for most modern rigs.

The capsule is mounted inside a cylindrical body at the top end of a very well styled goose neck (see photograph). On the table stand at the front is a PTT bar behind which, on the right hand side, is a lever which one can bring forward to lock the system onto transmit. Some rigs require a dc isolating capacitor in the live audio output lead, and this is fitted into the base on request.

We checked the impedance of the

capsule and found it to be 1800ohms with an inductance of 180mH. This source impedance is rather high for some applications, and many rigs have an input impedance, resistively defined at as low as 600ohms, so unfortunately, quite a lot of gain can be lost when the Heil mic is used into a low impedance input. Typically, around 12dB can be thrown away, but most rigs have plenty of mic gain anyway, and so you will just have to use the mic gain control rather higher up than usual. If a rig has a high impedance mic input, then the Heil capsule should deliver plenty of level.

In the specification, a fairly crude response graph shows that there is a 10dB climb in response between around 350Hz and 2.5KHz, but most fascinating is that the response is attenuated very steeply indeed below 300Hz and above 3.1KHz. This will prevent irrelevant frequencies from driving limiters hard, which might otherwise cause 'ducking' of the required transmission frequency band when a sibilant occurs with its main energy outside the transmitted band.

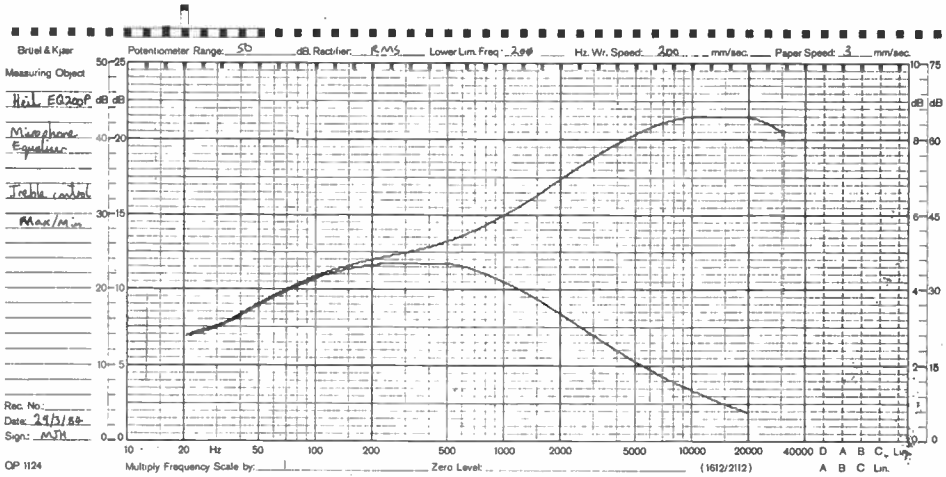
Performance

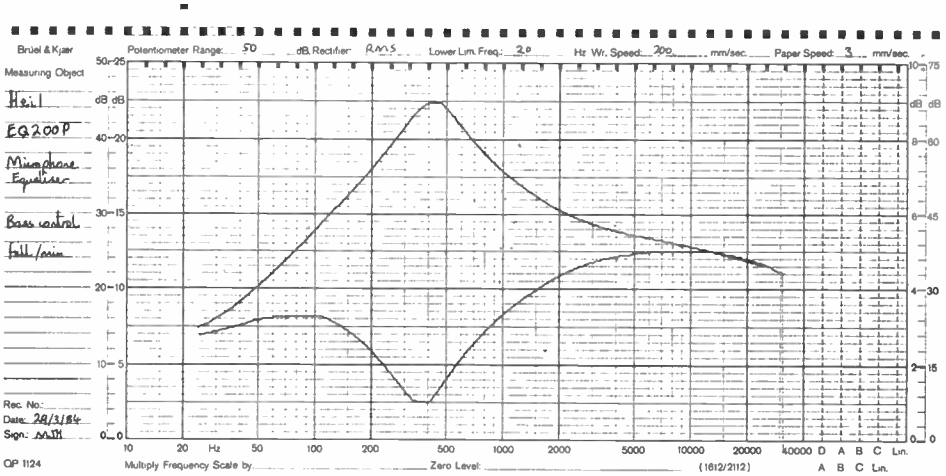
From subjective trials, I can report without question that the Heil microphone into both an FT757 and an Icom751 gave superb intelligibility at the other end, and was particularly impressive when there was a lot of QRM around. However, it has to be stated that the sound quality is not all that pleasant if you are relaxing back and listening to a transmission in which a Heil microphone is being used, for the sound is very toppy indeed, becoming fatiguing after a while.

Thus, there is a conflict of interests between the quality required for DX conditions and that for local working, and the Heil is clearly designed to cut through in cases where a normal mic would give a much less readable signal. I have sometimes criticised mics for having a large peak in the 'presence' region, but the Heil mic shows that such a peak can help intelligibility provided the overall frequency pass band is severely restricted to the range 300Hz to 3KHz.

Heil advise users to speak fairly close to the microphone, perhaps around 1 inch away, but I, myself, do not like to use a mic closer in than around 3 inches, as I don't want others to enjoy listening to my saliva clicks, coughing because I smoke too much and other throat noises well known to pop singers. Please don't eat your Heil mic, as this would be likely to shorten its life!

I highly recommend the Heil system if you want to make other people listen, but it would be as well to have a less toppy one also available for having relaxed local QSOs. The British agents for Heil





HEIL MICS

are Amcomm in Harrow, who have kindly loaned various Heil bits and pieces for review, and they can supply correctly configured mic leads for most rigs on application. They have also mentioned to me that Heil intend to produce a lower impedance version at some time in the future.

The EQ200 mic response equaliser

Amcomm supplied a frequency response equaliser box, the EQ200P, to enable me to fiddle with the tonal balance. The review sample excluded a battery, as Alec Allan made up a lead to permit it to take power from my Icom rig. Two models are available, the review sample having two eight-pin sockets compatible with Icom, and two pre-drilled holes with covers over them to allow for additional jacks to be fitted by the user, if required. There is a small power on/off switch in between the two sockets.

On the front panel are three rotary controls: mic gain, bass and treble. A switch on the right hand side bypasses the unit completely. Underneath the neat little box (measuring 110 x 50 x 115mm) are four small rubber feet to prevent the unit scratching the rig on which it can be resting. The unit is well styled and is housed in a completely screened metal box with easy access inside. An alternative model, the EQ200, has four-pin connectors for use with appropriate rigs, but is otherwise identical.

The equaliser can be used with internal batteries, and a dc12 external power supply is available to permit operation from the mains, independent from the rig itself. We measured the maximum available gain to be 14dB from input to output, although it would be relatively simple to increase this if necessary. Output clipping occurs at 410mV (with 12V dc supply) rising slightly with a higher HT voltage, but collapsing to 160mV with an HT of 7V. You are hardly likely to produce more than a few tens of mV under normal use, unless you really do start shouting!

'If you want to make a Satchmo voice sound like Diana Ross'

We pen-charted some typical responses which can be produced by the unit, and these show the LF control to be centred around 400Hz, having both boost and cut which is fairly broad, whilst HF either shelves up or rolls off (see pen charts). The maximum amount of boost or cut is around 20dB, which does seem rather excessive, but at two thirds up or down, the maximum variation is reduced to +/- 7dB which is a reasonable amount of response variation. The input impedance is stated to be nominally 2K ohms, and this does seem a little low, whilst output impedance is usefully very low at 25ohms or so, rising to 200ohms at LF, and thus suitable for driving almost all modern rigs. The internal circuitry includes integrated circuits in the main audio path, four amplifiers being housed in two separate chips.

Conclusion

In general use, stations reported that they had never heard so much variation available in the tonal balance of a transmission, and I seemed to be able to please everybody! So if you want to make a Satchmo type voice sound like Diana Ross, or vice versa, this equaliser is just the job! It will be most useful for improving the tonal balance on FM rigs that have the wrong pre-emphasis, and the fact that it has available gain makes it even more useful and recommendable.

NEW UHF COAX

A few months ago I had good reason to recable my Discone and SMC advised me that they could now offer a new high grade coax cable which was considerably cheaper than Andrews. Two 25 metre lengths arrived shortly after I placed my order, one being fitted on request with the dreaded PL259s, whilst the second had N-type connectors. We carried out some measurements on the 5121 type cable, and found it to be slightly better than Andrews LDF450 at lower frequencies, while not quite having the Andrews low-loss characteristics above 1GHz. At 29MHz, a 25 metre length had a measured loss of 0.3dB including connectors, at 145MHz 0.73dB, at 433MHz 1.3dB and 1GHz 2.3dB. Above 1GHz the attenuation begins to rise a little more steeply, but nevertheless the cable would be perfectly satisfactory for 23cm, though probably not for 13cm.

The cable has an outside diameter across the outer insulation of 17.0mm. The inner conductor, which is solid copper, is 4.6mm thick, surrounded by a foam dialectric, around which is a solid copper corrugated sheath with plastic insulation outside. The photograph shows the general structure of the cable, after much cutting and finishing! The outer covering is black.

The velocity ratio is 0.82, which is about average for this type of coax. The absolute minimum turning radius for a short turn is around 15cm, but frankly I do not advise such a small radius turn as the copper sheath could become damaged, and the stated normal bending radius is 35cm, which seems more sensible. The cable weighs 358gm per metre, although the spec gives weight per kilometre. (This works out at 3.4 million million tonnes per light year approximately, but loss is not specified for this length). The peak RF voltage allowable is 3.5KV, and the maximum power permissible is 1.1KW at 800MHz, 2.4KW at 200MHz and 5.6KW at 40MHz, which will be just fine for those legendary high power stations in the US. The nominal capacitance is 82pF per metre.

The price at the moment is £2.93 per metre, including VAT. Suitable plugs are cripplingly expensive, ranging from £8.91 for a male N to £9.95 for a female N. The connectors are made by Spinner, a top quality German manufacturer, and Andrews plugs will also fit the cable, but are even more expensive. PL259 type is only available from Andrews, but is normally held in stock at SMC. The cable is manufactured by a Belgian company, Kabelwerk of Eupen.

Other cables are available in the same series, type 5061 having an outside diameter of 9.7mm, with higher losses of course, and a heavier duty type 5161 which is similar to Andrews LDF550, having an outside diameter of 19.8mm. Even thicker versions are available for those with antenna farms a kilometre away from the rig!

I am delighted with the performance of the 25 metre run which feeds my Discone, and I have noticed no deterioration in performance over some months. However, do remember that H100 cable at less than £1 per metre also has quite a low loss, better than UR67, but of course inferior to the 5121 cable.

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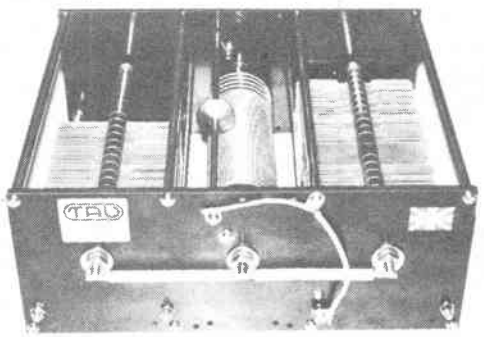

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24cm AMATEUR TV

6 Two constructional projects – the PA concluded and a simple but effective antenna, plus a stripline balun

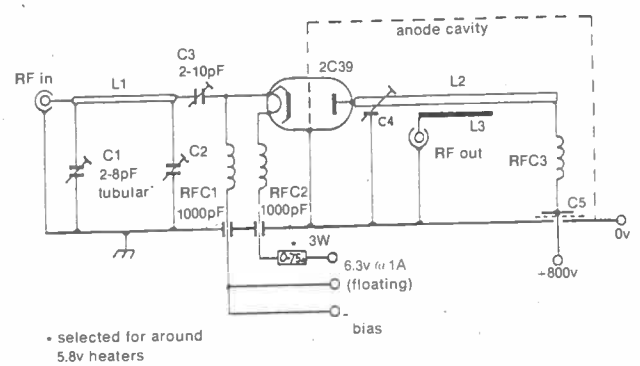
Well, here we are with the concluding part of this little series. Six months further advanced, three repeaters on the air with another couple being built and plans for several more 'boxes'. When I started the series there was just one commercial product specifically for the TVer on 24 centimetres. Six months later at the BATC convention I saw five people's products and no doubt more are to come. So the Fortop pioneers are now joined by Wood & Douglas, Solent Scientific, LMW Electronics and CQ-Centre, which is a good indication of the support 24cm now has.

New from Wood & Douglas is a varactor tripler and bandpass filter to get your 70cm signal up on 24. For 10 watts input you get at least 4 watts out, and the price is £63.95 including VAT. Fortop have a similar product and a matching 20 watt driver, which should poke out at least 10 watts at 24cm. They also have made some of their other products available in kit form and have a new receive system out.

Also making a complete FM receive system is Solent Scientific, who also have a smart 10mW test transmitter for aligning receivers – and checking that they still work after periods of inactivity. LMW has a 'Leicester repeater special' downconverter and a very handy solid-state PA for taking your 2 watts from a TVT 1300 up to 10W – just right for driving a twin-tube PA or perhaps for a repeater. CQ Centre have a downconverter which they misleadingly call the CQ-TV converter, but it is not to the CQ-TV design. Finally a word on the Sandpiper helical antenna: first reports from Rod G8VBC is that it gives about 2dB better results than the F9FT yagi design. VSWR matching appears better and the antenna has the advantage of being very broad band. And now back to the workbench.

PA construction finished off

Drill holes in the cathode compartment walls *(Figure 1)* to accommodate the BNC input socket, C1, C2 and the feedthrough capacitors. The height of L1 should be the same as the cathode flange (about ½in). There are three ways of making the connection to the valve cathode: (a) by using finger stock, (b) by a ¼in wide piece of springy copper or brass bent into a hook which should be a push fit over the cathode or (c) direct soldering to the valve. Whichever method is selected make sure the connection is really good. Solder the



L1. 1in long copper or brass tube. ⅛in dia. (lay across top of C1. C2. not between)
RFC 1,2,3. 7 turns 22swg enam. copper wire on ⅛in former, self-supporting.

Other components – see text.

The circuit diagram

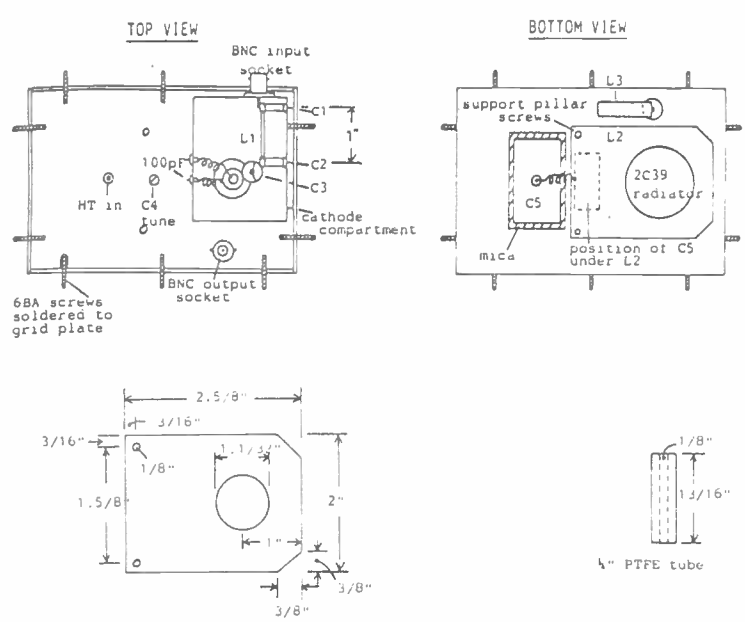


Figure 1 *Grid plate and anode line design*

trimmer C3 (film or Johannsen type) between the junction of L1/C2 and the cathode connector. The heater connection may be made using a small screw or pin that fits snugly inside the heater sleeve. Make sure that the connection is not too tight or the valve may be damaged.

Cut out L2 and drill the holes to the pattern in *Figure 1.* Mount the fingering and solder into place. The material chosen for the L2 support pillars is most important. PTFE is by far the best but other possibilities are glass or ceramic. Other materials could be lossy or affected by heat.

A piece of mica should be glued to the underside of L2 to provide insulation from the tuning capacitor C4 *(Figure 2)*. Remember the anode line will get quite warm, so a suitable glue should be used (try a contact adhesive rather than a 'superglue'). The pillars should be fixed using four BA or self-tapping screws not longer than ¼in or so.

C4 is made according to *Figure 3.* A nylon screw was used in the first unit but brass or steel makes a sturdier job and allows a drive to be attached for front panel tuning. The metal end of a glass cartridge fuse is soldered to the underside of the capacitor. The screw then fits inside this and cannot escape or bend while the capacitor is being operated.

Mica insulation is used in three places, detailed in *Figure 2* . The thickness required is approximately 0.010in and a suitable supply may be found in electric iron or toaster elements. These are more easily obtainable than the PTFE sheet normally specified and should be easier to glue. The mica used for C5 should be at least 3/16in larger than the C5 plate, this ensuring that the high voltage does not track between the plate edges and the cavity body.

Note that the circuit diagram shows the value of the feedthrough capacitors as 1000pF; this is for FM. On AM and SSB these feedthroughs should be reduced to 100pF.

The position of the grid tray has been found to be not too critical since there is a considerable capacity swing with C4.

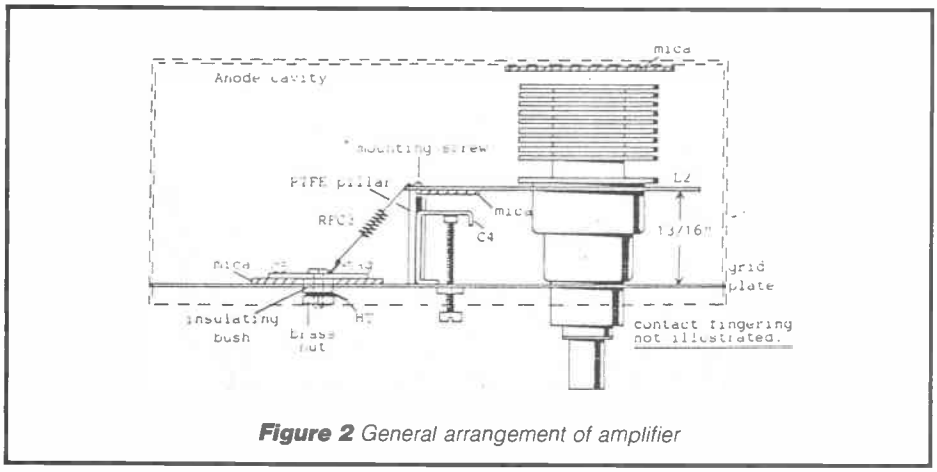


Figure 2 *General arrangement of amplifier*

This wide range effectively compensates for variations in cavity size. It should be borne in mind, however, that resonance should not be obtained at either extreme of C4, otherwise retuning to a different frequency may not be very easy.

It will be found beneficial to totally enclose the cathode tuned circuit department; this will reduce radiation from L1 and ensure that most of the drive power goes where you want it – into the valve! A lid may be bent from thin sheet brass, copper or tinplate. The lid should be a push fit over the outside of the compartment. A hole should be drilled in the lid to allow access to C3 and several ⅛in holes should also be drilled to allow a reasonable passage of air.

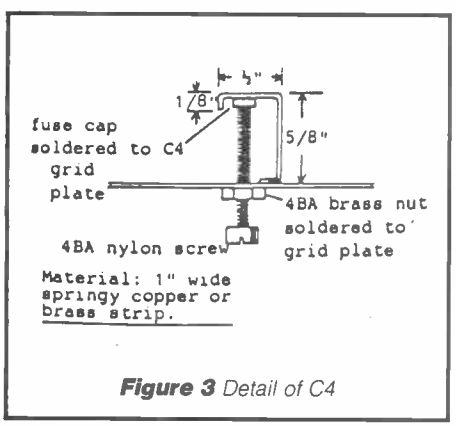


Figure 3 *Detail of C4*

Variable bias supply

So long as the amplifier is not being directly modulated (AM), a variable bias supply can be fitted. This will enable the output power to be controlled from virtually nil to the maximum available. A circuit is shown in *Figure 4;* the power transistor should be a 2N3055 and mounted on an insulated heatsink. The 1K control pot may be brought out to the front panel. Although no metering is shown on the circuit, a 250mA panel-meter in the anode supply rail is essential for monitoring operation.

Alignment

You will need the following equipment:

-RF power meter

-HT current and volt meters

-Dummy load (50ohm resistive) or aerial

-RF demodulator probe and oscilloscope (only for AM/SSB).

A preliminary alignment can be made first without HT applied. This will enable the resonant point of the cavity to be ascertained without harming the valve.

Adjust the grid plate to the maximum depth available and tighten the securing nuts. Set L3 *(Figure 5)* to a position parallel to L2 *(Figure 1),* and tighten up the locknut. Connect a throughline power meter between the drive source and the PA input, apply 1W or 2W drive and adjust C1 and C2 for maximum

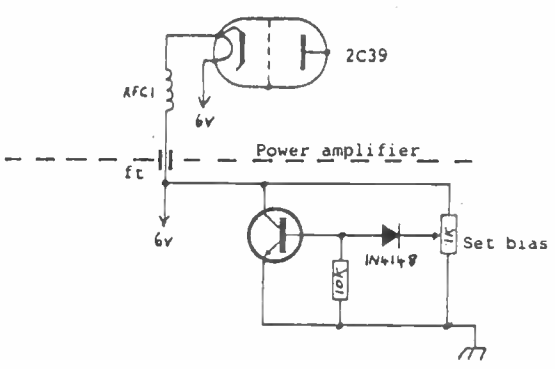


Figure 4 *Variable bias supply*

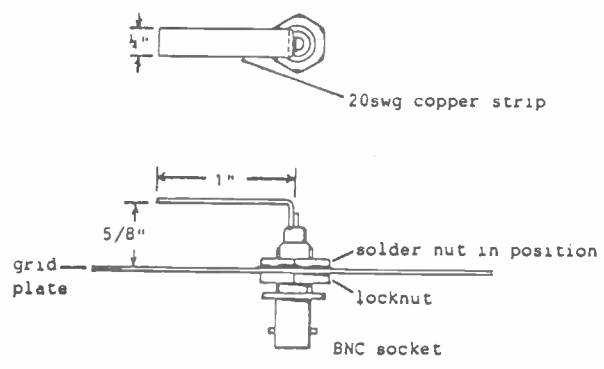


Figure 5 *Detail of L3*

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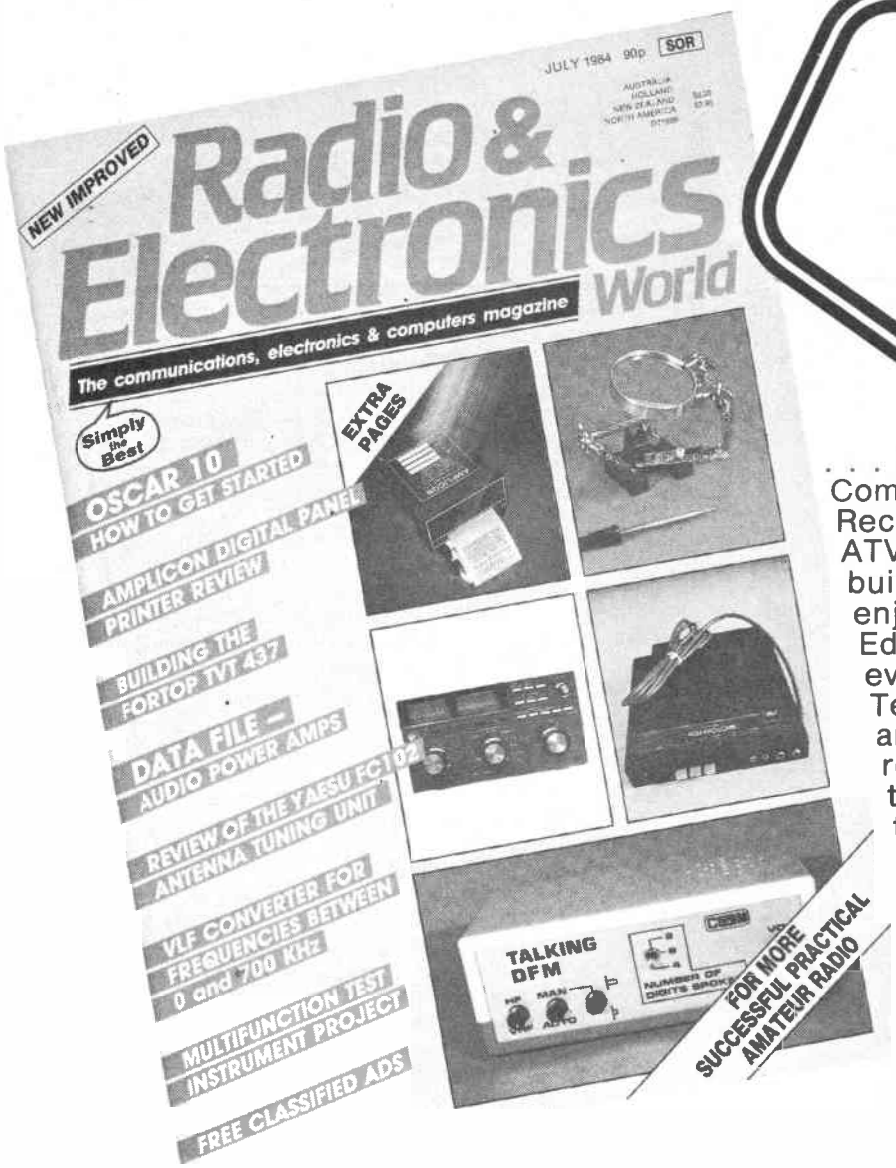

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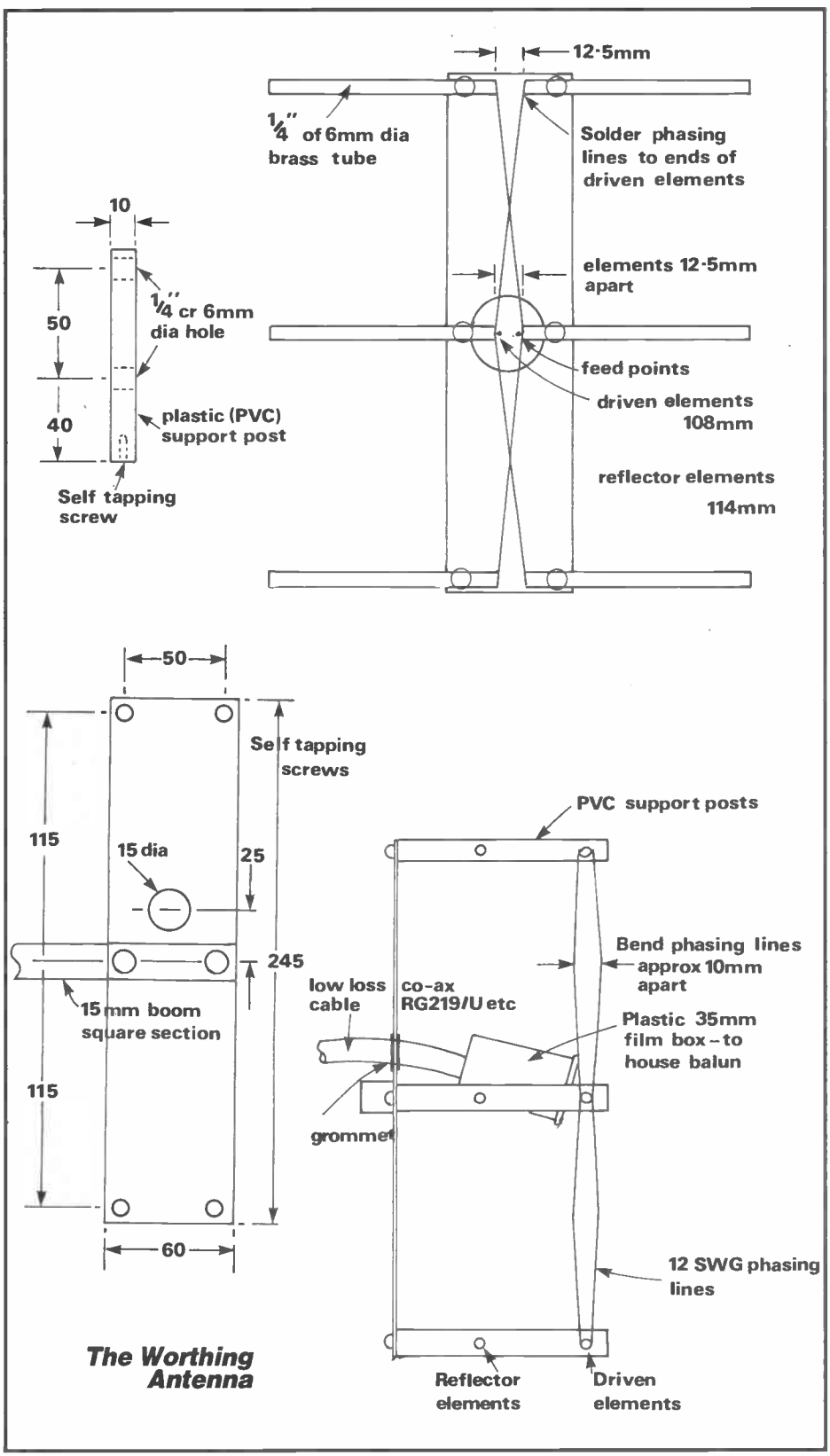
forward power and minimum reflected. This is critical to protect the drive source against bad VSWR.

Switch off drive source, remove power meter and connect the drive directly to the amplifier.

Connect the power meter between the dummy load (or aerial) and the amplifier output, then switch on the blower and heaters. Allow one full minute to warm up, connect 50 percent of the anode voltage and adjust the bias for 100-110mA anode current. Adjust C3 and C4 for power out, then alter L3 for maximum output. Switch off and move the position of the grid plate a few millimetres, switch on and repeat the previous procedure until the greatest power output is achieved, indicating resonance of the cavity. Finally apply full HT voltage and repeat the tune-up procedure. Try to obtain maximum output power with minimum current consumption.

Please note: For linear operation – AM and SSB – the procedure is somewhat different. See the BATCs magazine CQ-TV issue 119, August 1982, for details.



The Worthing Antenna

Notes

Adequate cooling is essential. The 2C39 has an anode dissipation of around 100W when forced air-cooled but only about 10W without. The valve will almost certainly be destroyed if cooling is interrupted. Ensure that the cooling is switched on together with the PTT; it is not essential during receive. Heater voltage should be kept at 5.8V or less; a full 6.3V will cook the valve to a premature death.

When adjusting L3 *make sure* you do not move the probe too close to the valve lest it touch and short out the HT. For this reason it is best to switch off the supply, move the probe and tighten up the locknut before switching the amplifier back on.

Please note the following safety aspects when operating the amplifier:

1. Do not look down any gaps between the grid plate and cavity wall.
2. Do not look into the air vent output.
3. Avoid accidental contact with the HT by ensuring that all connections are adequately covered.
4. Ensure there is a bleed resistor across the PSU capacitors to discharge them after the mains is switched off.
5. Fuse the HT at 250mA; an open (cartype) fuse with real fuse wire is best. The wire in glass tubular types can be atomised on the inside of the glass and continue to conduct (actual case history).

The PA should give you efficient and reliable service. Due to the heat generated by the valve slight expansion of the cavity parts will cause a small drift in tuning during the first few minutes of operation, requiring slight adjustment of C4. Provided the cooling is adequate, power output remains unchanged after well over an hour's soak test at full power.

The 'Worthing' antenna

For 24cm ATV work we need an antenna with broad bandwidth, ideally sufficient to cover the whole band from 1240 to 1325MHz with equal efficiency. Here is a design which does just that, and is easily reproducible to boot! The design comes from the Worthing ATV repeater group and I am grateful to Nick G4JEI, Roy G4WTV and Martin G8KOE for permission to reprint details of their handiwork.

The type of antenna in question goes under several names, including horizontal collinear and broadside array. The design goes back to the earlier days of UHF – many of the wartime radar sets used it. It has broad bandwidth and none of the dimensions are critical; the beamwidth is not very sharp but that may

not be a major disadvantage when searching for signals. Although the basic design is old, this antenna has a novel balun transformer which uses stripline technology. It was demonstrated at the 1983 Brighton Rally, and Roy has already worked Paris with just 4 watts and this antenna. So it must be good!

Theory

The antenna comprises six half-wavelength elements mounted before the same number of reflectors. The construction, dimensions and materials are shown in the main diagram. The three pairs of elements are end-fed at high impedance and are connected crosswise with the aid of 1.5mm (16SWG) silver-plated copper wire as shown.

Since the impedance of each individual half-wave element amounts to approximately 600/700ohms with this ratio of element thickness to length, an impedance of approximately 200/240ohms will be present after interconnecting all three pairs of elements. The balanced 200/240ohms is then transformed to an unbalanced 50/60ohms in a 4:1 balun transformer. The balun transformer is connected to the centre pair of elements and is built up using stripline technology as described below.

Stripline balun transformer

Normally, a balun transformer consists of an electrical half-wave length of coaxial cable. Since such a cable for 24cm would be only 8 to 9cm long according to the dielectric used, difficulties would be encountered using conventional cables, since it is not possible to bend them in a loop. This means that very thin cables would have to be used, and only cables with Teflon (PTFE) dielectric would provide adequate stability and low attenuation characteristics. In order to avoid these difficulties, G8KOE and G4JEI developed the described stripline balun for use with the antenna. The printed circuit board of the balun is shown here; it possesses a U-shaped half-wave 50ohm stripline. Connection to the centre elements is made with short pieces of 1.5mm diameter silver-plated copper wire. The striplines shown with their width of 2.5mm are designed for use with an epoxy glass fibre material with r=5 and a thickness of 1.5mm. The diagram shows how the low-loss coaxial cable should be connected to the balun.

Tests made by G8KOE and G4JEI showed the antenna to have a gain of approximately 10dB over a reference dipole and a horizontal beamwidth (-3dB) of 60 degrees. The reflection factor of the aerial when using the stripline balun was acceptable over the whole of the 23 and 24cm amateur band.

Conclusions

Since the bandwidth of the antenna is greater than that of the 24cm amateur band it is extremely suitable for ATV use. Antennae of this design have been in use in Worthing and Brighton for some time now, and transmissions at 1255 and 1318MHz between Worthing and Brighton with power levels of 10W into a varactor multiplier give a result of P5 pictures. In addition the antenna has enabled G4WTV to receive P4 pictures from Paris (F3YX) and P3 from Le Havre (F3LP). In comparison with a conventional yagi antenna (22 element F9FT design) the picture grade is P1 to P1.5 less, but the yagi does not possess the broad bandwidth.

Envoi

And so we come to the end of this series of articles. I hope it will inspire new activity and experimentation, as well as greater occupancy of our (shared) band. We have already seen the 70cm band reduced by two-thirds and a smaller 'depredation' of the 25cm band. Use it or lose it! FM and repeaters are a challenge – just the thing to get your teeth into... and the results are all the more rewarding. See you on 24!

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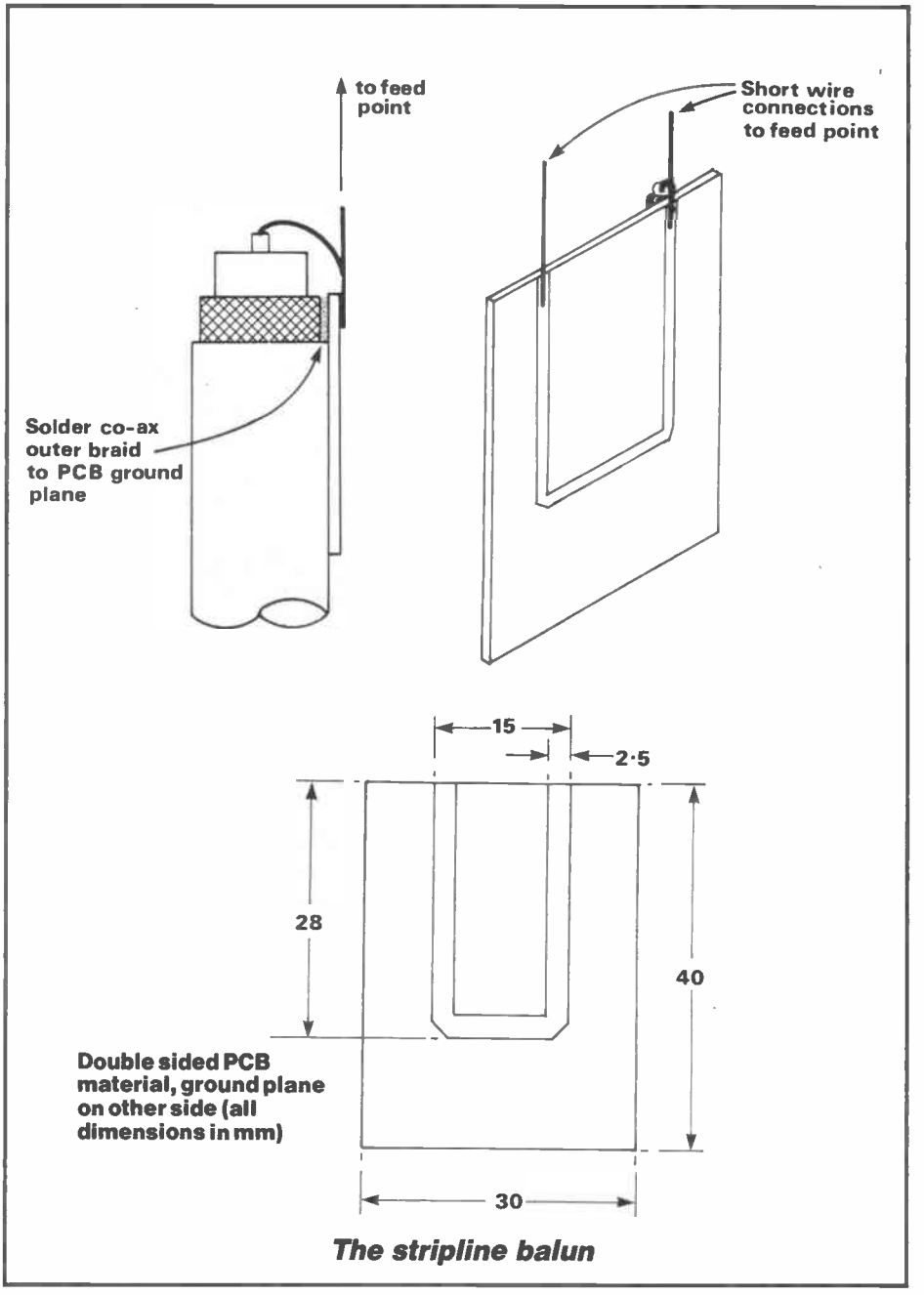

The stripline balun

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■Thandar 600 MHz divide by ten, prescaler, £22. Datong mobile doppler direction finding equipment, £95. Fincher, 27 Albert Street, Tring, Herts HP23 6AX. Tel: Tring 6752.

■E K Cole EKCO radio, all electric circular design, 3 wave bands, long, medium, short waves, bakelite case, tunes like a clock, dial illuminated, tuning finger moves all round dial. Vintage 1937. Good condition for its age. Best offer accepted or exchange for good, modern, short wave radio 0-30MHz. I B Eccles, 137 Appletrees, Barhill, Cambridge CB3 85P. Tel: Crafts Hill 81004.

■Lafayette HA380 ham bands receiver, in mint condition, £50. Or will exchange for 2 metre receiver. Douglas Scott, 114 Rowan Avenue, Dist, 13, Harraton, Washington, NE38 9AQ. Tel: 091 4178840.

■Oscilloscope dc to 8MHz. Micronta 9501 with probe, original box etc. As new, sell £40 or swap for almost any Bird element for Bird 43 meter. Scope tube 3BP1, £5. Homebrew 100W 2m linear, using QQV0640 A built in mains PSU, switching built into a large 19in box. Needs 2-3W drive. Move to QRO for £50, or swap for Bird element. Buyer must collect all items. Dave Kirkby G8WRB, 54 Ringwood Road, Walthamstow, London E17 8PP. Tel: 01-521 0727.

■Audio mixer, Chilton 10 in, 2 out. Suit amateur recordist, £150. Lots of goodies for mixer. Amstrad 901 with K40 speech processor mic, Yaesu LP filter and dipole £40. Fender Jazz Bass with HH100 Bass amp and 250W 2 x 15 CAB. Immaculate sound, no split, £450. G6ZEL. Tel: (Romford) 01-599 2541.

■ZX81 with 16K ram, leads, manual and some tapes. Offers. Possible exchange for Pye PF1 Rx/Tx RBO/Simplex freqs. wkg. 34, Cornbury Crescent, Downhead Park, Milton Keynes, MK15 9AS.

■Solid state WD SSB adaptor for B40, B41, £50 or swap for receiver AP 100335 WHY. Brian. Tel: 01-736 4656 (days) 01-736 6581 (evenings).

■Daiwa search 9, two metre FM receiver. VFO for 144 to 146 MHz. Xtal for UoSAT. Two months use only, as new, in box, £35. G1ERM. Tel: 0297 33068 (evenings).

■Yaesu FC902, ant. tuner, mint, boxed £75. Yaesu SP901 speaker £20. Yaesu YP150Z dummy load /watt meter, £65. Drae 6 amp PSU £30. Yaesu FT902DM HF trans, vgc, £550. Trio TS530S HF trans, £425. Yaesu FT101E HF trans, 160m to 10m mic etc, boxed £280 ono. Realistic DX200 G/C receiver, £60 ono. Tel: 0305 786930.

■DX-200 communication receiver, 150KHz to 30MHz, SSB, AM, CW, original packaging, perfect condition, £85. Also FDK multi 700AX 2m transceiver, 25W, 144-148MHz, original packaging, perfect condition, £125. Jon, 17 Lakeside, North Oxford, Oxon, OX2 8JF. Tel: Oxford 50245.

■Drake TR7 Tx/Rx. gen coverage Rx. TS7 PSU, vgc, £575. Icom 271E multi-mode 2 metre base rig, 25W, hardly used, £450. Consider exchange either or both rigs for BBC 2 Micro and disc drives, monitor etc. RTTY micro based converter required, also BBC 2 RTTY software (ROM). G4ULQ Bournemouth. Tel: 0202 875065 (evenings or weekends).

■Trio R300 receiver, no mods, manual, £90. Call after 4.30pm please. C Jones, 58 Bryn Yorkin, Caergwrle, Wrexham, Clwyd LL12 9HY.

■Yaesu FT501, classic HF rig, 560 watts PEP input, digital display, hard to part with, but bought HF mobile. Also PW speech processor Europa transverter for 2m 80 watts plus, all for £295, or would split. Also Heathkit Mohican communications receiver in carrying case, £40. John G4HMG. Tel: Iver 0753 651652.

■Icom 240 transceiver with scanner SS-240, manual, mag mount antenna and power supply included, £100. Tel: 01-693 8375.

■FRV7700 D converter, mint condition 118 130 MHz, 140 150 MHz, 70 80 MHz, £50. M I Gill, The Cottage, Barrowell Green, London N21 3AU. Tel: 01-886 9363 (evenings).

■Icom R70 Rx, very little use, mint, £400 ono. Or exchange for Yaesu FT77S or Tem Tec Argonaught. Cash adjustment. Stampton, 88 Wilberforce Way, Gravesend, Kent DA12 5DH.

■Exchange IC4E 70cms hand-held, as new, for HF communications receiver of same value. Sid Frisby. Tel: 0603 748570 (home) or 0603 667892 (work).

■Yaesu FT200, FP200, HF TRX. In excellent condition £240 ono. Ham Master 4500, base mic, £25. Tel: Abergavenny 0873 7141.

■Wood and Douglas 2m Tx (boxed). NR56 2m Rx, both working on four channels, £25 each. Tel: 021 350 0248.

■IC RM3 computerised remote controller. IC EX2 marker extension terminal, £75. Post extra. Tel: 0202 579115 (anytime).

■DX-100L general coverage Rx with manual £35. Sony TC-377 reel to reel three speed, three head four track tapedeck with mike atten facility etc, with manual, £185 ovno. Buyer/s collect from West Herts. QTH. Tel: 0442 45649 (weekday evenings only).

■Bremi BRL200 RF linear amplifier 200W SSB 100W FM output little used and in good condition, £55, plus carriage, ono. Also Harvard 402MPA FM CB almost new, £18. Tel: Garsington 475 (evenings).

■QRO? Lack of use means sale of linear. Easily 'legal' limit 80m-10m. New tubes (cost £130) hardly used, spare PA tube available. Any offers? Datong ASP checked by Datong, £60. DNT M40 for 29MHz, £30. Does anyone want collection of modern (1950→) 45's? Offers. Old radio mags to clear. TS 130V 10m tuned 30W PA £15. Martyn Bolt, 112 Leeds Road, Mirfield, Yorks WF14 0JE. Tel: 0924 495916.

■Icom 720A general coverage Tx/Rx with PS15 power supply, approximately 2 years old. Both units in very good condition. Used receiver only with standard acc/s, £550 ono. Buyer collects. Tel: 01-808 2606 (after 5.30pm weekdays).

■FT200 HF trans with mic and PSU, £175. AR88 Rec, £40. Peter G1AAC. Tel: Sheffield 0742 372051.

■FT200 Yaesu HF transceiver FP200 PSO speaker, 80-10 mtrs. All xtals fitted, £180. Buyer collects. Tel: Hexham 602830.

■Ni-Cad re-chargeable batteries 'C' cells. Have fair quantity available. Pack of six, £2.50. Now unwanted. For shack, not trade. All new, by Ever Ready, Have been stored only. Now surplus to requirements. John G1DLD. Tel: Telford 583637.

■TS430S, five months old with filters and FM. PS30 ATU FC707 Hyrchman rotator with inch half poles, also service manual, cost £1,148, will accept £900 ono. All in first class order with boxes. Can deliver within 30 miles of Bournmouth. Tel: 0202 826358 (evenings).

■FL100B, FR100B, spare valves, manuals and speaker. All in good working order, £170 ono. G4UOR QTHR. Tel: 0392 663120.

■Commodore 64 with PSU Datacassete Joystick, 2 games plus introduction to basic part one. Still under warranty. Mint condition £175, plus users handbook. P Cole. Tel: 0272 632400 (after 2.00pm).

■Quad valve stereo amplifiers in excellent condition, comprising: quad 22 control unit and 2 quad II amplifiers, with original manual, £110. 64 Sherbourne Road, Blackpool. Tel: 25177.

■Yaesu FRG 7700 communications receiver with memories. Plus FRT 7700 ATU and FRV VHF (C) converter. 140-170MHz. Practically unused, £350 ovno. Buyer to collect. Tel: Deal (Kent) 368284.

■Datong ANL auto notch filter, excellent condition, £40. Datong Active Antenna, £50. Angela. Tel: 01-319 2035.

■Few HRO's, S20R, S27, 1132, B44, some other military sets, headphones, crystals, accessories. John. Tel: 01-794 0823.

■Realistic DX-302 receiver 10KHz-30MHz digital read-out. Global AT1000 ATU, both boxed and in excellent condition, £170, or swap for 70cm hand-held Tx/Rx, scanner or WHY?. Tel: Oxford 0865 66075.

■Ham Int Jumbo UK spec, immaculate condition, bargain, £165. Also Protel stand mike, graphic equaliser, compressor etc. Model AM6000 used once, mint, £45. Sell both equipment together, £195. Both 1 year old and boxed. Tel: Seaton 22115 (evenings).

■Bearcat 220 scanning receiver VHF/UHF mains 12V, £125. G8RHU. Tel: 0273 516801.

■Marconi vintage radio/transmitter plus microphone, Phillips battery reel to reel tape recorder, Eagle capacitor clip on microphone.

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other bits and pieces, all for £60. Buyer collects. Joseph Earley, 3 Whitworth Terrace, Drumcondra, Dublin 3, Eire.

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■Yaesu FRT7700 ATU, 500KHz filter, Ham Int'nl MM II. Convert to ten?? Offers. Eddie Green. Tel: 01-445 0528 (evenings or weekends).

■Drake TR7, the complete matching system, worth over two thousand pounds, comprising fan cooled rig, PSU, synthesised VFO, tuning network, processor, speaker, mike and workshop manual with original packing boxes, £995. Dave G4RSR, QTHR. Tel: Yateley 0252 873792.

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■SX200N scanner with power supply, in excellent condition. £200 ONO. John. Tel: 01 688 8502 (after 6.00pm, weekdays)

■Icom IC255E 2m FM, mobile bracket. Scanning mic, five memory or band scan, low/high power (1/25W), LED freq display 5/25KHz channels. £170 ONO. C J Crook G6AFY, 19 Rylands Road, Kennington, Ashford, Kent TN24 9LH. Tel: 0233 24885

■Trio 9R-59D good condition with manual. £45 ONO. Army set Rx Tx No 19 MkII with instruction manual. £25 ONO. Taylor. Tel: 01 564 2652 (after 5.30pm)

■Yaesu FT227RB. Mint condition, with all accessories. Not used mobile. £130 plus postage. Television Panasonic 5in TR5030G. VHF/UHF 625 lines, 5.5/6MHz sound. Internal or external 9V battery. Mains pack included, very small, good DXer. £50 plus postage. Yaesu FRG7700 with FRT7700, no memory fitted, mint. First class Rx and tuner. £250 plus postage. G4I0T QTH/R. Tel: Folkestone 76063

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■Johnson 40 channel CB radio plus Eurosonic power supply and SWR meter. Plus Alcomm legal home base antenna. £60 ONO for the lot. P Wyeth, 44 Grovelands, West Moseley, Surrey KT8 0ED. Tel: 01 941 2942

■Pye Westminster radio Tx/Rx W15 AM Tx on 71-8875 Rx on 85-3875. Working order. Any offers or will swap for rotator. Suitable for small beam. Peter Penycate, 42 Carnoustie, Bracknell, Berks RG12 4ZW

■Trio 9R 59DS gen. Rx SSKM-30MHz vgc. Sell £60 ONO. Swap for Drake 2B or AR88. Tel: 061 653 1297

■Harvard H407 FM CB home base, can also be used mobile. Lead supplied. £60 ONO. Radio and TV servicing manuals 1967 to 1972 (5 vols) £20 ONO. Keith Gudgin G1FTQ, 70 Southdrift Way, Luton, Beds LU1 5PY. Tel: (Luton) 0582 21396

■Trio R820, ham band general coverage digital VBT, notch IF shift, four filters transceves with TS820. The ultimate receiver cost over £600, mint condition. £375. Trio TS700 2 metre multi mode VFO 22 xtl positions fitted all xtls. Mint. £265 complete with mike and SWR meter. Yaesu FRG7700 com receiver new, boxed and unused. £275 all. Buyer collects. L H B Huntley G4LW QTHR, 118 Bradford Road, Trowbridge, Wilts BA14 9AR. Tel: Trowbridge 3166

■7 Tektronix plug-in scope modules, 2 VHF transceivers BC624A/BC625AM, transmitter T1154, transmitter BC788-D No 22 set, 4 No 19 sets, 2 No 18 sets, No 4A mine detector, pair field telephones, dynamotor, GSR radio link-out station etc. Please send SAE for full list. W Loach, 30 Avenue Road, Wellingborough, Northants NN8 4EP.

■Realistic DX200 communications receiver 0.15-30MHz AM/SSB. Very good condition, boxed. Buyer collects. £60. S Mulligan, 196 Twist Lane, Leigh. Tel: Leigh 674503

■York JCB 8G1 mobile FM CB transceiver, complete with instruction manual, aerial, SWR meter and books about CB. £30. Buyer collects or pay carriage please. Tim Boorman GW1FBL, 109 Saunders Way, Sketty, Swansea SA2 8BH. Tel: Swansea 0792 201565 (evenings)

■Communications receiver, Kenwood R600, Code Master 610E RTTY CW decoder and Morse Tutor, Pye Rambler portable TV, all six months old, in mint condition with original instructions and packaging. Bargain at £400 OVNO. Tel: 01 203 3577 (not Fridays)

■FT480, hardly used. £280. Also FT707 with mobile bracket and fist mike. £380. Both boxed, complete with manuals. Jim. Tel: Ashtead (Surrey) 74558

■Yaesu FRG 7000 comm'n receiver, mint condition. £165 ONO. GW6YEZ. Tel: 0633 852013 (after 6.00pm)

■Maxcom 6E plus power supply. Good condition. 40 channel squelch, RF gain, S/RF meter, hi/lo output, Tx indicator lights, 5 tone bleep instead of a channel 9 switch. £20-£25. First come, first served. Highest price. Matt. Tel: 0252 24208

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■Trio TS520D HF transceiver plus VF0520 external VFO and SP520 external speaker. £390. All in good working order. Tel: Wakefield 0924 381607

■Yaesu FT101E, mic, desk mic, Yaesu external speaker, SWR meter, manual, immaculate condition. £300. Linear parts, 4CX250B base for 144/432MHz, transformer 1185V-0-1185V fan, capacitors etc. £30. Taylor signal generator. £35. D M Bonfield, 8 Derlyn Road, Fareham, Hants. Tel: Fareham 230737

■BBC Model B computer, complete with Wordwise Disc-Doctor, BASIC one and BASIC two. £300. Also G3LIV RTTY terminal unit, complete with software. £55. C S Beynon GW3WSU, Bungalow No 1, Racal-Decca TX Station, Llancarfan, Barry, S Glam CF6 9AE. Tel: 04468 261

■Uniden 2021. Mint. Offers. Part exchanges considered. FRG7 7000 etc. Tel: Bradford 676556 (after 6.00pm)

■TR2400 2m handheld transceiver, as new, complete with battery charger and instruction book. Tel: Bedford 62459 (evenings or weekends)

■Video Genie Mk1 16K computer, Tandy green screen monitor, CT600 Catronics RTTY terminal with software. £175 the lot, will not split. Upgrading to CBM64. Buyer collects. Steve (G1AUU QTHR). Tel: 01 363 9980 (evenings after 6.00pm)

■TR9130 2 metre. All mode. Immaculate. Bought February, hardly used. £400. Tel: 01 531 0658 (evenings)

■Eddystone EA12 amateur band receiver 1.8mcs to 30mcs in nine bands. AM/CW USB/LSB slot filter, CW filter variable 13FO pitch, selectivity control AM-SSB/CW, AGC noise limiter, in excellent condition with manual. £100. W E Niall, 4 Ham Road, Worthing, Sussex BN11 2QX

■Valves. New and ex equipment, all tested. Radio, TV and TX. KT88, 6L6m, 6V6, 6F6, KT61, QQV03/10, QQV02/6 5763, 6CH6, 6AQ5, 6BH, EL91, QY3-65, 807's. Over 500 valves. Lists sent. SAE. P G Robins (G8BSK), 290 Priory Road, St Denys, Southampton SO2 1LS

■Two 807 valves with ceramic chassis bases. £3. Valves 6EW6, 6BL8. £1 each. 6GM6, 150B2 stab. £2 each. Perspex tuning dial for Mohican receiver. £2. TCC TV aerial high pass 75Ω filter Belling terminations. £3. Belling-Lee radio set, lead interference filter, 2A. £4. 2 core flex lead suppressor, Belling for fan, cleaner, etc. £2. Mains transformer output 3.5-40-0-40-3.5V, 10amps. £5. Metal 6L6 valve. £3. Edwards, 244 Ballards Lane, London N12 0EP. Tel: 01 445 4321 (not June 4-20th)

■Drake R4C receiver, new, about 77-78, two extra filters, six extra crystals, matching MS4 speaker, superb job. £185 or swap solid state Eddystone or WHY. Hammalund HQ 180 gen coverage, classic American receiver .5-30mcs. Good condition. £65. Brian. Tel: 01 736 4656 (days) or 01 736 6581 (evenings)

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■Exchange Phillips 1501 video recorder, good heads, needs adjusting, for Tx-Rx, 2 metres 70cms. Icom Trio portable or linear 2 or WHY. G1BTG, 15 Cemetery Road, Bradford, Yorkshire BD12 0EU

■FRDX-500 communication receiver. 1-7-29-1MHz, SSB CW AM FM, plus citizen band and WWV. A double conversion super heterodyne (triple conversion for VHF bands) receiver. Use as a transceiver with a FL DX SSB transmitter. £120. W Mason. Tel: Sheffield 483732

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■ Needed, a comms Rx FRG7 or Eddystone or Ione SXR30 in gwo for exchange for a Sanyo portable stereo radio and cassette recorder value £284 and in good working order. If cash wanted, can be arranged. N T Ball, 140 Albert Avenue, Prestwich, Manchester M2S 8NE. Tel: 061 798 9269

■ Robot 70A or 70 SSTV unit, working or for spares. L T Borthwick, Torwood, Lilliesleaf, Melrose, Roxburghshire. Tel: 08357 314

■ Technics SX-K200 keyboard. F N Howard, 7 John Lewis Street, Hakin, Milford Haven, Dyfed

■ Case for Racal 17 or 117E and any bits or literature for Eddystone 1004 receiver. Brian. Tel: 01-736 4656 (days) 01-736 6581 (evenings)

■ Has anyone got an old working radio that they would like to present to a voluntary run sea school. If so, please tel: Folkestone 38401

■ Any TV receiver suitable for DX TV use. For example, Plustron type – new or used considered. John Pumfrey. Tel: Brighton 422679

■ Collins TCS 10/12 receiver transmitter wanted to buy or borrow manual, or diagrams. Any information welcomed. George Skacel, 32 Weelsby Way, Hessle, North Humberside HU13 0JW

■ Realistic DX200 vgc. Aerial tuner SAC extra speaker. Exchange for portable transistor with short wave band. H C Bach, 52 Tudor Close, Belsize Avenue, London NW3 4AG. Tel: 01-794 9790

■ 603 KHz crystal. Mann. Tel: 0223 860150

■ One copy of Short Wave and VHF/UHF frequency lists, called the Listeners Bible. Tom Valentine, 38 Grampian View, Ferryden, Montrose, Angus DD10 9SX. Tel: 0674 76503

■ Sea Voice Marine transceiver or any transceiver that covers from 17.15KHz to 2182KHz. Cash. Waiting for good working rig, VHF Marine transceiver will do if someone has one for sale. N Beadsworth, 2 Lapwing Way, Clooney Estate, Waterside, Londonderry, N Ireland. Tel: Londonderry 46871

■ WS No 38, must be complete and working. Wanted for nostalgic reasons. Other ex-WD sets, 18 etc also sought. Only battery portables. A Schiffman, 38 Torquay Gardens, Redbridge. Tel: 01-550 3610

■ Have camera, Contaflex Alpha ERC. Want morse tutor. Value £35. Straight swop. W Hopscroft, 1 Bircham Road, Alcombe, Minehead, Somerset TA24 6BE. Tel: Minehead 6283

■ Need short length, about 18in, of microwave tubing type WG16 scrap, and two flanges to fit, have hinges, to connect up dish centre arrangement assembly. Low cost (pensioner). Haylock G2DHV QTHR. Tel: 01-300 1649

■ Good HF TRx. All WARC bands eg FT101, ZD MkIII, ICOM 740, 101E MkIII etc. Tel: Felixstowe 282526

■ Urgent – FM board for Yaesu FT 101ZD, MkIII. Fair price paid for good board. John. Tel: Reading 598326 at any time.

■ 16mm films, sound or silent. Will exchange for like or valves. 70cm converter wanted, 28MHz IF. P G Robins (G8 BSK), 290 Priory Road, St Dennys, Southampton SO2 1LS

■ Drake equipment TR4C, L4E, T75E, MN2700, or later models. Also required information on Hallicrafters HT37 linear amplifier circuit. Handbook etc. Either sale or loan. B Havenhand, 410 Manchester Road, Sheffield S10 5DR. Tel: 666169

■ Datong Morse tutor for Air Training Corps squadron. Around £30. Tel: Struan on 0834 811186 or Jack on 0834 3935 (after 6pm)

■ Semi-invalid, two heart attacks, many boring hours, would like to become SWL. Taking RAE this autumn. Has anyone got a cheap Rx? Anything at all considered. Ex-Gov, gen cov, or Ham. Also 2mtr converter. Any books or tapes on Morse and RAE. All replies answered. Repeat – anything considered but, due to lack of cash, must be cheap. Collection can be arranged for me anywhere. Can you help? Write or phone anytime. Eric Parkes, 1 Silk Stone View, Platts Common, Barnsley, South Yorks. Tel: Rotherham 892388

■ Pentax MX with f1.4 lens, filter, and case. Other lenses include Telephoto/Macro lenses, Macro adaptor, X2 Magnifier, filters, 2 flash guns, exposure meter, shoulder pod, mono pod, lens cases, equipment case. Other accessories, all new and unused. Total cost £800. To swap for HF rig and ATU. Ken James (GW6 ZEU), 2 Marian Road, Llandudno, Gwynedd LL30 1HL.

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Eastern Communications

31 Cattle Market Street
NORWICH
(0603) 667189
MAIL ORDER
ICOM
ACCESS/BARCLAYCARD
MON-FRI 9.30-5.30
SAT 9.30-5.00

SOUTHDOWN RADIO SUPPLIES

40 TERMINUS RD
EASTBOURNE *(opp. Railway Stn.)*
Tel: (0323) 639351
Open: Mon-Sat 10-6 (Closed Tues)

Amateur Radio Equipment Yaesu, Icom, Standard, Tonna, Drae, Kenpro, Halbar, Wood & Douglas, Daiwa.

RTTY
THE EXPANDING MODE

Build your own terminal unit to interface your micro to a receiver or transceiver.

PL1
FP1
PLL T.V. . . . Kit..... £13.50
built module..... £18.50
Power supply & pre-filter Kit..... £11.25
built module..... £14.65

Software also available – please enquire
For full catalogue send s.a.s.e. to
Please ad V.A.T to all prices

PNP Communications (AR)
62, Lawes Avenue, Newhaven
East Sussex BN9 95B
Telephone (0273) 514465

G3SRK MORSE KEY (Direct form Manufacturer)

As used by Govt. Establishments in over 60 countries
NOW AVAILABLE TO AMATEUR FRATERNITY
£9.00 inc. VAT and carriage UK
J SYKES, 7 Top o'the Hill, Slaithwaite, HUDDERSFIELD HD7 5UA

McMichael ARS Home Counties
MOBILE RALLY
Sunday 22nd July at 11am. Sefton Park, Bells Hill, Stoke Poges, Slough. Talk-in on S22 and SU8
Enquiries please telephone 02814 2396 evenings only.

DW ELECTRONICS G3 XCF

Amateur Radio Supplies
71 Victoria Rd, Widnes
Tel: 051-420 2559
Open Mon-Sat 9.30-6 (closed Thurs) Sun 9.30-12
We supply Yaesu, ICOM, Tonna, Jaybeam, Microwave Modules, Datongs etc

U K REPEATERS

A 48K Spectrum program to display all VHF & UHF repeaters in the 145, 434 & 1296 MHz bands on 8 enlarged screens of the UK. Only £5 (incl P&P) from

P BUCK, 41 Marion Street, Brighouse, West Yorkshire HD6 2BJ

AERIAL BOOSTERS

Next to the set fitting
B45H/G-UNF TV, gain about 20dbs. Tunable over the complete UHF TV band **PRICE £6.70.**
AMPLIFIED SET TOP AERIALS for UHF TV, trebles the gain, **PRICE £11.70.**
All Boosters we make work off a PP3/006p/6F22 type battery or 8v to 18v DC **P&P 30p PER ORDER.**
ELECTRONIC MAIL ORDER, 62 Bridge Street, Ramsbottom
Lancs BL0 9AG. Tel (070662) 3036
Access/Visa Cards Welcome SAE Leaflets

Complete, full-size sets, any published service sheets £2 +large SAE - except CTV's/Music Centres from £3 +large SAE.
Manuals from 1930 to latest. Quotations, free 50p magazine, price lists, unique technical publications, for large SAE.
Repair data/circs almost any named TV/VCR, £9.50. The only comprehensive TV Repair Course (bound), £9.50. The only comprehensive Radio Repair/Servicing Course (bound), £9.50. All by return post.

TIS(AR)
76 Church Street, Larkhall, Lanarkshire ML9 1HE
Phone: 0698 883334

Amateur RADIO SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £7.00, 3 — £6.60, 6 — £6.30, 12 — £5.60.

AMATEUR RADIO SMALL AD ORDER FORM

TO: **Amateur Radio · Sovereign House**
Brentwood · Essex CM14 4SE · England · (0277) 219876

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue.....☐ 3 issues.....☐ 6 issues.....☐ 12 issues.....☐

COPY enclosed.....☐ to follow.....☐

PAYMENT ENCLOSED:..... £ — Cheques should be made payable to Amateur Radio. Overseas payments by International Money Order

CHARGE TO MY ACCOUNT.....☐

COMPANY .....

ADDRESS .....

SIGNATURE ..... TELEPHONE.....

.....

C P I

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
			series rates for consecutive insertions		
61 x 90	⅛ page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
			series rates for consecutive insertions		
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale Thurs
Aug 84	28 Jun 84	4 Jul 84	6 Jul 84	26 Jul 84
Sept 84	26 Jul 84	1 Aug 84	3 Aug 88	23 Aug 84
Oct 84	30 Aug 84	5 Sep 84	7 Sep 84	27 Sep 84
Nov 84	27 Sep 84	3 Oct 84	5 Oct 84	25 Oct 84
Dec 84	25 Oct 84	31 Oct 84	2 Nov 84	22 Nov 84

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations.

Printed — web-offset.

PAYMENT
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by the publication date.
Overseas payments by International Money Order.

FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Commission to approved advertising agencies is 10%.

CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

MICROWAVE MODULES LTD

AS IF YOU DIDN'T ALREADY KNOW . . .

Microwave Modules Ltd. Is a full time professional organisation, established over **15 years** ago in **1969,** and currently employs over **30 full time,** on site staff based in our two modern, purpose built factories. In addition, a similar number of 'Outworkers' are involved in assembly and mechanical operations.

OUR EXTENSIVE RANGE . . .

Our product range now exceeds **50 individual items** in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become **the largest** and **most successful** designer and manufcturer of R F Products, such as **Linear Amplifiers** and transverters, but also designers and manufacturers of **innovative** microprocessor and digital products such as **The Morsetalker,** MMSI, and the RTTY to TV decoder, MM2001.

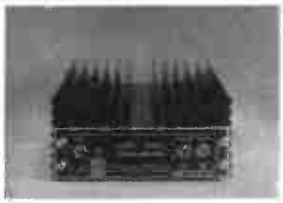
ALL BRITISH . . .

Every product in our range is designed and manufactured in the UK by our own employees, and wherever possible British Components are utilised.

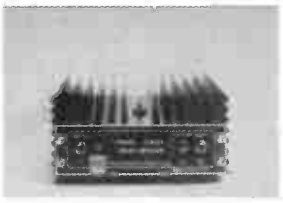
GUARANTEED . . .

All Microwave Modules Products are **Fully Guaranteed for 12 months.** This includes all semi-conductors and **PA Transistors.** We have built our reputation around our customer service and back-up and it is second to one.

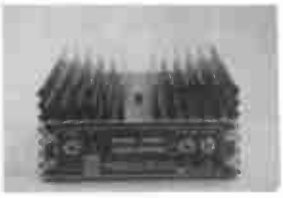
OUR RANGE OF LINEAR AMPLIFIERS . . .



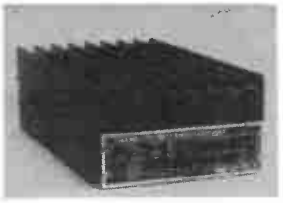
MML144/30-LS



MML144/50-S



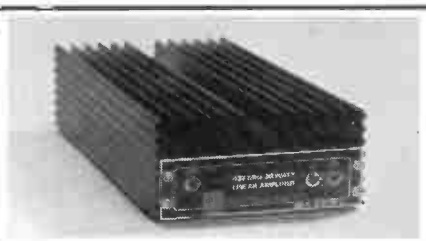
MML144/100-LS



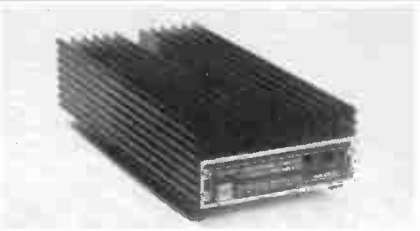
MML144/200-S

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	Pre Amplifier GAIN	Pre Amplifier NF	POWER REQUIREMENTS	RF * VOX	PRICE INC VAT
MML144/30-LS	**1 or 3W**	30W	SSB, FM, AM, CW.	12dB	**<1.5dB**	13.8V @ 4A	V	£75 (p&p inc £3)
MML144/50-S	10W	50W				13.8V @ 6A	V	£92 (p&p £3)
MML144/100-S	10W	100W				13.8V @ 12A	V	£149.95 (p&p £3.50)
MML144/100-HS	25W	100W				13.8V @ 12A	V	£149.95 (p&p £3.50)
MML144/100-LS	**1or 3W**	100W				13.8V @ 14A	V	£169.95 (p&p £3.50)
MML144/200-S	**3, 10 or 25W**	200W				13.8V @ 30A	V	£245 (p&p £4.50)

* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED



MML432/30-L



MML432/50

MML432/100

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER GAIN	PRE AMPLIFIER NF	POWER REQUIREMENTS	RF* VOX	PRICE inc VAT
MML432/30-L	1 or 3W	30W	SSB, FM, ATV, CW.	12dB	2dB	13.8V @ 6A	V	£139.95 (p&p £3.50)
MML432/50	10W	50W		12dB	2dB	13.8V @ 8A	V	£129.95 (p&p £3.50)
MML432/100	10W	100W		—	—	13.8V @ 20A	V	£245 (p&p £4.50)

*THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED.

CONNECTORS . . .

144MHz Products — Our standard connector on these products is SO239. We use a high quality PTFE socket of superior quality, but we are able to supply the choice of BNC or 'N' type at no extra charge. Please specify

432 MHz Products — The MML 432/30-L's fitted with BNC connectors, 'N' type available, please specify. The MML432/50 and MML432/100 both have BNC input sockets and 'N' type output sockets. If this is not to your preference please specify when ordering.

DATA SHEETS . . .

A full printed data sheet is available on each product, and is free on request.

CATALOGUE . . .

A copy of our latest.catalogue can be obtained by sending a large SAE (23p) or by sending 40p in stamps to the address below.

RALLIES & EXHIBITIONS . . .

We shall be attending most of the 1984 rallies and exhibitions. Come and see our products for yourself.

AVAILABILITY . . .

Our products are normally available from stock, either direct from ourselves or any of our 75 UK outlets.

ACCESS VISA

WELCOME

MICROWAVE MODULES

BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011. Telex. 628608 MICRO G
CALLERS AE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E & O.E.