AUGUST 1984 90p

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Almost four months ago, on the 29th of February 1984, we, DISPLAY ELECTRONICS were unfortunate enough to have a serious fire at our main location, reducing a substantial part of our stock, warehouse and offices to a pile of ashes and rubble. HOWEVER, we had seen the adverts about the "Benefits of Insurance" and some years ago had taken comprehensive insurance cover to protect against an event such as this.

The day after the fire we did not even have a single pen to write with, to say nothing of the non existant showroom and burnt out warehouse with direct access to the stars via our now non existant roof!!

The loss of stock and damage to the premises has resulted in losses in excess of £400,000 pounds in real money – no price can value time and effort.

We are still, although working under great difficulties, **VERY MUCH** in business. We owe this to supreme efforts by all our staff – perhaps knowing their jobs could have been at stake, stock being located at several different locations, help from business colleagues and our bank.

To these people, I say a very loud THANK YOU.

To both the mighty **PRUDENTIAL** and **GENERAL ACCIDENT** Insurance Companies who from the date of our fire have NOT even offered or paid **A SINGLE PENNY** in compensation or have not even offered an ounce of moral support....

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David Fisher, Managing Director, DISPLAY ELECTRONICS

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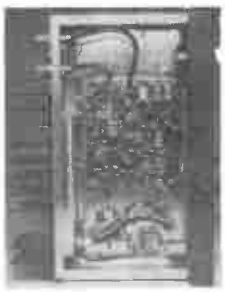
Amateur RADIO



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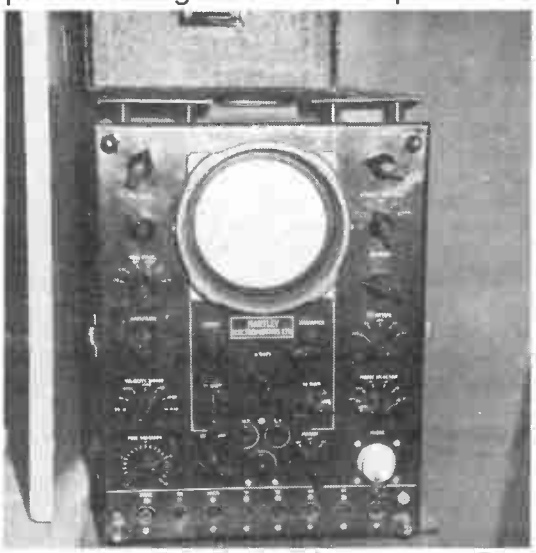

SERVICES

LOWE SHOPS,

Whenever you enter a LOWE ELECTRONIC'S shop, be it Glasgow, Darlington, Cambridge, London or here at Matlock, then you can be certain that along with a courteous welcome you will receive straightforward advice. Advice given not with the intention of 'making' a sale but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

GLASGOW

In Glasgow the LOWE ELECTORNIC'S shop (telephone 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit . . .

DARLINGTON

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

CAMBRIDGE

Cambridge, not only a University town but now the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

LONDON

The Capital City also has a LOWE ELECTRONICS' shop managed by Andy, G4DHQ. Easy to find, the address is 278 Pentonville Road, London N1 9NR (telephone 01 837 6702) and the shop is located on the lower sales floor of Hepworths. That's only a 3 minutes walk from Kings Cross railway station. So, when you're in the Capital City, visit LOWE ELECTRICS.

MATLOCK

Finally, here in Matlock David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

LOWE ELECTRONICS

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And don't forget from Matlock also

MAIL ORDER

SSB AND FM FOR £225, the **BELCOM** LS202E.

Until now, dual mode 2 metre transceivers have been designed for shack, car or shoulder operation. Mobile they may have been but convenient hand portables they were not. That situation has now changed. You will remember that I told you about the new BELCOM LS202E SSB/FM 2 meter transceiver in a previous edition of RADCOM; at the time I said the price would be around £1000. You will, therefore, be extremely pleased to learn that the transceiver is available for £225.00 inc VAT. Now for a few details; (if you want a colour leaflet to appreciate the full beauty of the LS202E transceiver then ring Beryl here at Matlock, alternatively you could always visit a LOWE shop).

● Full coverage of the 2 metre amateur band from 144 to 146 MHz in 5 MHz steps on both SSB (Upper and Lower) and FM, selection of frequency by means of rotary thumb wheel switches. In addition, a VXO control giving +/- 5 KHZ frequency shift and RIT with centre click stop are provided on the top panel. For night time operation the frequency readout and S meter can be illuminated by an internal LED.

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2.5 watts (at 7.2 volts)
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● The LS202E is equipped for repeater operation having both frequency shift and 1750 Hz tone burst.

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WHY NOT CLASS A?

by KEITH TOWNSEND G4PZA

Another radio amateur exam is now well and truly behind us and a great many nails will have been bitten in anticipation of the outcome. Once again the bands will ring to the sound of new callsigns and there will have been a few bitter disappointments. For those who have been successful, the next question to be faced is that of deciding whether to take full advantage of the facilities available to the radio amateur by pitting their wits against what, at first, seems like an interminable mass of indecipherable noises. I am talking about learning Morse code.

I see I have already divided the ranks. Straight away we have three distinct schools of thought on the subject. Within the first group, those who regard the necessity for any form of CW qualification as an outrage, we hear the oft-repeated argument that CW is out of date, an anachronism which should be allowed to pass into obscurity, unnoticed and unmourned. I cannot help but suspect that this belief owes more to some difficulty, real or imagined, in reaching the required standard, than to any genuine conviction of obsolescence. Nor does it take account of the fact that to many amateurs CW is a most rewarding mode of transmission which presents one challenge after another in the search for either a rare copy or a higher standard of operation.

Nevertheless there are very valid reasons why a CW qualification is required before we may be let loose upon an unsuspecting world. Consider those bands of which we are only secondary users. Because of the vagaries of propagation there will be numerous occasions when we can hear only one side of a QSO and it is not difficult to conceive the situation in which an amateur station begins to operate on a frequency which, although appearing clear at his QTH, is occupied by 'fish-phone' or some similar service. None of us cause such interference intentionally and, ladies and gentlemen that we are, would QSY in an instant, once advised of the problem. This is where the need for CW comes in, since many of the stations with which we share these bands use only this mode and there would be precious little use in their asking an amateur station to QSY in a language he couldn't understand.

The second group consists of the 'positive thinkers', those who regard the need to pass the test as part of the routine of becoming an amateur. Many of them will already be proficient, having learned their Morse either during military service, or as a member of either a school cadet company or one of the various Scout or Boys' Brigade groups. Others will set to with a will, determined that this new skill shall be their's in the shortest possible time.

Then comes the third group, that is, the majority, who will begin with considerable trepidation and steadily work their way to the desired goal. Sure, they will all arrive there at different times,for there is no end to the number of factors which determine the speed at which an individual may learn. Sure, there will be those who drop out before making the grade (usually from sheer frustration), and equally there will be a few who, having sucked it and seen, decide that CW is not the mode for them.

You can pass

It is primarily to this third group and to those not even contemplating learning the code that I offer the simple observation that there is virtually no-one who cannot learn Morse code. True, it may present special difficulties for those with certain forms of disablement. How do the deaf hear the tones and how do the sightless write down what they have heard? These are not insurmountable barriers. Vibration and pitch can help those with hearing difficulties and many a blind operator has learned Morse with the aid of Braille or a tape recorder.

The truth of the matter is that if you approach it in the right way you will almost certainly achieve that coveted class A licence faster than you reckoned. Most amateur clubs and many Adult Education Services provide courses in Morse code and you should experience little difficulty in finding such a class, the standard of which is generally very high, but regular attendance is not an automatic passport to the HF bands. How you learn is every bit as important as where and when you learn, and it is not sufficient to spend one night a week on CW in the expectation of success. On the other hand it is as well to guard against the temptation to spend every spare minute cramming your head full of sound. Take it to excess and not only will it become a drag but, you also face the danger of 'Morse-mania', a form of tiredness in which the mind refuses to take any more and you find yourself incapable of recognising those symbols which have, until now, offered no trouble at all. The secret is little and often. Better to do ten to fifteen minutes every day than to spend a couple of hours, say, two nights a week.

Obviously the first necessity in learning Morse is to associate each symbol with the appropriate letter of the alphabet and this can be done easily, even before joining an organised class. The trick is to use an 'idiot board'. Most published lists of Morse characters show the symbols as dots and dashes and I am willing to bet that this is the cause of more learning difficulties than any other single factor. Will someone please tell me what a dot sounds like? You can't hear a line on a piece of paper so first let's convert all these dots and dashes into a sound that we can remember. Let's substitute the sound 'dit' for each dot and 'dah' for each dash, simply because it is much quicker to say 'di-dah-di-dah' than 'dot-dash-dot-dash'. Sceptical? Go ahead and try it.

The next stage is to write out your crib sheet, transforming each symbol into its sound form. For example the letter A becomes di-dah, B is dah-di-di-dit, C is dah-di-dah-dit and so on. You will see that the letter 't' has been left out of each dit except the last part of each character. Again this is for speed. Try saying dah-dit-dah-dit quickly and you will see what I mean.

Now the fun begins. You didn't learn the alphabet all in one go, so don't try to learn Morse code that way. Better to pick a few letters, study their sound and then read through any old printed matter picking them out in code. When you are happy that you recognise them without too much trouble then add a few more to your repertoire until, before long, you

for £168 inc. vat not only a 32K COLOUR GENIE COMPUTER but £57 worth of RTTY receive/transmit hard and software

FREE!

plus 2 additional amateur radio programs, also FREE!

Many radio amateurs, very wisely, have not yet added a computer to their shack. Apart from the difficulty of which computer to choose, they consider it over expensive to purchase the necessary additonal soft and hardware to transmit and receive RTTY, create logging facilities or compute distances between themselves and other radio amateurs. Things have now changed. LOWE ELECTRONICS have put together a substantial package which includes FREE OF CHARGE with every COLOUR GENIE sold from Matlock the following.

A RADSOFT RTTY FULL RECEIVE/TRANSMIT SYSTEM (afsk) with the following features...

Split screen...enables incoming message to be displayed together with status of machine whilst you 'type ahead' your reply.

Status line...displays the current baud rate, a tuning aid and the callsign of the incoming signal if it has been captured.

Screen re-scroll...no need to scramble for a pen as details disappear of the top of the screen, more than 6000 characters are stored for reapraisal.

Memory buffers...10 x 255 characters enabling prepared messges to be stored, the pages can be pre written and saved to cassette for future use. They can also be edited at any time

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Callsign capture...on receive the incoming station's callsign can be automatically read from the screen and displayed on the status line. It can be transmitted at any time by the press of a key.

Baud rate...45, 50, 56 and 75 bauds transceive can be selected from the keyboard whilst in receive mode.

Normal and reverse shift is keyboard selectable, the selected shift and baud rate being displayed on the monitor screen. To simplify Operation an 'on screen' tuning aid is provided.

On transmit all the necessary carriage returns, line feeds, letter and figure shifts are built in making operation simple.

Connections could not be easier...a cassette lead is used between the computer and the 3.5 mm socket on the supplied terminal unit. To input an RTTY signal from the receiver requires a lead making up from the audio output of the rig to the 3.5 mm socket of the terminal unit. (one 3.5 mm jack plug is supplied) Transmit audio is generated inside the COLOUR GENIE, a lead from the computer audio out to the mic input completes the connections.

A comprehensive instruction manual is included with the package.

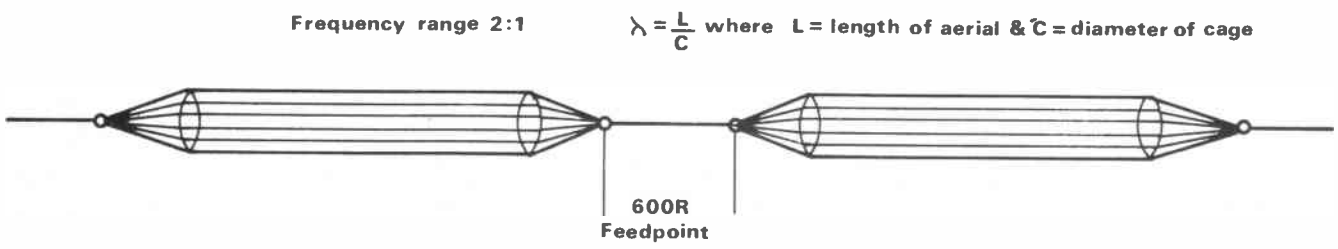
The list price of the RADSOFT package is £56.00 inc VAT. With the LOWE ELECTRONICS computer the system is FREE!

In addition purchases of the COLOUR GENIE will receive two other programs also FREE OF CHARGE. One is a log system enabling up to 700 stations together with their signal report and QRA locator to be stored, ideal for a contest. The second can be used to quickly tell you the distance between yourself and the station you are working. A map of the UK or, for the DX-er, Europe appears on the screen with flashing dots locating yourself and the other station.

Don't be carried away in your enthusiasm for RTTY, don't forget, you will own a COLOUR GENIE, a proven 32K home computer. This is a considerable advantage over the dedicated RTTY system. The COLOUR GENIE has a 'proper' keyboard just like todays electronic typewriters, not indefinite touch pads. It is not a games plaything but is capable of introducing the family to computing. That's if you'll ever let it out of the shack.

don't forget our open day!

On the 18th of August we are having our fourth OPEN DAY here at Matlock. With us for the day will be the RSGB, Practical Wireless, John Birkett and his bits from Lincoln and Strumech with their towers. In the grounds, for music lovers, will be a local Brass Band. For the family hot dogs, icecream, drinks etc. are available and of course ample FREE car parking. During the day conducted tours of the building will take place ending in Aladdin's cave (John's workshop where demonstrations of the extensive expensive test equipment will take place). And, of course, if you can't afford to buy then you may win the FREE raffle.



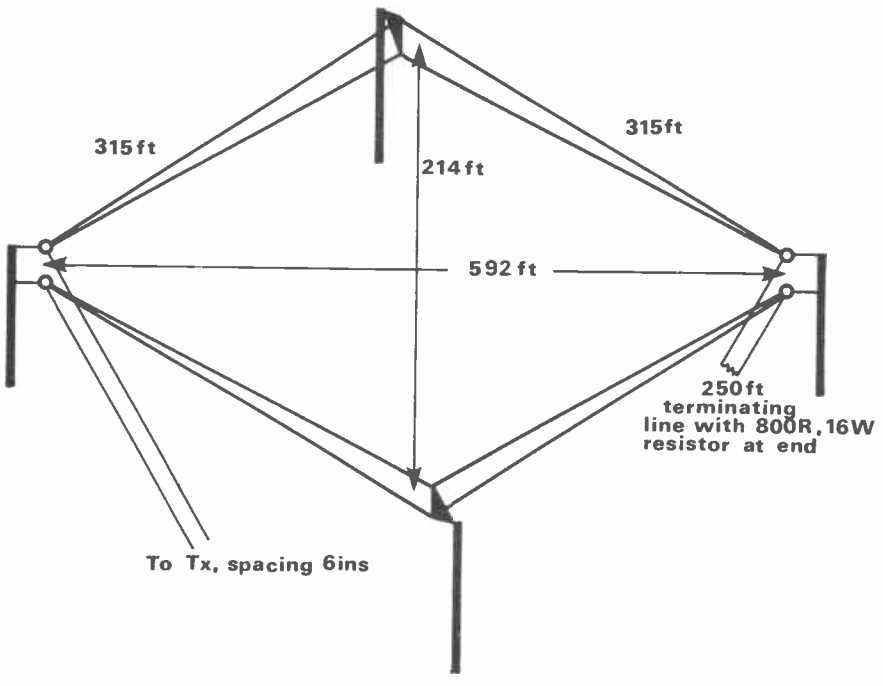
Caged dipole

with the availability of bi-directional properties if the terminating resistor is disconnected. A complicated system, it was originally designed to give good response from the F2 layer with long-distance targets on a specific bearing, or within a restricted target area.

The side angles of the rhombic are designed so that the individual power lobes about each wire combine at the design frequency in an additive manner to produce a concentrated beam in the direction of the terminating resistor. The tilt angle of the system is so arranged that lobes 2, 3, 5 and 8 are additive in the forward direction. A rhombic aerial operates over at least an octave (or 2:1) frequency range, which can be improved by using multi-wire construction (such as the three-wire rhombic), which helps maintain the impedance at around 600ohms. But having said that the rhombic is non-resonant, it is advisable to cut the length to suit the lower and higher portions of the HF band.

Really, a rhombic antenna is merely an extension of a 'long wire' aerial – a non-resonant system employing the principle of the travelling wave. A resonant aerial depends upon an incident wave of energy travelling towards a distant point from the feed, and reaching a discontinuity which will reflect energy back to the feed. The incident and reflected energy combine to produce a standing wave and resultant radiation.

If, however, a single wire is erected which is several wavelengths long, and the point most distant from the feed is terminated in an impedance equal to the impedance of the wire, no reflection occurs. The only wave remaining will be one which is travelling from the feed to terminating point: a wave radiated from this long wire to be received at the target is the resultant of the separate waves radiated to the target from all sections of the wire. For the purposes of reception, the output to a receiver is the vector sum of all the differently phased waves of energy induced in the wire as a wavefront sweeps across it. Because the speed of the travelling wave in the wire is less than the wave in space *and* the direction between wire and wave-front is usually different, the wire responds differently to wave-fronts arriving at other angles and frequencies. Furthermore, as the frequency of operation is increased, the direction of maximum response becomes closer to the longitudinal axis of the wire. This change is due to the longer electrical length of the wire providing different conditions for the cancellation and reinforcement of the different waves induced in the wire by the wavefront.



Rhombic antenna system, shown for 7–29MHz

Insofar as the dipole is the basis of so many aerial systems, the 'logarithmic periodic array of dipoles' employs its principles to the full. If any aerial array is constructed which consists of a repeated structure, the dimensions of which decrease gradually with little change between the size of successive elements, the system will be largely frequency dependant. The log periodic array consists of a series of half wave dipoles, the length and spacing of each decreasing from the largest, designed to be half a wavelength at the lowest frequency of operation, to the smallest, which is half a wavelength at the highest.

The ratio of the length and spacing between successive elements is in the region of 0:8, and is called the 'scale

CURRENT COMMENT

MAKING HEADLINES

From time to time items related to our hobby, and the world of radio in general, find their way into the pages of the local and national press. Typically these provide good, if slightly back-handed publicity: a quirky little 'ham' *à la Hancock* who is first with the news of a lone round-the-world glider pilot, a coup d'état in Outer Belgravia or the existence of class B licensees on Mars. Other items raise very serious questions involving amateur radio and its relationship to the outside world, and it is a few of these which we look at this month.

Justice/injustice

The first two items concern amateur radio operating procedures, and what can happen when these are ignored. As well as being controversial in itself, an additional element with regard to the relative seriousness of 'crimes' has been introduced. Both clippings come from the *Brighton Argus* of June 21st, and were kindly sent to us by Reg Moores.

Under the headline *'Radio ham fined £100'* comes the story of a licensed amateur who, for failing to log a call, failing to notify the authorities of a change of address, and two offences of failing to use a proper callsign, was in breach of licensing conditions and fined £100 with £50 costs.

Although few details of what happened are given in the report, the size of the fine makes it quite clear just how serious an offence was committed. This was not just a misdemeanour within the confines of a hobby, *this was a criminal act.*

Another criminal act which likewise found its way into the magistrates' court that day is described in an article headed *'Last chance for youth in attack'.* Here a 17 year-old youth, possibly not a radio amateur, made an 'unprovoked and particularly vicious attack on an innocent person', by clubbing him over the head with an iron bar. The youth, who had an 'appalling' criminal record, was put on probation and ordered to pay £75 compensation.


Last chance for youth in attack

A TEENAGER who viciously clubbed another youth over the head with an iron bar has been given a last chance.

challenged the youth to a fight, but was ignored.

He then hit Mr Richard-on the head with an iron bar he had removed from a temporary road sign.

Mr Mann said: "It was an unprovoked and particularly vicious attack on an innocent

police he had no idea why did it.

Dyson-Holland, said to have an criminal record, to pay £75 com his victim.

Mr Anth man of th hum- "Y ne- be

Two die in CB aerial tragedy

Radio ham fined £100

LOCAL RADIO TECHNICIANS ELECTROCUTED

A radio engineer and his 19-year-old helper were electrocuted when the outside broadcast aerial they were erecting touched a 30,000 volt overhead power line yesterday.

Mr Tony Copper, 39, Blakeney, Gloucs, and Lane, of Dean's Walk, G were dead on arrival at tenham General Hospit the accident at Suddle Winchcombe, Gloucs.

They were prepa ment for coverage gala by Severn S cester's independent station.

A radio ham, who 11 year ago was the youngest perso to hold an amateur licence to transmitted without using callsign or making a Brighton magistrates hear today.

Computer consultant, Pat Thomas Russell, 2h, of Islin picket Road, Brighton, admi ted failing to log a call, failin to notify a change of addre and two offences of not usi a proper callsign, all breach of conditions of lice ing a licence.

He was fined £100 with £ costs. The prosecution w brought by the Home Offic under the 1949 Wirele Telegraphy Act.

Current Comment is not the place to discuss the nature of justice or injustice in the British legal system but when the penalty for *failing to comply with licence regulations* so far exceeds that for *malicious wounding,* an offence which some might construe as attempted murder, then it is difficult not to share some of the indignation felt by Reg in his note accompanying the clippings:

'Warning to all amateur radio operators! One believes that this is a pleasant and harmless hobby, but may I suggest that you change to stamp or butterfly collecting? It has been said in the past that the easiest way to become a law-breaker was just to own a car, but no more! Amateur radio surpasses this: one operator of 11 years experience doesn't give his callsign, neglects to make an entry in his log and *bingo!:* £100 fine, £50 costs. One man with an iron bar, £75 compensation to pay and told not to do it again? Anyway, how can someone be prosecuted for telephony, under a *Telegraphy* Act? Surely that's like being done for riding a bike when in fact you were driving a car?' *Ouch!*

Our second foray into the newspapers brings us something which is ultimately more important to all. We refer of course to the tragedy which took place at Coombe Hill, where two CB enthusiasts were killed when an aerial which they were erecting touched 11,000 volt power cables.

The fact that these cables had been mistaken for *telephone lines* brought a predictable response from many readers, namely that lack of education had in no small way contributed to this terrible accident. In the wake of last month's *Current Comment* about novice licensing, many cited this incident as indicative of the need for more instruction in the basics at as early a stage as possible. One such letter stated:

'Being by nature conciliatory, I would like to see a logical development of the CB system into a properly taught and well regulated organisation, based on amateur radio principles. The use of common English (but not too common); encouragement to learn theory; regulations and CW are all important, if one seeks to be a serious operator.

I believe in the encouragement of learning and in helping CBers in the transition from CB to amateur radio – therefore any means is worth consideration. I attach a clipping from the newspaper: *'Two die in CB aerial tragedy'.* Please reproduce the information. I do not wish to see good radio-operator potential sacrificed by totally unnecessary risk. I feel that had the unfortunate victims been more aware of electricity, they would be with us today. The difference between 11,000 volt cables and British Telecom telephone lines is so obvious to those learned in basics. Hence the *need* for tuition prior to the gaining of empirical experience via untutored risk.

I am always willing to assist anyone wishing to learn how to become an amateur radio operator: indeed, so are many fellow amateurs.'

The sentiments expressed in such letters were quite generous, but within a week of this tragedy another incident cast new light on the situation, and brought to mind perhaps the most important lesson of all.

The tragic death of two technicians at work on an outside broadcast unit, once more as a result of masts coming into contact with HT lines, moves the spotlight off the question of experience or lack of experience and onto a matter which is vital whether your interest in radio is CB, amateur or even professional:

The first consideration at all times must be safety. An individual's fallibility with regard to potentially fatal accidents is NOT entirely dependent on experience. If ever you are in doubt, ask someone who may know more. Never do something on your own which might better be done with the help of others. In all instances, for everyone's sake, BE SAFE!

By all means let amateur radio make the headlines, for innovations such as satellite and data communication, for social and public service such as RAYNET or charity work, and for promoting worldwide friendship, but *please* let's keep our hobby off the casualty lists.

FREE CLASSIFIED ADS

FOR SALE

■ Eddystone full scale tuning dial and slow motion drive and Electroniqes bandspread transistor coil pack, all mounted on chassis ready for building receiver, £15.00 plus £2.00 post and packing. Quad valve, LW, MW, SW, tuner £20.00. Quad 22 preamp £25.00. All in good order. Letters only to Mel Fisher (G4WYW), 41 Setley Gardens, Strouden Park, Bournemouth, Dorset BH8 0HQ.

■ KW2000B transc. No mods, AC power unit, 6146B P/As. In regular use last 8 years. Well known on the air. Good working order and appearance. Call and test, Halifax G8CB £195. Tel: 0422 43104.

■ Collins TCS13 receiver and power supply, with spare valves and manual, £40.00. Also realistic DX160 receiver complete with speaker manual, £40.00. James Thomson, 2 Wilton Hill, Hawick TD9 8BA. Tel: 0450 75089.

■ Rare UHF airband receiver made by Collins. Covers 220.0 to 399.9MHz in 100KHz steps with no gaps. In full working order, with complete maintenance and operation manual. Also has full range of remote control facilities, E140 inc Discone antenna. Tel: 0482 864313 (after 4.30pm).

■ Yaesu FRD x 400S amateur band RX, 160-70m, read out to IKH3, including 200W SSTT2 ATU £150. ICS amateur radio course, 20 books, including test papers £20. Tel: Luton 23119.

■ Chinon CE4, 1.7SLR auto/manual camera, 50mm standard lens, 28mm wide angle, 100mm to 200mm, 200m power wind. Chinon 1090C pro flash gun with main flash and fill in flash. Two U/U filters, rubber lens hood, leather hold – all shoulder bag. Exchange for H/F TCVR or separates. Approx value £200. RT Field, 37 Cotswold Avenue, Rayleigh, Essex SS6 8AW. Tel: Rayleigh 779998.

■ FT208R Yaesu; handportable transceiver, Slimdim antenna, desk charger, portable charger, speaker mike, spare battery, good working order £225.00 ono. Cost over £350 new. Tel: M R Kember, Burgh Heath 50265 (between 9am-1pm).

■ OM10 SLR camera, 50mm F1.8 lens, 80-200 F4.5 macro 200m lens and various extras £210 or will exchange for FT208R and charger. G6YCV QTHR. Tel: Calne 812966 (after 7pm).

■ Ten metre all mode transceiver, Belcom LS102L, 8 months old £140 ono. Tel: 041 429 2841.

■ Dual beam oscilloscope, Calscope super 10, complete wih uniprobe x1 and x10. Kits 2 off. Less than 3 years old, very little used, £150 for quick sale. Tel: 0908 607796.

■ Microwave module 144-28, all papers, £20. Tel: 0453 810471.

■ Belcom LS102L, 26-30, mint cond, boxed and brackets. USB, LSB, AM, FM, CW. 10m mobile £195 ono. Also Cobra 146 and DNT FM for spares £12. SWR meter £8 ono. 200W mobile SSB, FM, AM, amplifier 12V, £30. Bremi 45W mobile £8. SWR has twin meters. Tel: Wraysbury 2617 (7.30 to 8.30pm).

■ New valves, Class D wavemeter, capacitors (paper HV). 27 knot fibreglass wih 10ft runabout with trailers and extras, wheel steering £300 lot. Also lamps, tools. Send SAE for lists. Multimeter wanted in perfect condition. E Williams, 25 Glenmore Rd, Oxton, Birkenhead, Cheshire L43 2HQ.

■ 2m Belcom LS20XE pocket transceivers with rechargeable batteries. Never used. Main charger. Two units at £95 each. Will split. Tel: 061 573 7882 (Mr Jones).

■ Trio 2300 plus extras:- GPVS collinear MM, 30W linear, PSU wavemeter, nicads, charger, case and strap, coat. All vgc, hardly used, £250 ono. Will not split. James Twigg, 12 Gatcombe Close, Stretton, Burton on Trent, Tel: 0283 62013 (evenings).

■ Swap digital multimeter up to 10 amps ac/dc for VHF/UHF wavemeter or cheap rotator or WHY. Tel: Hull 859445.

■ Trio TW4000A, dual band 2m/70cms, 4 months old, registered with Lowes, £399 or exchange for Trio TR9130. Realistic PRO2008 scanner, cost £200, accept £70. N Purkins, 32 Astral Road, Hessle, North Humberside HU13 9DD. Tel: Hull (0482) 644222).

■ Marconi Appolo professional general purpose communication receiver, digital frequency display, full coverage between 15KHz and 28MHz. This is the ultimate in receivers with a current cost of £3000. Too many features to list but would send copy of Marconi specification. Mint condition and fantastic value at £600. Tel: 0472 823643 (evenings).

■ Tonna 9 element portable antenna, new condition £15. Ant slim jim £4 (2 metres). 'Ham Radio Today' Morse course (tapes), half price, £5.50. Tel: 0532 585806.

■ Amprobe Canadian Clamp-on multimeter, unused, worth over £100. Up to 300A/600V £50. Clearing meters, valves, tools, big family tent, 10ft runabout & trailer, projector, filmstrips, etc. Send SAE for lists. Williams, 25 Glenmore Road, Birkenhead.

■ Trio TR7800, 25W mobil, complete with mobil mount 14 memories, £150. Trio TR2500 hand-held, ST2 charger, brand new. Surplus to requirements cost £300 sell for £250. Mr Sycamore, 50 Hillcross Avenue, Morden, Surrey SM4 4EB. Tel: 01 540 3959.

■ Belcom LS102L, 26-30, good cond. Boxed and brackets USB, LSB, FM, AM, CW. 10M mobil £195 ono. Also Cobra 146 and DNT FM for spares £12 plus twin scale SWR meter £8 ono. Also Antenna UK81, 1.5m base £5. Tel: Wraysbury 2617 (any evening 7.30-8.30pm only).

■ IC745 with £100 worth filters. FM board one month old. Illness forces sale. All books and boxes with SM5 and scan hand mics. Price includes Securicor. Cost over £1000, sell for £800. G13HNM QTHR. Mr Davies, 24 Brooklanes Ave, Belfast BT16 0PA.

■ BBC model B, 12 months old, fitted with Wordwise and Exmon Roms plus BBC cassette, software and books. Also available, Opus type desk. £400 for micro, offers on the rest. Buyer to collect. Tel: John 0774 819453 (evenings after 8pm and weekends).

■ Pye PF70, three channel RB14, RB2, SU8 preamp, £80. G6SVX QTHR Tel: Crawley 25032.

■ Three tone buzzers 12V but will work from 9 to 24V on PCB 3in x 1¾in, still new, cost £5, sell £2. 22K lin pots, small size, 7mm fixing hole 10 for £1. Mixed bags of new capacitors/transistors/resistors 100 + item £2.50. A good mix or send SAE for list. D Martin, 6 Downland Gardens, Epsom, Surrey KT18 5SJ.

■ Yaesu FT290 plus BNOS 100W linear. Chris Kelland, G6LRY, 40A Kingfishers Grove Village, Nr Wantage, Oxon DX12 7JN. Tel: 023-57 2205.

■ Yaesu FRG 7700 genral coverage receiver with FRT 7700 ATU. Boxed as new. £270 ono. Jim, Gravesend, Kent. Tel: 0474 57795.

■ SX 200N scanning receiver AM + FM all bands 16 memories 12VT car lead or mains. Still boxed. £175. Also have compatable antenna. Would swap for 934 rig. J Foster, 'Brecon', Rettendon Common, Essex CM3 5EW. Tel: Chelmsford 400760.

■ 308 Amateur Radio Club surplus equipment sale on Tuesday October 9th at St Marks Church Hall, Church Hill Road, Surbiton. Bring and buy. Tea and coffee available. For more details contact Dave G6YQD QTHR. Dave Davis, G6YQD, 13 Maple Rd, Surbiton. Tel: 01-399 5487.

■ Storno 70cm hand held, 2 channel, crystalled RB4 + SU8. Tone burst microphone. 2 nicads + dummy battery for remote PSU. £40 ono. G4MBD. Tel: Isle of Wight 753948.

■ Belcom LS102L 26-30. Boxed with brackets USB, LSB, AM, FM, CW. 10m mobile £195 ono. Cobra 146 plus DNT FM for spares £12. Twin meter SWR £10. UK81 antenna £7. 200W amplifier £30 ono. Tel: Andy Wraysbury 2617 (7.30 to 8.30pm only).

■ FT208R handheld, 6 months old, with case, charger £140 ono. Would exchange for 70cm handheld IC4E – FT708R. Consider part exchange for FT790R. Tel: Roger, G4IPE, Louth 0507 601030 (night); 0507 82 8002 (day). Not QTHR.

■ Trio R1000 general coverage receiver, boxed, Trio HS5 head phones, ATU, hardly used, the lot £135. A Hannaford, 9 South View, Horrabridge, Yelverton, Devon, PL20 7SU.

■ Yaesu FT227RB 2m/FM trans, 10W mic etc, vgc £135. FDK 725x 2m/FM trans, 25W mic, mint, boxed £170. Icom 255E sm/FM trans, 25W, mic etc vgc, boxed £145. Yaesu FRG7, G/C, Rx, boxed £125. Yaesu FT101ZD Mk3 FM, WARC boxed, £470. Trio R1000, G/C, Rx, vgc, £230. Tel: Weymouth 0305 786930.

■ Microwave modules MMC435/600, 70cm ATV converter, UHF output, brand new, £25. Marconiphone B/W TV set with Thorn 950 series chassis, needs attention, spares or repair £5. York JCB861 mobile FM CB transceiver complete with aerial, SWR meter and books about CB £30. Buyers collect or pay carriage. Tim Boorman, GW1FBL, 109 Saunders Way, Sketty, Swansea SA2 8BH. Tel: Swansea 0792 201565 (evenings).

■ 24GHZ directional coupler and detector (with crystal) £28. 10GHx klystrons 75mW £8, 25mW £4. Muirhead slow motion dial £10. Push buttons (reed contact), 12 for £9. Army PTT microphone £2. QQVO640, tested, £8, QQV0310 £3. Mains reversible motor (suit small beam) £4. Lamp and 2 matched photocells assembly £2. Wavemeter 1000-2000MHz £18. High resistance phones, Browns AF £15. Wanted 603KHz crystal. Tel: Cambridge (0223) 860150.

■ Sky King rotator, model SU2000, suit VHF-UHF beam, never been outdoors £20 plus carriage. Tel: Taunton 75776.

■ Yaesu FRG7700 and FRT7700. Six months old, boxed, with manual, excellent condition. £250. Tel: Rugby 67466 (after 6pm).

■ Yaesu FRG7 communications receiver with new digital readout £140. I Abel, 52 Hollytree Ave, Maltby, Rotherham, Yorks. G3ZHI. Tel: 0709 814911.

■ Swap 1955 Standard 10. Rebuilt engine, gearbox, brakes and steering. Resprayed and waxoyled, vgc. For fully synthesised 70cms mobile multimode and cash adjustment. Car value £1,000. Contact: John (G1FDJ). Tel: 01 693 6137 (office hours only).

■ Pye HF Tx/Rx 50W 1.6 to 3.9MHz with manual, as new, offers. Freq meter BC221 charts PSU, vgc £40. Airmec VTVM 217 vgc £35. Dawe test oscillator 0.1 10000Hz dual quadrature output vgc £40. Telequipment servi scope with new spare valves £40. Metrix VTVM MX202B vgc £40. Marconi VTVM TF899, vgc £15. Valves QV08-100, 723/AB, QF41, KT66, 11E3, QU37, 6CH6, 3C45, CRTs DG1814A, RMT59, offers. Tel: 0502 715419

■ Trio TS-180S TCVR. Fitted extra SSB filter, PS-30 PSU, spkr SP-180, VFO, VFO-180, ATU, AT-180, original owner, all manuals very good condition £450 ono. Tel: 0822 66867.

■ Erskins 1 inch oscilloscope with wobbulator and circuit £12. R1155, no mods £30. Heathkit RAI receiver £20. Grundig 'Reporter' tape recorder, collectors item. Offers. R Lucking, 62 Ember Farm Way, East Molesey, Surrey KT8 0BL. Tel: 01 398 3603.

■ TR7730 Kenwood Trio 2m FM mobile transceiver, include memory select. M switch, Mr switch freq display. Busy indicator on air. Indicator RPT. Indicators RF meter, Tx offset switch MS memory scan switch mic. Up or down tone switch, hold switch, scan switch, Hi/Low 5/25 step power vol squelch main tuning. £200 or swap for a gen c receiver. Tel: Sheffield 447117.

■ Selling collection old valve radios, valves, spares, service data, test equipment etc. Write today for list of remaining items, odds and ends. Please include SAE for your list. M Small, 8 Cherry Tree Road, Chinnor, Oxon OX9 4QY.

■ Yaesu FT101E, HF trans, 160m-10m mic, boxed etc £280 ono. Yaesu FT227RB, 2m, Tx/Rx, FM, 10W mic etc, vgc £135. Yaesu FT208R hand-held 2m FM, NC9C charger, mint, boxed £160. Trio 7010 CW SSB Tx/Rx mic etc, vgc, boxed £95. Yaesu YP150Z Durry load Wattmeter, mint £70. FT707, FP707, FC707, HF, Tx/Rx, vgc £470. Tel: 0305 786930.

■ Yaesu FT-DX 560 HF transceiver. Bands: 80, 40, 20, 15, 10m. SSB and CW. Power 560W input. Yaesu base microphone, fitted with 600Hz narrow CW filter. Complete with manuals and packing. In good condition £350 ono. S Cowell (G4XKH). Tel: 098 064 675. (Not QTHR).

■ Class D Wavemeter, 40Ch, FM, CB, valves, projectors and screen, filmstrips, tools, car accessories etc. Send SAE for A4 list. Williams, 25 Glenmore Road, Oxton, Birkenhead, Cheshire L43.

■ Belcon transceiver, all mode, good condition £180. Realistic radio 6 wave bands, DXC60 £20. Tel: 01 207 0706.

■ IC2E, spkr mic, BP4 battery case with 6 Nicads, DC1, 12V adaptor, mobile charging lead, cases, charger, helical ant etc £140. 20W PA, suit 2E £20. Rx converter 2m input, 10m output £10. Wanted FT290. G6RMA, QTHR. Tel: Dan 0322 524938 (after 6pm).

■ IC2E, 2 batts, case, mic £110. Hewlett Packard

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WINCH (800lb)
ROPES 5mm LOWER 4.5mm TOP
540 Kg (1200lb) S.W.L.
A STANDARD HEAD UNIT IS AVAILABLE ALTHOUGH ONLY REQUIRED IF ROTATOR IS BASE MOUNTED AS ALL 10m (30') TOWERS ARE FITTED WITH MOUNTING FACILITIES FOR 51mm (2" Dia) STUB MAST AND DEPENDING UPON AERIAL CONFIGURATION CAN BE UP TO 4m (13') ALSO ALL HEAD UNITS WILL TAKE A BEARING IF REQUIRED.
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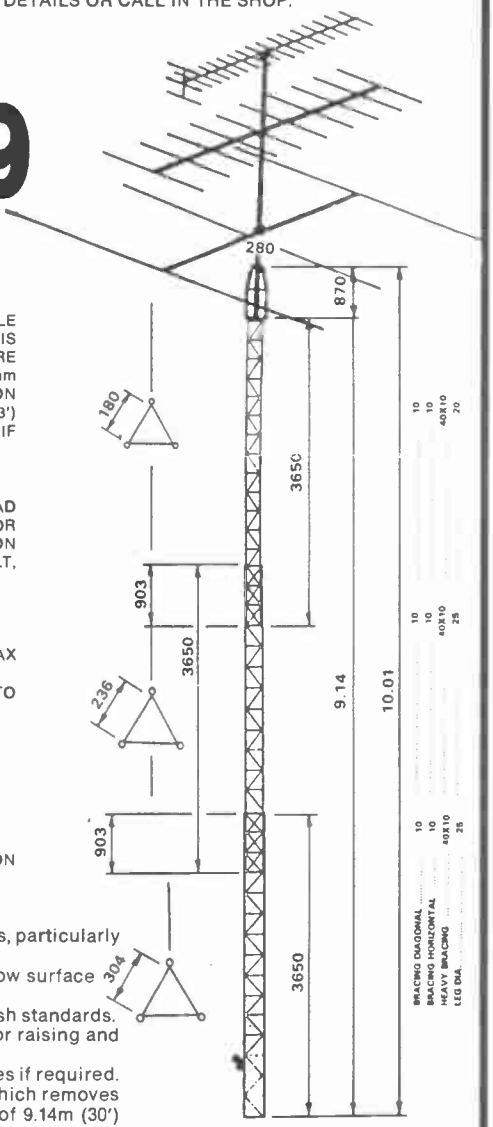

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The 30' Tower is the result of a detailed design programme to study the needs of today's Radio users, particularly in an urban environment.
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All Towers come complete with suitable winch cables, pulleys, bolts and accessories necessary for raising and lowering as standard. A safety latch is provided to lock the tower in its raised position.
The relatively low closed height of the towers make it practical and acceptable for planning purposes if required. Also the majority of owners find they are able to work on their aerial systems at this closed height which removes the necessity to purchase costly tilt over versions. The extended head height before head unit of 9.14m (30') provides a good operating platform at a most economic price. Bearing in mind depending on head load a 4m (13' stub mast can be fitted giving up to 13.7m (45').
The concept of our range is to provide the user with a basic tower unit and to allow him to choose from a selection of universal accessories to suit the precise needs of individual mounting requirements. If none of the standard items are suitable specific mounts may be manufactured to order.

WE ALSO SELL:
Jaybeam, Bnos, Drae, Fortop (ATV), Azden, Adonis, Met, Datong, Uniden Amateur, FDK, Yaesu, Oscar, Diamond, Sagant, Spectrum Software, RSGB Books and Maps. Also large selection of polls clamps, masts, cable-connectors, lashings etc.

8 TOLLGATE BUILDINGS, HADLOW RD, TONBRIDGE. TEL: (0732) 361850

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

series rates for consecutive insertions

depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 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

series rates for consecutive insertions

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

SPECIAL POSITIONS

Covers: 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
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.

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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.

L·E·T·T·E·R·S

This is where readers air their views on topics of interest in both the magazine and amateur radio in general. If you have any comments or criticisms, or just a point of view on a subject related to amateur radio, send your letters to ***Amateur Radio,*** Sovereign House, Brentwood, Essex CM14 4SE.

HOLIER THAN THOU?

After many years as a short wave listener I decided, as part of my plan for retirement, to take an RAE course. I find, however, that I am appalled by the arrogant, holier-than-thou attitude adopted by a considerable number of the devotees of this art.

Surely, in most leisure activities, the more expert practitioners should be only too pleased to help the novice improve his skill, for the benefit of all.

I should have thought that the fact that one is prepared to spend time and money on a course, rather than take the easy option of CB, is evidence of willingness to learn.

If more people had the attitude of the writer of the article in the June issue of your excellent magazine, I am sure a better spirit would prevail.

Although now started on the RAE course I am considering abandoning the whole project.

John D Morley, Morecambe

'SIDE-SWIPER'

Forgive that somewhat colloquial term, but that's what we used to call paddle keys years ago. Before many more readers go tripping base-over-apex into their workshops, let us consider an alternative to the hacksaw-blade.

In an inventive mood a long time ago I made myself a paddle key like 3XYO's, but being less like Stuart and more like 3SYX, I decided that facility combined with quality, was 'the essence of the contract'.

My XYL was later rather piqued in her observation that I had purloined one of her small table knives – the nice shiny stainless steel straight ones, with a yellow composition handle, which is an excellent insulant, and makes for comfortable use.

If you have none at home look out for one on any market junk stall, but ensure that it is in good condition with a firm handle. It beats the stuffing out of the old hack-saw blade whilst reducing manufacturing time, sweat, blood and tears.

I remember placing my knife in a vice and carefully grinding away the edge prior to use. I also used the brass legs from an old 15amp plug, but found no need for additional soldered contacts. One thing I did do was to drill through the split pin holding the blade. I then inserted a nut and bolt, tightening it in order to secure the paddle blade. It certainly brightened-up the whole job.

Ron Irving, Maltby-le-Marsh

CALLING OLD TIMERS

When I opened my copy of ***Amateur Radio***, July 1984, there on page 40 was '2OM Calling' by 'Old Ham'. My mind immediately went back to 1925 when I worked at 2LO, the London station of the British Broadcasting Company, 2 Savoy Hill, and where I first knew 2OM and his connection with Wireless Equipment Ltd.

Also working with me was Arthur Newman of WEL and as he was only a few years older than I he could well be still around. Possibly you are Arthur Newman!

There were others from WEL whose names I cannot recall, but I would be very interested to know 'Old Ham's' call, and if he ever knew 2LZ and 2NM.

Leo Shapter, Wimborne

AUTHOR REPLIES

Re Martyn Bolt's letter 'Spring Surprise', ***Amateur Radio***, July 84, in connection with my article 'Getting the best from roofspace aerials', I am completely at a loss to understand how he found any difficulty in threading a ferrite ring into the roofspace antenna in order to construct the current indicator. It would appear that he is trying to don his socks after his shoes!

The ferrite ring must obviously be slipped on to the wire before it is secured to the supporting stand-off insulators and the coupling added later. I suspect also that G4SUI must have tried using a rather small ferrite ring. I have invariably used 1 inch diameter rings for the purpose and when measurements are complete, left them in position.

Martyn's alternative suggestion is a good one which I have used several times in the past. The only difficulties are: with a clothes peg, only a small ferrite ring can be used and during measurement the ring can load the antenna to some degree, which may or may not be significant. The latter problem is eliminated if the ring is left in position.

Ken Williams

YOUNG FAN?

I took to reading ***Amateur Radio*** and find it very good. I am practicle, but, theory comes a little slower, but I'm being taught.

I like best, those on chips and transistors and things you can make. The historical side interests my Dad, but he's old and I'm more with it.

I've got a weekend job and am saving for a CB rig. Have made my aerial from copper tube, and am making a tuning unit *(shown below)*.

Steven (11)

I LIKE IT

I thank you for a most interesting periodical.

I used to read other magazines but they became boring.

I have no great knowledge of amateur radio, but I listen a lot and will soon take up CB, and who knows from there?

I love your early radio articles and those on aerials.

William Ross-Brent, Doncaster

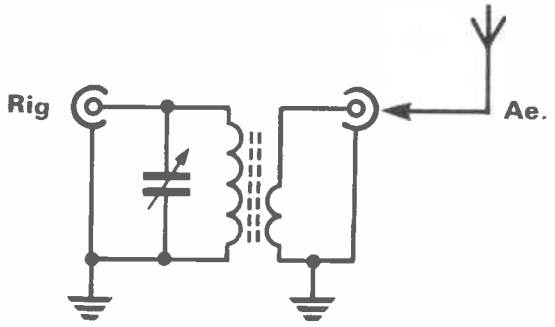
NOVICE LICENCE

Surely we have a novice licence already with CB, there is certainly not a requirement for an additional one.

I do not regard myself as being particularly bright, but I had no difficulty with the RAE, was self-taught and took the old written exam in 1959. I did not take up a licence (Class B) until 1979 and after failing the CW test once did achieve my ambition of a Class A licence. Anyone with the right motivation and enthusiasm can do it and without the need for a novice licence. Nowadays, everything must be made easy.

A more sensible idea would be to allow Class B licensees to use part of the VHF/UHF bands for slow Morse communication, possibly with a test say of five words per minute to ensure that they know the code.

N A Bedford, G4NJP, Bridlington



L·E·T·T·E·R·S

PRETENTIOUS AMATEURS

It does seem that the amateur radio fraternity has more problems than CB operators are led to believe. Your magazine contains many references to CB, usually of a derogatory nature. They prompt the following questions. Do the really keen amateurs of long standing, spend their spare time listening to the CB radio frequencies? Are the amateur bands so dull and uninteresting? Have amateurs nothing better to do? This seems to be the case; or is it that amateurs envy the CB channels for their informality and ability to have a friendly chat without having to be pretentious.

The Class A amateur has many different frequencies to choose from, but still has a fair allocation allotted to him. Why then do they have to listen to the CB radio frequencies they so much despise?

As far as CB is concerned, most of the troublemakers have now disappeared. Those who took the hobby seriously are still there and have weathered the storm.

I wonder what would happen if the amateur radio enthusiast found himself confined to 40 channels! Judging by the confusion caused by the space shuttle broadcasts, I have a good idea.

I can honestly say I have never heard a CB channel abused in such a way. Were those licenced amateurs that I could hear? If not, there were a lot of pirates out there. How can you expect a CB operator to become a useful amateur when all the amateurs seem able to do is throw flak at them.

A little more commonsense from both sides would further the future of all non-professional radio operators. Constructive advice is always acceptable, but not the tripe often dished out at CB.

A P D Selling, 'Cyderman', Burgess Hill

NO INTERLOPER

As an 'old-timer' I am much puzzled by being called an 'interloper' by two 'new' types who were in a QSO on 80 metres.

The 'new' types maintained that I did not exist and had never been heard of? Yet, I am in the log book. Is it any good having a licence?

SW Law, G3PAZ, Croydon

TRUE AMATEUR?

I read your magazine with interest and try to understand all that's written, but find you do not often include the CB user.

I would appreciate some info on all aspects of this particular subject.

I don't suppose I will ever take the RAE, mainly because of the financial outlay and, at 60 years of age, my brain box does not feel inclined to want to cope with all that it entails.

I have built my own receiver and have done minor repair son CB radios. I feel that I am an amateur in the true sense of the word because I really enjoy my CB, mainly in the early hours, and even prefer it to the 2 metre radios that I have had the opportunity to listen to; far less rules and regs.

C F Riches

YOUNG AND OLD

Just to tell you how much I like ***Amateur Radio***, particularly the old content.

I was an early experimenter and remember many of the old G2 stations. I never got a licence but built a lot of transmitters and receivers.

You provide something for everybody; a nice magazine for old and young alike. Keep it up!

H Robson, Horncastle

RALLY CALENDAR

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

August 5: **RSGB National Mobile Rally,** Woburn Abbey, from 10am. Large trade exhibition, bring-and-buy stand, RSGB bookstall and enquiries stand, RAYNET and BARTG stands. All under cover. Coach park. No charge for entrance to Rally but entrance to Woburn will be £1.70 per car, including passengers. Normal Woburn attractions available at small extra charges. Bars and cafes nearby.

August 19: **Hamfest 84** run by RAIBC and Flight Refuelling AR Society at latter's Social Club and Sports Ground, Merley, Wimborne. Talk-in on 2m and 70cm, trade stalls, bring-and-buy, RSGB and RAIBC stands, other attractions for the family.

August 26: **Preston AR Society Mobile Rally,** Lancaster University. Trade stands, bring-and-buy, RSGB stand, talk-in on 144MHz S22 FM, bar, cafe. Opens 11am, early entry for disabled.

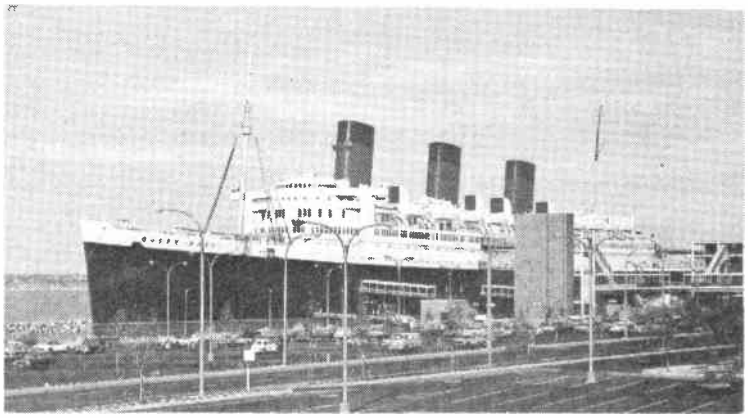
August 26: **BARTG Rally,** Sandown Park Racecourse, Esher. Open 10.30-17.00. Talk-in on S22. BARTG TU kits, components, data sheets and publications. Live demonstrations, trade stands, car boot sale. Entrance £1, 25p for XYLs, children and OAPs.

August 26: **Torbay Mobile Rally,** Paignton. Talk in on S22. Open 10am. Free admission and parking. Details from: Margaret Rider, 7 Kingston Close, Kingskerswell, Newton Abbot, Devon. G6GLP; QTHR.

September 23: **Lincoln Hamfest,** Lincolnshire Showground, (4 miles north of Lincoln City on the A15). Opens 11am-5.30pm. More trade stands than previous years.

STRAIGHT & LEVEL

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



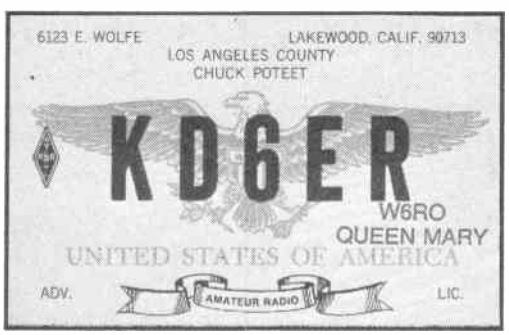
W6RO

We are pleased to pass on information on W6RO, the station located on board the Queen Mary, moored at Long Beach, California. The QSL card and pictures were sent to us by Art Newton G4FKZ of Oldham, who has twice worked Chuck Poteet KD6ER, the ship.

The station has over 100 different operators working on all bands from 1700 to 0500Z. Contacts with Europe have been made on 15, 20 and 40 metres.

The station manager is Nate Brightman K6SOC, with Rosemarie Pitz N6BCY acting as QSL manager.

Over 800,000 tourists a year visit the Queen Mary and see the station in operation.



SCOTTISH CONVENTION

This year's Scottish Amateur Radio Convention, to be held in Glasgow on Saturday, 8 September, will be an even bigger event than last year's record-breaker at the same venue.

More traders have been attracted to exhibit this time than have appeared at any previous show north of the Border, more demonstrations of various aspects of the hobby have been arranged and new record attendances are expected.

The RSGB will have an information stand with books and there will be the traditional large bring-and-buy sale.

The organisers, from the West of Scotland Amateur Radio Society, have arranged a programme of lectures including: 'Amateur radio – an alternative approach' by Rev George Dobbs G3RJV of QRP fame, 'Modern Developments in Electronics' by Chris Bartram G4DGU of Mutek Ltd, and 'An EME DXpedition to Andorra' by the HADRABS contest group.

The convention takes place in Cardonald College, which proved an ideal location when it was used for the first time last year. It is situated just a short distance from the M8 which affords easy access from all parts of Scotland and the South.

Facilities include extensive car parks within the college grounds, bar, restaurant and facilities for snacks.

A demonstration HF station will be on the air all day and, on VHF and UHF, talk-in will be provided on S22 and the GL repeater on RB14.The convention will be open from 11 am till 5 pm and admission is £1.

ATV NEWS

The following items of interest have been received from the British Amateur Television Club:

Amateur TV enthusiasts in Central Scotland who would be willing to participate in financial support or construction of a 24cm ATV repeater for the area are asked to contact Norrie, GM4BVU, 3 Townhill Road, Earnock, Hamilton, ML3 9UX.

Recent ATV contest activity continues to show an upswing of interest outside the South East.

The top three stations, G8GLQ/P, G8DIR, and G4CRJ in the recent Summerfun Contest were located in Wiltshire, Shropshire and Buckinghamshire respectively.

About 20 stations were also active in Scotland, although not all transmitting!

G8MNY pointed out that a narrow band sound receiver and a narrow bandwidth (1MHz) TV receiver are a great help in finding and resolving the weaker stations, particularly in the presence of local QRM.

ATVers should note that the big contest of the year, the International Contest, takes place from 1800 GMT Saturday 8th September to 1200 GMT Sunday 9th September. Full details from *G Shirville, G3VZV, 18 Church End, Milton Bryan, Milton Keynes, Bucks MK17 9HR.*

Some more dates for the diary...

The winter cumulatives will be held on the following nights early in the New Year: Jan 17 & 25, Feb 2 & 10 1985.

Will all other contest and events organisers please note so as to avoid clashes.

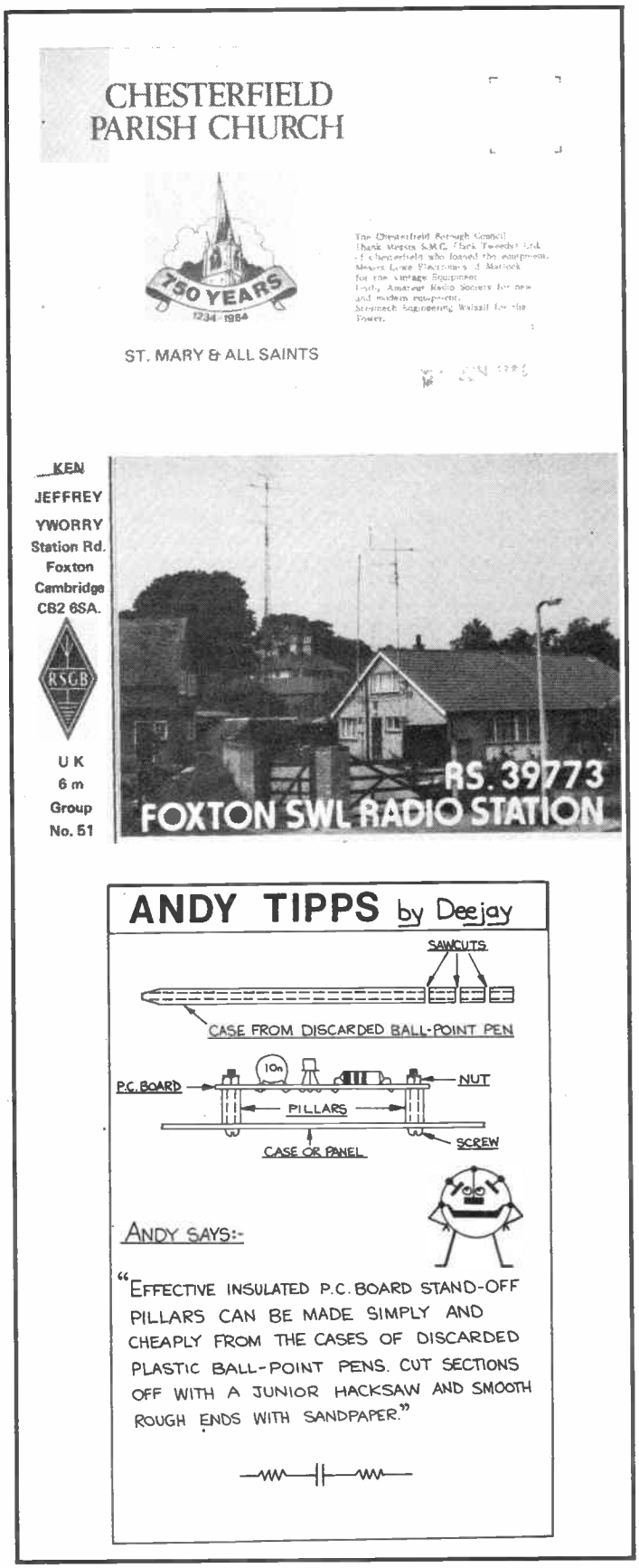
AROUND THE CLUBS

The callsign GB0CAR (Chesterfield Amateur Radio) was used to celebrate the 750th anniversary of the world famous Crooked Spire church in Chesterfield.

The three day event was held in the Lecture Hall, Chesterfield, 26-28th May and nearly 700 contacts were made from the three stations set up.

Detail from the specially issued QSL card is pictured below.

Operating equipment was supplied by SMC (Jack Tweedy) Ltd, of New Whittington, Chesterfield, and the 60ft mobile tower by Strumech of Walsall.



Carmarthen Amateur Radio Society will be operating a special event station, GB2EGL, from 4-11th August from the field of The Royal National Eisteddfod of Wales at Lampeter, Dyfed.

Operation will be on both HF and VHF. Special QSL cards will be issued for contact with the station. Details from Allan, GW4VPX. Tel: (055 934) 434.

To accommodate their growing membership Worthing and District AR Club now meet at Lancing Parish Hall, South Street, Lancing, West Sussex, every Wednesday from 7.30pm.

At the new venue the club will continue its regular programme of technical talks, videos, ragchews and HF station operation.

The previously neglected Welland Valley area now has its own Amateur Radio Society. Strength to their arm in encouraging the hobby in the area. The Club meets at Welland Park College, Market Harborough, on Monday evenings, 7.30pm.

It is intended that the first Monday of every month be a special meeting with a guest speaker, technical visit or similar.

Club secretary is Dave Lunn, G3LSL. Tel: Market Harborough 880746.

RADIO COURSES

RAE courses take place all over the country. The following colleges have advised us of details.

Arnold and Carlton College of Further Education, Mapperley, Nottingham.(Tel: 0602 876503):

Full courses – Wednesdays 7pm commencing 19 September for the May examination. Crash courses – Thursdays at 6.30pm commencing 20 September for December exam and 10th January 1985 for the May examination.

Enrolment for these classes is on 11-12 September, 2pm to 8pm.

Both courses are suitable for re-sit candidates and those with a knowledge of basic electronics.

Other courses include 'Construction', 'After the RAE' and an 'Introduction to Amateur Radio'.

For details contact the College.

Bradford and Ilkley Community College, Great Horton Road, Bradford, Tel: 0274 753111. Courses start in September and enrolment commences 11th September. The syllabus is:

1st year – Preparation for the City & Guilds 765. 2nd year – This is optional and is also available for existing Class 'B' Licencees who wish to obtain an 'A' licence. 2nd/3rd year – A project-based course for holders of the RAE certificate who wish to gain more in-depth knowledge of amateur radio topics.

Dacorum College, Marlowes, Hemel Hempstead.

Classes will be on Wednesdays between 6.30 and 9.00 (Tuesdays between 6.30 and 9.00 if there are sufficient numbers). Enrolment 10th September, courses start September 26th. Further details from the College. Tel: 0442 63771.

Derby College of Further Education, Wilmorton, Derby DE2 8UG Tel: (0332) 73012

Enrolment is on 10-11th September and the course commences Wednesday, 19th September. Further details from F Whitehead (G4MLL), the course tutor at the College.

Langley College of Further Education, Station Road, Langley, Slough. Tel: (0753) 49222

The course follows a modular scheme. Thursday, 1730-1900, Operating Techniques (on the air operation). Thursday, 1900-2030, Morse. Wednesday, 1900-2100, Theory.

Students can choose modules to make an individual programme. The College has a fully equipped station (G3XPL).

In addition, the College hopes to offer short courses (8 weeks) on such topics as 'Use of Test Equipment by Radio Amateurs'.

Enrolment will be at the college on either Tuesday, 11th September, 12.00 to 8.00pm or Wednesday 12th September, 12.30 to 8.00pm.

STRAIGHT & LEVEL

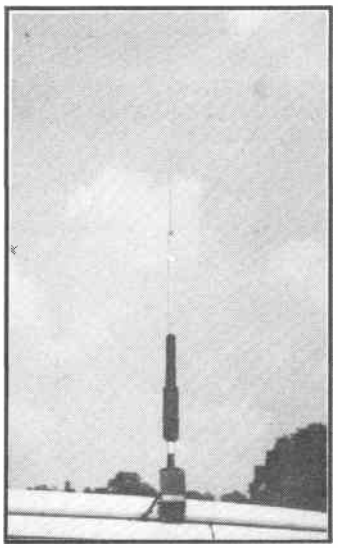
MOBILE ANTENNAE

Glenstar Electric Motors Ltd based in Henley-on-Thames, has not wound an electric motor for many years, but has in fact been pursuing the task of producing a range of efficient HF mobile whip antennae for the amateur market. Development has taken place over the past 3 years and during all stages of this process tests have been carried out by radio amateurs. Here are some of their reports:

G4VSZ/M has worked on 40m EA, DL, YU, OE and GM often with 5/9 signal reports using the Yaesu FT77 with ATU about 75 watts PEP.

G4SOV/M has found that the Navy Specials for 10m, 15m, 20m and 40m work well. All continents have been worked mobile including a Special Event Station in Antarctica. The rig operated was an Icom 720A with ATU. He enjoys in particular the 10m whip to ragchew on 10 FM.

G4FOE/M reports: Having been presented with 40, 20, 15, and 10 metre Navy Special mobile antennae, the first fifteen minutes of operation on 40 metres yielded a contact with a PA in Hilversum. Next was a contact in Rochdale followed by 5/9 + signals from all over Europe. All this without an ATU, just fifteen



feet of UR76 cable between the Yaesu FT7's 10 watts and the Navy Special. The 20, 15 and 10 metre antennae also loaded beautifully without an ATU.

The small size of the resonator and whip (about 1.4m) gives a discrete looking antenna. With the Navy Special's low cost and the compactness of modern mobile HF rigs more amateurs will surely be tempted into the fascinating world of mobile HF operation.

For more information contact Glenstar at: *Newtown Rd, Henley-on-Thames, Oxon RG9 H1Q.*
Tel: (0491) 575901.

GIFTS AID RAYNET FLOODING SERVICE

Radio equipment to help in a flooding emergency on the North Norfolk coast was handed over at a triple presentation at Eastern Communications' new showroom in Norwich.

The presentation was to Raynet, the Radio Amateur Emergency Network, and will help permanently equip the flood control room at North Walsham police station.

Until now, Raynet members called in to help in an emergency have had to set up their own equipment. The Rotary Club of North Walsham presented a Yaesu FT790 70cm transceiver, handed over by their president Mr Stephen Dorey. Paul Willies G6TMU, son of Raynet's County Controller, Mr Douglas Willies G3HRK, presented equipment, including a power supply and 70cm linear amplifier, bought from the money he raised by running in a local half-marathon. Dr Tim Thirst G4CTT, of Eastern Communications, who is also Deputy County Controller of Raynet, handed over a Yaesu FT290 transceiver from his company and from an anonymous donor who sent fifty pounds to help equip the flood control room.

Raynet's role in emergencies was outlined by Chief Insp David Pardon, Deputy Commander of the North Walsham police sub-division which covers the coastline from Holkham to Horsey. He said the radio organisation, started in the 1953 floods, helped with communication, particularly during flooding, but also had a role in other major emergencies, such as plane crashes and blizzards.

Dr Thirst said the flood control room now had about two-thirds of the equipment needed, aerials, supplied by North Norfolk District Council, already having been installed.

Eastern Communications have recently moved to new larger premises in the centre of Norwich, at 31 Cattle Market St.

Included in the new premises is a fully stocked branch of Amateur Electronics UK including a servicing centre, covering East Anglia.

CB SERVICING

The following letter has been received from SE Services and may be of interest to readers:

'Our company feels that there is a need for more information on the repair and modification of CB radios.

To serve the needs of the hundreds of 'rig doctors' across the country, we intend to produce a quarterly newsletter. Technical explanations of various rig improvements will be given. We shall try to keep the explanations simple, whilst providing sufficient information to guarantee success. We hope, also, to review electronic accessories for CB.

The quarterly newsletter will be available, by subscription only, at a cost of around £7.50 per annum.

Although the newsletter will be directed mainly at those whose business it is to repair rigs, enquiries are welcomed from anyone who can wield a soldering iron.

For further details, send an SAE to: *SE Services, 14 Hazel Court, Aiskew, Bedale, North Yorks DL8 1UX.*

NBTVA

The tenth Annual Convention of the Narrow Bandwidth Television Association was held at Clifton, Nottingham on April 29, 1984. Several TV cameras working on a low line standard were shown, all amateur-built.

A guest of the Convention was Tony Bridgewater, until 1968 Chief Engineer of BBC Television, and a pioneer of broadcast television with Baird. He spoke of his experiences both in the planning and in the operation of British 30-line TV, 1928-1935.

The NBTVA was formed in the early 1970s to link amateurs' work in applying modern techniques to low definition and mechanical TV. Since formation, membership has grown throughout Britain and in several other countries. Members are exploring the possibilities of continuous, moving-image television contained within audio channels, under 15KHz. Sys-

tems frequently involve mechanical image analysis, similar in principle to Baird's first system.

A common standard, and the one used in the recent demonstrations, is 32 lines, 12.5 frames per second. This can be tape-recorded and is a viable amateur radio mode, and can reproduce remarkable detail within its small (6 to 9KHz) bandwidth.

Work in progress currently includes trial transmissions on amateur bands.

Contact the NBTVA through the Chairman: *Doug Pitt, 1 Burnwood Drive, Wollaton, Nottingham.*

KW M40

This model is a specially selected design of CB transceiver modified by KW and 'peaked' for operation on the 10m FM band. The 40 position channel selector covers the band 29.31 to 29.7 MHz and provides channels every 10KHz. The channel in use is clearly indicated by a digital display – channel 30 being the recognised calling frequency (29.6MHz).

All frequencies are controlled by phase locked loop (PLL) circuitry, using modern integrated circuit technology ensuring excellent frequency stability. The KW modification includes the replacement of the ceramic first IF filter with a two section crystal unit. An alternative model is available with 100KHz offset for working the US repeaters. As radio amateurs we are advised to make more use of the 10m band, otherwise there is fear that we may lose part of it to interested parties. This low cost equipment is well made and very efficient.

KW Communications are at *Vanguard Works, Jenkins Dale, Chatham, Kent.*

AMATEUR RADIO AND CB IN HARMONY

A group of radio amateurs and keen CB operators were on the hills of Sutherland on the 2nd and 3rd of June, in aid of the Highland Scanner Appeal. The amateur radio group were using a Yaesu FT77 HF rig, and a Yaesu FT290 for VHF, with two sixteen-element Jaybeam antennae at 30ft above the ground for 2m, and a trapped dipole for HF. They also used a 100 watt BNOS linear for 2m.

The location was at the summit of Beinn A'Bhragaidh, QRA (XR10b) 1293 feet asl, 1½miles northwest of Golspie. The callsign of the station was GB2DOS, which stands for the Duke of Sutherland. Both the CB and the amateur stations operated from horse boxes located at the statue of the Duke of Sutherland.

The weather was fine and sunny on the Saturday, but by 3.00pm Sunday, it started blowing a gale and raining cats and dogs. 2 metre radio conditions were 'very poor' and despite the power and aerial sytems being used, a distance of only 150 miles was worked. HF conditions were variable but they managed to work Stateside, Poland, Sweden, Russia and the Scandinavian countries and Europe, as well as UK stations.

On CB, using 4 watts legal FM, they managed to work down into Aberdeen and some stations in the UK on Sporadic-E, as well as many local stations.

A total of over 600 stations were worked between the two groups. Special QSL cards will be sent to all CB and amateur radio stations contacted.

Local business and people from the Highland area sponsored the total number of contacts for the two days. At the time of writing over £500 has been collected and the money is still coming in.

PATHFINDER VIEWPOINT

From Alexander Lex-Arnold of the West Herts area Pathfinder Radio Group:

'As amateur radio is a mainly technical based pursuit, and Citizen's Band (CB) radio of a mainly localised social nature. . .it is somewhat difficult to understand just why there should be any unnecessary friction between 'Hams' and 'Breakers', unless (of course) such friction is the result of misplaced intolerance on the one hand, and ignorance on the other.

As an active user of the CB facility, the totally unnecessary 'bickering' between some (not all) amateur radio and CB operators is, to me, both distasteful and contrary to the spirit of the radio hobby.

I'm well aware of the foul-mouthed morons and misfits on CB, but I am also very much aware of the real 'good buddie' type of breaker too, and whilst it is always all too easy to find fault might I suggest that those appalled at some of the conduct of some CB-users might try doing what I have learnt to do – flick to another channel.

The novice licence has long been a thorny issue in the world of amateur radio. Why not a third class with, as suggested in this magazine, lower outputs, etc, etc? Unfortunately the short answer is that in addition to numerous really good type 'Hams', regrettably, there are some within the hobby possessing a lack of both tolerance and goodwill. Fortunately the *majority* of licensed operators outnumber their arrogant and selfish minded 'colleagues' in possessing a sense of toleration and good manners,and do find the time (if and when approached) to advise, help and encourage newcomers to our hobby without seeking to 'lord it over' shortwave listeners and others, including the CB enthusiasts!

Perhaps some of the problems between CB and amateur radio are also the result of most CBers having no interest in SWLing, which, frankly, I think is about the best introduction to our hobby – whereas to go from CB usage straight into getting one's ticket does create a gap in knowledge which can only be obtained by experience and not from textbooks.

I would finalise by complimenting the radio clubs and societies which seek to cater for all forms of radio interests rather than one selective activity. This, in my view, should help heal the unnecessary rifts.'

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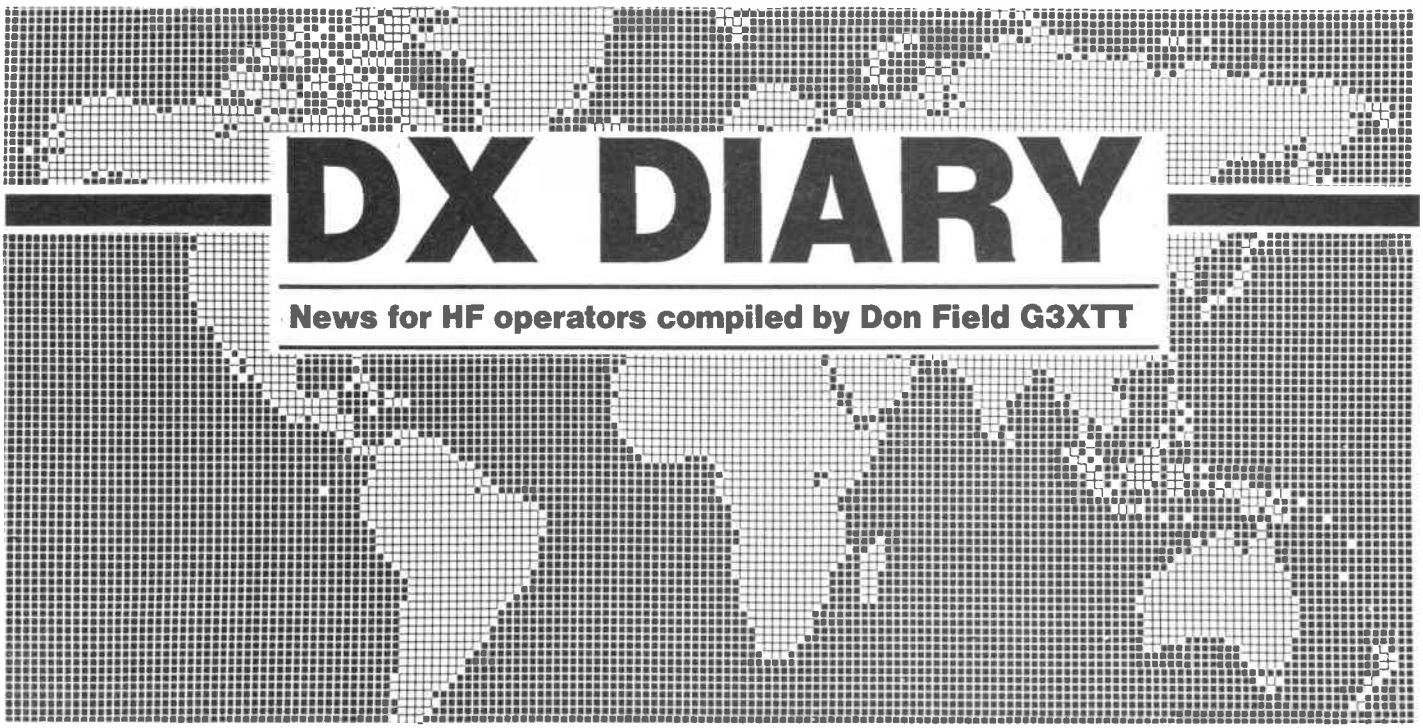


DX DIARY

News for HF operators compiled by Don Field G3XTT

The summer period is usually fairly quiet on the DX front, with poor band conditions (especially on the lower frequencies), few DXpeditions, and only the occasional contest. For these reasons, and with the good weather, August and September are ideal months to get outside and sort out the aerial system before the contest season proper (and the autumn winds) hit us. Coaxial cable deteriorates due to the effects of sun and rain, connectors become corroded, guy ropes wear thin, and cable winches need greasing. There is an old American adage which maintains that if your antenna didn't fall down last winter it isn't big enough. However, we amateurs don't want to get a bad reputation for causing damage and devastation, and a spot of preventive maintenance can work wonders in this respect. For those with vertical antennae, summer is also a good time to put down more radials to reduce earth losses. For those putting up their first tower, remember to lay that concrete base before the ground becomes waterlogged with the winter rains.

Paperwork

As well as all this outdoor work, amateur radio can also involve us in a great deal of paperwork. In addition to log-keeping there are contest entries to write out from time to time, records to keep when chasing awards, and QSL cards to send off.

QSLing has always been a topic of great interest to amateurs, with heated debate between the 100%-QSL enthusiasts and those who think the whole exercise is a waste of time. Most fall between these two extremes and like to receive cards for contacts with new countries, new prefixes, or other stations of particular interest, as well as (hopefully) replying to all cards received.

QSL managers

For better or for worse many DX stations nowadays are making use of a QSL manager. This often makes a lot of sense. It gives the DX station more time for operating, much to the delight of the waiting masses. It often leads to a faster reply because many out of the way spots have no QSL bureau and a poor postal service, whereas the QSL manager probably lives in Europe or the USA. In the case of DXpeditions a QSL manager is almost inevitable because the expedition call was only a temporary one and may be unknown to those who run our QSL bureaux.

How are you to know whether a station uses a QSL manager? He may, of course, tell you over the air. Otherwise you will need to resort to a column such as this, a DX newsletter of the kind I discussed last month, or to one of the publications dedicated to disseminating QSL information. Of the latter, by far the most comprehensive is the monthly W6GO/K6HHD list. This particular list is continuously updated with information from around the world and contains the QSL routes for several thousand DX stations. The list is available in Europe from Brian Russell, 163 Halton Road, Runcorn, WA7 5RJ.

Another publication dedicated specifically to providing QSL information is *QSL Report* published by the QSL Management Association of Japan. Details can be obtained from the editor: Hiromichi Katsurashima, 5-2236-33 Iriya, Zama-city, Kanagawa, Japan.

QSL Report contains information not only on who the QSL managers are, but also their full addresses. The W6GO/K6HHD list does not, but assumes that you have access to an up-to-date callbook. The international *Radio Amateur Callbook* is published annually in the USA in two volumes, one of which contains the addresses of US amateurs, and the other which contains addresses of all other amateurs. The Callbook is a valuable aid to all serious DX enthusiasts; unfortunately it is also rather expensive.

A quick buck?

Of course it isn't essential to have the address of a QSL manager. Cards can be sent via the bureau with the QSL manager's call shown clearly, and in most cases a reply will be received in due course. Naturally a direct card to the manager with return postage in the form of international reply coupons (IRCs) or a dollar bill will bring a much quicker response.

Unfortunately there is a growing tendency among QSL managers not to answer cards received via the bureau. This is usually not so much a plot to get rich by encouraging you to send direct with dollar bills, but rather a plot to avoid becoming poor. The reason is that to keep the bureau supplied with envelopes to receive, say, 5000 cards a year, to have 5000 cards printed, and to mail those cards back via the bureau, can be an expensive business (work it out for yourself, and for an active DX station this number of cards is by no means unusual). Most managers rely on making a small profit on cards received direct to subsidise replies to cards received via the bureau (this is a social service, especially to our East European brethren who, in most cases, have no alternative to the bureau). Make no mistake, there are very few wealthy QSL managers around. It is a lot of hard work, as I can testify from experience, though it can of course be very rewarding in the non-financial sense.

What can you do to speed the return of that much-needed card? If you are sending direct, enclose a self-addressed envelope in addition to the return postage. It isn't much fun for the QSL manager having to write out hundreds, or even thousands, of return envelopes so naturally he will deal first with cards that came with a return envelope (or at least

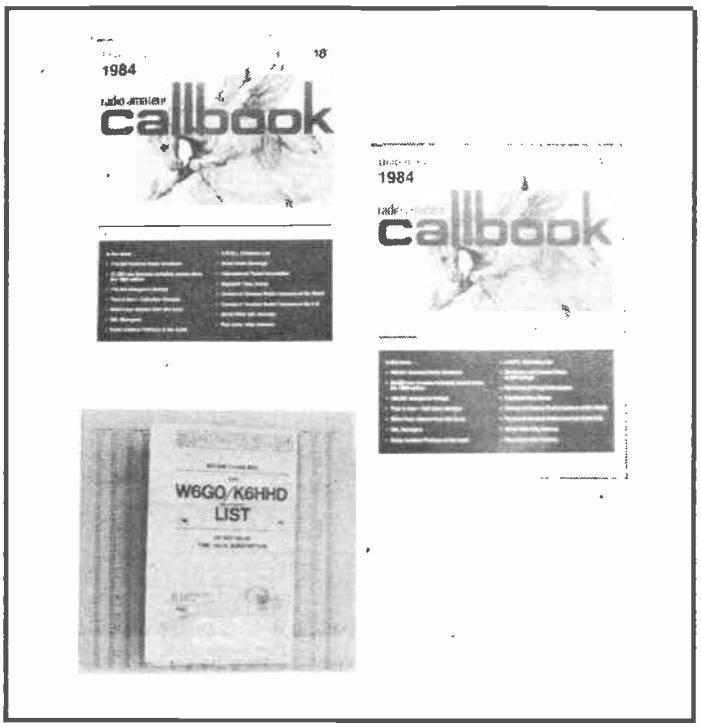
a sticky address label). Ensure that the details on your card are correct: time and date in GMT, correct band and mode (many DX stations keep separate logs for each band and mode), and of course the right callsign. My own QSL management experiences (for GJ6UW and GJ3XTT) indicate that probably one in ten cards received has at least one of these pieces of information wrong, which makes it that much more difficult to locate the contact in the log.

How long?

How long should you wait for the card before getting impatient? Although some DX stations keep weekly schedules with their QSL managers, many mail the logs out perhaps once a month or so. Thus a delay of six weeks is by no means unreasonable. In the case of major expeditions, the cards are not printed until after the operators return (after all, until then they don't know how many cards they will need), and it can take three to four months to make headway with the cards, even with the best will in the world.

Where a DX station does not have a QSL manager it may well be necessary to send a card direct to his callbook address. There are still a number of countries without a QSL bureau. When sending cards to stations in Africa, Asia or South America it is advisable not to put any reference to amateur radio (eg callsigns) on the outside of the envelope. Often envelopes which are marked in this way fail to arrive at their destination or arrive with the IRCs removed.

It must be clear from what I have said that QSLing can be an expensive, slow and frustrating process. To save money, use the bureau wherever possible (it is essential when sending cards to the USSR). To save postage on direct QSLs use some common sense. Some managers, such as W3HNK, handle cards for a number of DX stations, so it might be possible to batch up several cards at once. As for IRCs; they come expensive if bought from a Post Office, but QSL managers often sell them off for several pence less rather than exchange them for stamps. Keep a lookout in the small ads.



Whatever the frustrations, at the end of the day when you have accumulated the cards for 5BDXCC, Worked All Zones, or whatever, you will be in no doubt at all that it was eminently worthwhile.

News

There has been lots of activity reported from China in recent weeks. BY1PK, BY4AA and BY8AA have all been active during the mornings on 15 metres, both CW and SSB.

The Chinese operators tend to be rather slow but very precise and will persevere until a contact is fully complete.

Our Canadian friends have the use of some special prefixes until August 20th to mark the 450th anniversary of Jacques Cartier's landing (amateur radio can be good for your history as well as your geography!). VE1 stations can use the prefix CZ1, VE2-8 become VY2-8, VO1 and VO2 become VA1 and VA2, and VY1 becomes CK1.

A German group which visited Tunisia recently was unable to obtain licences. According to the Tunisian authorities 3V8PS is the only licensed station in the country, and all other calls are pirates. Fortunately 3V8PS tends to be quite active on all bands, 80-10 metres. His QSL manager is IN3RZY.

If you still need a contact with Kermadec Island, Warwick (ZL8AFH) is there until the autumn and has been appearing on Wednesday mornings on 14220KHz. He has also been worked in the USA on 15 metres around midnight GMT, at which time it is possible that there will be occasional propagation to Europe.

Tristan da Cunha

Several ZD9 stations have been worked recently in the evenings on 15 metres, usually between 21300 and 21335KHz. The story of Tristan is an interesting one because the island was vacated in the early 1960s after a volcanic eruption. The islanders were brought to England, but most were unable to adapt to the British way of life and elected to return at the earliest opportunity. The island population is now about 325 in 50 houses at the one settlement of Edinburgh. The island is visited by ship several times a year but is certainly not on the tourist beat. Local industries include philately, fish processing, and some sheep farming.

For many years there was little or no amateur radio activity from Tristan, but in the last couple of years a host of ZD9 calls have appeared on the bands, sparked off by Andy Repetto (ZD9BV) who also operates the commercial radio link from the island. In fact there are actually only two amateur stations on the island, one being Andy's own and the other a club station installed in the broadcasting-/commercial radio building. Unfortunately the club station cannot be used when other broadcasting is taking place from the building.

Another frequently heard ZD9 call is ZD9BU/MM operating from the 'Tristania', a fishing vessel owned by the people of Tristan which spends most of its time in the vicinity of the island.

Other current ZD9 calls include ZD9YL, ZD9BZ, ZD9CA, ZD9CB, ZD9CC, ZD9CD, ZD9CE, ZD9CJ and ZD9CS. Surely Tristan must have about the highest population of radio amateurs pro rata of any country in the world.

The global QTH locator system

Those of you who cut your teeth on the VHF bands will be familiar with the QRA locator system which divides Europe into a grid of small squares. All three IARU regions have now adopted a variant of the system for VHF use which covers the whole world. In Europe the new squares coincide with the old QRA squares, though the designations have changed (for example what was QRA square AK becomes 'global' square JO11). It remains to be seen whether a range of awards will now appear for working these squares on the HF bands, but the possibility obviously exists. What happens to the grid at the North and South poles is not entirely clear. Perhaps by working a station at the pole you can claim 18 squares at once!

Contests

August brings the All Asia CW Contest on the 25/26th. On the 26th is the RSGB's ROPOCO Contest from 0800-1000 GMT on 80 metre CW. This one involves exchanging postcodes and represents a commendable attempt by the RSGB to get away from the stereotyped exchange typical of so many contests. The LZ-DX Contest takes place on 2nd September (a CW event, this), and the IARU SSB Field Day on 1/2nd September (24 hours starting at 1500 GMT on the 1st).

Finale

That wraps it up for this month. News, views, photographs, suggestions, or what have you, as usual to 63 West Drive, Caldecote, Cambridge, CB3 7NY.

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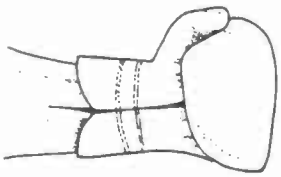

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Kit £14.80, assembled PCB module £19.80

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This kit is reviewed in the May issue of "Shortwave Magazine" by G3RJV. The article says a lot more than we can in this space. Suffice to say these are very popular with both beginners and experienced operators.
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PA/15 2M LINEAR AMPLIFIER 15 Watt
Do you have a 2M hand-held that could do with a boost? Suitable for mobile or base station use this unit will give a 10dB gain with any hand-held having up to 1½ Watts output. Easy to build, with preformed inductors for simplicity, this unit is also suitable for 1 Watt SSB rigs. An RF switched (or PTT operated) change-over unit is available type C01, see below.
PA2/15 Kit £18.90, assembled PCB module £22.80

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This unit gives approx 8dB gain for use with an IC202, FT290 etc. It puts out a clean signal with margin against overdriving with these popular radios. The PA2/30 includes preformed inductors and PTFE output trimmers for good performance. 13.8 Volt operation. The C01 change-over unit can be used with this item.
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This unit is designed to switch a linear, preamp, or both in and out of line. Suitable for all bands 160 to 2M, with an RF sensitivity of ½W for switching. Will switch up to 100W RF output from a linear, 25W max from the rig. Suitable for many uses apart from switching our PA Series Linears.
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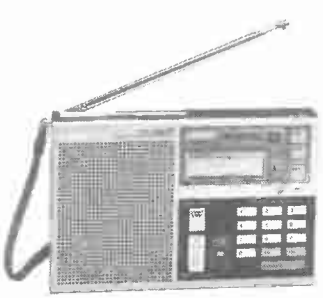

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THE ANGUS McKENZIE TESTS

SSB PRODUCTS 23cm TRANSVERTER

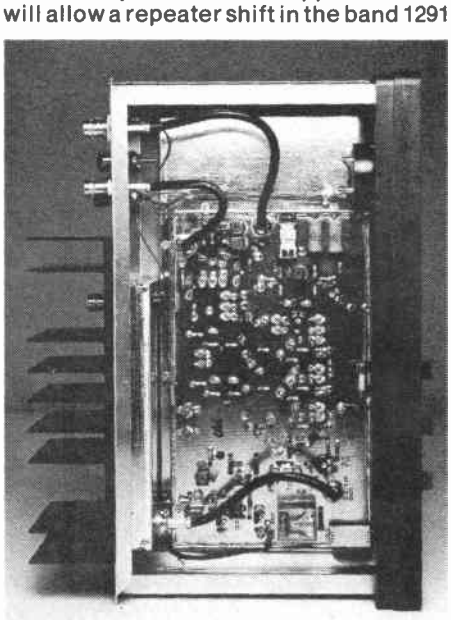
I am delighted to see that activity on the 23cm band is rapidly increasing, since by no means is it just a 'line of sight' band as so many newly-licensed amateurs seem to imagine. An average station using this transverter and a good antenna system can work stations regularly at 50 to 100 miles distance quite reasonably, and the band is subject to very strong tropospheric ducts which allow DX communication occasionally at amazing distances.

The LT23S should give a nominal 10W PEP output in the band from 1296 to 1300MHz, whilst coping with a wide frequency coverage outside these limits. The transverter has a typical input noise figure on receive of just under 2dB, GaAs-FETs being used for the RF preamp and mixer. The transverter is housed in a smart free-standing cabinet which is encased in plastic-coated metal, rubber feet being fitted on the underside which avoids an expensive rig being scratched underneath it.

The 145MHz BNC socket carries both Tx and Rx RF, and unfortunately there is no independent receive output on 145MHz, which I feel may be an annoying omission. The 23cm outputs and inputs are again on BNC sockets and I would have much preferred these to have been on N-types which can then go straight on to a thick cable, since BNC plugs with wide entry holes for thick cable are very difficult to obtain. The transmit output BNC is rather crammed in between two blocks of heatsinks and is awkward to use because of this.

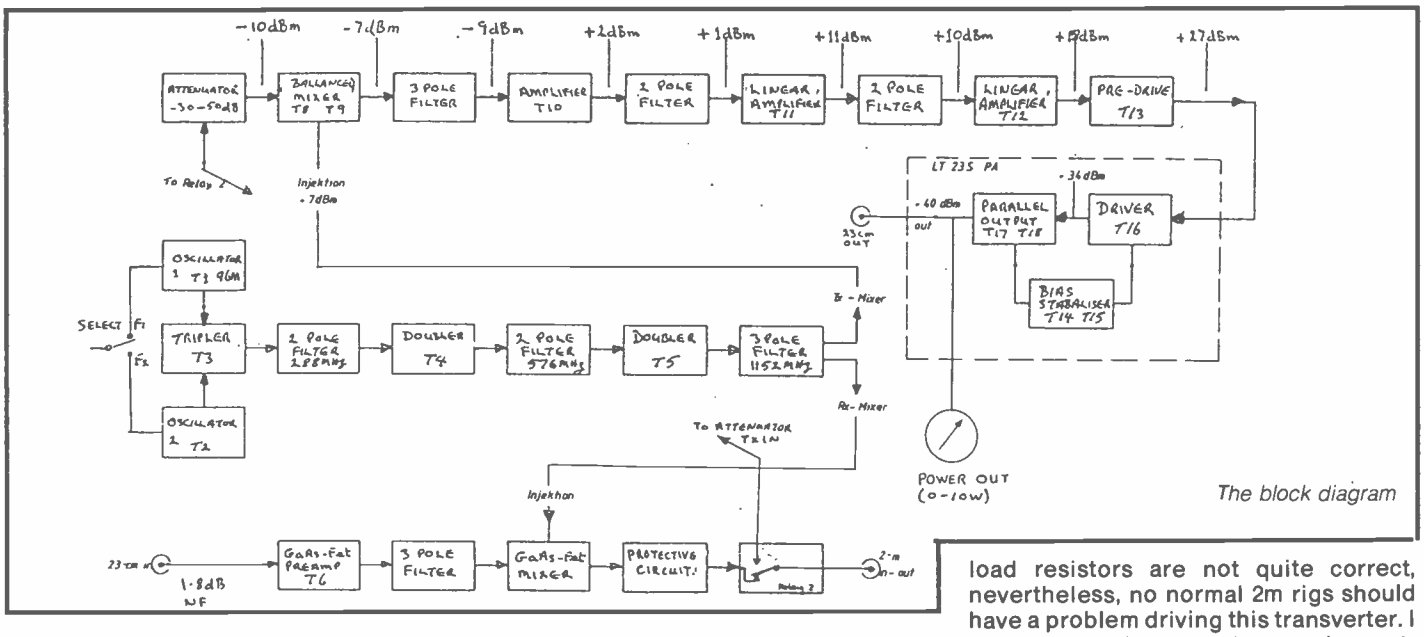
Three banana type terminal sockets are provided for up to 14.5V positive dc input and earth positive and negative, and a relay socket which the rig energises with up to 14V on Tx for operating external changeover relays. A phono socket is provided which, when shorted, pulls the rig over to Tx. These interconnections are far more convenient than having to solder on to dreadful 5-pin DIN sockets with their very narrow pins etc. The heatsink itself extends over the entire back panel with three groups of fins and these give adequate heat dissipation.

On the front panel are three up/down lever switches. The first one selects either of two local oscillator frequencies which thus allows an input band of 144 to 146MHz to come out at 1296 to 1298MHz. A second crystal can be supplied which will allow a repeater shift in the band 1291 to 1293MHz. The second switch puts the transverter over to Tx if you do not have a PTT line. It is absolutely vital to remember to put the rig to Tx first before transmitting into it as otherwise the 144MHz RF will go through the RF input relay into the output of the receive section, although there is a protection circuit here. The third switch turns the HT on to enable Rx. There is also a power output meter on the front panel, whose calibration was reasonably accurate.



The 144MHz input passes through the relay into two 100ohm resistors which are in parallel. Across these is a preset pot for adjusting input sensitivity. The manufacturer claims that the sensitivity for full output can be adjusted for input powers of 100mW up to 10W. This is a very useful range of adjustment, but alas, the maximum sensitivity of my review sample was only 250mW, which actually made it rather awkward to test. There are plenty of band pass filters around both the transmit section at 144MHz and 1296MHz, and again in the receiver path, giving excellent image responses and local oscillator rejections.

A symmetry control is provided for balancing the mixer and there are several stages of amplification before the final PA is reached, which in turn consists of two ON921s in push/pull, driven by another one. The local oscillator runs at 96MHz which is trebled to 288MHz, doubled to 576MHz and then doubled again to 1152MHz. This avoids any 144MHz components or harmonics being in the transmit or receive chain from the local oscillator. As will be seen from the photograph, the LT23S is



The block diagram

extremely well made and plenty of room is allowed for heat to dissipate, and thus the stability is good. The construction is quite robust and various connecting leads are in very low-loss, fairly thin 50ohm coax which is extremely well clamped and soldered into place.

The block diagram shows the general sequence of components in the transmit, local oscillator and receive sections, and this should make the transverter's operation fairly obvious. However, I was again disturbed by the lack of circuit details in English, although basic operating instructions with specifications and brief technical data *are* at least supplied in English.

Laboratory tests

Unfortunately, there was insufficient gain in the review sample for us to test the equipment directly from the combined outputs of my two Marconi 2019 signal generators, so we used a Marconi 2175 amplifier for driving the rig at 145MHz. We checked the two tone intermodulation performance of this amplifier first and found it to be very satisfactory, the third order product at an output PEP of 400mW being around –49dB. At lower output levels, the intermodulation products fell very rapidly, and furthermore, high order products were very well down. We ran the rig at a dc voltage measured on the HT input terminals at 14.6V Tx. We were unable to get more than around 8W single carrier output using the Marconi as driver (*see postscript*). PEP at microwave is not easy to measure, but I estimate that the absolute maximum PEP output on two tones was around 9W and, if anything, I have erred in an optimistic direction here. It was quite clear that at this level there was some compression taking place, and if we had had much more drive available we might have been able to achieve 10W, but the IPs would have been intolerable.

We looked for local oscillator breakthrough on the output and this was at -47dB ref 3W output, which is quite tolerable. The image on the transmitted output was below -65dB and not visible on the analyser. We checked the power bandwidth, and there was a 3dB fall off at 1290 and 1303MHz. We checked the existence of breakthrough on the output of the input 145MHz signal, and this was at least 68dB below the 3W output level, again below the noise floor of the analyser. This was, however, for an input of 100mW, but I do not suppose that even 10W in, with the preset appropriately adjusted, would cause any significant breakthrough.

We interconnected a Wiltron bridge to the input of the transmitter and sent a 145MHz signal in at a level of 1mW from a very stable source impedance. When the transmitter was switched on, the return loss was at quite a tolerable level at –15dB, which is equivalent to an SWR of 1.43:1. Whilst this shows that the built-in load resistors are not quite correct, nevertheless, no normal 2m rigs should have a problem driving this transverter. I hasten to add that under no circumstances should you attempt to use a rig which delivers more than 10W into this transverter, as otherwise you will burn up the load resistors.

We applied two carriers spaced 200KHz apart and examined the intermodulation products on the spectrum analyser at the 23cm output. We used a NARDA 20dB power attenuator which then fed directly into the analyser. At an output PEP of around 7W, the third order products were at -24dB, which rose to –22dB at the maximum output. What is most significant is that the fifth order products were way down, even at full output, at -43dB, whilst seventh order could not even be seen on the analyser!

This explains why those amateurs using this transverter put out extremely clean signals which are somewhat narrower than many others (provided, of course, that the 2m drive is itself clean!).

SSB PRODUCTS 23cm LINEAR TRANSVERTER – LT23S: LABORATORY RESULTS

Transmitter Tests	
Maximum RF output power	9W PEP approx
Transmitter intermodulation products (ref 8W PEP output)	3rd order -24dB 5th order -53dB
Power bandwidth (3dB power drop)	1290-1303MHz
Frequency accuracy (after warming up)	within 500Hz
Frequency drift (after 5 mins)	-400Hz
Input VSWR	1.43:1
Image rejection	<-65 dB
Local oscillator breakthrough at 3W o/p	-47dB
145MHz breakthrough on output	<-68dB
Receiver Tests	
Receiver gain	8dB approx
Receiver intercept point	-20dBm approx

Obviously the adage 'garbage in/ garbage out' applies here, so make sure that if you use an FT290 with it, that you have increased the standing current of the 290 PA by suitably adjusting the bias resistor. This can make an astonishing difference to the FT290.

We checked the drift characteristics of the transverter on transmit using 20mW drive, thus giving an output of around 800mW, which represents a reasonable average continuous power equivalent to a 10% duty cycle for SSB. On initial switch-on, the output was 900Hz high. The Marconi 2305 transmitter test set was locked to Rugby, and the counter can read frequency to the nearest 100Hz at 23cm. The 2019 generator was locked to its own crystal but its frequency was checked against Rugby. After about four minutes the output frequency had stabilised to be 500Hz high. We then transmitted for a minute or two at a time, and in between each period we received for a minute or so, and on returning to transmit the same output frequency was given, so this means that the transverter is remarkably stable over long periods. Any drift versus time was clearly below 100Hz, and I consider this quite remarkable as this represents a short term stability better than 8 parts in 10 raised to the power 8, ie one hundred million. I have owned many other UHF and microwave transverters and this stability is far superior to that of any other that I have tested.

I did not have at hand a means of measuring the input noise figure accurately, and there is no point in giving a measurement which might be accurate only to +/- 1dB with the wind in the right direction. In my installation I use an SSB Products GaAs-FET at masthead with a cable loss including plugs, sockets and relay of around 6.5dB. When I switched on the preamp the system noise increased by many dB showing that the noise figure of the transverter must be good. Of course, the improvement in system noise figure using the preamp is amazing and equivalent to around 7dB.

I found it very difficult to carry out two tone RF tests on the receiver as I do not have signal generators capable of transmitting at 1296MHz, so I got round the problem by mixing the outputs of the two Marconis with an amplified harmonic of a crystal controlled generator at a lower frequency, using a Mini Circuits Lab microwave mixer. We fed the output from the mixer into a 1296MHz interdigital filter and checked the intermodulation products on the analyser. We then drove the two tone wave form into the GaAs-FET input and looked at the products on the 2m output. I was a little disappointed to see that the intercept point would seem to be in the region of -20dBm.

Using the same technique we measured the receive gain and found this to be only 8dB, despite the 18dB claimed gain. We were very puzzled here so I tried another method. I beamed up on GB3NWK and with the masthead preamp in, obtained a level of -78dBm into the analyser when fed directly by the input coax, taking into account the extra lead loss to the analyser. We then measured the 2m output signal and again this showed only 8dB higher level, so something was very wrong here (*see postscript*). In my installation the output is fed directly into a Microwave Modules' 2m transverter with an input noise figure of around 2dB. With masthead on I am just overcoming the lack of transverter gain but, without the preamp the system is clearly a little noisy.

The bandwidth of the receiver is quite wide but the interdigital filter in between the front end and the mixer gives good rejection of image so there should be no problem here.

Subjective tests

My Microwave Modules 2m transverter is set up to give 0.4W into the LT23S for Tx, and is driven by a Trio TS830. The output of the LT23S feeds into an EME linear, as reviewed a few months ago in this magazine. There was enough drive available to get between 100W and 140W PEP output from the linear. The transverter gain drifted very slightly over an hour or two and tended to fall back by about 1dB. The modulation reports have been very good indeed, and stations reported that the transmissions were very narrow and of good quality, with low-level sounds extremely faithfully reproduced and without any signs of non-linearity. I did not receive any report of drifting even over long periods.

Despite the fairly poor intercept point on receive, only one station tended to cause receive problems, even when the masthead was switched off when I beamed right at him. I should mention though that when G3JXN and I are beaming at each other, every meter in both shacks goes on the end stop, and I estimate his signal at many mV. John once gave me rather a bad report when he was receiving me at only 5/8, and I wondered what had gone wrong my end. After a while, John discovered that he had not plugged the aerial relay through to the receive converter so you can imagine how we pounded into each other with aerials connected!

What is particularly interesting is that there are virtually no spurii received across the band, whereas one or two other transverters have produced the odd strange carriers which will not go away! These are probably due to image and local oscillator harmonics beating with secret or illicit carriers, which are out of band!

Conclusions

The choice between this transverter and that of Microwave Modules (which I hope to review shortly) is not altogether easy, for both have advantages and disadvantages. The main asset of the LT23S is that it has the capability to drive fully an EME linear, which has now become very popular, whereas the Microwave Modules transverter can only deliver a clean 1.5W output, thus giving a greatly reduced output from the EME. The LT23S is very clean on transmit, but the receiver gain has to be criticised (*see postscript*), although the noise figure is good, as is that of the MM. However, the MM has too much gain which is annoying, and requires an external attenuator load which is untidy. The MM has a separate receive output, however, which is useful.

It would be very difficult to weatherproof the LT23S for use at masthead, but it is eminently suitable for mobile and portable applications because of its superior power output capability. Its price is very reasonable for the power, and the MM together with an SSB Products linear which is required to bring the power up to be competitive costs quite a lot more.

I was particularly impressed with both the frequency accuracy and stability of the LT23S, and its presentation in all respects is superb. If you have appropriate test gear, it will be very simple to align, as everything is so well spaced out and is thus easy to adjust. I suggest that if you want to operate seriously on 23cm, that this transverter should be very highly recommended, and at its price of just over £300 it seems good value for money.

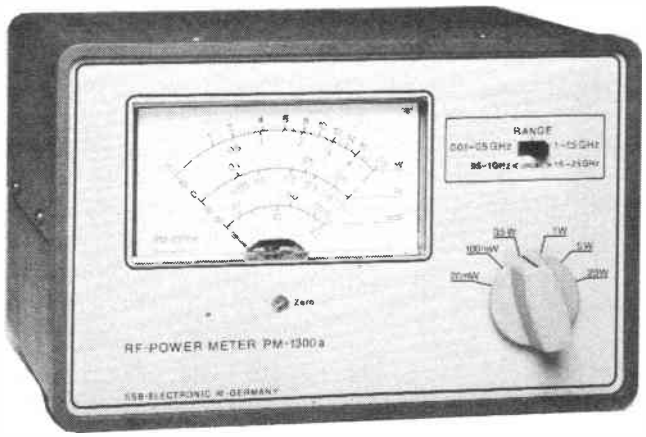
I realise that many will want to build their own transverters, but an awful lot of us have not got the patience, time or even competence to build what is obviously a very challenging device. The importer is Piper Communications of 4 Severn Road, Chilton, Didcot, Oxon. Telephone: 0235 834328. I would like to thank my colleague, Mike Hatch G1DEW, for his help in taking all the measurements with me, and what a difficult time we both had!

Postscript

I discussed the findings of this review with the importer when I sent the original copy to the publishers. At very short notice, Dave Aram brought over another sample for some brief checks. I immediately saw over 18dB gain on GB3NWK, and actually an increase of around 11dB was noted on my S-meter, which is reasonably well calibrated. I noticed a marginal improvement in system noise figure which was predictable, as the original review sample was not quite overcoming the noise of the following stage. The transmitter section required around 80mW for full output which again showed a major improvement. On 14.5V we saw just over 10W output, and so in every way the unit was better.

Subjective reports were again excellent, and I noticed an improvement of apparent intercept point on receive. Frequency accuracy seemed within 1KHz after the same warm up period, but I did not check to tighter limits than this. The original review sample will be checked by the manufacturers to see why it was apparently faulty, or if the local oscillator injection might have been low, which seems the most logical explanation of the earlier problems.

SSB PRODUCTS PM1300a RF POWER METER



Last autumn I reviewed a considerable number of in-line power meters. Since then I have been looking out for a good general coverage meter which has a very high sensitivity capability and which can also absorb the output of various rigs up to 20W or so. This meter was supplied to me by Piper Communications, and it was absolutely fascinating to put it through its paces. The meter is specified to measure power from 10MHz to 500MHz on one band, and 1 to 1.5GHz on another, these bands being switchable with a slider. Six power ranges are incorporated, giving full scale deflections of 20mW, 100mW, 500mW, 1W and 20W, the ranges being switched by means of a chunky rotary.

Six scales

As will be seen from the photograph the meter's scales are easy to read over most of their range, six different scales being provided for the different ranges. The accuracy is claimed to be within +/- 10%. The input connector on the back is an N-type socket mounted on a panel incorporating a well ventilated heatsink. The N-socket feeds into a metal film lump circuit dummy load, which allows for 20W dissipation, the feed being along a 50ohm printed circuit transmission line. The meter sensitivities are changed with a chain of 10-turn pre-set cermet resistors, separate trimmers being provided for the two frequency ranges. The meter is housed in a metal cabinet with a smart green finish, and is well styled.

We initially checked the accuracy of the meter by sending into it a 20mW signal from our Marconi 2019 generator. This is itself extremely accurate in frequency and output level calibration, but nevertheless we checked the output calibration with our Racal 9303 power meter, which in my experience is generally within around 1% accuracy taking cal factors into account. We were astonished to find that whilst the instrument is specified only down to 10MHz, it was actually within spec right down to 1.9MHz, thus making it an incredibly useful instrument. As will be seen from the tables, the meter was very accurate but, if anything, would have been even more so if its sensitivity were increased generally by an average of around 4%.

We then inserted a Marconi general coverage power amplifier type TF2175, which is capable of giving up to 300mW output with quite low distortion. With this, and again using the Racal, we checked the 100mW and 500mW ranges, the latter being checked out at 300mW. For the 1W, 5W and 20W ranges we used an Icom IC751 with adjustable RF level together with calibrated power attenuators, and a Trio TW4000A for VHF and UHF.

For the 23cm checks I used an EME precision directional coupler in-line with my 23cm transmitter output. This coupler is available in two versions, one calibrated for 2m, 70cm and 23cm (type 7020/30, £65), whilst the other is for 70cm, 23cm and 13cm, (2320/30A, £58), both having extremely good claimed accuracies. The couplers have N-sockets for the in-line connection, and two built-in 50ohm terminated coupling lines feeding BNC sockets for interconnection to an RF power meter, giving forward and reverse powers. The coupling loss of the higher frequency coupler is around 30dB on 70cm, 20dB on 23cm and 17dB on 13cm. The loss is actually calibrated on the coupler to the nearest 0.1dB, which is most useful, and specified at 0.3dB accuracy.

Using this coupler, also available from Piper Communications, and comparing the power measurements with the Racal, the 23cm accuracies were within around 5% centre line. I could only check accuracy, though, up to the 1W range, although I have no reason to doubt the two higher ranges.

Terminating load

Having determined that this instrument gave remarkably accurate power measurements throughout over an amazing frequency range, and thus putting to shame many professional instruments costing a great deal more, I thought it would be a good idea to see if there were any snags in the accuracy of the terminating dummy load.

We used a Wiltron Bridge in combination with the Marconi 2019 generator, with a 10dB attenuator right on the input to the bridge on its RF input. The bridge RF output fed directly into the Racal 9303 power meter. Frequencies were checked between 1.9MHz and 1040MHz to check the return loss with the test port of the Wiltron connected right onto the PM1300a's input socket. For each frequency we checked the open circuit return loss and set it at 0dB reference, then measured the return loss when interconnected with the meter. From 1.9MHz to 145MHz the SWR was better than 1.03:1, which is excellent, whilst on 70cm the SWR was 1.09:1. Even at 934MHz, the SWR was 1.28:1 which is acceptable, but by 1040MHz, it had risen to 1.34:1, so I assume that on 23cm the load is just slightly inaccurate, although adequate.

Very low powers

At 145MHz we checked the 20mW range across the meter scale, and found the accuracy to be well maintained down to just below 10mW, but very low powers under-read by around 25%. This is quite usual though, if you try to use a normal moving coil instrument for measuring only a few mW. The rectifier is a hot carrier diode, and the 10 turn cermet trimmers can be used to improve the average accuracy if you have a better lab standard. Cermet trimmers are far more temperature stable than carbon types, incidentally.

Directional couplers

I can think of 101 uses for this meter, which will be especially useful if you use it with the EME directional couplers for VHF, UHF and 23cm, and directional couplers are generally available for LF and HF frequencies, which would allow the instrument to be used as an in-line one, provided the couplers are calibrated. A coupler with a loss of 20dB will represent 100W as 1W, whilst a 30dB coupler (I frequently use a Bird one), divides the power conveniently by 1000. Such a coupler therefore means that you can read down to 20W in-line power using the 20mW range.

The PM-1300a will be particularly useful for checking the output of very low power stages, including mixers, if you do a lot of building for yourself. You can of course check normal mobile rigs very rapidly, provided their maximum power does not exceed 20W. You can buy power attenuators, but unfortunately these cost a fortune, and I do not know of a good one at a reasonable price built for

SSB Products RF Power Meter - PM 1300a Laboratory Measurements

Power Accuracy	Range					
	20mW	100mW	500mW	1W	5W	20W
1.9 MHz	-7.5%	-5%	-12%	-5%	-12%	-7.5%
3.7 MHz	-5%	-3%	-7%	0%	-4%	-5%
7.05 MHz	-3%	0%	0%	0%	-2%	-2.5%
10.1 MHz	0%	+2%	0%	+2%	0%	0%
28.5 MHz	-5%	-3%	-7%	0%	-4%	-5%
50.2 MHz	-5%	+3%	-7%	Not Measured		
70.2 MHz	-5%	0%	-3%	Not Measured		
145 MHz	-10%	0%	-3%	-5%	0%	-2.5%
433 MHz	-2%	0%	0%	0%	-8%	-7%
934 MHz	0%	Not Measured				

Scale Linearity @ 145 MHz **20mW reads 18mW; 10mW reads 9mW; 5mW reads 4mW; 2mW reads 1.5mW**

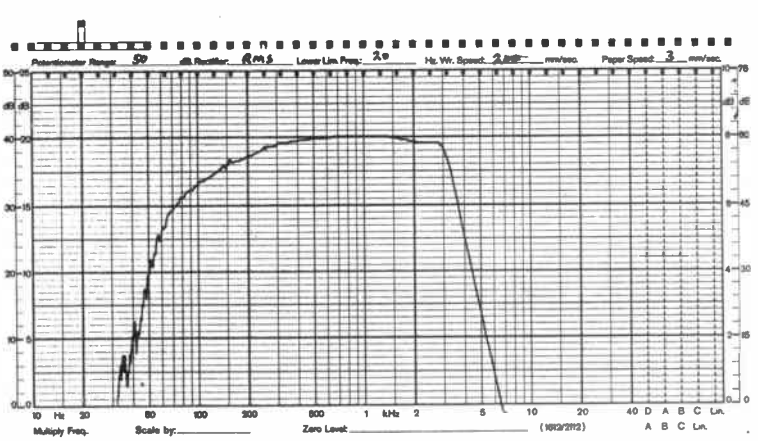
Input VSWR

1.9 MHz	better than 1.02:1
3.7 MHz	better than 1.02:1
10.1 MHz	better than 1.02:1
29 MHz	better than 1.02:1
70 MHz	better than 1.02:1
145 MHz	1.03:1
433 MHz	1.09:1
934 MHz	1.3:1

amateur use that is still available. A 20dB power attenuator covering a frequency range from Top Band to 23cm would be extremely useful, so how about designing one! If a reader does know of a source of supply of such a device, or an importer can supply one which doesn't require a mortgage from the bank, perhaps a letter to the editor would be appropriate.

This instrument costs £128 (inc VAT) and is extremely good value for money. Of course there are cheaper power meters, but I have never found one so flexible at less than many times its cost, so it is thoroughly recommended for those amateurs who like to check cable losses, linear amplifier gains, outputs from oscillators, as well as normal power outputs. This instrument has been thoroughly reliable, and is frankly one of my favourites. Piper Communications are at 4 Severn Road, Chilton, Didcot, Oxon OX11 0PW, and Dave Aram will be pleased to give further details. Finally, one criticism: the instructions are in German, and thus virtually incomprehensible to most of us, and there is no circuit diagram with them, which is a serious omission. Dave Aram has promised to make a translation available soon. This is an instrument which professionals should look at, for it is particularly handy, and in no way is it an unprofessional product just because it is designed for use by radio amateurs.

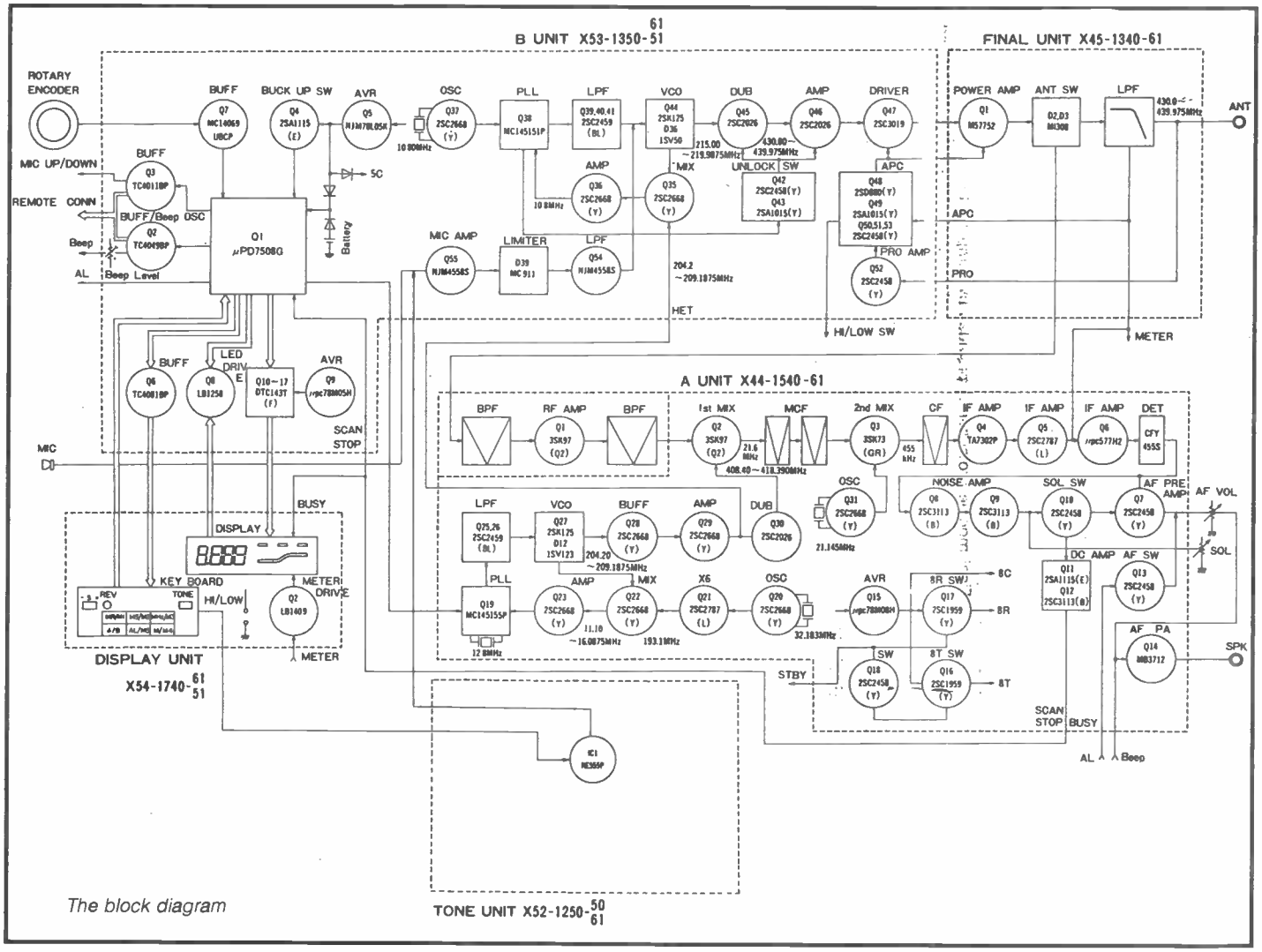
THE TRIO TM401A 70cm FM MOBILE TRANSCEIVER



Trio TM 401A transmitted audio response with 750μS de-emphasis

I have noticed with great pleasure that mobile activity on 70cm has been increasing rapidly in the last year or so. Curiously, 70cm mobile seems to have been more popular in the Midlands than in the South East for a while, but at last penetration has shown a dramatic improvement with so many more excellent repeaters being provided on the band.

The Trio TM401A is extremely similar to the Trio 201 which I reviewed last month; its output power is limited to 12W as quoted, but is actually somewhat higher. The rig is very small for its facilities, measuring 141 x 40 x 183mm and weighing only 1.2Kg. I am pleased to see that the rig is equipped with an N-type socket for the aerial interconnection, as on the excellent Trio TW4000A. Like the 201, the socket is at the end of a short captive coaxial lead and is thus easier to use than one actually mounted on the back. The only other connections on the rear are a captive-power lead, 2m long,



The block diagram

which is fused in the positive and fitted with bullet connectors at around 30cm from the set, and a 3.5mm jack socket for interconnecting the external loudspeaker, no internal speaker being fitted. This external speaker can be easily mounted conveniently almost anywhere in the front of the car, the thin connection lead being around 3m long.

Across the back is a very chunky heatsink which dissipates the heat very well. This rig runs somewhat cooler than the 201 as it is delivering only half the RF power. A mobile mount is supplied and the rig can be used with the 201 with an attachment stacking plate which allows for rather a swish installation. This allows crossband working in duplex, or even stereophonic if you wish!

Repeater switch

Two VFOs are incorporated, one having 25KHz steps, and the other 5KHz. The repeater switch has three positions: minus, simplex and plus, whilst to its side is a push button which gives fixed reverse repeater operation when repeater mode is selected, the button not being spring-loaded. In simplex mode this button becomes a frequency lock. Small on/off/volume and squelch controls are in the centre at the bottom of the front panel, and above them is an easy-to-read frequency display using bright green LEDs on a black background. As with other recent Trio models, the readout is much easier seen, even in bright sunlight, than the readouts of older Trio mobile rigs. On the right hand side are buttons for 1750Hz tone burst on/off and high or low power together with six buttons for access to memories (5 of them), these having dual functions of memory recall, memory scan, MHz up, memory write, priority alert and, finally, VFO A/B switching. Please see the 201 review for details of the various bleep and memory functions as they are virtually identical.

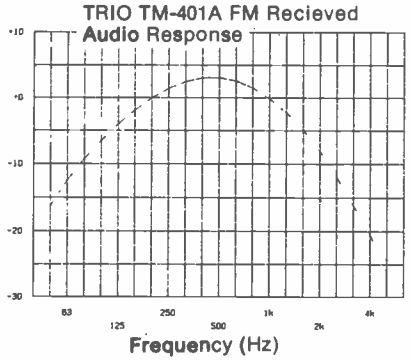
The microphone, supplied with the rig, has a long coiled cord and an easy to use PTT which only requires light pressure for operation. Up and down buttons for frequency control are on top of the microphone,together with a hook so that the mic can be hung when not in use. On the right hand side cheek is a remote control socket which provides remote frequency indication, memory recall, MHz up, normal up and down and VFO A/B swiching. The memory facility could thus allow the rig to be operated remotely with fixed audio gain and squelch on receive. Optional accessories include a Trio mains power supply unit, a two tone unit for non-European use and alternative microphones could be used. Unfortunately, the Trio voice synthesiser cannot be fitted into this box which is a pity.

The rig covers the whole band from 430 to 439.995MHz. Repeater off-sets are normally 1.6MHz, but memories 4 and 5 can each be loaded with separate receive and transmit frequencies anywhere in the band which might be useful. Scanning facilities allow scanning between transmit and receive frequencies on memory 5 or full VFO scan.

Laboratory tests

The input RF sensitivity was very good indeed in the part of the band normally used but deteriorated by 2.5dB up at the very top end which should not be a problem. The RFIM two tone intermodulation tests showed the rig to have quite a good performance, the intercept point being reasonably good for a UHF rig, although it could have been a little better.

In the context of 70cm you should have no problem here. We could only check the reciprocal mixing performance with our normal generators, and so the results in the tables should be taken as a minimum, and they are probably rather better. Even so, I consider the performance very good for a UHF rig.



Although 12.5KHz spacing is not available on this box, and at the moment is not used on 70cm, the selectivity measurement, using the white noise method, was good, 25KHz being very good and 50KHz excellent. Note that the 201, however, is even better but the measurement is probably limited by off frequency noise of our own generators.

The S-meter, as seems usual with FM rigs, appears to have a very limited range between the weakest and strongest indications, the difference being only 13.5dB here. I do wish that something could be done about S-meters on FM, incidentally, but I can see the problem is in the type of circuitry employed. The capture ratio measured well which shows that the rig can discriminate well between two stations of differing strength on the same channel.

Audio quieting at the 12dB sinad sensitivity point is 16.5dB which shows that the sensitivity is limited mainly by distortion at very low levels. The discriminator gave quite good distortion readings at higher levels, which is clearly responsible for the reasonably clean audio as reproduced from a good transmission. Plenty of volume is available into the 8ohm speaker, and you can get even more if you want into a 4ohm one, which would be enough to drive the back seat passengers nearly round the bend!

The 3dB limiting point was at an extremely low level so that the reproduced audio levels should be virtually constant, no matter how strong or weak the received station is. The maximum attainable signal-to-noise ratio is reasonably good, but there was a slight trace of synthesiser whine in the background when the volume control was turned well up. The receiver was well centred throughout, and no improvement could be gained in signal-to-noise, sensitivity or distortion when the set was off-tuned, or the signal generator frequency was shifted slightly off channel. An extremely weak signal can still open the squelch which is as sensitive as one should ever need, although the squelch range was slightly limited. The received audio response shows a good bass roll-off below 150Hz which is fairly steep, and the HF end falls gently above 2KHz, followed by a steeper fall at 3KHz. Don't forget the pen chart response as shown was of the signal generator with no pre-emphasis.

The transmitter actually gave 15.5W output at the lower end of the band, and power output was only marginally down at the very top end, and this is really excellent. The frequency accuracy was very good, being within 80Hz! Typical speech had just about the right deviation, and in the subjective tests no over-deviation pips occurred when checked with various repeaters. The tone burst deviation seemed about right, but could not easily be measured because of its slightly short duration. The repeater shift was very accurate, so no problems should occur with repeater operation.

Second and third harmonic outputs were checked and these were both very well down. The current drawn on transmit was slightly high but reasonable, whilst the receive current when squelched was thought acceptable. The transmitted audio response was pre-emphasised very accurately at 750μS up to 3KHz, above which frequency the response was curtailed extremely rapidly, which is splendid, being 30dB down by 6KHz. At the bass end, there is a 6dB per octave slope below 250Hz, but attenuation becomes very steep below 100Hz which is welcome.

Subjective tests

Modulation reports were excellent from this rig and no problems were encountered in operation. The audio was certainly very good, and modulation was still clear when I was shouting into the microphone when fairly close. Intelligibility is the main factor and it is certainly good. The received audio was of excellent quality and very clear, so the speaker provided was also good. Sensitivity was good and no problems were noted in the receiver. I very much liked the ergonomics of this rig, as I did on the 201, and since 12.5 KHz is not used on 70cm, I do not miss it.

Conclusions

This is clearly a most recommendable rig for 70cm mobile operation. Its small size and excellent ergonomics allowing it to be easily mounted and withdrawn from the car are strong points. I liked the aerial interconnection being on a short flying lead, and feel this rig has got everything on it that one would normally require on a 70cm mobile, and it is much easier to operate than most of its competition.

When switched to low power the output fell by just over 10dB and this is just about right,whilst the current taken did reduce quite substantially. Both the transmitted and received quality was above average and the overall performance excellent, and so this rig is obviously a very good one to consider.

No problems at all were experienced at any time, so I assume that reliability must be excellent. Quite a few of them have already been sold, and I have not heard the slightest criticism from any users. I would like to thank Lowe Electronics for the loan of the review sample and my colleague, Mike Hatch G1DEW, for taking all the measurements.

TRIO TM-401A MOBILE TRANSCEIVER – LABORATORY RESULTS

Receiver Measurements

Sensitivity for 12dB Sinad
(3KHz deviation, 1KHz modulation)

432.025MHz	-123.5dBm (0.15μV)
433.400MHz	-123.5dBm (0.15μV)
439.975MHz	-121.0dBm (0.2μV)

Selectivity;
blank carriers off channel to degrade Sinad by 3dB (ref 12dB Sinad)

-/+ 12.5KHz spacing	48/60dB
-/+ 25KHz spacing	69.5/70dB

Selectivity; second method
carriers off channel modulated with filtered white noise (ref 12dB Sinad)

-/+ 12.5KHz spacing	30/30dB
-/+ 25KHz spacing	67.5/68dB
-/+ 50KHz spacing	74/74.5dB

RFIM Performance: carriers off channel for 12dB Sinad product
(ref 12dB Sinad)

50/100KHz spacing	74dB
100/200KHz spacing	74.5dB

Calculated RF intercept point-12dBm

Reciprocal Mixing Performance at 433.4MHz (*see text)
RF Levels required off channel to degrade Sinad to 3dB (ref noise floor)

25KHz spacing	81dB
50KHz spacing	86dB
100KHz spacing	93dB
200KHz spacing	99dB

S-Meter; RF levels required to produce the following S-meter readings;

S1	-110dBm (0.72μV)
S3	-107dBm (1.0μV)
S5	-105dBm (1.28μV)
S7	-100dBm (2.24μV)
S9	-96.5dBm (3.4μV)
'S10'	-91dBm (6.4μV)

Capture Ratio 4.0dB

Audio quieting (at 12dB Sinad) 16.5dB

3dB limiting point-127.5dBm (0.09μV)

Maximum audio output (10% THD into 8ohms) 2.8W

Maximum audio output (10% THD into 4ohms) 4.4W

Audio distortion (125mW into 8ohms)

1KHz deviation	0.7%
3KHz deviation	1.5%

Best obtainable Signal-to-Noise ratio

Unweighted	52dB
CCIR/ARM weighted	47dB

Current drawn on standby 370mA

Current drawn at full AF output 950mA

Squelch sensitivities;

Minimum	-114dBm (0.45μV)
Maximum	-130dBm (0.07μV)

Transmitter Measurements

RF Output Power	High/Low
432.025MHz	15.6/1.3 W
433.400MHz	15.6/1.3 W
439.975MHz	15.3/1.2 W

Carrier frequency accuracy at 433.4MHz -80Hz
Peak deviation (typical speech) 5.2KHz
Repeater shift accuracy -20Hz
Harmonic Output at 433.4MHz
(ref fundamental)

2nd Harmonic	-65dB
3rd Harmonic	<-72dB

Current drawn on transmit 2.9/1.2A (High/Low)

ICOM

FOR THE SWL...

IC-R70, £565.

The R70 covers all modes (when the FM option is included), and uses 2CPU-driven VFOs for split frequency working, and has 3 IF frequencies. 70MHz, 9MHz and 455KHz, and a 100dB dynamic range. It has a built-in mains supply. Other features include input switchability through a pre-amplifier, direct or via an attenuator, selectable tuning steps of 1KHz, 100Hz or 10Hz, adjustable IF bandwidth in 3 steps (455KHz). Noise limiter, switchable AGC, tunable notch filter, squelch on all modes, RIT, tone control. Tuning LED for FM (discriminator centre indicator). Recorder output, dimmer control.

The R-70 also has separate antenna sockets for LW-MW with automatic switching, and a large, front-mounted loudspeaker with 5.8W output. The frequency stability for the 1st hour is ± 50Hz, sensitivity – SSB/CW/RTTY better than 0.32 uv for 12dB (S + N) ÷ N, Am – 0.5 uv. FM better than 0.32 for 12dB Sinad. DC is optional.

Ever since its introduction the IC-R70 has proved to be a popular and reliable HF receiver making your listening hours a pleasure. Please contact us for further details on this excellent set.

IC-R71E, £649.

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz, 9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

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

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ICOM

FOR THE DX'er...

IC-745, £839.

ICOM's IC-745 is the all-in-one transceiver featuring an HF all band SSB, CW, RTTY, AM (receive only) ham transceiver, plus a general coverage receiver. Options for FM transceive and an internal power supply make the IC-745 the complete transceiver in an all-in-one package.

The receiver section features a 100KHz to 30MHz general coverage receiver, this allows access to all HF bands plus all the frequencies in between. The IC-745 has an adjustable AGC circuit and DFM (Direct Feed Mixer) giving a wide dynamic range of 103dB with an intercept point at + 18dBm. Exceptionally clean reception is achieved with a low noise PLL circuit and a 70MHz first IF.

The IC-745's features include IF shift, 16 programmable memories with lithium battery back-up, passband tuning, a noise blanker both wide and narrow, threshold level control, notch filter, receive audio tone control and an all mode squelch. Also available is a front end switchable receiver preamp providing 12dB gain. RIT has a ±1KHz range.

We could go on all day about the 745, get in touch with us and we will send you the full story.

IC-271H, £819.

The IC-271H is the most advanced 2 meter transceiver available today, it covers the spectrum from 144-146 MHz with FM, SSB, or CW using the most advanced 10Hz PLL system. The IC-271H is suitable for simplex, repeater operation, moonbouce or satellite work, and has features found on no other transceiver.

Some standard features include 32 tunable memories, a high visibility fluorescent display, RIT readout, scanning, 12V DC operation with optional AC power supply.

The 271H has a speech synthesizer that announces the displayed frequency, ideal for blind operators, this is an optional extra along with the SM6 desk microphone and 22 channel memory extension with scan facilities.

As you can see from this brief description the IC-271H, (and its 430-440MHz brother the IC-471H) are very versatile sets indeed. More detailed literature can be easily obtained from Thanet Electronics Limited.

ICOM

ON THE MOVE...

IC-27E, £319.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H x 144mm W x 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 5Khz 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 £319 and £25 for the optional speech synthesizer.

IC-290D, £499.

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW,Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with optional IC-HM1 microphone. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory. What a great little transceiver!

You can get what you want just by picking up the telephone. Our mail-order dept. offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

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ICOM

FOR COMPUTERS

Tono 5000E, £799.

From the famous TONO stable comes the new THETA – 5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASCII.

Features include:- 5" high resolution monitor displaying 400chr. x 16 lines x 2 pages, ARQ/FEC, time clock, Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTL level); 3 shifts (170,425 and 850 Hz) and two tones (2125 and 1275 Hz); manual or automatic Tx/Rx; Battery back-up memory (72 chars x 7 channels and 24 chars x 5 channels); type ahead correctable buffer memory; Morse code 5 – 100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A, B and L – the list goes on and on..... Power requirements by the way are AC mains or 13.8v DC.

Tono 9100E, £699.

The famous TONO THETA 9000E has had AMTOR modes A, B and L added to its functions providing transmit and receive facilities with selective calling on AMTOR, RTTY (with 3 selective shifts and 2 tone pairs), CW with built in practice function and random generator, and ASCII with full Duplex facility. The 9000E requires an external VDU. The battery backed memory covers 256 characters x 7 channels with Channel 6 which is divided into 16 subsections of 16 characters each and Channel 7 into 8 subsections of 32 characters. Any of the subsections may be used individually and messages can be repeated 1 – 9 times from a keyboard command.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Give it a visit, BCNU.

Agent: Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900 – 2200 hrs.

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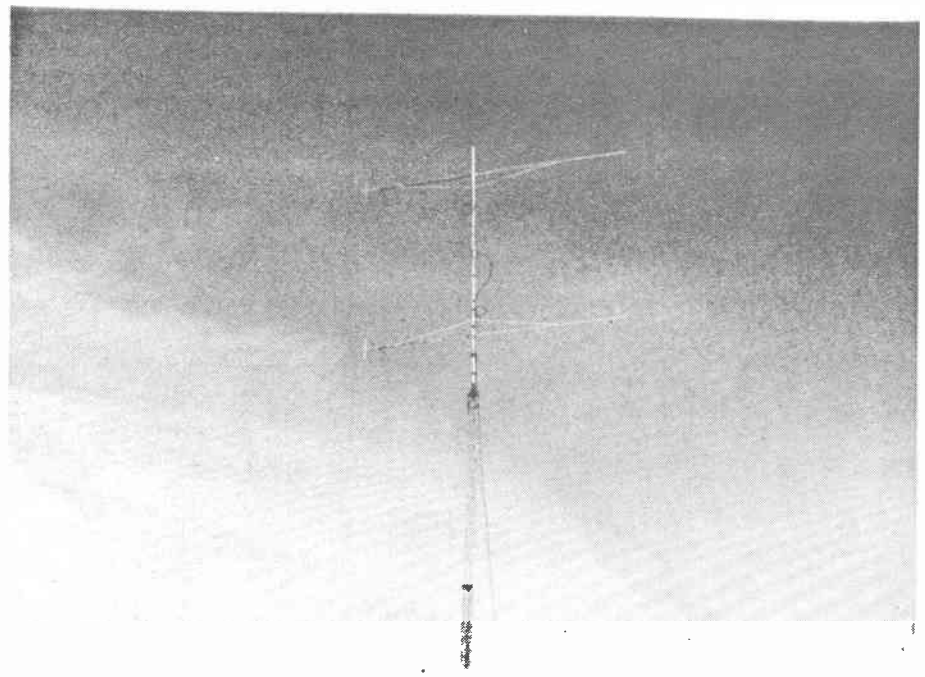
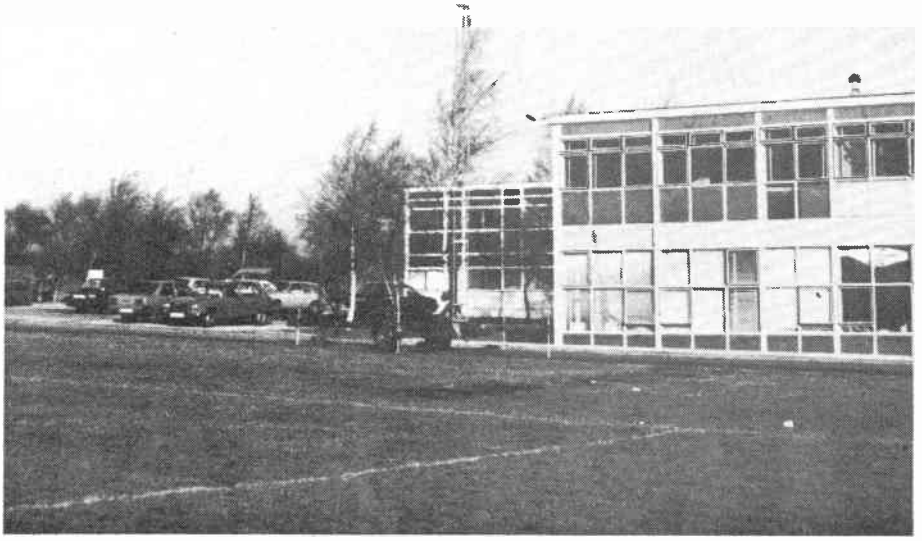
Dept AR, 143 Reculver Road, Herne Bay, Kent.
Tel: (02273) 63859/63850





1983 2 METRE FIXED STATION CONTEST

Some observations

by R G Wilson G4NZU

Sunday December 4th 1983, the day prescribed for the two metre fixed station contest, was approached with great anticipation by the team, for what could be better: an experienced (in the main) contest team, lift conditions and a good site.

The call, G1ACC, is held by the Arnold and Carlton College of Further Education and was, at that time, hardly dry. Moreover the College site, kindly made available to us by the Principal, and situated on the Mapperley ridge on the northeast side of Nottingham enjoys an elevation of some 400ft asl with clear views (radio-wise) in virtually all directions but especially in the arc from south through east to north – just where the continent is!

The Amateur Radio Club of Nottingham does not have good VHF propagation from its club site, being very nearly at the bottom of the proverbial bowl. As a consequence a group joined forces with the College, decamped with the club's 60ft trailer tower to the College site and spent a busy Saturday afternoon setting up the equipment: an IC251 with Mutek front end and a homebrew linear giving approximately 150 watts to a phased pair of 17-element Tonnas at approximately 70ft agl. We then spent the night hoping the lift conditions would continue.

First call

On the day itself the first call at 0900 brought an immediate repsonse, and so it continued for the rest of the day! The beam had been pointed vaguely south-east but was moved nearer east after a short time and was not moved for the remainder of the time under consideration.

Hence the great majority of contacts were made from a single fixed heading, an event that can be considered to be rather unusual, at least within the accumulated experience of the ARCON members.

It was these unusual conditions which prompted this analysis of the action between 0900 and 1600 hrs, at which time the station conditions changed due to the College closure!

An analysis of the QTH locator coordinates on a big square basis was carried out with the results illustrated in *Figure 1*, which gives the number of contacts into each particular square. The string of contacts down to ZI and BI were made with the original more southerly setting of the beam. Removing these from the

Prefix	Number of QSOs
F/TO6	18
DL, DG etc	204
ON	27
PA, PE etc	109
OZ	1
LX	1
G1	2
2	1
3	7
4	26
6	22
8	18
TOTAL	**436**

picture, the remaining data would conform to the actual heading of roughly ESE from the site in ZM05a.

The traditional petal-shaped radiation pattern associated with beam antennae would seem to be borne out by the contact distribution. A matter of some surprise was the paucity of contacts 'off the back of the beam', in view of the opinion that most stations, in the lift conditions, may well have been beaming in the same general direction. Alternatively this lack of contacts may have been due to the high level of activity, allowing stations to settle and stay on one frequency, hence having no need to 'go hunting' for contacts. It must be stated that in contrast to the popular contest sites in Derbyshire, the actual location proved to be very quiet with regards to QRM.

Fall-off

A point of interest is the very marked fall-off in contacts per square to the east of the solid line on *Figure 1*. According to the geography staff of the college this could well tie in with the Luneberg Heath area (in EN and EM), rising to some 800ft and then falling fairly sharply to the north German plain. Similarly, the Rhine Highlands (in DL and DK), of some 3000 to 5000ft, would provide a multitude of good VHF sites, while also forming a block for signals from beyond.

A cursory analysis of signal reports, taking into account their unreliability under contest conditions, indicated that signal strengths were down somewhat in squares beyond the 'line', hinting that our signals were perhaps reaching a power/distance limit. In summary, our results provided a demonstration of the classical petal-shaped radiation pattern and the influence of topographical barriers.

In any contest situation there nearly always seems to be highlights and disasters, the former for us being connected with the newness of the G1 series of calls, causing many stations to reply to us with any number *except* 1. *The* highlight was a charming station patiently explaining to us why our call was wrong, a process which occupied him for several minutes. The matter was exacerbated by the fact that the operator at the time is not one to 'suffer fools gladly' and whose comments, to the great amusement of the rest of the team, were short, sharp and not quite sweet. However in the great traditions of amateur radio the reply was equally charming followed by a quick 'QRZ'!

The 'disaster' incident was caused by a guy jamming the tower, as a result of which we went on to learn that a jammed tower may be unjammed by the use of 'impact engineering'!

Our thanks go to all who loaned equipment and assisted in other ways, for we all enjoyed the weekend, were able to introduce some newcomers to this aspect of the hobby and are looking forward to next year. Any bets that conditions will be 'dead as a dodo'?

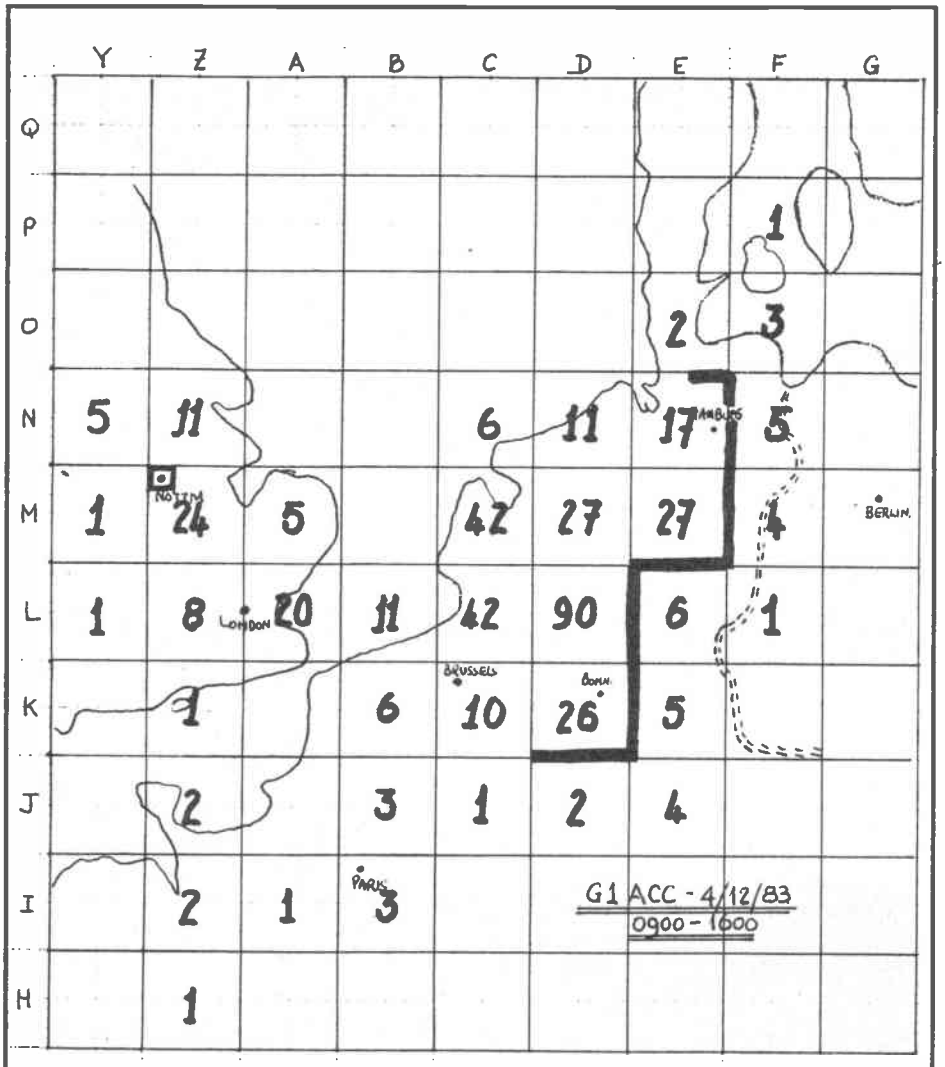


Figure 1 *Plotting map of QSOs per QTH square for G1ACC in the two metre fixed station contest, 4th December 1983, 0900-1600 hours only. Note the dropping off of contacts beyond the bold line (see text), and the early contacts (bottom left), made with the beam pointing ESE from near Nottingham (QRA square ZM05a)*

Operator summary

Time	0900-	1000-	1100-	1200-	1300-	1400-	1500-
Operator	G6ABU	G6DNT*	G6HKS	G4NZU	G4AFJ	G6ABU	G6DNT
Contacts	52	78	67	62	65	55	53

* Now G4VVZ
Chief Logger – G4SGU

Overall (including 3 duplicates) 439/7 = 62.7 QSO/hr
Average points per contact = 19.3 or 482 Km/contact

In next month's AR we take a look at an HF contest held annually in September, the Scandinavian Activity Contests. Don't miss your copy. Place a regular order with your newsagent, or take out a subscription now.

Earths, Radials and Counterpoise Systems

by John D Heys G3BDQ

The importance of a good earth connection was first appreciated by Marconi before the opening of this century, and the so-called 'Marconi' antennae, which are often a quarter wavelength long and tuned against ground are still widely used, especially on the lower frequencies. The self resonant or Hertzian antennae, which first came into prominence when our amateur wavelengths were lowered in the mid-1920's, can work well without an earth connection: indeed they are the more likely to perform with best efficiency when raised well above the ground.

Amateurs using such Hertzian antenna types, which include dipoles, long wires and beams, do their utmost to get them as high as possible to minimise ground effects. Such effects are high angle radiation and a fall in radiation resistance and feed impedance. Any earth connections made when using such aerials are often only for safety (lightning protection) and to reduce or prevent those nasty manifestations known as 'hot chassis' or 'RF all over the shack'!

Earth resistance

If the earth resistance is high when using a Marconi type of aerial, at least half and often even more of the transmitter output power can be lost. The radiation resistance of a quarter-wave antenna is usually reckoned to be about 35ohms; that is just half of that for a half-wave dipole. Recent work suggests that the radiation resistance of a quarter-wave may actually be as low as 18 to 20ohms (Moxon), and this means that earthing arrangements must be even better if losses are to be minimised.

If the earth resistance plus the ohmic resistance of all the wire in the aerial (including any coils) equals the radiation resistance of the aerial, only half of the applied power will be radiated; the other half is lost in heating the wire and the ground. If the radiation resistance of the antenna is lowered and the earth resistance remains the same, a greater proportion of the power will then be lost. We cannot do much about raising antenna radiation resistance in the case of a simple quarter-wave antenna (although using a folded element is one possibility), but we can do a lot to reduce the earth resistance.

In order that it should work correctly and radiate at low angles, a vertical quarter-wave antenna must be located above a large conducting surface. A poor earth immediately below and for a considerable distance from the antenna will *absorb* RF energy, and it has been estimated that a quarter-wave antenna above average soil with no special earthing arrangements will only radiate about *one per cent* of the power fed to it! This may help to explain why many amateurs have so little DX success on Top Band, while those who have carefully optimised their earthing and other arrangements can do well.

By the way, being near the sea can help a lot. Ideally the Marconi aerial will work most efficiently if it is over sea water, but if it is not too far away in terms of wavelength, say within ten wavelengths of the sea (about a mile on Top Band), ground losses will be halved. This assumes that the antenna can 'see' the sea and is not behind a hill or a metal-framed tower block! The writer is fortunate in being within the 'magic' mile from the briny to the east and the south east and has noticed enhanced results in those directions. Old Marconi knew a thing or two and he didn't locate his early radio stations on the coast for nothing!

Earthing

Earth conductivity is not easy to measure but research has shown that it increases with frequency, whilst the dielectric constant of the soil decreases (Ladner and Stoner, *Short Wave Wireless Communication).*

Moisture content is important and this means that, in our variable climate, earth resistances are always changing. An average loam with a moisture content of 25 per cent will have a resistance of about 6,000ohms per cm^3 (at a frequency of 1.2MHz). The relative conductivity of different soils and areas is interesting. If sea water is assumed to have a relative conductivity of 4,500 the value for other 'earths' is as follows:

Good rich soil	=15
Average soil	= 7
Fresh water (lakes etc)	= 6
Rocky hills	= 2
Sandy or chalky soil	= 2
City residential areas	= 2
City industrial areas	= 1

This table was taken from an American Naval study of earth resistance.

These figures suggest that landlubbers must somehow try to reduce their earth resistance if they want to use Marconi aerials. People on urban sites are at a natural 33dB disadvantage, which represents six or seven 'S' points. A very good friend, now sadly a 'silent key', was attached to the Post Office Radio Interference Branch and spent much of his working life tracking down the electrical interference that can play havoc with BC sets and televisions. One dear lady 'client', when asked if her set was earthed, replied, 'Yes, it's down there under the table'. Following the earth lead along soon revealed that it terminated inside an earthenware plant pot filled with garden soil and standing in a saucer! Presumably she watered it occasionally!

Spike

Funny as this true story seems, a logical extension is towards the amateur who has just a single 'earth spike' in his garden. This garden is a bit of rubble-filled ground surrounded by buildings, each of which has extensive and deep foundations which go down many feet, and in most cases lower than the tip of the earth rod. Here we have the same 'plant pot' situation on a large scale, and the amateur's 'earth' is almost useless.

One earth rod is never sufficient to provide a good low resistance earth connection. A square of four or even better still a ring of a dozen all connected to a centre 'master' rod with each rod going down at least six feet is needed as a *minimum* requirement. Thin spikes are useless and the writer has now several 2 inch diameter lengths of aluminium scaffold pole hammered down in various places in his front garden.

A large conductive surface area is needed and to this end G3BDQ now also employs metre square sheets of thick aluminium knocked in edgewise when the ground is damp and relatively soft. This material is fairly expensive but it does not seem to suffer from corrosion very much. Never use it however in conjunction with other metals, or some nasty electrolytic effects may happen and you will start making batteries!

Aluminium connecting wire must go to such earth plates or rods and a suitably thick wire is obtainable from Tandy stores. This heavy gauge wire is bolted to the earth rods etc, with the special aluminium 'greenhouse' nuts and bolts available in garden shops and centres. Do not rely upon just one connection: put several in parallel and 'weave' the wire in and out of holes in the plates. The wires coming from the earth points may be run below the surface towards the house entry place and then be twisted together to make a hefty cable to run to the shack.

Upstairs shacks can present problems

when using the higher frequency bands, for the earth wire may be anything from a quarter wave to a wavelength long, but on 3.5 or 1.8MHz a 20 or 30 foot run is negligible in terms of wavelength.

If it is only possible to put in one earth rod this must 'have the treatment'! A large diameter copper tube at least six feet long must, after hammering into the soil, be surrounded by a circular trench 1 foot deep and about 3 feet in diameter. This trench may be filled with either rock salt, magnesium sulphate or copper sulphate, put in dry and then flooded with water. After this soaking the trench is covered with soil. Some fifty pounds of chemical is required and the treatment must be repeated every two or three years! I have never used this method and I suspect that anyone doing so must expect scant horticultural success in that part of their garden! This treatment must be a sure-fire way to kill off a lawn.

Water pipes

That old favourite earth connection, the cold water pipe is still worthy of attention. Many of the underground water pipes are still made of iron but the actual electrical connection between such pipes and the smaller pipe leading indoors must be often suspect. The point where the house water main enters the property is the place to connect your earth lead, and for this aluminium wire is *not* recommended. Use instead a thick multi-strand copper and file or emery off the natural patina of the water pipe before wrapping this wire around it tightly many times. I have found it impossible to solder to a cold pipe full of water! Secure your connection firmly with a plated hose clamp and cover the lot with silicone rubber sealant. The copper earth wire must run separately up to or along to the 'shack'. This avoids contact between dissimilar metals.

Some people use gas pipes for earthing but this is a rather useless exercise, for these days the underground gas piping is of the well known yellow plastic variety. The hazards of sparks and explosions were overplayed by earlier writers and to my knowledge there has never been an instance of disaster brought on by using such piping for earthing.

Some flat dwellers are often forced to use central heating pipes and their radiators for earthing but these too are unsatisfactory. They are not connected directly to the incoming water main and their water supply is usually via a storage tank. At best such earthing arrangements present a useful capacity to earth and are better than nothing. Ring main earths and telephone earths are also in the 'useless' category and should only be pressed into service if there is no other way to make or find a proper earth connection. Using them invites breakthrough and interference problems.

A good earth will lower the earth resistance and so bring down the I^2R losses, but it will not improve the actual radiation from the antenna. Earthing itself is not enough so further steps must be taken to reduce the ground absorbtion loss.

Radials

The missing 'dipole half' of a Marconi quarter-wave antenna is normally the ground, but instead of relying upon this, an actual quarter wavelength of wire can be used. This will run out horizontally, insulated from earth and connected to the 'earthy' terminal of the antenna feed point. The resulting antenna is now a dipole with its legs at right angles but the radiation resistance will remain low (20-30ohms). This is now the familiar 'ground plane' antenna but it will not have an all-round radiation pattern. By increasing the number of quarter wave radials and spacing them equally, the all-round pattern will improve. Putting in more than about eight or nine wires is about the limit in this respect and little gain in all-round directivity will come from increasing the number still further.

Some pundits say that more than two or three radials are never needed whereas other experts swear by a minimum of four! Whatever the number of radials used, the fact that they extend to no more than a quarter wavelength from the antenna base means that surface losses are not much reduced. If the radials are buried their length becomes no longer critical and they operate quite differently. Buried wires behave like a 'better' earth and the more of them there are the more effective will be the earthing of the antenna system.

Ideally the buried wires should run out like the spokes of a wheel and be a foot or two below the surface. A dozen or more of such wires each being up to a half wavelength long is an ideal to aim for but we live in the real world and must compromise! For 160 metre work ten such wires of differing lengths (a minimum of 50 feet) running out in as many directions as possible can give good results and reduce the ohmic earth losses. They should be used in conjunction with a good earthing as earlier outlined. Burying the wires deeply is difficult, expensive, and time consuming so most amateurs only put them down a few inches. If the ground is not hard a spade edge can be used to make narrow slits about 6 inches deep into which the wire may be pushed. This wire can be bare or insulated. If bare copper is used it can corrode after a few years and in fact may vanish! Aluminium wire or stout plastic covered multi-strand tinned copper works well and lasts longer than bare copper.

Should you have recently inherited a sizable legacy from a long lost uncle (in Patagonia or Timbuctu of course!) why not go the 'whole hog'? Invest in some rolls of expanded aluminium mesh or a good quality 2 inch galvanised 'chicken wire' and lay it down on the lawn all around the base of the antenna. This mesh must extend out as far as possible with each section electrically bonded to its neighbours. For a year or so it will look rather odd but right from the start it will remain possible to cut the grass where it pokes through the holes in the mesh! After a year or two, soil displacement by worms will cover the metal and it will vanish. If undisturbed the soil level will rise a few inches each century – this is how lost coins, etc become buried until dug out centuries later by archaeologists and the lucky. Buried radials and metal mesh *must* be effective or they would not be used by broadcasting stations all over the world.

Counterpoise systems

The early pioneers soon discovered that an 'artificial' earth system consisting of one or more wires insulated from, and held horizontally above ground proved very effective when used with Marconi aerials. Such wires were not cut to any resonant length. Resonant lengths of counterpoise wire are best avoided, and the wires can be suspended from almost ground level up to eight or ten feet. Amateur stations between 1920 and 1927 often used up to eight parallel wires

With all these aerials, BDQ still needs Mickey Mouse for good DX!

under their main antennae. The actual antenna tops also had two or more parallel wires to increase the capacity of the aerial system and ease the tuning to resonance of 'short' radiators.

The maximum length of antenna was 100 feet and when used on about 200 metres wavelength extra top capacity helped to tune it. Old photographs of the early aerials show multi-wire 'sausages' aloft and the 'fan' of counterpoise wires beneath. The advent of Hertzian antennae which were easily made for use on the shorter wavelengths killed off the early aerial systems. The present revival in long distance working on the lower frequencies and especially Top Band (now that most of the world seems to have an allocation there), has focussed attention upon the effectiveness of counterpoise systems in conjunction with Marconi type antennae.

The February 1983 issue of *QST Magazine* contained an article all about counterpoise wires and was a description of the work done by three American 'old timers', K8CFU, W3ESU and K4HU. This article is a 'must' for anyone contemplating the construction of a worthwhile and efficient counterpoise arrangement and it gives a wealth of information. I cannot hope to cover this subject in such fine detail here but will attempt just to give the main conclusions of the American research.

Air dielectric

It seems that the long accepted theory that a counterpoise is not much more than a simple capacity to earth is incorrect. The actual earth resistance (which is a variable factor in any location) at points below the counterpoise wires influences the currents flowing in those wires and should be taken into account. Most of the return currents in the counterpoise wires are collected directly from the antenna or the ground through the air dielectric and they do not have to pass through the ground itself, as is the case when buried radials are used. This means that the counterpoise is more efficient than a system of buried wires and it also appears that fewer counterpoise wires are needed than buried radials for the same efficiency.

The authors developed their 'Minipoise', which was an elevated system 100 feet square having 32 radial wires running out from the centre to the sides and corners of the square. A short 30 foot vertical radiator was used with this counterpoise on 1.8MHz. This combination provided QSOs, most of them on SSB, with many stations in all the American states and with countries on every continent.

The BDQ real estate does not allow the construction of the ideal 'Minipoise', but an effort to put up as many counterpoise wires as possible has certainly resulted in some DX success on Top Band. No one wants an elaborate 'cat's cradle' of wires festooning every inch of garden so a craftier solution is to run the wires inside all the boundary and cross hedges. Behind my house the garden is fifty feet wide and about 200 feet long. At the front it has the same width and is a trapezium with the length changing from 30 to 40 feet. Instead of the square plan of the original 'Minipoise', a rectangular version was developed. I use the word 'developed', for each year a little more wire was added to the system. Four additional wires are to go up in time for the coming winter DX season and they will be rolled up and put away when next spring comes along! This hopefully will placate my long suffering XYL!

The 'Minipoise' square was used with the ends of the radial wires joined by a circumference wire and also with the ends free. I always avoid closed loops in a counterpoise arrangement for it is difficult to calculate unwanted resonances within such loops and they might give rise to huge power losses. Some writers on the subject suggest the use of 'jumpers' or short circuit wires to break down the loops into small units and avoid LF resonances. To do this would be a difficult and tiresome exercise making the garden even more cluttered. The far ends of counterpoise wires should not be earthed, for this again can give rise to inductive loops.

Oddly some writers in the past have shown the ends of their counterpoise wires connecting to metal posts and earthed. It has been noticed by myself and others that if the counterpoise in total is not arranged as a balanced unit around the antenna there will be some directivity of radiation. Unfortunately my own system does not have much wire running towards the direction of South America and at present this is proving to be the most difficult part of the world to hear and contact. If possible, arrange it that your counterpoise has a good run out towards your favoured directions. Another factor concerning directivity is that an inverted 'L' used as a Marconi aerial (few of us can get up a 100ft vertical!) has its maximum radiation off the 'elbow' of the wire.

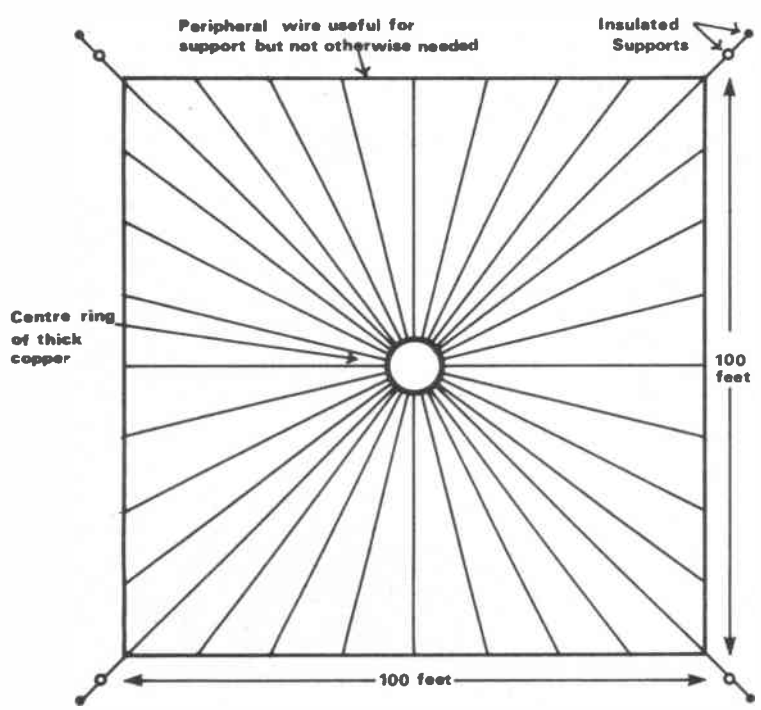
My own complete system employs all three of the methods outlined in this article. I have some buried metal plates, buried wires, earth rods, a disused well in which hangs a miscellaneous collection of large aluminium objects, a connection to the water main and the water pipe network in the loft! There are four above ground quarter-wave radials (not straight), and of course the counterpoise arrangement. The writer is really a 'belt and braces' man at heart!

The simplified sketch plan of my garden will, it is hoped, illustrate these arrangements and perhaps suggest how the reader can concoct a similar scheme. Remember though that the height of your counterpoise wires will reduce the effective height of your antenna by a corresponding amount so don't have them more than about 10 feet up. If possible run them inside hedges, along walls and fences where they are unobtrusive and where they can be kept down to between three or four feet from the ground.

Conclusion

Although a quite elaborate earthing and counterpoise system as described is really intended for the operation of Marconi antennae on an LF band, I find that it has also enhanced my DX capability on the higher frequencies where the Marconi then becomes a long wire. It probably reduces the surface earth losses on all bands.

The 'Minipoise' counterpoise system devised by a trio of American old timers. The original model used copper plated electric fencing wire. The centre ring is the common connecting point



The writer has now between a third and half a mile of buried and counterpoise wire and this may appear to be an awful lot of wire to the uninitiated! It is always most interesting to study the information given on the QSL cards of stations worked on 160 metres and learn something about their gear, especially their antennae. Here are a few snippets from the cards of four of the numerous USA stations worked last winter:

WB0RMT: 'Folded inverted 'L' and many radial wires'.

W3ESU (one of the old timer experimenters): '60 foot top loaded vert and 3,500ft of counterpoise wire 8 feet above ground'.

K5UR: 'Vertical with 12,000ft (2½ miles) radials'.

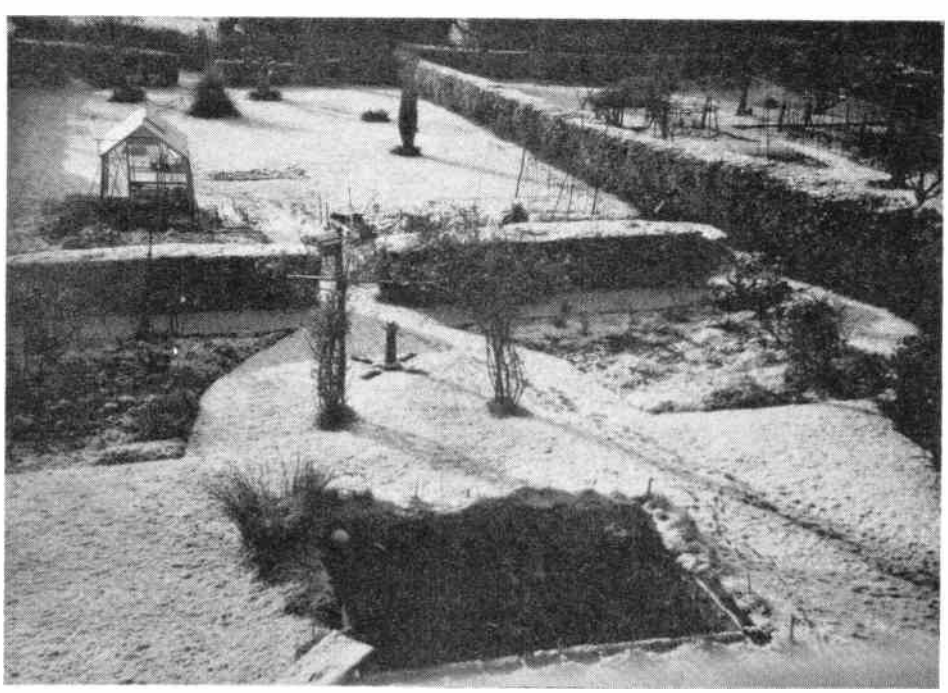
K6SE: '2 element vertical tower array with six miles of radials'.

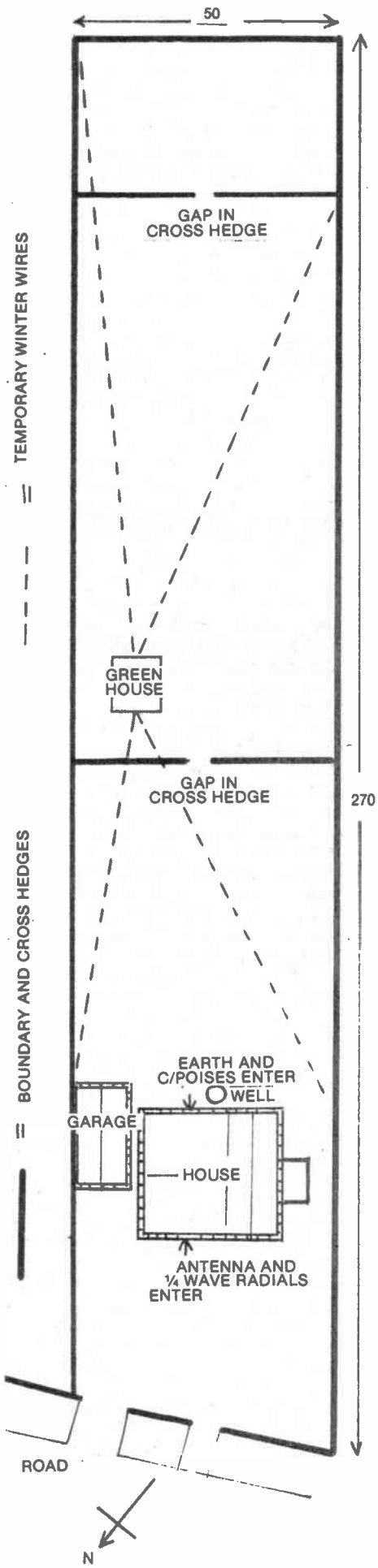
We also had SM6EHY on the band who was always S9 plus 40 here. He said he has 26Km (more than 16 miles) of radials and counterpoise!

Any kind of wire will do for counterpoise work, but I prefer the quite thick multi-strand plastic covered stuff, especially the grass-green variety. It is quite reasonably priced by a well known purveyor of feeder and coax and may be obtained in 50 metre rolls. Do not use the very thin bell wire or similar or you will have resistive losses and it is so easily broken. Whatever you use take extra care when doing the hedge trimming this summer! Some people use barbed or other existing iron fencing wire but this must be properly bonded with no 'dry' joints. It too has a big resistive loss and it is doubtful if a really long run of the stuff gives any advantage.

The 'common' ends of all my counterpoise wires come together at one point which is where an earth wire leaves my well. A good mechanical connection must be made if soldering is not possible and remember to weatherproof. Even soldered joints need a liberal coating of that wonderful silicone rubber stuff which does not seem to be affected by even the heat of a hot iron. The ends of the resonant quarter-wave radials are taped and kept from earthy objects or branches; or at the shack end they go directly to the chassis and frame of the ATU. This makes sure that they are reasonably resonant at the operating frequency.

It is hoped that this quite detailed and lengthy article on the subject of earthing, etc will be a practical help to those who are considering operation on the LF bands. Every QTH is different but a little ingenuity (and perhaps cheek) will result in a much more efficient aerial system. The humble but ubiquitous G5RV with strapped feeders will be a different animal (a tiger and not a mouse) when used in conjunction with a good ground system. If you can get up a well elevated quarter or ⅜ wave wire with at least 40 feet of vertical you will really be ready for the DX!





Plan view (simplified) of the G3BDQ property showing the layout of the hedges which hide the many hundreds of feet of counterpoise and resonant radial wires. There are no closed loops in the system. The broken lines indicate the siting of temporary wires only used in the winter months. There are many earthing plates and posts together with much buried wire which are not shown on this plan. The earth and counterpoise wires enter at the back of the house and run across the loft, also connecting there to the water piping. The water main connection is near the western corner of the house. Some buried wire actually leaves the property boundary and runs below the grass verges at the front by the road! The ground slopes away to the rear of the house towards the sea about one mile away.

DONT LET BE YOUR

For some years now, I have seen jokes printed on the wrapping of aerials in the form of gain figures. These figures seem to range from 5 to 10 (dB) and I suspect relate to the colour of the aerial. There is another theory that says they relate to the gain over a six-inch nail.

The gain of an aerial is very important and in the next few articles, I will try to show the reader how to recognise different types of aerials and so avoid the disappointment of buying a bad one or possibly one that is totally unsuitable for the environment the reader may have in mind. Having established the type of aerial, the reader will eventually be in a position to guesstimate the gain (or lack of it) of his or her prospective acquisition.

The unit of gain

The unit of gain is the Decibel. The gain of an aerial is the same in both the receive and transmit modes and is measured at the horizon, although in practice this is not necessary. In terms of aerial work the figure of 3dB is very important as it represents a doubling of power. That is to say if an aerial is quoted as being 3dB better than another, it is equivalent to the worse one but with twice the transmitter power being fed into it. The better aerial would produce equally better results on receive, ie signals would be one 'S' point stronger on the receiver in use. To take the explanation one stage further, if we consider two aerials A & B: the B aerial is 6dB better in performance than the A aerial.

If our receiver was at the horizon with its own aerial and the A aerial was connected to a 10W transmitter, then in order to produce the same signal strength at the receiver, the B aerial would only need 2.5W into it as *every* 3dB represents a doubling of power.

There are four ways of increasing the gain of an aerial system. Only three apply to the receive performance as well:

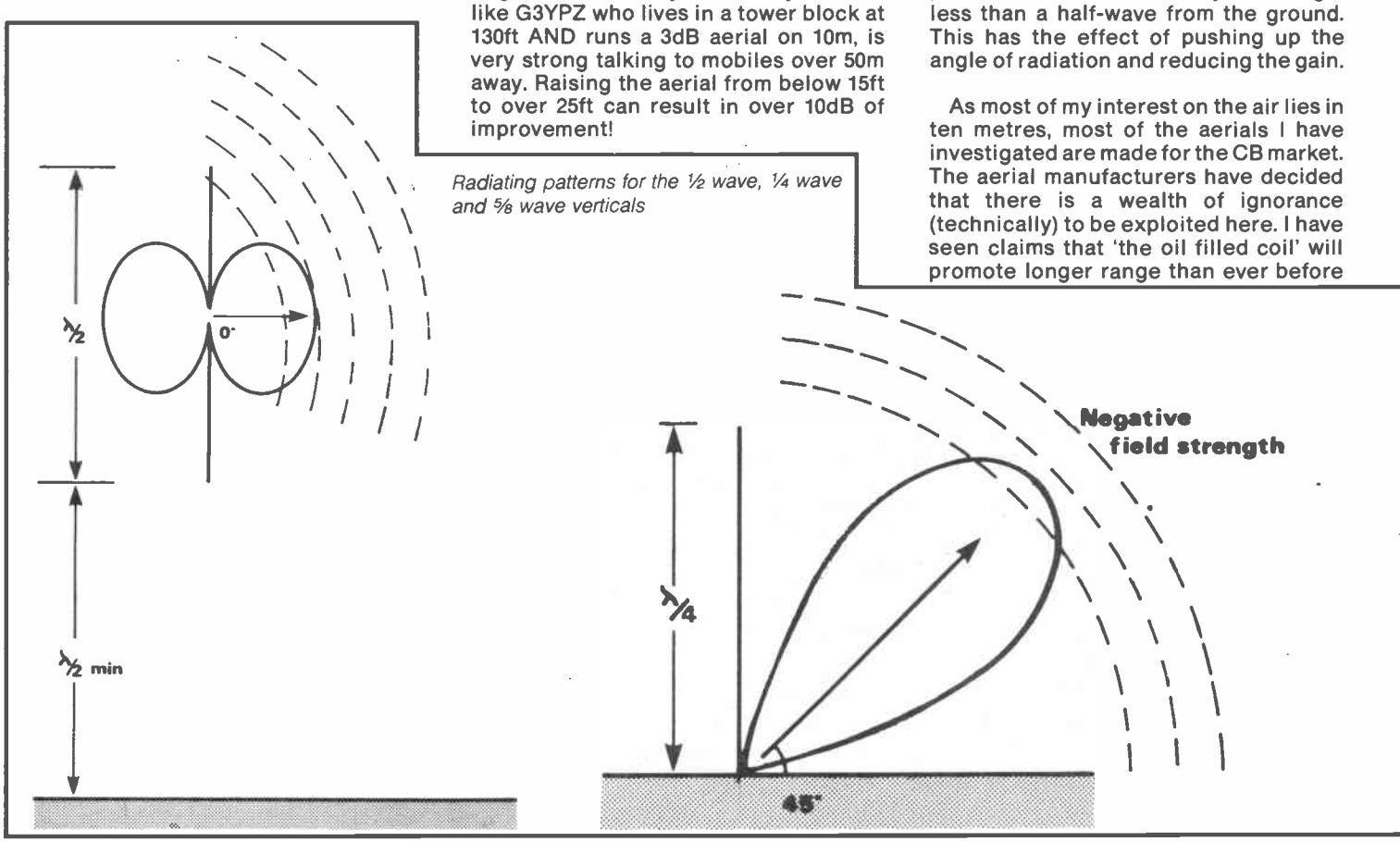
1) Increase the power from the transmitter into the aerial. This measure will obviously not help the receiver at all. As already mentioned, a doubling of power will give you a 3dB increase, quadrupling 6dB, & x8 9dB. Incidentally, 3dB represents 50% more range, subject to the frequency in use, eg no amount of power will get you 500 miles on 2m unless reflective conditions prevail. Similarly, where they do exist on the HF bands it would be difficult to prove. The rule really only applies where the signal reaches the receiving aerial direct.

2) Raise the aerial. If the aerial is below 20ft there will be enormous attenuation due to surrounding buildings, trees etc. If we consider the aerial at say 25ft and it is raised to 50ft the advantage is 3dB. In order to gain a further 3dB it would have to go to 100ft. Now you see why stations like G3YPZ who lives in a tower block at 130ft AND runs a 3dB aerial on 10m, is very strong talking to mobiles over 50m away. Raising the aerial from below 15ft to over 25ft can result in over 10dB of improvement!

3) Increase the number of aerials. Using two aerials of the same type connected together with a phasing harness, gives you a gain of, yes you've got it, 3dB. There is not the space to go into detail now but, if you connect two verticals together you get a bi-directional aerial. Incidentally, if you connect say two 8dB yagis together you get 11dB not 16dB gain. Two is, of course, not the limit. You can connect as many elements to your aerial as you wish, as long as you observe the correct matching and spacing requirements. As a rough rule of thumb, every time you double the elements you gain 3dB in one or possibly more directions.

4) Lowering the angle of radiation. If the aerial in use is a vertical and not a ground plane type (with radials), then there are certain essential siting rules to be observed which will greatly affect the performance of the aerial with respect to the angle of radiation. This is a subject on its own which I will cover in a later article. If the aerial in question is a horizontal, then although the radiation is in all directions from the wire (except the ends) it is possible to destroy the performance of the aerial by mounting it less than a half-wave from the ground. This has the effect of pushing up the angle of radiation and reducing the gain.

As most of my interest on the air lies in ten metres, most of the aerials I have investigated are made for the CB market. The aerial manufacturers have decided that there is a wealth of ignorance (technically) to be exploited here. I have seen claims that 'the oil filled coil' will promote longer range than ever before



Radiating patterns for the ½ wave, ¼ wave and ⅝ wave verticals

THEIR GAIN LOSS

by NOBBY O'BRIEN G32EV

and the more wire on the aerial the better.

One aerial examined was claimed to be a full wave, although it was only 5ft high. From the weight of it I would not have doubted it. It is worth remembering, however, that a full wave is high impedance at the feed point and would not match a 50ohm rig at all.

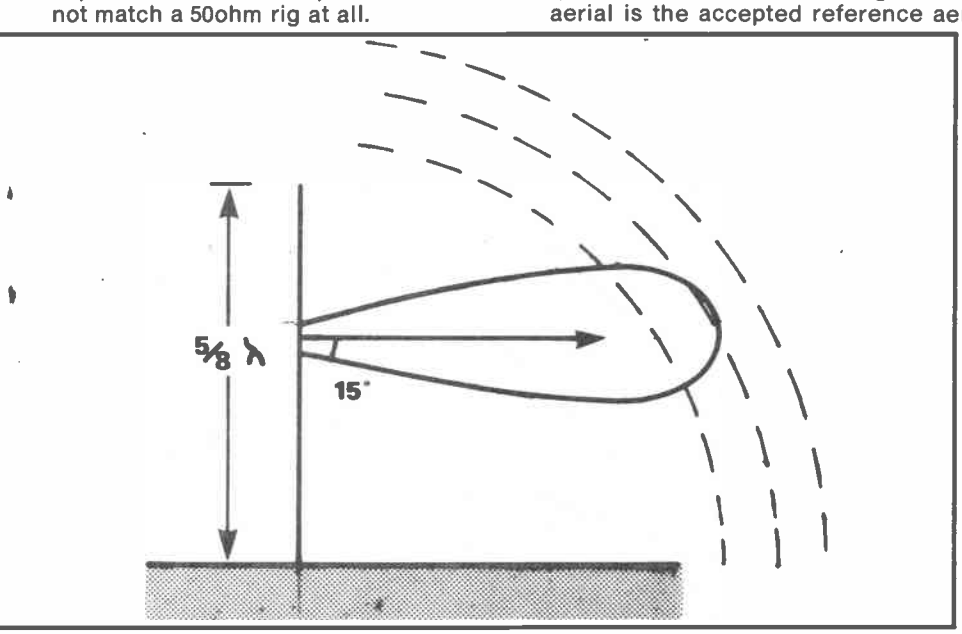
Nor, for that matter, would a ⅝ wave. Only odd quarter wavelengths will match, eg quarter, three-quarter etc.

The vertical aerial that exhibits the most gain in either mobile or base use is the ⅝ wave. If we examine the diagrams we will see that the main lobe leaving a quarter wave vertical is 45 degrees. This aerial is the accepted reference aerial for mobile use. Reputable aerial manufacturers will quote the gain of their mobile aerials with respect to a ¼ wave. The best single element vertical aerial is the ⅝ wave (excluding the ⅞ wave collinear used on 2m) as previously mentioned. This aerial exhibits 3dB gain over the ¼ wave (see table) because the angle of radiation is much lower, in the order of 15 degrees, and the main lobe is more concentrated. The ⅝ wave does not match the usual 50ohm set-up, so on VHF there is an additional matching coil at the base of the aerial. On lower frequencies, ⅝ waves are loaded aerials and are wound for ¾ wave matching. As you will see from the chart, the gain with the additional ⅛ wave drops like a stone to 1dB less than a ¼ wave or 4dB less than the ⅝ wave. There is a school of thought that says the additional ⅛ wave does not influence the aerial, as the ground plane of a vehicle is so ineffective on 29MHz and lower, that the second ¼wave lobe cannot establish itself and alter the radiation pattern. There are numerous aerials available for 27/29MHz nowadays and I will detail in a later article those best left in the shops.

Annoyed

The reference aerial for base station use is the ½ wave dipole. In theory, all base station aerials should have gain figures which have been compared with respect to a ½ wave dipole. This was not the case with an aerial I spotted on sale, for 27MHz, which stood ten feet high, was base loaded and was advertised as a 6dB collinear. So annoyed was I by this, that I rang the manufacturer and asked him about this wonderful aerial. He was very cagey until I told him I was doing a review and he might get some free advertising, which he now is. Eventually, I discovered that the reference aerial was an ⅛ wave *mobile* aerial mounted in an 'unfavourable' position on the vehicle, while the base aerial had been mounted at 20 feet!

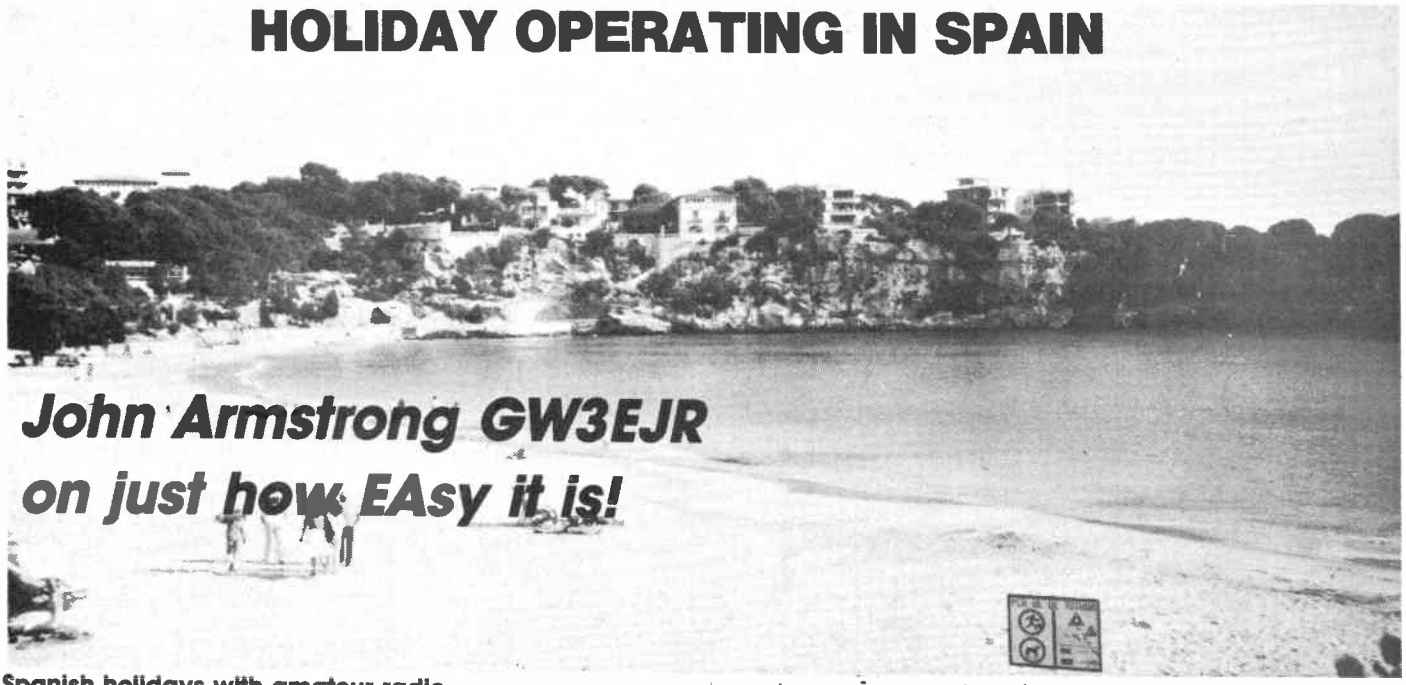
If you can establish by observation, what the aerial you are looking at is electrically, eg ¼, ½, ⅝ wave, then you can use one of the charts to establish its true maximum attainable gain. Don't let their gain be your loss.



Mobile Reference	
Aerial	*Gain*
¼ λ	0dB
½ λ	+1.8dB
⅝ λ	+3.0dB
¾ λ	-1.0dB

Base Reference	
Aerial	*Gain*
¼ λ	-1.8dB
½ λ	0dB
⅝ λ	+1.2dB
¾ λ	-2.8dB

HOLIDAY OPERATING IN SPAIN



John Armstrong GW3EJR on just how EAsy it is!

Spanish holidays with amateur radio

With the gradual increase of reciprocal licensing, it has become possible for radio amateurs to operate radio equipment during holidays abroad in those countries with which the UK has an agreement.

The purpose of this article is to put forward the various aspects of holiday operation in Spain, a country which is popular with thousands of sun-seeking Britons.

I have, since early retirement some years ago, spent several winters in Spain, the last two occasions with an exchange licence involving operation on 2 metres and 20,15 and 10m.

Amateur radio in Spain has, in recent years, seen a rapid increase in the number of licenses issued, similar to the increases in Britain and due in no small way to an influx of former CB operators.

The total number of licensed radio amateurs in Spain last summer was 31,000, comprising 18,000 Class A, 9,000 Class B and 4,000 Class C, the latter being novices, for which there is no comparable class in the UK. The Class A and B licences approximate to our own A and B, and have the prefix EA and EB respectively, while the Class C novice licence has the prefix EC, with operation permitted in designated portions of the 80,40,15 and 10 metre bands, with a power limit of 20 watts. Second operators are also allowed to operate the stations of Spanish nationals and permanent residents – this permit is normally granted to close members of the family, ie wife/husband, son/daughter, brother/sister of the licensee.

There are flourishing radio clubs in the majority of Spanish towns and cities, usually affiliated to the national society URE – Union de Radioaficionados Espanoles, whose address is PO Box 220, Madrid.

I have visited radio clubs in the cities of Murcia, Torrevieja, Benidorm, Valencia, Lerida and Zaragoza, and was always received with interest and friendliness, and any visiting amateur can expect to be received with typical Spanish hospitality.

True, there may be a language barrier, but there is invariably at least one English speaking member present who can help with conversation and introductions in a very informal atmosphere. English and French are the language options in the majority of Spanish schools, but nevertheless, some knowledge of the Spanish language is a distinct asset to the visitor. The whereabouts of the radio clubs can often be ascertained by enquiring at a TV and radio shop – many of the service engineers are licensed amateurs or 'radioaficionados.'

The application requirements for a visitor's licence are quite straightforward. Send the following to Madrid:-

1. Photocopy of front page of your licence.

2. Letter certifying validity of licence, obtainable from the licensing authorities in Chesterfield.

3. International Giro cheque for 1,600 pesetas (at current rate of exchange about £8).

Additionally you must supply the following details:

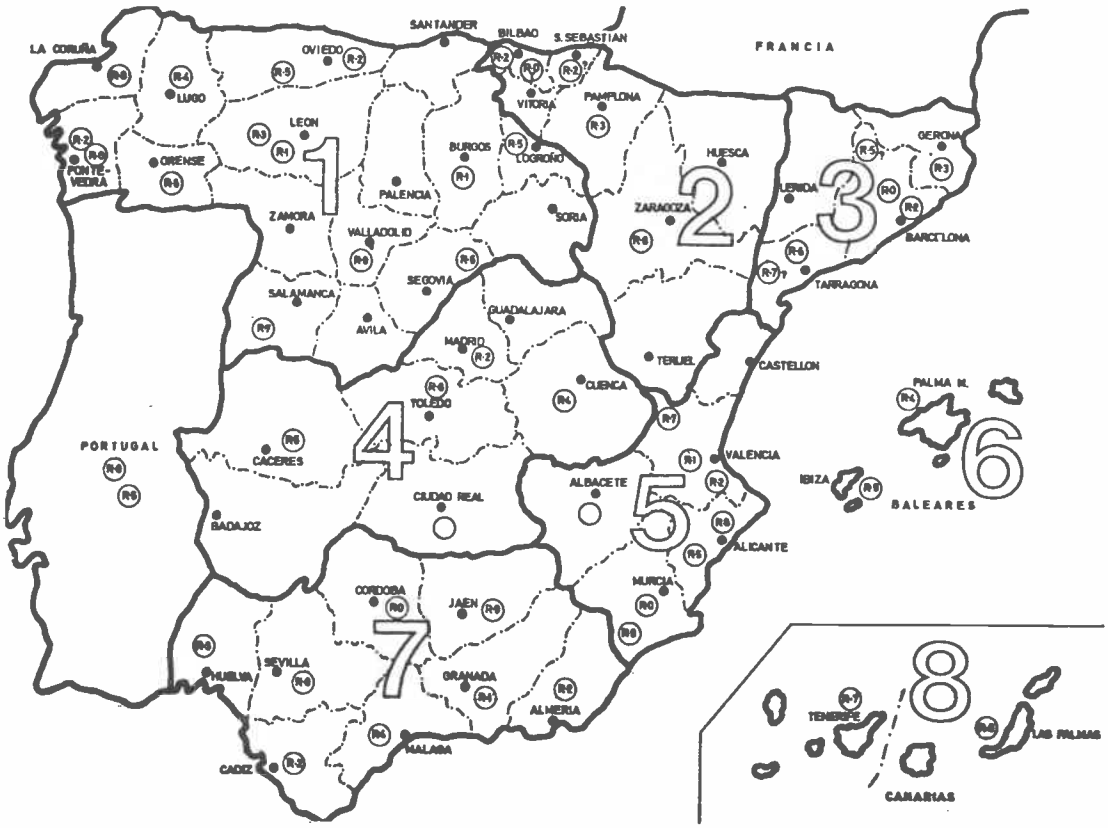
Dates of holiday, holiday address (or in the case of a mobile, the make of vehicle and registration number), make and model of radio equipment, mode and power output, aerial system, and intended frequency bands.

Apply to:
Subdirector General of Telecommunication, Ministry of Transport, Tourism & Communications, Madrid, Spain.

Allow 3 to 4 weeks for issue of the temporary licence. My own permit, issued in December 1983, is in fact valid for the whole of 1984. It is as well to carry a receipt for the equipment, in case of any Customs query.

Radio gear in Spain is much more expensive than in Britain. For the 2 metre operator there is plenty of activity, with a good network of well sited repeaters, giving excellent coverage, with initial access by carrier only and generally no time-out.

SPAIN



A typical example is a repeater on R7, located 30 miles west of the city of Valencia at height of 1,198 metres ASL! Repeater frequencies on channels R0 to R7 have the same frequencies and spacing as in Britain, with minus 600Kc/s between output and input frequencies.

I spend my winters in a small fishing village just to the south of Valencia, and with 10W to a collinear antenna, it is possible to access and copy repeaters on every channel.

The weakest was S4, but most were S8 and S9+. This included R3 on the Balearic island of Ibiza, and R6 near Tarragona, South of Barcelona, through which contacts over distances of 200 miles or more could regularly be made.

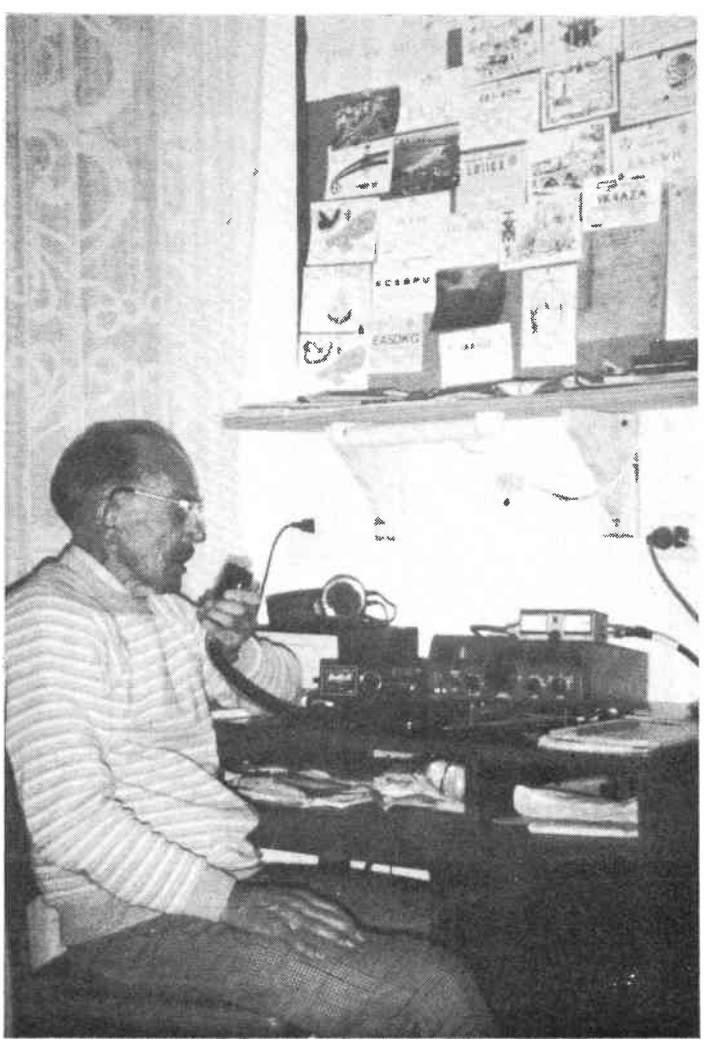
On simplex there is usually plenty of activity, but in many areas it will be found that S20, 21 and 22 are, in the main, occupied by amateurs who earn a living driving lorries, vans and taxis, with first names generally used more than call-signs. They are, naturally, useful contacts if you are mobile and looking for a particular road or location.

For the longer-stay visitor contemplating HF operation and prepared to carry a transceiver, wire dipoles and feeder, some interesting contacts can be made, and there is usually no problem in stringing up some kind of temporary antenna system.

As the authorities in Madrid authorise the use of the suffix EA, the writer was GW3EJR/EA – quite a mouthful, but one gets used to it, and it certainly aroused interest by the many stations contacted.

With a Yaesu FT7 putting about 10W into a Fritzel 3-band ground-plane mounted on the flat roof of the 15 storey apartment building, it was possible to have regular QSOs with the UK, and many early morning contacts with an invalid friend in Australia, VK4AZA; and of course, many QSOs with Spanish stations and most parts of the world. On HF it is felt worthwhile to include the area number to the suffix, in my own case EA5, as to the distant contacted station with a directional antenna, there is a vast difference in beam headings between for example the Costa Brava and the Canary Islands. Spanish callsigns EA1, 2 3,4,5,6,7,8 and 9 are issued according to the district/province (county) in which the licensee resides.

For the radio amateur who seeks a change of operating venue and the chance to make new friends, Spain has much to offer.



GW3EJR/EA5

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have the whole alphabet. Make the whole job interesting. Play games with the letters you recognise. Transform car registration plates and street signs into Morse and you will be amazed at your own progress.

In writing out the sounds you will have noticed that some characters are the exact opposite of each other. For example K is 'dah-di-dah', while R is 'di-dah-dit'. Ignore the fact completely. To start thinking that K is the opposite of R and A is the opposite of N requires yet one more thought process and that will only slow you down. A final thought on learning the alphabet is that you would do well to learn letters taken at random, rather than in alphabetical order, to avoid falling into the trap of expecting 'di-dah' to be followed by 'dah-di-di-dit' and so on. Once you have mastered the letters you should have no difficulty learning numbers.

Speed

The next trick is to build up your speed, and since speed comes from confidence it is a simple matter of practice. If you are an SWL, or already hold a class B licence it is fairly easy to find slow CW to listen to. In almost every area there are slow Morse transmissions at regular times and these are of immense help to the beginner. Write down what you hear and, despite the obvious temptation, try to ignore any characters you might have missed. Whilst you are wondering what they were you have missed two or three more.

Whether you have access to CW transmissions or not it is a good idea to get someone to make up a few tapes, preferably of characters in random order, starting very slowly and progressing to the required twelve words per minute. The only danger with this form of practice is that you might learn to recite the contents of the tape parrot-fashion, but this can be overcome by swapping tapes with a friend. Never be afraid to listen to transmissions that are a bit too fast for you. You will only learn by struggling. Pick out the letters you know and it will surprise you how soon the others will fall into place.

There are a number of excellent machines on the market to aid your progress but they have their drawbacks, not least of which is their price. Many send groups of five characters followed by a pause, and it is all too easy to slip into the habit of anticipating the pause when listening to CW from other sources, with the result that as soon as a six letter word comes along the last letter gets lost. Most such machines can easily be converted so as to send continuously and, in my opinion, you will learn more easily for the investment of a few minutes with a soldering iron. Many students opt for a machine from which emanates a voice to tell you what has been sent, and whilst many of my friends hold that this is invaluable, I contend that there is a very real danger that you will wait for the machine to do the decoding, rather than think it out for yourself. Machines can help you to learn Morse but they cannot replace the brain and, in general, they make getting that ticket a considerably more expensive business than is strictly necessary.

So far we appear to have done a lot of listening but precious little of the real thing. We haven't touched the key, yet – nor should we. Learning to send is, if approached in the correct manner, very much easier than learning to read and as a rule of thumb, it is unwise to go near a key until you can comfortably read at about eight words per minute. When, however, you do begin to practice sending always remember that accuracy is far more important than speed. So far as I know no test centre will allow the use of paddle or bug keys so it is important that you first learn to send on an ordinary 'up and down' key, whatever you may be considering for the future.

Send clearly and learn to recognise your own mistakes the instant you make them. It is permissible to make a small number of errors during the sending part of the test but you will fail if they go uncorrected. A good method of both monitoring your own sending and improving your reading ability is to make recordings of the results of your efforts. When practising with the key you should also make sure that the key is adjusted to your personal preference and that it is positioned so that you may use it comfortably. There is nothing more frustrating than trying to send CW in discomfort.

As I pointed out earlier, each of us learns at a different speed and many people become discouraged by seeing their fellow students take and pass the test while they are still slogging along at a lower speed. Don't let it happen to you. There are no prizes for being the first to the finishing post and whilst friendly rivalry can be an incentive, the only thing that matters in the end is that you get there – at your own speed. Learning CW is a personal challenge and the rewards are well worth the effort and the frustration. Twelve words per minute may seem like the Inter-City express at the beginning but once you have your class A licence it is surprising how quickly your speed, both in reading and sending, will increase.

The dreaded Morse test

I think I have heard more rubbish talked on this one single subject than on any other aspect of amateur radio. Everyone has nerves to some extent when facing any form of examination and you will be no exception. To your advantage the examiner is well aware of the fact and I have lost count of the number of candidates, both passed and failed, who have returned from the test centre in a state of near shock at the very high degree of consideration which they have encountered. The examiner derives no benefit from making the test harder than its specification demands, and in my view gets far more satisfaction from conducting a successful test than from writing out a failure slip.

Before going for the test it is important to ensure that you really can send and receive at twelve words per minute, but I speak from personal experience when I say that getting up to fifteen or so, 'just to be on the safe side', can be a positive disadvantage. I came within a whisker of failing the test because I found it so slow and I was faced with a tendency to try to separate elements of the same character with spaces that simply weren't there.

Before starting your test always ask for a few minutes in which to adjust the key to your liking and to practice using it. Many centres will permit you to use your own key but it is important that you gain those few minutes' familiarisation if you are about to try one that you are unused to. If a test passage is designed to take three minutes be sure not to rush it. The old adage 'more haste, less speed' is particularly applicable to the Morse test and here again clarity is more important then speed.

It is only after passing the test that you really begin to feel at home with CW. Using it on air for the first time takes a fair bit of courage. Until now you will have been used to sending everything in plain language and the abbreviations in common use come as something of a shock at first, not to mention punctuation marks, which the test does not require you to learn. Nevertheless there is a great kick to be gained from your first CW contact, however faltering. Don't worry about a few mistakes. Even the most competent CW operator makes mistakes now and again and with a little practice your confidence and ability will soon increase.

Have no fear

Never be afraid to answer a CQ call because it was a bit too fast. If the operator originating the call hears you he will slow down to your speed. Equally, never try to race simply because you know that the guy at the other end is faster than you. Quality is invariably more important than speed on the key, and it is very important to develop a style which gives the other guy every opportunity to read what you send.

Don't be afraid of it, guys and gals, especially the girls because there are simply not enough of them on the bands. Remember that 2 metre CW can be just as rewarding as the HF bands and provides a fairly noise-free environment in which to become acquainted with the various types of CW QSO available to you.

Good luck to those who are already struggling and to those who aren't. I hope my views offer some encouragement. Don't just think about it – do it! It isn't really so hard and the rewards more than equal the effort. Just one more thing: don't use CW simply as a means to plug a mike into an HF rig. Like so many other things CW is a perfect example of the principle of 'use it or lose it' and it seems a shame to throw away the achievement.

SHORT WAVE LISTENER

by Trevor Morgan, GW40XB

Buying your first short wave receiver is always a bit of a traumatic experience as, usually, one has little or no knowledge of what to look for or, for that matter, where to look for it.

However, looking through the pages of this magazine will show you the popular brands of equipment usually to be found at the local amateur radio dealer. The problem is you don't find a 'ham shack' in the average high street and this is the first port of call for most newcomers to the world of short wave listening. For instance, call in at the local Trio dealer and he'll be pleased to tell you about the latest in 'stacked hi-fi' systems, but he won't have a clue about receivers. Despite this, there are plenty of good quality receivers on the high street shelves under names that are not generally associated with amateur radio (at least, not in this country at the moment).

What do you look for? Some time ago I gave a run-down on the requirements for short wave listening, but to refresh the memory, here are the basics again.

BFO: the best frequency oscillator, used to resolve single sideband signals.

bandwidth: on most receivers this is marked 'wide' and 'narrow' and is very useful on a crowded band, especially when receiving Morse.

fine tuning: this is either mechanical with the band all covered on one scale and switchable gearing on the tuning knob (eg push for slow – pull for fast), or electrical where a separate control operates a separate capacitor over a narrow section of the band.

pre-selector: which presets the range covered by the RF stage.

notch filter: useful to cut interfering heterodyne whistles and other noises by reducing the gain of the areas either side of the selected frequency while boosting the gain on the spot frequency.

noise blanker: this cuts impulse type noise such as car ignition noise.

RF gain: increases the gain of the RF input stage as opposed to the:

AF gain: which increases the audio gain or volume of the output stage.

The business

In a similar way to the amateur radio dealers, high street radio/television dealers invest their capital in a selection of franchises or dealerships which enable them to concentrate their capital and buy at preferential terms. However, this does mean that, to a certain extent, the manufacturer has control over the selling price of his product. The abolition of retail price maintenance, where the price of the product was set at source, was intended to allow a free market in which the retailer set his own profit margin.

However, manufacturers insisted that the retailer could not provide the desirable service facilities if their profits were reduced. Some dealers disagreed and prices in some stores fell, but these dealers found that popular items were suddenly 'out of stock' and that manufacturers withdrew the factory spares back-up service. Other companies tried direct importing via European markets and in some cases were successful, but not many high street stores carried the necessary financial cover.

You can't really blame the retailers for the situation we have today where it doesn't matter who you buy your rig from (you will be asked the same price for it) and those claims of 'if you can buy it elsewhere cheaper . . . etc.' are quite true. As manager and buyer for a retail setup at that time I know the inside story and agree that it's annoying when you hear that the £800 rig you saved hard for costs £200 less in the USA.

So how do you know where to go? Ask around the clubs. Listen to the chat over a pint in the local hostelry. Find out who the best dealer is locally and part with your money confident that if something does go wrong he's not going to let you down. Even the best equipment can go wrong and it's handy to have a sympathetic dealer when you do need service. Does he stock spares or accessories or are you going to wait three or four months? When you show interest in a product range does he advise you sensibly or is he a 'tuck-up merchant' out to strain the last penny out of your wallet?

Use your own common sense too. Do you really need 25 memories and a built-in flashing alarm or would you be better off buying a cheaper model and a decent ATU?

What's on offer

As I've been out of the trade for over 6 years I have no allegiance to any brand name so the examples here are totally unbiased and are based on the available equipment in May 1984 in Swansea. In London your choice may be wider and the reverse in small towns. Shop around and try the receiver in the shop. If you know the chap in charge he may let you try it at home overnight . . . *ask him.* So let's have a look at the receivers.

National Panasonic is a company which produces a number of short wave receivers which are all very well made.

The RF3100LBE is the bottom of the range and has full coverage of the spectrum from 1.6MHz to 30MHz. For those interested in broadcast reception it also covers the long, medium and VHF bands.

The layout is neat and uncluttered consisting of, on the front panel, push switches for BFO on/off, panel light on/off and bandwidth wide /narrow. There is a variable BFO control and a nice big tuning knob on the far right.

The meter reads battery power and relative signal strength. The tuning was smooth and no backlash was evident. Other front panel controls were for volume, tone and RF gain. The digital readout was very clear being set back from the front panel. The unit has a telescopic antenna with provision for an external aerial on the back panel.

The receiver was stable in use and quite pleasant to operate. I liked the 'home base' appearance although it was also portable, running from batteries housed under a panel bearing a time zone map and band plan chart. Expect to pay around £179.

The National Panasonic RF 6300LBE is a conventional upright styled portable of quite large proportions and with the batteries fitted is no lightweight. It has digital display of frequency by LEDs but the clock display is using LCDs! The BFO is continuously variable and there is a preselector and RF gain control, but the price of this receiver makes it a questionable buy in terms of value for money.

The performance, however, was good and signals were clearly received and stable. If you like the upright styling it's a very attractive receiver but at £325 perhaps not a 'best buy'.

If money is no object and you prefer upright styling the National Panasonic RF 9000 is the one for you. However, this is definitely not for the serious listener as most of the features are gimmicks. It boasts 15 preset stations with autoscan, 22 key touch tuning or manual option with fast or slow tuning rates and just about every timing facility you can imagine. At *over* £2000 it's way over the top.

Sony are arguably the most well known audio distributors in the country and they did have a quite respectable range of receivers a short time ago (I have their ICF 6700W) but their current range is a bit thin with only one serious attempt at the amateur scene. However, the ICF 7600D is an extremely compact receiver and has a superb performance. It features 10 memory presets and manual scanning covering 153-29995KHz AM and 76-108MHz FM. It is extremely small and just the job for the travelling listener. The design has been copied by at least two other companies and that must be a compliment! At £160 it is a good buy.

Who hasn't heard of Grundig? This company has had receivers on the market for years and gained a reputation in the field for quality. Unfortunately, their earlier receivers had a separate BFO and adverts can still be seen from people wanting one of these units.

The current range includes two receivers of interest to the serious listener. The Yacht Boy 700 is upright styled with digital and analogue tuning, bandwidth switch, switched filtering, fine tuning and variable BFO. The audio and reception quality was superb and the tuning very precise. A nice one at £210.

The Satellit 600 Professional is a bit of a sheep in wolf's clothing. It is a beautifully made receiver, looks extremely attractive too but, and this is the clanger of all clangers, it only covers up to 26.1MHz! I wonder what Grundig have against ten metres? However, this problem aside, it really is a nice piece of work having a clear LCD readout and analogue scale, memory storage of up to 60 frequencies, selectable bandwidth (why isn't this installed in all transceivers?), RF gain, variable BFO, Automatic Noise Limiter and a clock/timer. It looks the part too with two neat front mounted handles and a clean semi matt black finish. With the reservation of the ten metre loss, it's worth consideration for £330.

There are many 'recognised' receivers on the market from the major manufacturers such as Trio, Yaesu, Icom etc, but these are only usually available from recognised amateur radio outlets and details of these are available from any of our advertisers.

Some of you may be considering eventually taking the RAE and think that you needn't bother with a receiver. Far from it!

Short wave listening, apart from being a hobby in itself, is the way most of the older amateurs gained their experience of operating technique, propagation conditions and their effects, antenna construction and use and an endless list of wrinkles.

Many of the recent amateurs have come from the army of citizens band users and some of them have become excellent operators, but there are many who have had no experience of the HF bands and find that they cannot cope with the extremely busy and noisy amateur bands as they are today. As a result we find many new licensees who study for the ticket only to let the licence lapse after a short period (it would be interesting to see the figures for lapsed licenses over the past couple of years).

Two metres only

Some of these new amateurs reach the 2 metre stage and don't progress from there, not meaning, of course, that those who stick on two metres are any less amateurs, but these people are seldom heard even on that band!

There is the theory that these people just take the RAE to prove that they can pass the test just as easily as anyone else and I suppose that is a point. However, the experienced listener has a background of knowledge built up over a period of time that will stand him (or her!) in good stead if he aspires to the RAE.

Short wave listeners are certainly *not* second class citizens but are, in fact, mostly dedicated people following a hobby that needs just as much patience and, indeed, knowledge of operating procedures as does amateur operating. This is probably why the ex-listener taking the RAE is probably less likely to fail the Part 1 exam paper.

Next month we'll have a look at prefix and special event working and some more of the available awards for short wave listening. Meanwhile, keep listening and enjoying the hobby.

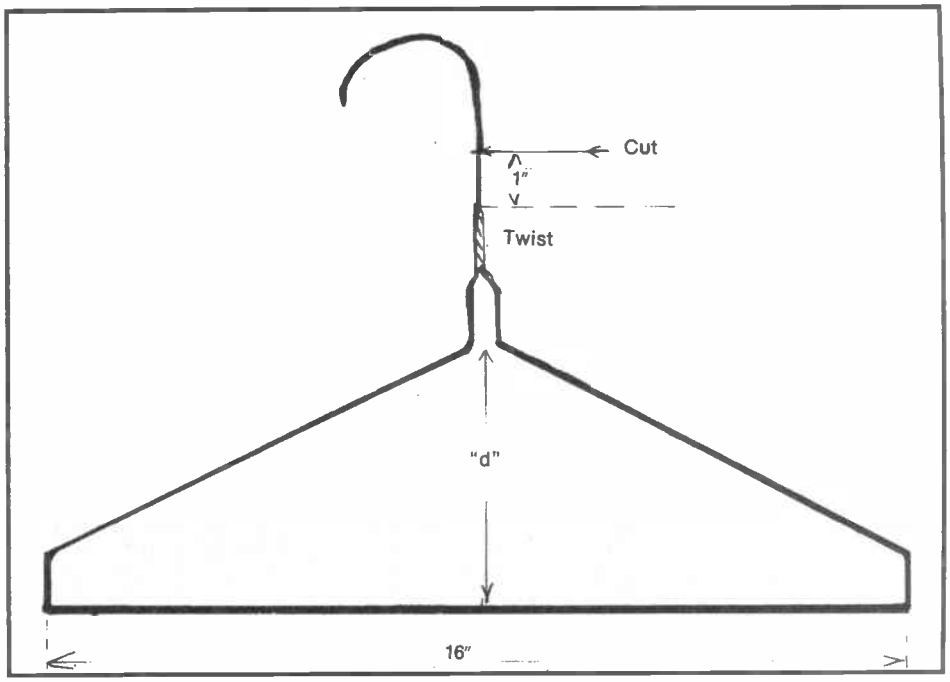
73, Trevor.

Ken Williams introduces

THE COATHANGER

THE CHEAPEST-EVER 2 METRE AERIAL

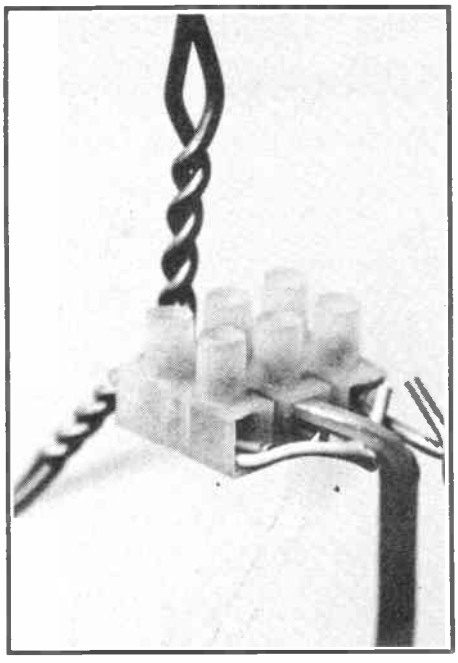
The other day, as I was searching the town centre car park for that mobile heap of mud and rust which I laughingly call my car, I was greatly impressed by the number of car owners who had eschewed the skills of the vehicle antenna designers and replaced their car aerial with that most mundane of objects: a wire coathanger. Working on the principle that a million motorists can't be wrong, I decided that on returning home, I would investigate to what use these homely objects could be placed in the Williams' aerial farm.

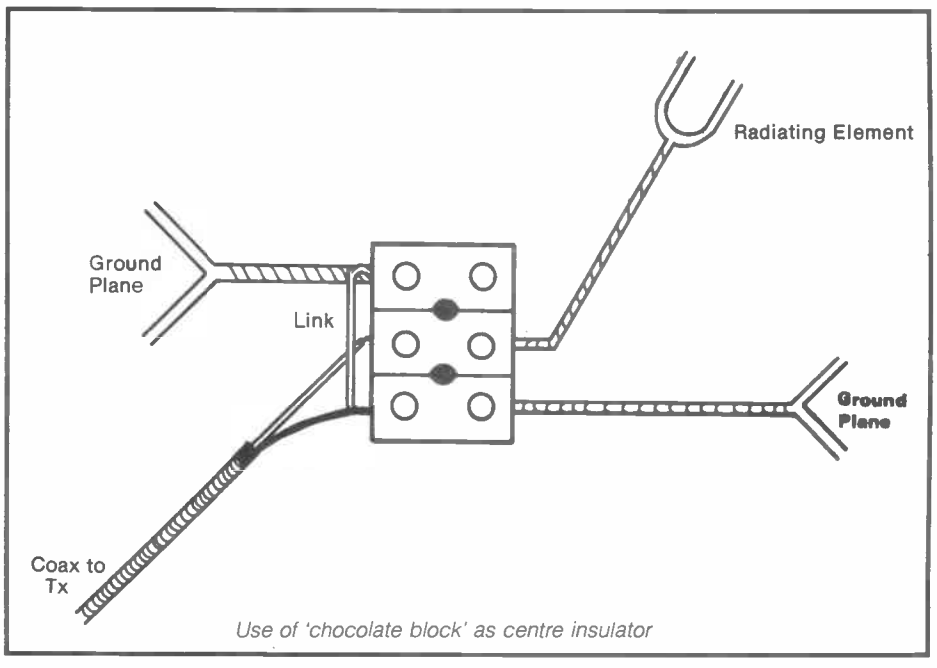


The first consideration was the suitability of the material. Traditionally, amateur radio antennae have been constructed from either copper or aluminium alloy. However, many professional Band 4 & 5 transmitting aerials are constructed from galvanised steel, and in recent years several commercially available amateur transmitting aerials using stainless-steel elements have been introduced. It would, therefore, appear that the galvanised steel wire of which coathangers are fabricated could prove perfectly satisfactory for the purpose.

For a first trial, a three way 'chocolate' connector block was used as the centre insulator, with two coathangers for the ground plane and a third for the radiating element. The hook of each hanger was cut off at a point about an inch above the twist. The wire above the twist of the hanger selected as the radiating element was also bent at a right angle.

The ends of the 'ground plane' hangers were placed in the chocolate block from opposite sides, connected together with the outer braiding of the UR43 feeder.





Use of 'chocolate block' as centre insulator

The radiating element hanger was fitted into another of the chocolate block sockets with the inner of the feeder.

Many years ago the author purchased a wartime American VHF signal generator at a club junk sale. Despite the fact that the frequency of the output was not particularly stable, nevertheless over the years it performed sterling service as a signal source on ten, four and two metres for testing receiving equipment. More recently another junk sale provided a more modern generator. Rather than dispose of the older equipment, its attenuators were removed and it was then found that the output was just sufficient to drive an ordinary, twin-meter VSWR indicator. Since then, the old generator has found a new lease of life for testing aerials.

With this it is possible to measure the VSWR of any antenna within the frequency range of five to 200MHz. For the aerial under consideration it was decided to look at the range 130 to 160MHz in five megahertz steps, thus covering not only the two metre amateur band, but also the 136MHz satellite band and the marine VHF allocation.

The first results were not particularly encouraging with the VSWR varying between 5:1 and infinity across the band. The vertical hanger was then 'opened up' a few inches and a further set of readings taken. These were slightly better and in consequence further sets of readings were taken as the vertical element was gradually opened up a few inches at a time.

Best results

Not surprisingly, the best results were obtained when the loop had been stretched as far as it would go – and a measurement showed that the length of the loop plus the twist was equal to 19 inches – a quarter wave at two metres.

At this point the VSWR across the band varied between 7:1 and 1.2:1, with a reading of 1.5 at 145MHz. This was very gratifying but it was thought that a little attention to the ground plane could probably improve things still further.

The 'opening up' process was therefore applied to the ground plane elements. At first there was a considerable improvement, but as the opening was increased beyond nine inches the situation rapidly deteriorated. Nine inches was therefore selected as optimum. With this configuration the VSWR at 145MHz had only improved from 1.5 to 1.4, but across the band a much greater effect was noticeable with 3:1 only being exceeded at the lowest frequency.

It was still felt that the VSWR could be improved further, but how? It was then remembered that in the past, the radials of some ground plane aerials had been bent downwards, this being reputed to give a better match to the feeder. This was tried, a little at first, but when the angle was increased to 45 degrees the improvement was dramatic, for although the VSWR at 130MHz increased, throughout the remainder of the band it did not exceed 3:1. From just above 140MHz it did not exceed 2:1, and across the two metre band the worst reading was 1.13:1 at 144MHz with better than 1.1:1 at 145 and 146MHz.

It now remained only to conduct some practical tests over the air. The aerial was hung up in the roofspace and the feeder brought to the shack. Comparison with the conventional ground plane aerial which I use as a reference antenna indicated that the performance was well up to standard. This was confirmed by a series of QSOs during which comparisons were made between the two aerials.

The 'Coathanger' aerial, however, has

Effect of stretching the radiating element

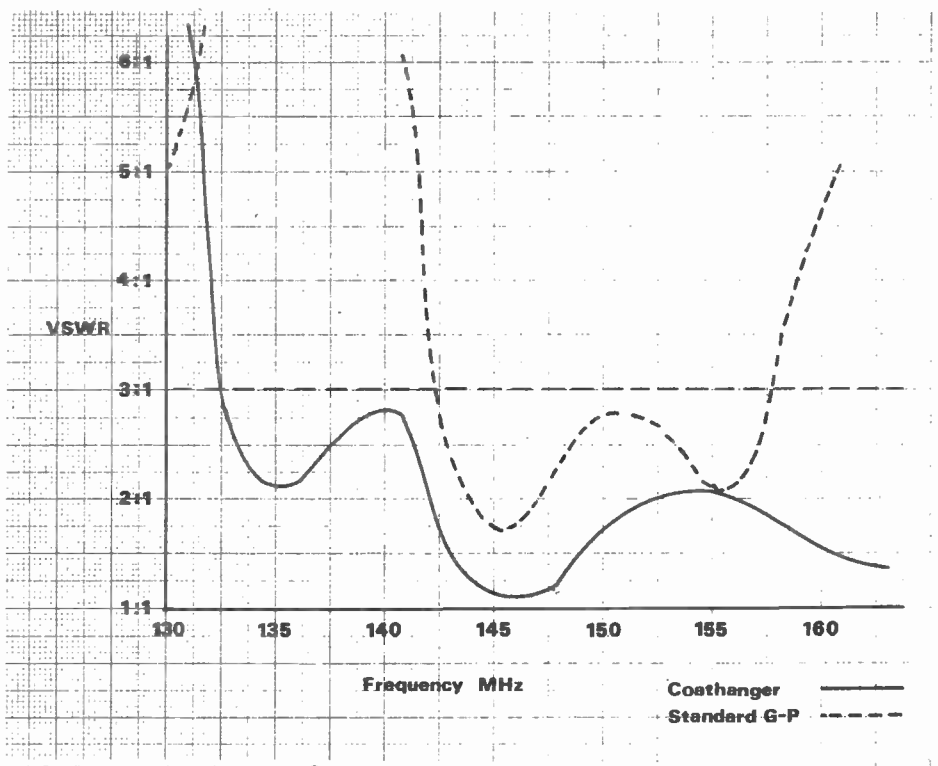
'd'	VSWR at: MHz						
	130	135	140	145	150	155	160
original	inf	10	inf	10	5	8	5
6″	inf	10	inf	7	4	6	4
9″	inf	9	inf	5	3	5	3
12″	inf	9	inf	3	5	3	2.1
15″	15	5	10	2.5	2.5	3	1.6
17″	7	3	4	1.5	1.8	2	1.2

Effect of stretching the ground plane elements. Vert element = 19 inches

'd'	F(MHz)						
	130	135	140	145	150	155	160
9″	5	3	3	1.4	2.2	3	1.9
12″	5	2.6	3	1.6	2.1	3	1.9
15″	10	3	10	2.4	2.6	4	2.5

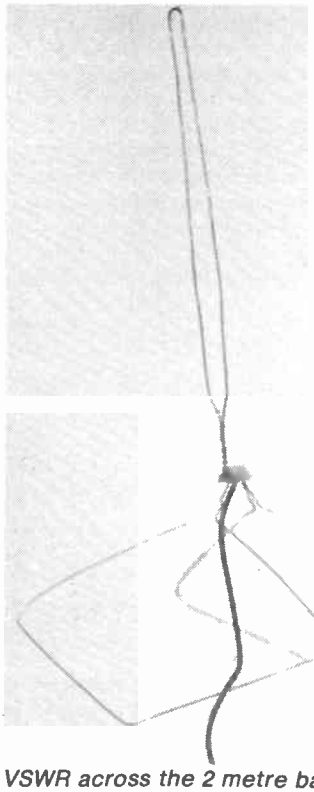
Effect of 'drooping' ground plane elements. 'd' of GP elements = 9 inches

F(MHz)	130	135	140	145	150	155	160
radial ends lowered 4″	5	2.7	3	1.2	2.2	2.4	1.8
radial at 45deg	10	2.1	2.7	1.1	1.7	2.0	1.8



VSWR comparison between 'Coathanger' and standard ground plane, 130-160 MHz

THE COATHANGER

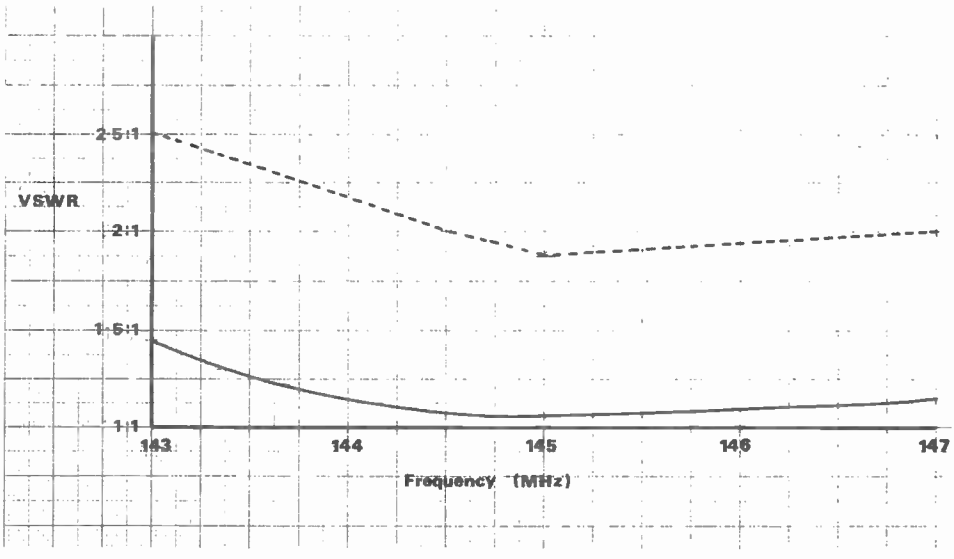


one great advantage over the conventional ground plane: bandwidth, for it is almost equally effective across over 25MHz of the VHF spectrum.

A workshop project for the near future is to convert an old 2 metre converter to the 136MHz satellite band, and I am certain that when this is complete, my 'Coathanger' aerial will see even more use.

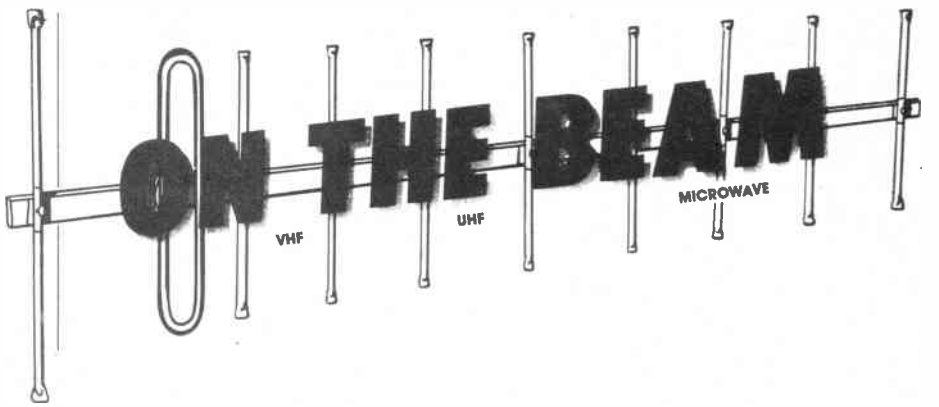
As described, this aerial is only really suitable for indoor use for two reasons: in the first case the centre insulator is not sufficiently robust to withstand the strains imposed by more than a moderate wind and, secondly, the coaxial feeder is not sealed against the ingress of moisture. Both of these reasons, however, could be eliminated 'at a stroke' if, after resonating and testing, the centre insulator and first few inches of the feeder were encased in fibreglass.

VSWR comparison between 'Coathanger' and standard ground plane (dotted), 143 – 147MHz



VSWR across the 2 metre band

F(MHz)	143	144	145	146
VSWR	1.35	1.13	<1.1	<1.1



News and topics of interest for the bands above 50MHz by Glen Ross G8MWR

Packet radio is currently getting quite a bit of attention, due possibly to it providing another use around the shack for that computer you bought.

For those of you who have not run up against it before, packet radio is a method of sending digital information with a very low error rate. The information is transmitted in short bursts.

If a burst contains an error it is automatically detected and the burst is repeated until the receiving station sends a signal to say that all is well. Only then does the transmission continue. That is an over-simplified description but it gives the general idea of what it is all about.

. In the States and Canada the system has been established for some years and even makes use of a repeater network.

Each packet of information has a code to indicate the sender and the destination of the packet and one of the nice advantages is that, while the repeater is waiting to handle the next bit of information from you, it can be handling communication for several others. The receiving stations dig out the piece that is destined for them by making use of the encoded address at the start of each packet. Sounds great you say, and indeed it is. The only problem over here is that our repeater networks are not yet able to handle this type of message although this will come in due course.

Another problem is doubt about the system's legality in this country. The situation was badly handled by the RSGB who first went into print to say that it was not legal and then did an about turn and claimed that it was. The justification was that it was considered that packet radio came under the general heading of data transmission. This may or may not be the case. What is clear is that Packet Radio is legal for point-to-point transimissions, and its use is growing.

A letter from Trevor, G8KMV, gives the information that there are already several people using this mode around the Herts and London area. The activity is mainly on Monday evenings starting about 8pm and the frequency is 144.675MHz FM.

He says that all stations are presently using the packet system on the Acorn Atom computer, but there is no reason why other machines can not be used. An RS 232 interface will help to make things easier, and we believe that some commercial equipment will soon be available for this mode. All the more reason for the authorities to come out with a definite statement.

Seconds out

This is where we have a look at the contest scene over the next month or so. The starting date is 4th August for the low power 432MHz contest and this one has a SWL section. The power limit is 10 watts and the times are from 1700 to 2300 GMT. All entries to Geoff Stone, G3FZL.

The following day sees the low power 144MHz affair, again it includes a SWL section. The times are 0900 to 1700 GMT and the power limit is 25 watts pep. Entries for this one to Petra, G4KGC.

The 12th August is the next 10GHz cumulative contest. Activity on these has been very high this year, with at least 40 stations known to have been active in the Midlands area alone. Please keep 144.175MHz clear for them.

On to the 19th August, where there is a new event in the calendar for 1296 and 2320MHz operators. Times are from 0900 to 1700 GMT and entries go to G3VPK. The main idea on this one is to encourage activity on the 13cm band and, to make this a little easier, talkback will be allowed on the lower frequencies.

Expeditions

News of a couple of expeditions this month. First is that being mounted by the Derbyshire Hills contest group. They will be going to Eire and activating WL square from the 4th to 15th August.

They will be operational on 70,144 and 432MHz but the more interesting part is on the higher bands. On 1.3GHz they will be on 1296.230MHz, A3J only, with 120 watts, 4 times 23 element Tonnas and a MGF1202 pre-amp. On 2.3GHz they will use around 2320.23MHz, again A3J only, with 10 watts to a 3 foot dish and a pre amp. On 10GHz they will operate on WBFM only, presumably around 10.1GHz using the normal talkback of 144.175MHz.

Add to that lot HF capability and all the tents etc and then you will get some idea of what a tremendous undertaking it really is. More information and skeds from Martin, G6ABU, on Nottingham 289122.

The other one is now a bygone but it would have been well worth working F6CTW who went to ZJ and operated on all bands, two metres to 13cm, plus 10GHz, with up to 10 watts out to a four foot dish and Gasfet pre-amps. That sort of power needs some handling!

There is also a report of a probable first on 23cm between Gordon, G8PNN, located in ZP52d, and Y23BD in East Berlin, GM05f. The distance is around 977Km and reports were 5/3. Gordon was running 60 watts to a Quad Loop aerial, although this has recently been changed to a five foot dish. He must have helpful neighbours!

QRP contest

The QRP contest at the end of June brought out a tremendous amount of activity. A lot of people seem to have become rather disenchanted with the 'big guns' contests. They feel that unless you are prepared, as the big boys are, to cart the bits and pieces for a portable station to some almost inaccessible site, possibly having to carry a ton or so of gear over the last couple of miles, then you might as well forget it. But what a different story with this one. True, there were people around with fairly massive aerial systems but the vast majority were running FT290s and HB9CVs or similar, and were having a whale of a time.

Then the Sporadic-E arrived. It didn't last long, but the QRP station heard working into Malta must have been over the moon.

Only one thing soured what was otherwise a great time. On the same day the microwave men had a contest and life was made a misery by people operating on the calling frequency around 144.175MHz. The problem was that they did not know if a station heard around this spot calling 'CQ contest' was looking for two metre or microwave contacts, so

a good deal of time was wasted in finding out. Then when the microwave men went up to 10GHz it left a nice clear frequency for a QRP operator to move into; but when a microwave man returned to his calling channel the problem started all over again. The whole thing got so out of hand that many microwave operators gave up and went home. No one is blaming the QRP operators, they were just using what seemed to be a clear spot in the band and they were all prepared to co-operate when the position was explained and they were asked to QSY.

New ideas

The two metre band seems to get more crowded every day, with more special interest groups looking for a dedicated calling frequency.

There is a possible solution that we would like your comments on. The CW allocation is far too wide for the small amount of CW activity that takes place. Do we really need 50 per cent more space for CW on two metres than is used on twenty metres on a worldwide basis? When there is so much demand for space, an allocation that wide cannot be justified. Our idea is that the area from 144.100 to 144.150 should be designated as a special interest group area. This would not supercede the existing frequencies used by RTTY etc, but would be available for use by minority groups as occasion required.

Before the CW army gets round to beating me over the head for raising such an idea, let's do a few sums. A CW station should not need to take up more than 100Hz bandwidth so that, in the 100KHz allocation we have put forward, there would be space for 100CW stations to operate at the same time with no mutual interference.

In practice there would probably be no more than a dozen CW stations on the band at any one time, so even stations using 2.5KHz filters on SSB (which they should not be doing if they want to get the best out of the mode) would still find more than enough space. Please let us have your thoughts on this idea. We feel that it could solve a lot of problems and inconvenience no one.

Up and away

Moving still higher in frequency we come to 24GHz. Yes, there really are people up there! To try and generate more activity, the contests for this band are now being run separately from those on 10GHz. The first was on 1st July but no reports are to hand. The second is on the 26th August. Will anyone who intends to be active please contact Steve on 0296-22782 who will try and co-ordinate activity to the best effect.

Stations which may well be active include G8ASP from Old Redding or Brill, G3FYX from Charterhouse or Cleeve Common, G4KNZ from Walbury or Lacey Green, G3YGF from the Berkshire Downs and GW3PPF from Coombe Gibbet. G3YJH, G3BNL, G2DSP, G3JHM and G4MBS may also be active. It looks as though this could be an excellent event. If you have gear on the band, even if only Tx capability, why not give it a try?

Odds and ends

The RSGB are intending to issue a *VHF-UHF Newsletter*. Why this can't be incorporated within the usual column in *Radcom*, where all members can see it, is a mystery. Presumably they have their reasons, but it seems odd that a society journal should not contain all the news and that members should have to subscribe to several newsletters to keep up to date with their particular interest.

The powers that be now say that frequencies around 1.41GHz will not be used as the first IF in receivers intended for satellite TV. This should kill a lot of potential TVI problems for us.

Finally it's back to 24GHz and the news that two Italian amateurs have set a new world record for the band with a distance exceeding 289Km.

Good DX to you and may your various interests provide you with a lot of fun and a few problems to make it all worthwhile. The address for all correspondence is 81 Ringwood Highway, Coventry.

MAIDENHEAD — LOCATOR SYSTEM

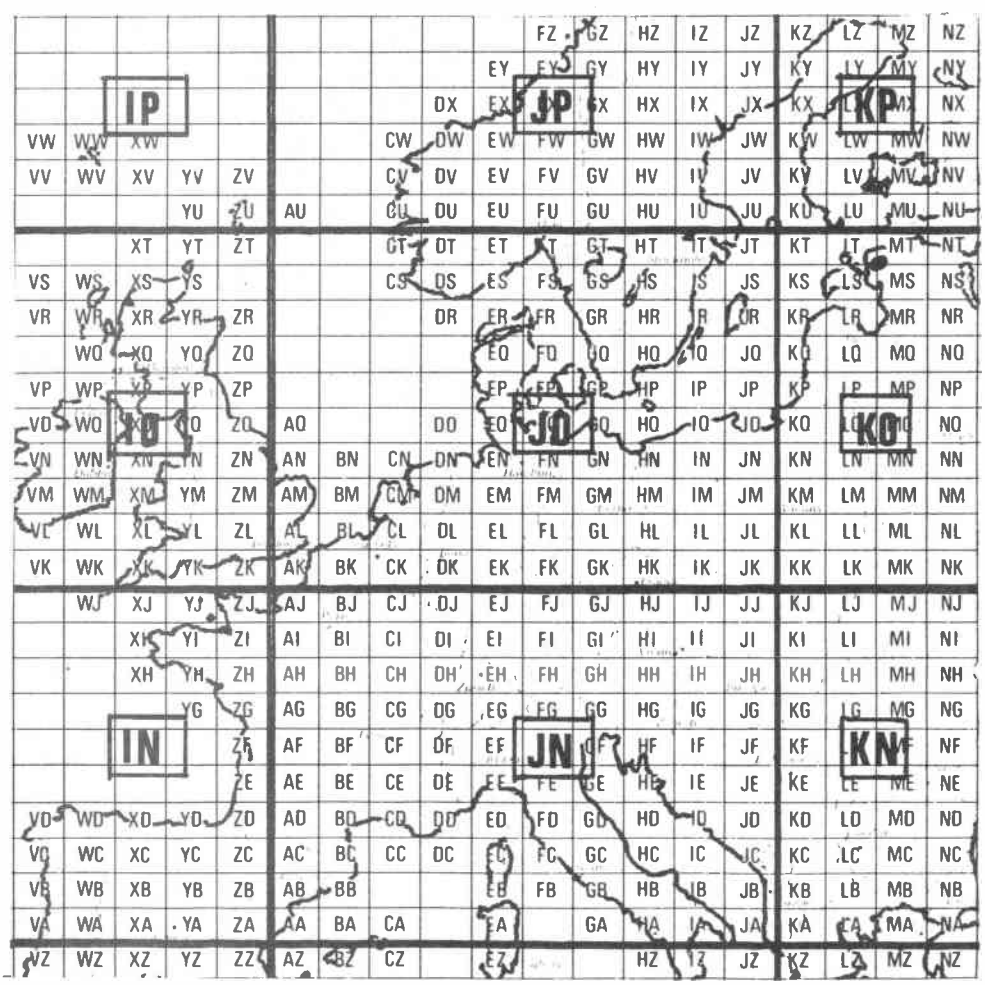
As from the 1st January 1985 a new locator system comes into use. In this article we look at locator systems in general, the new 'Maidenhead' system in particular *and* provide computer programs to calculate the new squares.

by Glen Ross G8MWR

CONVERSION CHART

QRA												New
1st letter	U	V	W	X	Y	Z	A	B	C	D	E	
	I	I	I	I	I	I	J	J	J	J	J	**1st**
	4	5	6	7	8	9	0	1	2	3	4	**3rd**
2nd letter	J	K	L	M	N	O	P	Q	R	S	T	
	N	O	O	O	O	O	O	O	O	O	O	**2nd**
	9	0	1	2	3	4	5	6	7	8	9	**4th**

For example: the old square 'ZM' becomes IO.92 on the new system. This would then be followed by two more letters to indicate the 'unit'



Why do we need a locator system at all? First of all it provides a convenient means of describing a particular spot on the earth's surface. Imagine during a contest having to log the fact that the other station is located 12Km south west of Llan..... gogogoch! You then try to pass the information that you are 8Km east of Lower Slaughter and both stations later try to work out the distance and the points. You would need a huge database on your computer to handle that one! That brings in the second point, the general use of computers to sort out distances and scores.

For many years now we have been using the QRA locator system and to a very large extent this has been satisfactory for most purposes; but it does have one major and insurmountable problem and that is the fact that a QRA locator does not indicate a unique point on the earth's surface. For instance, is a station in HB square located in the centre of Italy? He may be, but he could also be located in the north of Scandinavia. You know where he is because of the unique callsign but your computer is now rather confused to say the least.

Another problem is that if you try to extend the present system, the results on a worldwide basis would be chaotic. This may not seem to be too much of a problem, but with the increasing use of satellites and the feeling that a locator system would also be useful on the HF bands, something needs to be done.

The criteria

One of the major problems in the implementation of a new system is that it must have a degree of compatibility with the existing system, particularly from the point of view of awards and certificates. You are not going to be very happy if you have 200 squares confirmed on the old system and then, because of a change of locator squares, you have to start all over again. Any new system must be 'globally unique' and it must specify the location with a fair degree of accuracy. It is generally felt that this should give an accuracy of within 2Km. It is virtually impossible to better this because the size and *shape* of the square varies with

its position. If you think about it, a 'square' located at the North Pole is actually a triangle.

The actual format of the locator should be concise and the layout of letters and figures should be consistent, AA 56 ZZ for example, rather than a mixture such as 1O S5 0l. For local working it would be convenient if the first letters could be dropped without causing confusion. The major 'fields' should be divided into 'squares' which correspond to the present large squares (ZM etc) for compatibility with the existing system, and these should be subdivided to a size which maintains or improves on the present accuracy.

The solution

Many systems have been put forward to try and meet these requirements and the one that has been implemented is that put forward by John Morris G4ANB, commonly known as the 'Maidenhead'. Let us see how this is organised.

The system follows the present one in that it is based on three squares. The largest of these is known as a 'field' and is 20 degrees wide from East to West and 10 degrees from North to South, dividing the earth's surface into eighteen squares. The origin of these squares is at 180 degrees West located at the South Pole. They are indicated by two letters in the sequence AA to RR, the first letter specifying the longitude and the second the latitude. These 'fields' are then divided into 100 'squares' which are identical in size to the present large QRA locator squares. These are numbered from 00 in the South West corner to 99 in the North East, each square being 2 degrees wide and 1 degree high. Finally these are divided into a grid of squares 24 high by 24 wide, these 'units' being each 5 minutes wide by 2.5 minutes high. This compares favourably with the present small squares which are 4' by 2.5'. These 'units' are lettered from AA in the South West corner to XX in the North East.

Apart from anything else this brings some sanity into the situation in that the first, third and fifth characters define latitude from South to North and the second, fourth and sixth characters define longitude from West to East. This compares favourably with the present system where the third and fifth characters depend on both latitude and longitude (and do so in a complex manner), the second character runs from North to South, the fourth from South to North and the last one runs in a spiral finally disappearing etc!

The six-character code formed from these squares will be unique and they will always consist of two letters, two figures and two letters so there can be no confusion as to whether 'II' is figures or letters, it will simply depend on the position within the locator. All of the UK, with the exception of QRA squares starting with 'A' will come in the 'IO' (India Oscar) field, the 'A' squares coming in 'JO' (Juliet Oscar).

The programs

These are given in two forms, the first of which is 'Microsoft' BASIC. This is written assuming that the computer it is to be used with will only take one statement per line and that variable names may only consist of one letter (you can't get more basic than that!). You can dress it up by writing your own screen layout routines and putting more than one statement on a line if your machine allows it.

The second listing is a fully developed version for any of the IBM compatible machines which are now available. For those of you who do not have a computer available we give a table which will at least enable you to work out the first four letters of your new code, which should be enough for most purposes.

As a check on whether the program is running correctly, enter the following data: 52. .22. .10. .North and 1. .4. .12. .West. This should result in the locator IO. .92. .LI, which is equivalent to the present QRA locator ZM55b. This program will enable locators anywhere in the world to be calculated from latitude and longitude.

Prog 1

```
10 CLS
20 REM.....MAIDENHEAD SQUARES PROG
30 REM...WRITTEN IN MICROSOFT BASIC
40 REM...BY GLEN ROSS.....G8MWR
50 PRINT "Input degrees latitude"
60 INPUT A
70 PRINT "Input minutes latitude"
80 INPUT B
90 PRINT "Input seconds latitude"
100 INPUT C
110 PRINT "Is latitude North or South?"
120 INPUT A$
130 PRINT "Enter degrees longtitude"
140 INPUT D
150 PRINT "Enter minutes longtitude"
160 INPUT E
170 PRINT "Enter seconds longtitude"
180 INPUT F
190 PRINT "Is longtitude East or West?"
200 INPUT B$
210 G=A+B/60+C/3600
220 H=D+E/60+F/3600
230 IF A$="S" THEN G=-1*G
240 IF B$="W" THEN H=-1*H
250 I=INT((H+180)/20)
260 C$=CHR$(I+65)
270 J=INT((G+90)/10)
280 D$=CHR$(J+65)
290 K=H-I*20+180
300 L=INT(K/2)
310 M=G-J*10+90
320 N=INT(M)
330 O=INT((K-L*2)*60/5)
340 E$=CHR$(O+65)
350 P=INT((M-N)*120/5)
360 F$=CHR$(P+65)
370 Q=(L*10)+N
380 G$=STR$(Q)
390 H$=C$+D$+G$+" "+E$+F$
400 PRINT "LOCATOR IS....";H$
```

Prog 2

```
10 REM.....** CALCULATE MAIDENHEAD SQUARES **
20 REM.....** PROGAM IS I.B.M COMPATABLE **
30 REM.....** AUTHOR..GLEN ROSS...G8MWR.....**
40 REM.....** INPUT ROUTINE **
50 CLS:LOCATE 1,20:PRINT "Enter data in UPPER case"
60 LOCATE 3,20:PRINT "INPUT LAT DEG, MIN, SEC."
70 LOCATE 3,50:INPUT ND,NM,NS
80 LOCATE 5,20:PRINT "NORTH OR SOUTH ?"
90 LOCATE 5,50:INPUT LA$
100 LOCATE 9,20:PRINT "INPUT LONG DEG, MIN, SEC."
110 LOCATE 9,50:INPUT ED,EM,ES
120 LOCATE 11,20:PRINT "WEST OR EAST ?"
130 LOCATE 11,50:INPUT LO$
140 REM.....** VALID DATA ROUTINE **
150 IF ND>90 THEN 60
160 IF NM>60 THEN 60
170 IF NS>60 THEN 60
180 IF LA$<>"N" AND LA$<> "S" THEN 80
190 IF ED>180 THEN 100
200 IF EM>60 THEN 100
210 IF ES>60 THEN 100
220 IF LO$<>"E" AND LO$<>"W" THEN 120
230 REM.....** CALCULATION ROUTINE **
240 LA=ND+NM/60+NS/3600:LO=ED+EM/60+ES/3600
250 IF LA$="S" THEN LA=-1*LA
260 IF LO$="W" THEN LO=-1*LO
270 C1=INT((LO+180)/20):C1$=CHR$(C1+65)
280 C2=INT((LA+90)/10):C2$=CHR$(C2+65)
290 CA=LO-C1*20+180:C3=INT(CA/2)
300 CB=LA-C2*10+90:C4=INT(CB)
310 C5=INT((CA-C3*2)*60/5):C5$=CHR$(C5+65)
320 C6=INT((CB-C4)*120/5):C6$=CHR$(C6+65)
330 C7=(C3*10)+C4:C7$=STR$(C7)
340 REM.....** DISPLAY ROUTINE **
350 LOCATE 18,26:PRINT "LOCATOR IS...."
360 LOCATE 18,42:PRINT C1$+C2$+C7$;" ";C5$+C6$
370 REM.....** CHANGE ROUTINE **
380 LOCATE 22,24:PRINT "CHANGE THE DATA ? [Y,N] "
390 LOCATE 22,51:AN$=INKEY$
400 IF AN$="Y" THEN GOTO 10
410 IF AN$="N" THEN CLS ELSE 390
```

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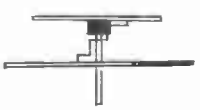

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DODSON AT RANDOM

WHATEVER HAPPENED TO WIRE?

Some advantages of traditional HF antenna systems – if you've got the room

In the world of radio, there was a time when big was beautiful. In much the same way as early 20th century houses were built on a scale calculated to reflect the glory of a nation at the hub of a vast empire, so 'wireless' equipment was constructed with a view to a permanence which the Empire was not to enjoy. In those days, space and weight were of little consequence, and as a result, transmitters and receivers were built like office-safes, where handles and brass-bound switches were standard and bulbous pot insulators the norm.

But although the design of radio gear may have changed with the advent of the semi-conductor *and* to suit the environmental pattern of society, propagation in general and radio waves in particular have not: the equipment that once filled the amateurs' shacks in back gardens now only occupies a corner in the living-room, but still functions according to the laws of nature. Similarly, a society that demands that people should live in little boxes with a minimum of surrounding air-space, or high in the air with no access to the ground at all, evoked a need for compact antenna systems: beams, in a word, were 'in'. They were a compromise – and a very good one – but a compromise for all that.

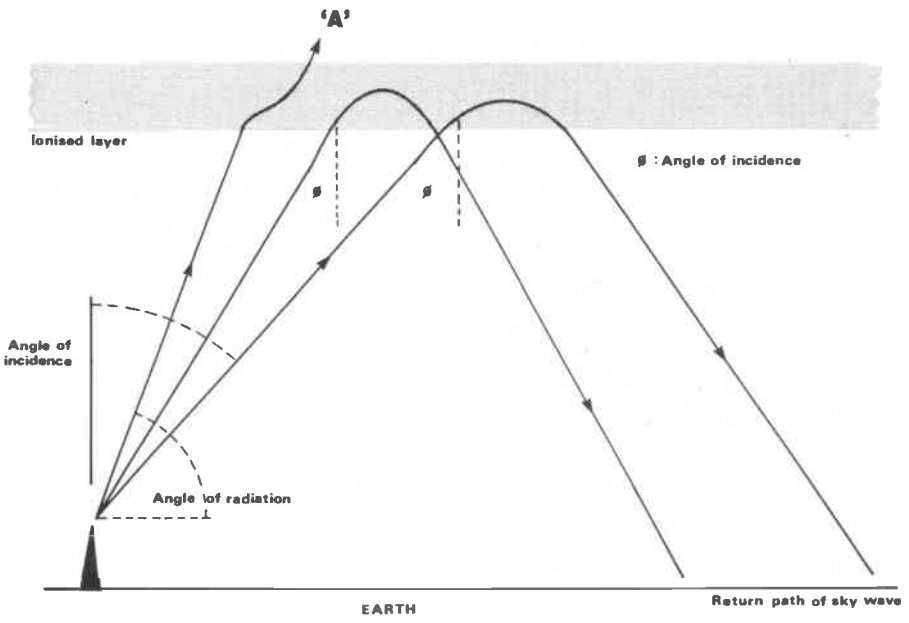
Space

Surprisingly enough, there are people in this world apart from pop-stars and tax-exiles who do have the space to erect antennae of the more traditional variety. 'Aerial farms' they might have been called by commercial organisations; 'antenna allotments' could well be a more appropriate term to suit the less demanding needs of the radio amateur! Without going into the realms of ionospheric refraction, a subject which has been adequately covered in other issues of ***Amateur Radio,*** the ability to 'hit a target' in one hop is dependant upon the frequency of the transmission and the ionospheric layer that is used, having regard for the time of day – or even year. Broadly speaking, the following ranges are applicable:

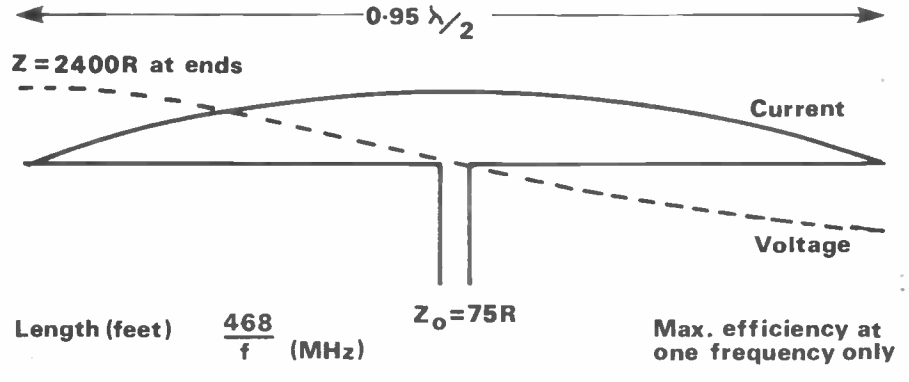
E layer – 2000Km
F layer – 3000Km
F1 layer – 3000Km
F2 layer – 4000Km

For distances in excess of 4000Km, communications are achieved by multi-hop propagation whereby the wave is 'bounced' between the refracting layers and the earth in successive hops, but with diminishing power.

Similarly, the angle of radiation from an antenna is important, as the angle of incidence is dependant upon it: the lower the angle of radiation, the greater is the angle of incidence, and therefore the greater is the range of the transmission. Important too, in the choice and erection of antennae, is 'effective height'. Nothing whatever to do with the physical distance between the ground and the aerial, as effective height will always be less. It is in fact the height which, when multiplied by the electric field-strength, gives the EMF generated in it. If, for example, a transmitted wave has a strength of 2mV per metre at the receiving end, and the effective height of the aerial is 5 metres, then the signal voltage generated in the antenna will be 10mV. Furthermore, to increase the radiation from a vertical aerial without increasing its height, a horizontal 'top' can be added.

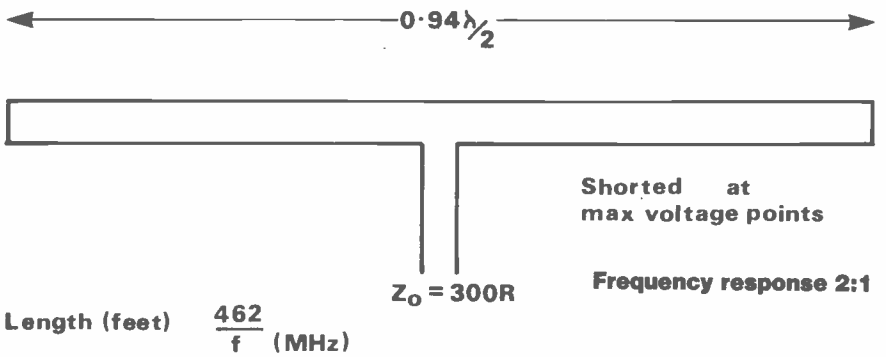


Angle of incidence. Signal 'A' does not achieve total internal reflection and thus passes through the ionised layer (an escape ray).

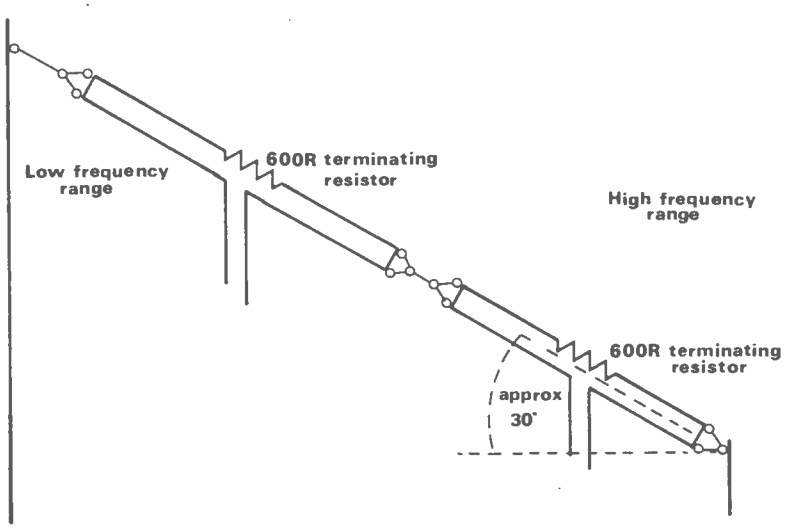


Voltage distribution on ½ dipole

Aerial systems can be broadly divided between 'resonant' and 'non-resonant' types, the difference being that the former is responsive to specific frequencies whilst the latter responds to frequency bands. Starting with the basic half-wave dipole, being the type against which all other systems are measured



Folded dipole



Sloping folded terminated dipole

with regard to gain, it is perhaps the simplest to understand and, for that matter, to construct. A dipole has a characteristic impedance of 75ohms at the feed-point, which rises to 2400ohms at the ends. It is a balanced, resonant aerial which responds with maximum efficiency at one frequency only which is determined by the physical length to which it is cut. The formula from which to determine this length is:

$$\frac{.95 \times \text{wavelength}}{2} = \text{length in metres,}$$

or $$\frac{468}{\text{Frequency}} = \text{length in feet.}$$

The next logical step would be to 'broad-band' the dipole to give it a frequency response in the order of 2:1 or, say, 4 to 8MHz. This is achieved by 'folding' the dipole which not only broad-bands the system but also increases the feed-point impedance by a factor of 4, from 75ohms on the half-wave dipole to 300ohms on the folded version, thus making 300ohm ribbon-feeds an ideal choice of feeder. 'Folding' simply means joining two dipoles, one of which is matched to the 300ohm transmission line, and connected to the other at the maximum voltage points. In theory, the distance between the dipoles should be less than a quarter wavelength, but in practice it finishes up in the region of six inch separation by insulated spacers.

SFTD

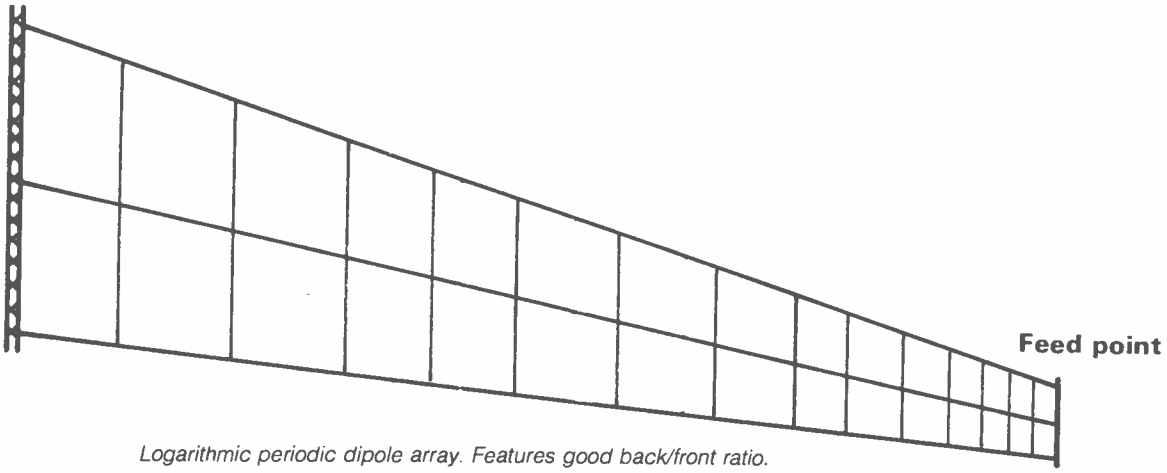
In order to discuss the virtues of the next of the family – the sloping, folded, terminated dipole – it is first necessary to look again, albeit momentarily, at propagation. Under normal propagation conditions, a horizontally polarized wave will be refracted towards its target without change of polarization. However, under conditions of intense ionization turbulence, normally encountered at dusk and dawn, radio waves can undergo changes from horizontal to vertical polarization – and vice versa. In effect, this means loss of signal.

To overcome this shortcoming on the part of the ionosphere, the SFTD was developed. Erected at an angle of about 30° to the earth's surface, and of folded dipole construction, this configuration will give broad-band reception in both horizontal and vertical planes. Furthermore, if two such aerials are mounted, sequentially, between the same poles (but cut to different lengths) and each fed with independent 600ohm feeders, a frequency range of 5:1 can be achieved – say 2.5 to 10MHz. Until now, the antenna systems under consideration have been bi-directional: the SFTD introduces an element of omni-directivity. Still bi-directional in response is the 'cage dipole' – a more sophisticated way of broad-banding (by 2:1) the basic unit than merely folding it. By multiplying the number of elements in a dipole it is again possible to decrease the ℓ/c ratio, thereby lowering the Q factor. In this instance, the ℓ/c ratio equates simply to length over diameter of cage.

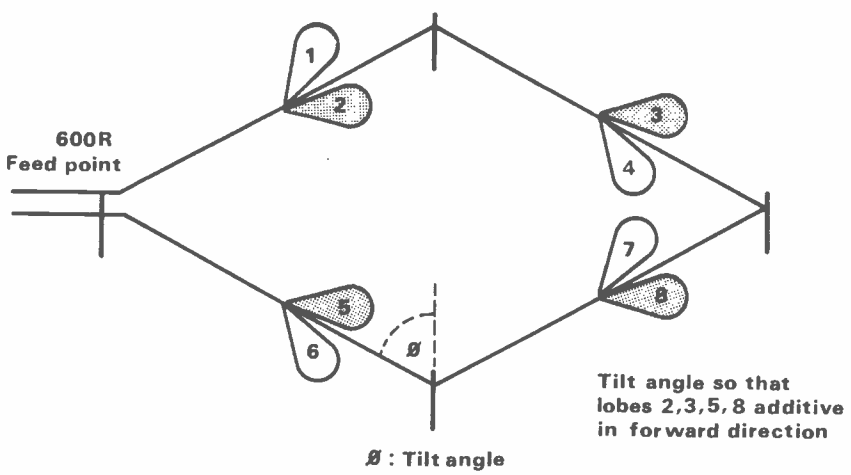
Omni-directional

On the other hand, a derivation of the simple cage system is the 'Quadrant', or Wells aerial which has omni-directional properties. It consists of two horizontal cage dipoles at right-angles to each other cut for, say 3-6MHz, forming two sides of a square that is completed by two more cages (again, at 90°) cut to 6-12MHz. Supported by four poles, the array gives all-round response between 3 and 12MHz.

Similar in that it is mounted on four poles, but much bigger in size, is the rhombic aerial – one non-resonant system to be considered in this review. Diamond-shaped, it is uni-directional,



Logarithmic periodic dipole array. Features good back/front ratio. Frequency independent.



Rhombic aerial directivity

factor'. The closer to 1 the scale factor becomes, the more elements are required to cover a given frequency range and the higher the directive gain – because the beamwidth becomes more narrow. This type of array is fed at the smaller end. Transposing the feed to each successive dipole provides a 'back-Pfire' effect so that the direction in which the main lobe is orientated is along the line of the array from the longest to the shortest elements. This type of aerial array provides a good back-to-front ratio in that the back lobe is very small by comparison to the forward or main lobe.

But *any* antenna system is only as good as the feed to it. By definition, a transmission line is employed to transfer energy from the aerial to the receiver or from the transmitter to an aerial, incurring the least loss and having maximum durability. The most commonly used media are open wire feeders – a pair of normal copper wire conductors supported on insulated poles about 10 feet from the ground and kept at a constant distance apart by insulated spacers, and coaxial cable. Unlike conductors which are usually used for the transfer of electrical energy such as mains at a frequency of 50Hz, transmission lines must cope with RF, which are generally several times longer than the wavelength of the energy which is being transferred. For instance, at 10MHz, the wavelength is 30 metres. A transmission line which is 300 metres in length (a not uncommon distance) is 10 wavelengths long. It is said to have an electrical length of 10 wavelengths. Due to the inherent capacitance and inductance of the conductors which form the transmission line, it behaves in a manner completely different from the conductors carrying energy at mains frequency.

If an infinitely long line is connected to a source of EMF which is alternating, the applied voltage and the current flowing may both be measured by the formula $Z_o = V/I$. If, however, a generator output is terminated with a resistor, all energy fed to the resistor will be dissipated as heat. Voltage and current will be in phase in the resistor. In a similar manner, if a transmission line of infinite length is connected to a generator, voltage and current will be in phase and the line will behave resistively: all energy supplied by the generator will travel down the line if the impedance of the line equals the impedance of the generator. Having said that, if the infinite line is now cut, and a resistor equal to the characteristic impedance of the line is inserted as a load, the generator will still 'see' the line as one of infinite length, and all energy produced by the generator (which is fed into the line) is dissipated in the resistor. The terminating load need not be a perfect resistance for these conditions to exist: it is sufficient that the impedance of the load matches the characteristic impedance of the line.

The study of aerial arrays and the technology involved has been very much a simplification in this review – whole books have been written on the subject by others. Suffice to say that reverting to the use of long-standing methods of aerial construction might tempt the odd radio amateur (and we're all odd!) to go out and talk to his estate agent about a country house with a view: if you're thinking about a 'long wire' antenna, I should talk to the motorway authorities as well!

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MC1349P	1.20	STK015	7.95	TBA540	1.25	TDA2030	2.80		2.95
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AAY12	0.25	BC172C	0.10	BD179	0.72	BF355	0.37	R2010B	1.70
AC126	0.45	BC173B	0.10	BD182	0.70	BF362	0.38	R2322	0.58
AC127	0.20	BC174	0.09	BD201	0.83	BF363	0.38	R2323	0.66
AC128	0.28	BC174A	0.09	BD202	0.65	BF371	0.20	R2540	2.48
AC128K	0.32	BC177	0.15	BD203	0.78	BF394	0.19	RCA16334	0.90
AC141	0.28	BC178	0.15	BD204	0.70	BF422	0.32	RCA16335	0.80
AC141K	0.34	BC182	0.10	BD222	0.46	BF457	0.32	SKE5F	1.45
AC142K	0.30	BC182LB	0.10	BD223	0.48	BF458	0.36	TIP29	0.40
AC176	0.22	BC183	0.10	BD225	0.48	BF467	0.68	TIP29C	0.42
AC176K	0.31	BC183L	0.09	BC232	0.35	BF595	0.23	TIP30C	0.43
AC187	0.25	BC184LB	0.09	BD233	0.35	BF597	0.25	TIP31C	0.42
AC187K	0.28	BC204	0.10	BD234	0.35	BFR39	0.23	TIP32C	0.42
AC188	0.25	BC207B	0.13	BD236	0.45	BFR40	0.23	TIP33B	0.75
AC188K	0.37	BC208B	0.13	BD237	0.40	BFR41	0.28	TIP34B	0.75
AD142	0.79	BC212	0.09	BD238	0.40	BFR81	0.25	TIP41A	0.45
AD143	0.82	BC212L	0.09	BD241	0.40	BFR88	0.30	TIP41C	0.45
AD149	0.70	BC212LA	0.09	BD242	0.50	BFR90	1.50	TIP42C	0.47
AD161	0.39	BC213	0.09	BD246	0.60	BFR91	1.75	TIP47	0.65
AD162	0.39	BC213L	0.09	BD376	0.32	BFT42	0.28	TIP120	0.60
AD161/2	0.90	BC214	0.09	BD410	0.55	BFT43	0.28	TIP125	0.65
AF106	0.50	BC214C	0.09	BD434	0.55	BFW92	0.85	TIP142	1.75
AF114	1.95	BC214L	0.09	BD437	0.50	BFX29	0.30	TIP146	2.75
AF121	0.60	BC237B	0.09	BD438	0.60	BFX84	0.26	TIP161	2.95
AF124	0.65	BC238	0.09	BD520	0.65	BFX85	0.32	TIP2955	0.80
AF125	0.35	BC239	0.12	BD538	0.65	BFX86	0.30	TIP3055	0.55
AF126	0.32	BC251A	0.12	BD597	0.75	BFX88	0.25	TIS91	0.20
AF127	0.40	BC252A	0.15	BD701	1.25	BFY50	0.21	TV106/2	1.50
AF139	0.40	BC258	0.25	BD702	1.25	BFY51	0.21	2N2110	4.50
AF178	1.95	BC258A	0.39	BD707	0.80	BFY52	0.25	2N2219	0.28
AF239	0.42	BC284	0.30	BDX32	1.50	BFY90	0.77	2N2905	0.40
AU106	3.25	BC300	0.30	BDY57	1.65	BLY48	1.75	2N3053	0.40
AU107	3.50	BC301	0.30	BF115	0.35	BR100	0.26	2N3054	0.59
AU110	2.00	BC303	0.26	BF119	0.65	BR101	0.49	2N3055	0.52
BC107A	0.11	BC307B	0.09	BF127	0.24	BR103	0.55	2N3702	0.12
BC107B	0.11	BC327	0.10	BF154	0.12	BRC4443	0.85	2N3703	0.12
BC108	0.10	BC328	0.10	BF158	0.22	BT100A	0.75	2N3704	0.12
BC108A	0.11	BC337	0.10	BF160	0.27	BT106	1.49	2N3705	0.12
BC108B	0.12	BC338	0.09	BF167	0.24	BT116	1.20	2N3706	0.12
BC109	0.10	BC347A	0.13	BF173	0.22	BT119	2.35	2N3708	0.12
BC109B	0.12	BC461	0.35	BF177	0.38	BT120	1.65	2N3773	2.75
BC109C	0.12	BC478	0.20	BF178	0.26	BU105	1.22	2N3792	1.35
BC114	0.11	BC527	0.20	BF179	0.34	BU108	1.69	2N4280	3.50
BC116A	0.15	BC547	0.10	BF180	0.29	BU124	1.25	2N4427	1.50
BC117	0.19	BC548	0.10	BF181	0.29	BU125	1.25	2N4444	1.15
BC119	0.24	BC549A	0.08	BF182	0.29	BU126	1.60	2N5294	0.42
BC125	0.25	BC550	0.08	BF183	0.29	BU204	1.55	2N5296	0.48
BC139	0.20	BC557	0.08	BF184	0.28	BU205	1.30	2N5298	0.60
BC140	0.31	BC557B	0.08	BF185	0.28	BU208	1.39	2N5496	0.65
BC141	0.25	BC558	0.10	BF194	0.11	BU208A	1.52	2SA715	0.80
BC142	0.21	BCY33A	1.60	BF195	0.11	BU208D	1.85	2SC495	0.80
BC143	0.24	BD115	0.30	BF196	0.11	BU326	1.20	2SC496	0.80
BC147	0.09	BD116	0.60	BF197	0.11	BU407	1.24	2SC1096	0.80
BC147B	0.09	BD124P	0.59	BF198	0.18	BU500	2.25	2SC1106	2.50
BC148A	0.09	BD131	0.42	BF199	0.14	BU526	1.90	2SC1172Y	2.20
BC148B	0.09	BD132	0.42	BF200	0.40	BU807	2.25	2SC1173	1.15
BC149	0.09	BD133	0.40	BF241	0.15	BUY69B	1.70	2SC1306	1.00
BC157	0.12	BD135	0.30	BF245	0.30	MJ3000	1.98	2SC1307	1.50
BC158	0.09	BD136	0.30	BF256 LC	0.28	MJE340	0.40	2SC1364	0.50
BC159	0.09	BD137	0.32	BF257	0.28	MJE520	0.48	2SC1449	0.50
BC160	0.28	BD138	0.30	BF258	0.28	MPSA13	0.29	2SC1678	1.25
BC161	0.28	BD139	0.32	BF259	0.28	MPSA92	0.30	2SC1909	1.45
BC170B	0.15	BD140	0.30	BF271	0.26	MRF237	3.45	2SC1945	2.65
BC171	0.09	BD144	1.10	BF273	0.13	MRF450A		2SC1953	0.95
BC171A	0.10	BD159	0.65	BF336	0.34		12.50	2SC1957	0.80
BC171B	0.10	BD160	1.50	BF337	0.29	MRF453	17.50	2SC1969	1.95
BC172	0.10	BD166	0.55	BF338	0.32	MRF454	23.50	2SC2028	1.15
BC172B	0.10					MRF475	2.50	2SC2029	1.95
		BY206	0.14	1N23C	2.95	MRF477	10.00	2SC2078	1.45
		BY208-800	0.33	1N23ER	2.95	OC23	1.50	2SC2091	0.85
		BY210-800	0.33	1N23WE	2.95	OC42	0.55	2SC2098	2.50
		BY223	0.90	IN4001	0.04	OC44	0.75	2SC2165	1.95
		BY298-400	0.22	IN4003	0.04	OC45	0.55	2SC2314	0.80
		BY299-800	0.22	IN4004	0.05	OC70	0.45	2SC2371	0.36
		BYX10	0.20	IN4005	0.05	OC71	0.55	1SD234	0.50
		BYX36-150R		IN4007	0.06	OC81	0.50	3N211	1.95
			0.20	IN4148	0.02	QC16W	2.50	3SK45	0.70
		BYX38-600R		IN4448	0.10	R2008B	1.70	3SK88	0.55
			0.60	IN5401	0.12				
		BYX55-600	0.30	IN5402	0.14				
		BYX71-600	1.10	IN5403	0.12				
		BZY95C30	0.35	IN5406	0.13				
		CS4B	4.50	IN5407	0.16				
		CS10B	8.45	IN5408	0.16				
		OA47	0.09	ITT44	0.04				
		OA90	0.05	ITT923	0.15				
		OA91	0.06	ITT2002	0.10				
		OA95	0.06						
		OA202	0.10						
		1N21DR	2.95						
		1N23B	2.95						

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AA119	0.08	BY223	0.90
BA115	0.13	BY298-400	0.22
BA145	0.16	BY299-800	0.22
BA148	0.17	BYX10	0.20
BA154	0.06	BYX36-150R	
BA156	0.15		0.20
BA157	0.30	BYX38-600R	
BAX13	0.04		0.60
BAX16	0.06	BYX55-600	0.30
BB105B	0.30	BYX71-600	1.10
BT151	0.79	BZY95C30	0.35
BY126	0.10	CS4B	4.50
BY127	0.11	CS10B	8.45
BY133	0.15	OA47	0.09
BY164	0.45	OA90	0.05
BY176	1.20	OA91	0.06
BY179	0.63	OA95	0.06
BY182	0.55	OA202	0.10
BY184	0.35	1N21DR	2.95
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DK92	1.20
DK96	2.50
DL35	2.50
DL63	1.00
DL70	2.50
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EC81	7.95
EC86	1.00
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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
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ECH4	3.00
ECH35	2.15
ECH42	1.00
ECH81	0.65
ECH83	0.78
ECH84	0.69
ECH200	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	1.50
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	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
H133DD	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	
QQVO3-10 Mullard	9.50
QQV03-10	5.50
	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
S130P	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	0.95
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

6AT6	0.75
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
6BW7	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	2.50
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
12ALS	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

30FL13	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
813USA	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
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6350	2.00
7025	2.50
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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

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B7G Skirted	0.30
B8G	0.70
89A	0.20
B9A Skirted	0.30
B108	0.16
B13B	0.50
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14 Pin DIL	0.15
14 Pin DIL Q	0.30
16 Pin DIL	0.17
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BZY88 0.07

2V7 3V 3V3 3V6 3V9 4V3 4V7 5V1 5V6 6V2 6V8 7V5 6V2 9V1 10V 11V 12V 13V 15V 18V 20V 24V 27V 30V

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自己又忙着干别的事情去了。
这时候我想，这些事情安排
们事先知道我要来避雨吗？
我坐不住，就走出院子，看见

JAPAN

INFLUENCE AND ACTIVITY

by Angus McKenzie G3OSS

看到这些，我感动得不知道
，我发现老大爷家里水快用
水桶去挑水。老大爷见我挑
心疼地说："看，衣服都淋湿了

I recently made my seventh visit to Japan at the invitation of Akai, the well known hi-fi company, and they kindly escorted me one afternoon around an incredible part of Tokyo, known as Akihabara. I wonder if you can imagine an area of almost one square kilometre packed full to the gills with hi-fi, computer, electronics and amateur radio shops. Many of the electronics stores have up to six floors with escalators belting up and down and one floor for each department. You will find shops of perhaps 40m² selling just electrolytic capacitors, whilst others would stock resistors. Many have installed dreadful loudspeakers above or beside their doors which belt out loud horrible music.

Fans

On a hot day perhaps the most popular frontage in the district is one large shop selling just fans, with perhaps 100 going all at once in the entrance! Many a European audio critic ends up here to cool off for half an hour before attacking the next shop!

One shop, called 'Rocket' includes a well known amateur radio equipment emporium occupying two large floors which would be the envy of any UK dealer. Just about every model that has been current over the last two years or so will be found stacked up somewhere with a price tag, so that one shop bench might contain six rigs side by side and another six rigs vertically! Everything seems immaculate, and brochures are freely available, but in Japanese, which is utterly incomprehensible to most of us Western folk!

I was fascinated to find that there were no rigs that are unavailable in the UK, other than special ones for 220MHz and 50MHz. Some of the Japanese type numbers are different, just to cause confusion, although their facilities and operation are usually identical. The IC751 and 745 are numbered IC750 and 741, respectively.

Discounts

'Rocket' typically gives discounts of around 15% on prices, which are frequently substantially lower than those in the UK, and an average price would be around two-thirds of UK prices with sales taxes included both ends. There are stores which can supply equipment excluding tax and can arrange to deliver direct to the Airport so that it can be collected when you leave the country.

There are many snags though, for in many cases the Japanese model, which is likely to have a different suffix, may give only 10W RF output rather than 100W for an HF rig, or 10W instead of 25W for a VHF one, a typical example being the Trio-Kenwood TW4000 which is 10W in Japan. Export models are, of course, available to special order but these are more expensive.

I have spoken to very many Japanese amateurs that I have met in Tokyo and Yokohama and they all tell me that there is far more VHF and UHF operation in Japan than on LF and HF. The basic problem in Japan is that whilst the population is many times that of the UK, and there are half a million licensed amateurs, the inhabited area represents a mere 10% of the total area, the rest almost entirely consisting of mountains, volcanoes and inaccessible valleys etc.

Tokyo, when first seen, gives one quite a cultural shock, for hotel after hotel is 40 floors high, but interspersed with one or two storey buildings that are many hundreds of years old.

To find your way around Tokyo is almost impossible because most of the streets are unnamed, and the general populace seem to have to learn the 'knowledge' that would be normally possessed in London only by a taxi driver or policeman! With horror, on examining the business card given to me, by Rocket (I think) my XYL saw just Japanese characters, and for all I know it could be the card given to me by a bath house!

I understand that the total percentage of Japanese amateurs in their national association is substantially smaller than in the UK.

Notwithstanding this, there is a superb monthly magazine, *CQ Ham Radio*, which contains around 500 pages and is about 1in thick, crammed full with advertisements and articles. Much of it is in Japanese characters, but a few pages

are written in American English. One can interpret most of the advertisements from photographs and specifications which are written in normal Western type, so one can always find out about the latest available Japanese made rigs. This monthly magazine costs around £1.50, and is absolutely fascinating.

As a result of the stunning density of Tokyo amateurs, relatively few have even moderately good antennas for the LF and HF bands, typical installations including a window mounted bottom fed vertical or, at best, a single band ground plane on the roof. Large beams and long dipoles for LF are quite rare. We hear many JA stations in the UK, of course, but they are only a tiny percentage of the half million who are equipped with one rig or another.

Licences

There are four classes of operator, and relatively few have the top licence allowing them high power HF operation with comparatively few restrictions. Another class allows the use of up to only 10W at HF, the other licences concerning the Japanese equivalent of class B UK ones.

Interference to television and other electronic equipment is a very serious problem, although the Japanese authorities are very cooperative; but since many Japanese live in blocks of flats with very small rooms, many amateurs find that the nearest goggle box may only be a few metres away from their transmission cables or antennae. The Japanese are a delightfully polite and unselfish race and so many of them do not like to risk causing TVI, and often wait until after TV hours. Quite a few, however, have gone to extreme lengths, as I have done myself, to add filters etc to neighbours' sets so that they can operate at normal times. If you bear this in mind, you can see why Japanese stations often come up between 1600 and 2400 hours GMT.

There is one extremely unfortunate political barrier which exists which I feel is very undemocratic. It is virtually impossible for any foreigner to obtain a Japanese licence, even if he speaks Japanese. Their Government just will not give reciprocal licences, so many licenced Japanese friends of mine cannot obtain a reciprocal arrangement for the UK. Many Japanese engineers who have JA calls and are resident in the UK, have found this most frustrating. Perhaps somebody who reads this could get things moving, as I did myself nearly 20 years ago when I invited Lord Brockway to my house with the then President of the RSGB and organised reciprocal licences from the then Home Office within a few days.

There was one incident which occurred when I first visited Japan in 1976 which really was a lot of fun. I had asked my hosts to arrange for a Japanese amateur to have breakfast with me in the Okura Hotel, Tokyo. I had just sat down in the main breakfast room with a European colleague when in walked a director of JVC and an interpreter who were to have breakfast with us. I was a little embarrassed when I realised that my JA friend could speak no English and the furthest that I can get is 'ohaiyo gozaimas', which means 'good morning'. The interpreter was most helpful, but we had problems over technicalities!

After some minutes I decided to try Morse code across the table with my mouth! My friend caught on immediately and the two of us were burping away across the table for around 10 minutes exchanging a considerable amount of information to the utter astonishment of not only the interpreter, but of the waiters and other guests!

After a while I turned to the interpreter and asked him to tell my friend, referring to him by his Christian name, several facts. The interpreter said that he had been working with his colleague for some years but had never known his Christian name, and asked me with a straight face how I knew it. I then explained that the strange noises which had been emanating from both our mouths had in fact been Morse code, and I don't think an interpreter has ever shown such instant relief, as he thought the two of us had suddenly gone totally bonkers!

How fascinating it is that one can exchange so much information in this way and I have used the same technique on other occasions with Japanese amateurs. I suppose we were lucky not to have been shown out of the dining room, but the Japanese seem to expect anything from us strange Europeans.

Calls

I have often wondered about the numbers in Japanese callsigns and whilst I suspected that they corresponded to different areas of Japan, I thought it might be useful to list them as some of the call areas are very much rarer than others: JA1 is Tokyo Metropolitan area and Yokohama; JA2 is Shizoka; JA3 is Osaka and Kyoto; JA4 is Hiroshima area; JA5 is Shikoku (south side of Inland Sea); JA6 is Kyushu and Nagasaki; JA7 is Northern Honshu; JA8 is Hokkaido (very rare); JA9 is North West Honshu (Akita); JA0 is Migata. JD1 is Ogasawara Island (small island south east of Tokyo).

Many Japanese amateurs who are out in the country have large aerial installations, and you are more likely to work these stations, although they are few and far between. Most of the Tokyo stations that you might hear will either be comparatively weak if they are in the urban area, or they might be in some of the higher class areas, particularly to the west of Tokyo.

I was fascinated to find that on VHF most amateurs use simple hand portable rigs, and there are so many on 2m in the large cities that they do not expect to get more than a few miles anyway because of QRM. There are no repeaters on 2m, which is why many 2m rigs bought by foreigners, somewhat unsuspectingly, omit tone burst or even a repeater facility, which is only discovered when you arrive back in the UK! There are very many repeaters though on 70cm, but the shift is 5MHz down for Tx, which again foils many a foreigner.

From comments made by my friends in Tokyo, it is quite apparent that many rigs which come into the UK as parallel imports are Japanese models as well as American ones, and it is for this reason that they are not the same as the more legitimate European versions. As the market is so enormous in Japan, the Japanese models are quite inexpensive, but they may require much time and patience to modify for European use. The basic designs are the same but sometimes components and even complete chips are omitted from non-European models. You may find a tone burst that is spring-loaded rather than switching on and off an auto tone burst. Having seen many production lines, I can understand how a fairly simple addition required for export can put the export price up quite considerably, for whilst a home market version may sell in tens of thousands an export model may only sell thousands, and each production line has to pay for itself.

Tariffs

When considering the price differentials you should also take into account that there is an import tariff into the EEC of around 11%, and transport costs can represent as much as 15 or even 20% of the retail cost for large items which are not that expensive. A heavy beast like a linear for the HF bands can cost a fortune to import, as will a large Japanese hi-fi speaker. A fairly simple accessory loudspeaker has quite a large cubic capacity for its cost of production, and this is why extension speakers for Japanese rigs cost so much. So perhaps our British importers are not ripping us off anywhere near as much as you might think, for they also have to give a very good after sales service whilst being around 8000 miles away from Japan as the fly crows over the North Pole.

I know from my hi-fi connections that the Japanese have a fetish for bringing out new models every year. The same situation, of course, occurs in amateur radio equipment so there is no time to put design faults right, as by the time the problems are feeding back the production lines are already beginning to produce the new model. Even if you do manage to catch the problem in time, and the solution is incorporated into the new design, there will then be more problems with the new bells and whistles which are put right on the next model – and so it goes on merrily, year in and year out. If only models could last longer and more market research could be undertaken, as well as pre-production sample testing in foreign markets, rigs could be very much better, and could last for longer. Additionally, prices might not increase so much, as new designs and tooling form a healthy proportion of the sale price.

Returning to the types of equipment

that I saw and talked about in Tokyo, I was struck by how much older equipment is still in use. Many old Trio and Yaesu rigs are still very much in service on the HF bands, and portable walkie-talkies, such as the Japanese equivalent of the Yaesu 708, are very popular. The very top end rigs cannot be afforded by many Japanese, and I think we all know the same feeling! I did not see any Drake, Collins or, indeed, any British or American equipment at Rocket, and I was surprised that they had not heard of such companies as Microwave Modules, Datong or Mutek.

Unknown

Many names that are well known over here do not seem to sell at all in Japan, for I did not see Belcom, Standard, AR and other smaller Japanese companies represented in the shops, and most of the Japanese amateurs had never heard of these names. I did see various types of rig by Matsushita and some other Japanese manufacturers which have not even appeared in the West, so there appears to be room for some more representation.

If you do have the opportunity of going to the Akihabara, I consider it absolutely essential to take a Japanese friend with you who can act as an interpreter, for it is quite rare for shopkeepers in this area to speak any Western language. Even so, the Japanese assistants try their best to assist, but I must admit that it is even more awkward if you are a white stick operator, as I am. It seems absolutely fascinating that so high a proportion of the Japanese are highly electronics orientated, and their technical knowledge seems, on average, to be of a higher order than that of an average Western amateur.

I was delighted to find that there are many YL operators in Japan who are not shy, despite the fact that the female in Japan is regarded in the same way as they were in the 19th Century in the UK. Fortunately, the Japanese race is gradually becoming less 'male chauvinist piggish', but I must admit that I do find Japanese YLs utterly charming and great fun to talk to.

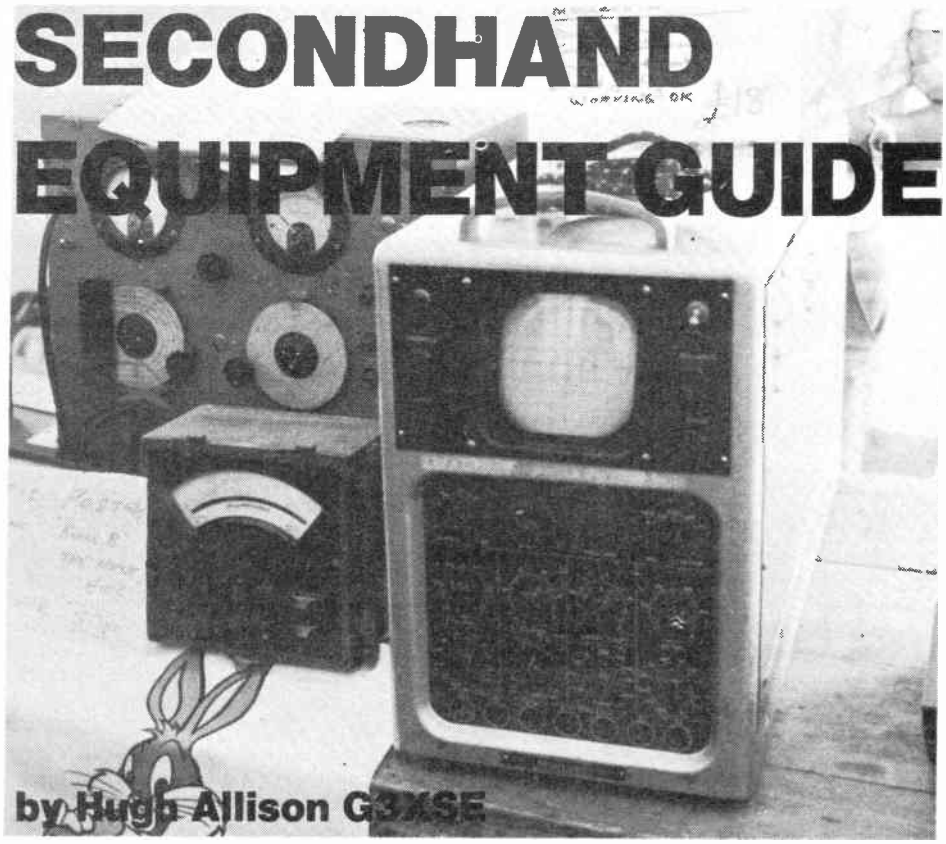
I met JK1IJH at a meeting with five other amateurs and we discussed the amateur radio scene for ages. Yuko told me that she was mainly interested in HF work and liked to contact Europe in particular, so if you ever do work her, then please give my 88s!

Language

Finally, I think we should all be thoroughly ashamed that so few of us can speak any Japanese other than 'Sayonara', and yet so many Japanese amateurs speak surprisingly good English to us. How wonderful it would be if a lot of us could converse excellently in Japanese, and break down what is quite a considerable language barrier. This could result in a much better understanding of our Western requirements and criticisms of Japanese designs and ergonomics. Do turn your beams to Japan, for every contact between G and JA leads to more friendship with a country that I admire very much, and which is well worth a visit if you can possibly manage it. The countryside is very beautiful and the old capital, Kyoto, has some of the most beautiful attractions for tourists that you can imagine.

If you do go, avoid Japanese sea pineapple, sea cucumbers and sea urchins at all costs, and don't forget that if you are offered fugu fish, you will hopefully only be given the minor non-poisonous part, for even a drop from many of the internal organs will first cause your lips to go blue, to be followed by a slow and painful shaking death! I did have just a little fugu fish in a cocktail, and I did not suffer, although I was not particularly struck with the taste. We have foods that are singularly unpopular with the Japanese by the way, so don't give them stilton or gorgonzola cheese, or any extremely highly flavoured sauces. It is a good idea though to have some sake and some raw fish around, and perhaps a few Japanese delicacies, if they are to visit you in the UK.

SECONDHAND EQUIPMENT GUIDE



by Hugo Allison G3XSE

A common problem for the newcomer to the hobby of amateur radio is what equipment to buy for the shack, especially on a limited budget. Equipment reviews of the latest offerings from Japan at prices that would knock a big hole in a thousand pounds or more are only of passing interest to your average amateur with two point seven children, wife and mortgage to support. It is thus not surprising that many newcomers turn to secondhand equipment, and this column is designed to advise such people.

Sources

The most reliable way of purchasing secondhand equipment is obviously from a dealer. You should get some form of guarantee (usually three months) and the equipment is often serviced, or at least checked over, prior to being offered for sale. However, as with most things in life, you get nowit for owit, ie this is probably the most expensive method of purchasing the new love of your life.

Advertisements, in this or in other magazines, are another source. Provided the seller is not too far away you can roll up and inspect the goods before purchase. Legally, this is a private sale and thus the trades descriptions act does not apply – let the buyer beware! You have no comeback on the seller and goods are normally sold as seen, unless you can get the seller to write out a receipt to the contrary. The foregoing also, obviously, applies to equipment bought via 'word of mouth' adverts, either at radio clubs or heard over the air.

The rallies

The third and most common source of secondhand equipment is the radio rally. These are held throughout the country and are normally organised by local clubs as a club fund raising activity. A list of rallies and their venues appears elsewhere in this magazine and a newcomer is well advised to make the effort to attend one. As well as gathering a good selection of traders under one roof, the rallies normally have either a 'car boot sale' area, a 'bring and buy' area or a flea market. Here your mind will boggle at the bewildering array of goodies, ranging from a week-old, all-singing all-dancing example of the latest Japanese gizmo down to a box of junk that might come in handy one day.

It is the intention of this column to educate the newcomer so that he can sort the wheat from the chaff and the bargain from the rip-off. Due to the seasonal nature of the rallies, traditionally stretching from Leeds a week or two before Easter to Harlow at the end of September, this column will make a semi-regular appearance in the magazine.

Is the price right?

Let us suppose that you have located an example of your heart's desire, and it's checked out OK. How do you know that it is worth the asking price? Next month readers of this magazine will again be privileged to inside information – the prices that equipment has actually *sold* for as distinct from the price at which the equipment was advertised. Although not covering every item of amateur equipment, the list is fairly extensive so don't miss next month's copy.

What if it breaks down?

Your scribe probably repairs an item of amateur related equipment every day. Over the years certain patterns emerge and, quite often, stock faults occur, particularly as equipment ages. Quite often serious symptoms, ie a totally dead receiver, can have quick and easy solutions. One classic example that springs to mind is the AF series of early transistors, particularly the AF117. I make no apologies for mentioning this problem again since dozens of EC10's come my way with the fault, which is an internal short in the transistor between collector and screen. Check with an AVO on the low ohms range between the two wires of the transistor with the set off. If you have a dead short, then snip the screen wire through and turn on. Motorola car radios of the same era, about 1970, are also now plagued with this trouble –very strange. Purists may like to replace the transistor, but if there is no sign of instability, why bother? I'll hand on stock faults as they occur.

Avoiding a 'lemon'

How does the newcomer, or indeed the experienced amateur, avoid buying a 'lemon'? Your scribe cannot truthfully claim to know all the answers since a rather sad example of an airband transceiver lies on the workbench as I write. It had been mended beyond repair prior to coming into my possession and will require several hours of happy soldering to get working, but since it only cost 50p I'm not too upset. Suppose you paid real money for amateur gear that burst into flames upon switch on, how would you feel?

A good tip is to look for a label about complying with FCC regulations. This often means that the equipment is designed for American markets. Apart from, maybe, only working on 110V (in which case an expensive autotransformer may be required), the bands covered may not be exactly those of the UK. I've come across several Kenwood examples of the 2200 family that are prime culprits. Not only are they full of crystals that are of no use in the UK, but they are 'peaked' for the American market and have a poor performance on 145 until re-tweaked.

Another good tip is to look for unusual spellings. Colour spelt Color on a TV camera bought for £50 by a friend of mine should have warned him that it was for the American NTSC system rather than the UK PAL system.

Colours of lead out wires can sometimes give a clue – especially the mains cable. You should already know that older pieces of equipment have red, green and black wires, the newer ones brown, green/yellow and blue. Beware white, green and black, often found on equipment from abroad. Unusual mains plugs moulded onto equipment, particularly the 'continental' plug, often indicate 220V. You may be lucky and it will run on 240, but beware!

Finally there should be no trouble demonstrating mobile equipment at a car boot sale. Think about it, there should be a battery in the car! Even if no aerial is available to try out the transmit side you ought to see it light up and hear some kind of noise out of the speaker.

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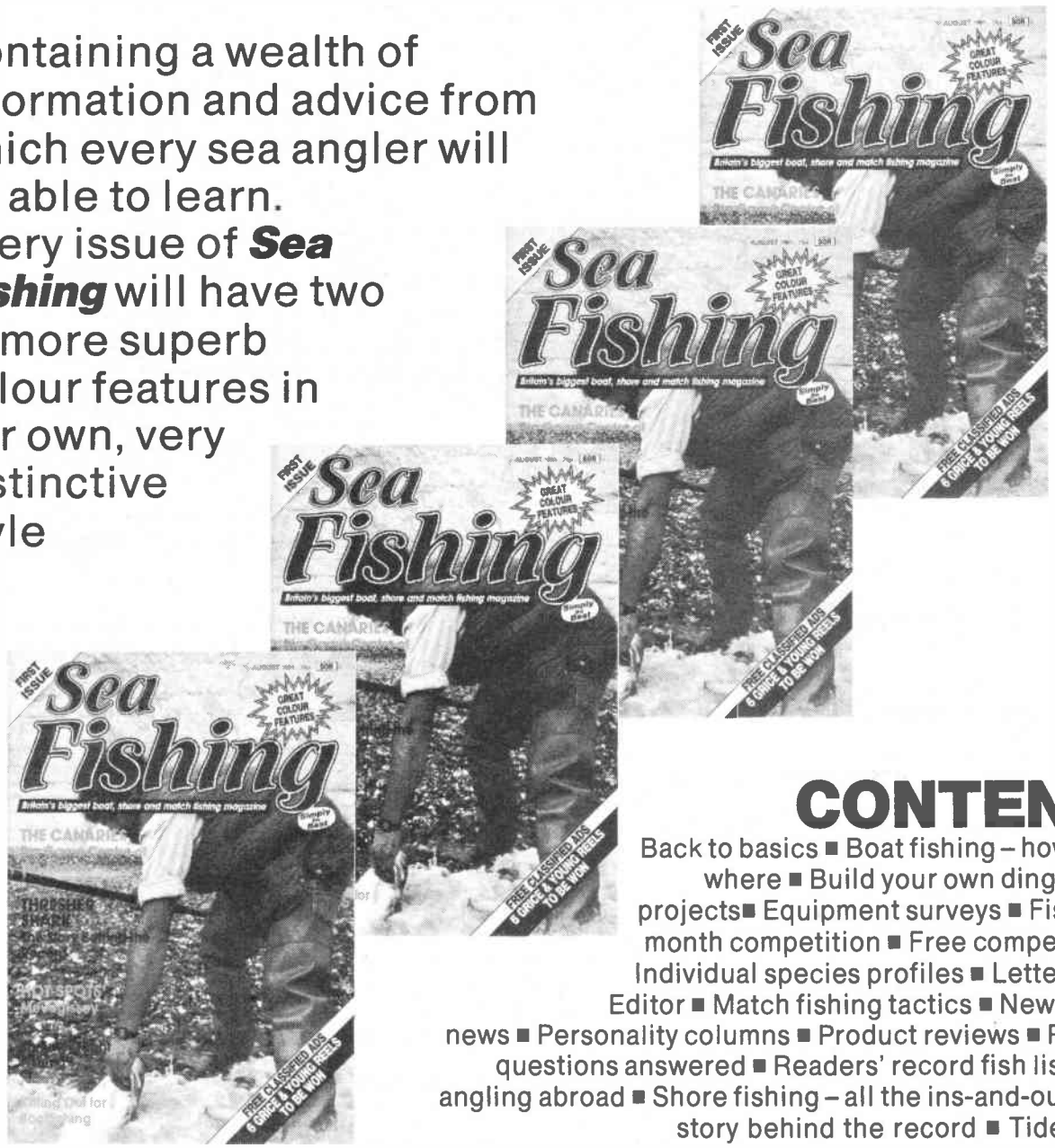

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DFC40 0-4MHz £14.95 built DFC41 0-32 MHz £18.50 kit DFC42 0-200MHz £21.95 kit

LNA144. OUR ace RF designer Timothy Edwards has done it again! In line 144MHz RF switched pre amp which needs no modification to any rig. Just put it in the co-ax feed, supply 12V and your deaf rx will have ear ache. Uses the BF981 with a total of 4 tuned circuits for the best out of band rejection. The relays are 50ohm gas filled with earthed metal cans and are good to over 800MHz. This was originally designed for 'British Telecom Satellite Division' hence the provision for gold 14GHz SMC connectors. 1dB noise figure and 18dB gain is guaranteed to improve all standard rigs on 144-146MHz. Will fit in standard diecast box (not supplied). Try one in the car under a wing mounted aerial and be surprised. LNA144 kit £14.95. Built and tested module £24.95.

TONE BURST. Probably the smallest crystal controlled unit available. 1750Hz ± 0.1Hz. Supply 5-15V. Will fit in the tiniest of rigs or even microphones.

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UC160 Kit £9.95 UC160 built and tested £16.50

2M MONITOR RECEIVER. A superb design featuring crystal and ceramic filters coupled with the MC3359 and BF981 results in an almost bomb proof monitor. Single channel with squelch and 500mW audio amplifier. No coils to wind and little alignment required. Uses standard crystals from 'PM Electronics'. **MON2M Kit £19.95 Built and tested module £29.95.** For professional use on 18-200mHz built and tested module **£38.50** including crystal.

WHO IS TIMOTHY EDWARDS? He's 32, licenced for 14 years, was a senior design engineer at Pye Telecomm and now works full-time for Timestep. He's also responsible at Timestep for designing the synthesizers and down convertors for British Telecom used on the current ECS satellite system. He also specified and uses our new Spectrum analiser and signal generators costing over £40,000. Now you can see why our amateur modules always work properly and have full meaningful specifications..

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New Japanese 50 ohm low loss gas filled RF relay. Only 0.3dB loss at 430 MHz with 35 watts input. Ideal for switching pre-amps and the TRW MX15. BSWR 1.5:1 at 1gHz. 12 volt coil. **DR12V £4.75**

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FOR SALE

■ Robot 400 slow scan television, slow to fast and fast to slow scan converter. £290 plus carriage. No offers. Dave Lane (G3VOM). Tel: 061 794 6659

■ RTTY to TV converter, Model MM2001 for sale or exchange for good quality CB, AM, FM, USB, LSB, plus usual facilities expected on this type of rig. Also CB for use abroad. Offers to Claude. Tel: 01 431 2919 (evenings)

■ Secondhand valves, assorted, Sharp radio record player. £30. Russian 8 wave band radio. £23. Thompson, 12 Fyfield Road, London E17 3RG

■ Morris Mini Cooper 998cc, MOT Nov, original condition, used as second car, not raced or messed about with. Now for sale, due to change of employment. Will swap for Vic 20 or Commodore 64 plus cash. Also included is a garage full of spares. No time wasters. Asking price for cash £500 or swap 2m multi. David Dixon, 3 Towns End, Wylye, Warminster, Wilts. Tel: Wylye 09856 327 (evenings)

■ Become a Radio Amateur with help from Dover YMCA Amateur Radio Club. We can teach you wherever you live in the country. Write for details to RAEC, Dover YMCA, 2a Leyburne Road, Dover, Kent CT16 1SN. Feel free to include any queries you have about our hobby of amateur radio. P J Pennington, 146 Elms Vale Road, Dover, Kent CT17 9PN

■ Sony CRF320, 32 bands, long, medium, VHF digital read out on short wave, mint condition. £250. Tel: Dereham, Norfolk 0362 2143 (after 6.00pm)

■ £505 worth of 48K ZX Spectrum, Radsoft RTTY/CW receive interface with software, Maplins RS232 interface, Kempston joystick interface with quickshot joystick, together with £310 worth of games software. Selling for £250 ono. Robert Playford, 21 Lammas Road, Watton-at-Stone, Herts SG14 3RH. Tel: 0920 830491

■ Power supply 13V, 15 amp £60. Oric Atmos RTTY program £9.50. Atmos/Electron Morse tutor £6. QTH locator, handles Lat/Long, QRA and world wide locator codes £5. Also Sinclair QL programs MML 144/100 2 metre linear £70. Trevor Tugwell, 11 The Dell, Stevenage, Herts. Tel: 0438 354689

■ Shimizu SS105S HF all mode transceiver, fitted FM boards and CW filter. Absolutely as new condition. £275. Might also sell matching homebrew 2m transverter, 16W output, BF981 front end. £60. G4ILO. Tel: Colchester 572685

■ Icom ICB-1057 modified for ten metre FM band with 20 channels, complete with circuit instruction book, mobile mounting bracket and mic. In original packing. £30. Ex-Gov't, 33ft fibreglass whip antenna, made in approximately 4ft screw together sections, complete with insulated base-/mount plate. £30. Buyer to collect or arrange carriage. H Stogdale (G4FEQ), 14 Main Street, Ledston, Castleford, W Yorks WF10 2AA. Tel: Castleford 0977 552862

■ Icom R70 Rx, excellent condition with Icom FM board fitted. In original packing, a bargain at £400. Tel: Newcastle-upon-Tyne 0632 673507

■ FRG7 Yaesu communication receiver, excellent condition. Also 2 metre converter. £135. For both, buyer must collect. Tel: 0533 738377.

■ Racal RA1217 digital general coverage receiver 0-30MHz in 30 bands, all filters. £320 plus carriage. FV901DM digital scanning VFO, as new. £100 plus carriage. (G3WMX) Tel: 073687 405

■ Need a handy around the house, but put off by the price? Then buy my FDK Plamsizer Two. All you need and more! 145-146MHz in 25Kc steps, switchable auto toneburst, repeater shift, 1watt out, Nicads and charger, will run from 12V direct, speaker mike, real leather case, helical and ¼ wave whip, carry strap, ⅝ telescopic whip. £60 ono. Tel: 01 247 6097 (day)

■ Realistic PRO2001 scanning receiver 16560 freqs, complete with Discone antenna and VHF/UHF portable antennas. £90. Also Realistic DX200 comms recvr. £65 ono. Both in mint condition, complete with handbooks and original packing. Lowe TX40 CB Tx/Rx complete with SWR meter, Ant tuner and AR2 legal antenna. £30 ono. G P Alban, 12 Ingram Crescent, Dunscroft, Doncaster DN7 4JG. Tel: John (G6UGU, QTHR) 0302 841530

■ Shibaden FP-100 studio camera, Fujinon 200m lens, 20-100mm cables, sync gen, effects gen, GWO £180 ono. Racal 811R VHF freq counter. £60. Dymar 931 radiotelephones £15 each. Ness MC934 CCTV camera £15. Ikegami VR611 CCTV camera £18. Inegami VR622 £20. Decca colour monitor 22in £25. Mono monitor 24in £7.50. Heath HA-202, 2 mtr linear 40W £22. 52 set. Offers. R Hill, 7 Willowbrook, Greytree, Ross-on-Wye, Herefordshire HR9 7HN

■ Morse tutor program for BBC Micro. £3.50. Morse Rx/Tx program for BBC. £4. 747 Flight Program. £3.50. Also other amateur radio programs available. Circuit diagrams and constructional details for many projects, both valve and transistor. Many old and new valves available, due to shack clearout. SAE for full list. Wanted double beam oscilloscope, fully working, with manual if possible. C J Duffy, 105 Cranbrook Street, Oldham, Lancashire OL4 1QH

■ RCA AR88 com Rx, spare set of valves, manual recent alignment. £55. Pye boot mount Vanguard AM25b £12. D J Plant, 15 Heathcombe Road, Bridgewater, Somerset. Tel: 0278 423288

■ Labgear LG300 CW amateur bands transmitter. Also Woden UM2 power supply and modulator, neither in working order but could be made workable. Ideal for valve enthusiast. Circuit diagrams also available. £70 the lot. Buyer must collect. A Mackay, 20 Broom Covert Road, Swinfen Hall, Lichfield, Staffs. Tel: Shenstone 480909

■ Recently registered disabled person has, as new, a Unisex fully adjustable fold-up bicycle, complete with 3 speed gears, dynamo lighting. (Protective covering still on aluminium mudguards). Also 14 volumes Radio & Television Servicing by J P Hawker published by Newnes. Vol 1 Radio/Receiver Practice 1946-55. Television 1948-55. Vol 14 Radio & Television Models 1967-68. Exchange for aerial rotator and controller in good working order. Tel: Minster 0795 876091

■ Sell or swap electronic typewriter (EX 44) with 6K matching memorymatic (M44) unit. Has correctable function and twin keyboard facility plus other features. Cost over £500. Selling in as-new condition with manual £330 ono or swap for Yaesu FRG7000M or Trio R2000 W/VHF facility. Buyer or swapper to collect. Also for sale Sony TC-377 four track stereo tapedeck with three speed, three head and sound on sound, plus mike atten'r facilities. With owner's manual. Takes up to 7in reel size. £135 ono. Buyer collects. QTH very close to gate 8/M1. Tel: Hemel Hempstead 0442 45649 (weekday evenings only)

■ Four Emic 4CX250B valves, 2 SK610 bases, 2 chimneys. All new and boxed. Abandoned project. Tel: 0635 25301.

■ Pye pocketphones PFI receivers, one crystaled and tuned for RB11 with BNC socket fitted £12. One not converted but very sensitive £5, or £15 for both. Also Zetagi B70 SSB/AM linear amplifier, 4W in 20W out £25 ono. Tel: Alan G1DJG. 0297 33871.

■ Trio 9130 and BO9 base £320. Kenwood TS 130S with ATU 130, VFO 120, SP120, PU30, MC35, mobile mount. Complete station £500. Daiwa rotator £75. 13 element portable Tonna £10. Tel: 0229 23348 (evenings).

■ Yaesu FRG7 general coverage receiver, digital readout, excellent condition £120. FRT7700 ATU for receivers £30, perfect order. Mr Jenkins, 61 Edinburgh Street, Swindon, Wilts SN2 6DE. Tel: Swindon 725914.

■ Manuals USA, BC610, SCR211 reperf, type 14. Printer TG7A/B, TG37, TT12/13, 21/25, 26/52. B28, RA63D, antenna AB38/CR. British TF144G. Heathkit SB301, IM13U, Iliffe TV servicing, two vols. Second thoughts radio theory. Newnes TV engineers pocketbook. Pitman worked radio calculation. Mazda Pal receiver servicing. McGraw-Hill colour TV theory 1929. General catalogue radio apparatus illustrated. Drake SPR4 comm Rx. Datong ANF auto filter. SWR bridge. Offers: Trowell G2HKU, Hamlyn, Saxon Avenue, Minster, Sheerness, Kent ME12 2RP. Tel: 0795 873100

■ As new, Icom IC7400. Used Rx only, less than one year old £485. Daiwa AF 600K all mode active filter £45. Tel: 0322 63968.

■ Zenith R7000 £350. Mint. Exchange 35mm Nikon camera–video recorder, WHY. C Haynes, 13 Lionel Road, Eltham, London SE9 6DQ. Tel: 01 850 1543.

■ Trio communications receiver, model 9R-59, 0.55MHz to 30MHz £50. Microwave modules, 144MHz from 10 meters transverter £85. Wanted FT290R. J S Park, 17 Brathwic Place, Brodick, Isle of Arran KA27 8BN. Tel: 0770 2515.

■ Ham international, Major M588, USB, LSB, AM, FM, 26.515 to 27.855MHz. 5KHz shift. Zetagi BV131, 200W, linear amp. Eurosonic 178, power/SWR/mod/FS meter/matcher. Zetagi P27, RF preamp. Superb condition, only eight months old, current owner now licensed. £130 or exchange HF receiver in good condition. Tel: Ron, Camborne (Cornwall) 0209 718021.

■ Bearcat 100FB, 16 channel synth'sd hand-held scanner, Nicads charger, PSU, cost £345. Would exchange for hand-held 2 metre Tx/Rx, prefer FT208R with Nicads. Others considered, WHY. Will sell for £200 ono. Mike Cochrane, 57 Goulden Street, Seedley, Salford, Lancs M6 5PZ. Tel: 061 736 5422.

■ Home base CB aerial. Sirtel signal keeper, fully legal for CB, a quality aerial, brand new (landlord refused to let me put it on the roof), cost £22, nearest offer to £15 buys. CB slide mount, as new £3. Very large quantity of electronic components. R's, C's, transistors, IC's, diodes, coils etc. Over 50,000 pieces. The bargain of a lifetime for £25 the lot. Various equipment, PC boards for spares £10 the lot. Tel: 021 472 3688. (Try anytime. Delivery anywhere easily arranged).

■ Realistic DX200 receiver, in mint condition, with instruction manual, 0.15MHz to 30MHz, AM, SSB, CW, CB. 10dB signal to noise ratio, price £65. Apply: Sheppard, 86 Sandcroft, Sutton Hill, Telford, Shrops TF7 4AD.

■ Yaesu FRG7 general coverage receiver, one owner, first class condition, manual, original packing, can demonstrate £125. Buyer collects. N Richardson, 2 Edna Road, Ringlestone, Maidstone, Kent ME14 2QJ.

■ Trio 2400, 2 metre hand-held, complete with Nicads and charger elt £125. General coverage receiver, Century 21, 0.15KHz to 29.999MHz AM USB. LSB £70. Crushcraft 2 meter 13 element beam £25. 2 metre 5/8 wave ant on Mag Mount, complete with coax etc £12. Texas Instruments T199 computer £40 ono. Tel: Chester 0244 311496

■ Audioline 341 CB £25. Ext SP852 £4. RD6 resistance box 1Ω to 1MΩ £15. Also loads of capacitors, transistors, transformers, IF coils, variable capacitors, switches, valve holders, connectors, LED's, neons, videwound, plus high wattage resistors. Very high current relays, fuse holders, fuses. All of this due to a long awaited shack cleanout. Bob Jones. Tel: 0685 74061

■ Straight swap Brenell MkV, series M, reel to reel tape recorder. Four speeds, monitor facilities etc. Also Jason FM tuner for fully synthesised 70cms mobile multimode. Contact: Ray (G1FDI). Tel: 01 693 6137. (Office hours only).

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HP41C port computer b/n £95. VHF comm mags 1968-83, full set £25. BBC printer cable to any Tandy printer £12. LCD digital mult/m, 16 auto ranges, b/n £30. 8 digital LCD Thandor freq counter 0-600MHz. 10mV sensitivity, b/n £150. Rotring drawing system A3 rapid board, heads many pens, templates etc. All b/n, boxed, cost £170, sell £50. Ultrasonic alarm, one unit, go anywhere, cost £150, sell £35. Tel: Peter 047 385526.

■ Sony CRF320 professional communication receiver, FM/M/LW superhet SW. Synthesised double conversion, 30 bands, 1MHz 1-30MHz. Digital readout, AM, U/L, SB, CW modes, 110/250ac or 12V dc input. Quartz clock and timer, condition as new. Cost over £700, accept £300 ono, or exchange expansion box and disc drives for TRS80, Model I. D Heath, 15 Hollybank Avenue, Upper Cumberworth. Tel: 0484 606542.

■ Racal RA17L receiver, good condition, offers, or would swap for pair of hand-held's, Pye etc. Must be working. Jones, 3/11 Brooklea Grove, Kings Norton, Birmingham B38. Tel: 021 451 2074.

■ Zetagi BV131 mains linear amp, 26-30MHz, 100-130 watts, AM/FM, 200-250 SSB. Brand new in box, with instructions. Swap for 48K Spectrum or Sx200N scanner or good 2m RIG or 2m hand-held. R Twose, 14 Green Road, Headington, Oxford. Tel: Oxford 65156 (after 5pm on Sunday).

■ Shinwa CP80, dot matrix printer, Centronics interface. Swap for Yaesu FT290R etc. Dave. 76 Medway, Crowborough, East Sussex. Tel: Crowborough 63910.

■ DR31 Panasonic, 32-band shortwave receiver with Yaesu antenna tuner, perfect condition and good reception on many overseas radio broadcasts, just £150 with headphones. Tel: 01 441 2060.

■ Ino digital voltmeter, type DM2022S, maker Digital Measurements Ltd, with LF amplifier, Module A1 and RMS detector, Module B1. Good condition, £250.

Also video oscillator by Marconi. Signal generator, type 65B £125. C Rogers, 64 Armagh Road, Newry, N Ireland. Tel: Newry 67766.

■ Dymar 3 channel portable. Complete with xtals for R2, S20, S16. 4 battery packs and Dymar automatic battery charger. Not fully working, as lost interest. Sell £35 or swap for 2m pre amp (mast head) or long 2m Yagi or anything interesting. Terry, G1AMQ. Tel: Heath Hayes 0543 75410 (after 6pm).

■ Yaesu FT77 HF mobile, as new. £350 ono. Also Datong Morse tutor £25. Buyer collects. G4XLH. Tel: Bath 317411 (evenings only).

■ Trio R2000 receiver, six months old, with 144/28m converter £350 the two. Tel: Ipswich 830468.

■ Discone antenna £5 each plus £2 postage and packing. M Marsden, 205 Moss Lane, Burscough, Ormskirk, Lancs L40 4AS.

■ Icom 740, HF, RIG with FL44, FL54, FM board, keyer etc. Used only two months, as new in box £500 ono. Tel: Clive, G4TIH. 01 834 7296 (work days).

■ Rotator head (RH2) for Altron SM32 mast. Drilled for KR600 rotator, mint condition, complete with separate drilled plate for K5065, mast support bearing, £20, carriage extra. ICS Amtor program for BBC £40. Tonna 23cms Yagi (new) £22. 4-way power splitter £23. Stacking frame £16. Cushcraft 2m Ringo II colinear base antenna (new) £36. Yaesu FT225RD, 2m, Tx/Rx, perfect condition £450 (rare item s/h). P Chamberlain, 9 Goffs Close, Crawley, Sussex RH11 8QB. Tel: Crawley 0293 515201.

WANTED

■ HQ1 or G4MH mini beam and rotator and ATU KW107 transmatch or similar. Can swap superb B40 Admiralty receiver, recently serviced and aligned. Letters only to: Mel (G4WYW), 41 Setley Gardens, Strouden Park, Bournemouth, Dorset BH8 0HQ

■ Plug 3-pin for R107, high price OK. Marconi Atalanta Rx, top quality, quote price. Marconi 118M alias AD94 Rx with dyno. Cyril Marshall, 26 Main Street, Loughgall, Armagh, N Ireland BT61 8HZ

■ Single or double trace oscilloscope. R Lucking, 62 Ember Farm Way, East Molesey, Surrey KT8 0BL. Tel: 01-398 3603

■ 19 set and 19 set Variometer, mains plug for Marconi CR100 Rx, commercially made PSU for R1155N Rx, antenna base for 62 set. P Cleaver, 86 Main Road, Dovercourt, Harwich, Essex CO12 3LH. Tel: Harwich 2195

■ Three-D stereo views, 3-D camera, holiday (summer or weekend) or WHY. Williams, 25 Glenmore Road, Oxton, Birkenhead, Cheshire L43

■ DG5 digital frequency readout for Trio/Kenwood TS520S. Also wanted DC/DC converter for same. Will consider other frequency counter compatible with unit. Tel: Ian. 0283 212157

■ Swan 102/3 BX, Tentec Corsair, Trio 930, Dentron MT3000 ATV. Must be in good condition and a reasonable price. W C Moscrop, (G4EMG) 91 Buxton Road, Stratford, London E15 1QX. Tel: 01-534 3460

■ SSB unit 200 for Grundig Satellite 2100. Short wave receiver. K Burrows, 14 Charles Street, Inverallochy, Fraserburgh, Aberdeenshire AB4 5XX.

■ FRG7700 with AT4 active ant. Swap my FT101 MkII CW crystal filter control 10A, 10B, 10C, 10D, 11, 15, 20, 40, 80, 160 JJY WWV perfect condition. Spare Tx valves. Call any time. H W Elvin, 214 Horninglow Road, Firth Park, Sheffield S5 6SG. Tel: 389202 (11am to 4.30pm)

■ Any info circuits handbook for Astronic 10W amp Type A1760. Would like to buy the control unit etc for this unit. W Pascoe, 54 Laburnum Close, Falmouth, Cornwall TR11 2HU

■ Valves W81 or equiv's 7H7, W143, W148 to fix BRT 400 Rx. Also manual or any info for Gertsch freq meter model No. FM3. Ed (G8FAX). Tel: Rayleigh 0268 770716 (evenings)

■ Yaesu FC902 or similar. Also other types of ATU considered, like Trio 230, KW107 SFM etc. Also wanted Yaesu FTV902R or similar and desk mike for FT1012. V Sayer, 10 St David's Road, Locks Heath, Soton. Tel: Locks Heath 84340

■ FT480R in good condition. Have Trio R-300 gen coverage Rx. £60 ono. Tel: Bristol 0272 719163

■ Acorn Electron with extras if possible. Robert Playford, 21 Lammas Road, Watton-at-Stone, Herts SG14 3RH. Tel: 0920 830491

■ Any information circuit diagrams etc on Tx/Rx Burndept BE201 100MC/S to 156MC/S, plus any crystals to fit same radio. All letters answered. Wegg, 23 Kerdane, Dane Park Road, Hull HU6 9GB. Tel: 855052

■ Manuals for Texscan 100MHz sweeper, Model VS30, Marconi IF995A/2 sig generator, Marconi IF899 valve voltmeter. Your price paid. J M Allsop (G1FEX), 15 Woodland Grove, Woodhouse, Notts NG19 8AZ. Tel: Mansfield 0623 841709

■ February 1984 issue of Amateur Radio. Price paid depends upon condition. Tel: 0452 67377 (after 4.30pm)

■ Ekco radio, Model A28. Any condition. Frank Cho-Yee, 27 Lea Crescent, Ruislip, Middlesex HA4 6PN. Tel: Ruislip 33949

■ Information on Burndept BE 201 Tx/Rx, ex-Army circuit diagrams or any kind of help on getting same operational. Wegg, 23 Kerdane, Dane Park Road, Hull HU6 9EB. Tel: 855052

■ A handbook for Labgear LG300 Tx (1955) and a service manual (not a handbook) for Racal 17L Rx. Will gladly pay for a loan of either to photocopy, if you don't wish to sell. Phone or write. All letters answered.

Dave Marshall (GM4RKA QTHR), Beech Cottage, Main Street, Ormiston, East Lothian, Scotland EH35 5HT. Tel: 0875 610778

■ Exchange Colonel FR360 mobile transceiver 26.965MHz-28.805MHz, AM-SSB with turner M+2U mic and rotel RVC 240FM with Ham International TW2325 mic. Also Bremi 3A power supply, Zenith Electronics P202 speech processor. RA201 reverberator plus gap. 27MHz, ½ wave for Belcom LS102L, 26MHz-29.999MHz and suitable PSU. Or any other radio eg Yaesu, Trio etc with above spec. Must have AM USB and LSB. Please write to: S J Bishop, 22 John Street, Brightlingsea, Essex CO7 0NA

■ Crystal wireless set for exhibition. Must be genuine item of the 1920's. Details to: Stan (G3XON), 14 Dagden Road, Shalford, Guildford, Surrey GU4 8DD. Tel: Guildford 0483 36953

■ MBARO Morse reader RTTY, ASC11. Tel: 029 922 279

■ Constructional details for 10 metre linear amp. Also wanted any details of improvements or mods for old AR88 receiver. Tel: 040 924 435

■ Second-hand, hand-held, synthesised scanning radio, must have aircraft band 118-136MHz. Suggested makes – Tandy, Bearcat or Regency. Tel: 01 998 4336

■ Gemscan 70 or PRO2002 50cm scanner or similar AM+FM, all bands. Also 70cm Rx, TV converter. (G8RHU). Tel: 0273 516801

■ 934MHz CB transceiver in working order, with or without antenna and rotator. State make and price required. M Marsden, 205 Moss Lane, Burscough, Ormskirk, Lancs L40 4AS

■ Yaesu FT-225RD wanted in good condition. Would be prepared to travel to collect. Chris Kelland (G6LRY), 40a Kingfishers Grove Village, Nr Wantage, Oxon OX12 7JN. Tel: 023 57 2205

■ ICOM-ICB1050 CB transceiver, which must have 3 crystals and an integrated circuit Motorola chip with the number MC145106 on it. I will pay the very top price. Ian Macadams, 9 Walpole Road, Boscombe, Bournemouth, Hants BH1 4HA

■ Exchange Colonel FR360, 26.965MHz-28.805MHz, AM, SSB, digital freq readout with turner M+21v mic and bremi BRL210 2 months old for Eddystone 770/R receiver or any receiver with same spec, must have 27MHz FM. Mr S J Bishop, 22 John Street, Brightlingsea, Essex CO7 0NA

■ Any bits and pieces for R1155 or R1154, for restoration work. Incomplete sets, valves, knobs, switches, capacitors etc including plugs, sockets and leads. Send or phone details. All letters and queries answered. Mr G B Howell, 37 Milton Abbas, Blandford, Dorset DT11 0BP. Tel: 0258 880523

■ Radio mags of the 1940's to 1960's and early items of radio equipment to form basis of the 'Max Loveless Pioneer Memorial Collection', Tasmania. Also handbook for wireless set No 19 (ex-World War Two) and copies or photocopies B28, B40 handbooks. Seamail postage by arrangement. Some limited funds available. John Rogers, Darville Court, Blackman's Bay, 7152 Hobart, Tasmania VK7 JK. Tel: 010-61 02 293402

■ Hammerlund Super Pro or BC779, BC794, BC1004 or R129, scrap or working with power unit RA74C, RA94A or RA84B or output t/former and good cabinet. All replies answered. S A Wright (G4LBY), 22 Crown Street, Mansfield, Notts NG18 3JL. Tel: 29473 (evenings or weekends)

■ Manual or circuit diagram, or both, for communication receiver SR-550 by Star Co Ltd. Eagle Products. R Connell, 15 Firthcliffe Drive, Liversedge, West Yorks WF15 6HR. Tel: Heckmondwike 404410

■ Exchange ICOM IC25E 1W 25W, plus VIC 20 for FRG7700 or similar. Computer, has adaptor for use with any cassette player. Contact: Jim. Tel: 0504 59634

■ Antenna suitable for Tx on 104MHz VHF. Well made up or bought at fair price. Urgent, large outdoor antenna. No rubbish please. Andy. Tel: Wraysbury 2617 (7.30pm to 8.30pm)

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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

EAST CORNWALL COMPONENTS

TRANSISTORS DIODES

Type	Price (£)	Type	Price (£)
AC126	0.35	BC108	0.10
AC127	0.30	A B or C	0.12
AC128	0.30	BC113	0.14
AC128K	0.34	BC114	0.12
AC132	0.55	BC115	0.12
AC141	0.26	BC116	0.15
AC141	0.26	BC117	0.22
AC141K	0.40	BC118	0.17
AC142	0.26	BC119	0.30
AC142K	0.48	BC125	0.12
AC151	0.45	BC140	0.28
AC152	0.45	BC141	0.42
AC176	0.28	BC142	0.30
AC176K	0.48	BC143	0.30
AC187	0.26	BC147	0.08
AC187K	0.40	A or B	0.10
AC188	0.28	BC148	0.08
AC188K	0.40	A or B	0.10
ACY40	0.88	BC149	0.09
AD142	1.10	BC157	0.10
AD143	1.10	BC158	0.10
AD149	0.96	BC159	0.10
AD161	0.42	BC160	0.30
AD162	0.42	BC161	0.30
AD161/AD162	0.98	BC168B	0.12
AF106	0.48	BC169C	0.10
AF114	2.10	BC170	0.14
AF115	2.10	BC170B	0.12
AF116	2.10	BC171	0.10
AF117	2.10	BC171	0.10
AF118	0.85	A or B	0.08
AF121	0.62	BC172	0.08
AF124	0.48	A or B	0.12
AF125	0.48	BC177	0.20
AF127	0.48	BC178A	0.22
AF139	0.88	BC182	0.08
AF178	0.88	A B or C	0.09
AF239	0.88	BC182L	0.09
AF279S	0.72	A B or C	0.09
AL100	2.50	BC183	0.09
AL102	1.88	A B or C	0.10
AL113	2.20	BC183L	0.08
ASY80	1.75	A B or C	0.12
AU110	1.40	BC184	0.10
AY102	4.32	A B or C	0.10
BA102	0.34	BC207	0.15
BA110	0.67	BC208	0.16
BA121	0.40	BC212	0.09
BA129	0.38	A B or C	0.10
BA148	0.16	BC212L	0.08
BA154	0.08	A B or C	0.10
BA155	0.10	BC213	0.09
BA156	0.08	A or B	0.10
BA157	0.28	BC213L	0.10
BA164	0.14	A or B	0.10
BB104B	0.52	BC237	0.11
BB105B	0.30	BC236	0.12
BB105G	0.48	BC239	0.14
BB110B	0.42	BC251	0.12
BC107	0.10	A B or C	0.14
A or B	0.12	BC301	0.30
BC302	0.32	BD244A	0.65
BC303	0.32	BD375	0.32
BC307	0.10	BD410	0.76
BC308A	0.10	BD434	0.68
BC323	0.99	BD436	0.68
BC327	0.14	BD437	0.76
BC328	0.14	BD438	0.75
BC337	0.12	BD439	0.68
BC338	0.12	BD507	0.48
BC350	0.14	BD508	0.53
BC440	0.30	BD509	0.54
BC441	0.32	BD510	0.48
BC461	0.32	BD517	0.56
BC547	0.12	BD520	0.66
BC548	0.12	BD699	1.25
BC549	0.12	BD707	0.88
BC550	0.18	BDX18	2.35
BC550C	0.18	BDX32	2.10
BC557	0.12	BF115	0.32
BC558	0.12	BF117	0.54
BCX34	0.27	BF119	0.82
BCY70	0.15	BF120	0.38
BCY71	0.17	BF123	0.40
BCY72	0.18	BF125	0.42
BCZ10	1.68	BF127	0.38
BCZ11	1.45	BF152	0.16
BD124P	0.80	BF154	0.23
BC130Y	0.68	BF157	0.40
BD131	0.34	BF158	0.22
BD132	0.34	BF159	0.24
BD131/BD132	0.95	BFR160	0.23
BD135	0.32	BF167	0.30
BD136	0.36	BF173	0.25
BD137	0.36	BF177	0.42
BD138	0.38	BF178	0.30
BD139	0.38	BF179	0.32
BD140	0.38	BF180	0.35
BD144	180	BF181	0.35
BD145	1.82	BF182	0.32
BD150A	0.51	BF183	0.32
BD159	0.65	BF184	0.32
BD160	1.65	BF185	0.32
BD165	0.45	BF194	0.08
BD175	0.80	BF195	0.10
BD182	1.00	BF196	0.10
BD183	1.10	BF197	0.10
BD184	1.20	BF198	0.14
BD201	0.72	BF199	0.16
BD202	0.87	BF200	0.48
BD204	0.80	BF222	0.48
BD222	0.80	BF224	0.20
BD225	0.88	BF224J	0.16
BD232	0.45	BF240	0.20
BD233	0.80	BF241	0.26
BD234	0.62	BF244	0.26
BD235	0.63	BF244A	0.28
BD236	0.63	BF244C	0.24
BD237	0.86	BF245A	0.26
BD238	0.58	BF254	0.15
BD241	0.80	BF256	0.40
BD243A	0.80	BF257	0.32
BF258	0.30	BT101/300	1.15
BF259	0.32	BT101/500	1.26
BF262	0.30	BT102/300	1.38
BF263	0.30	BT102/500	1.65
BF270	0.30	BT106	1.50
BF271	0.26	BT108	1.30
BF273	0.18	BT109	1.18
BF274	0.32	BT116	1.25
BF323	0.92	BT119	3.62
BF336	0.26	BT120	3.60
BF337	0.26	BT121	3.02
BF338	0.26	BT138/600	1.30
BF355	0.42	BT151/560R	0.90
BF363	0.82	BT151/300R	1.15
BF367	0.24	BTY79/400R	2.80
BF371	0.27	BU100A	2.30
BF422	0.38	BU104	2.00
BF450	0.38	BU105	1.20
BF457	0.33	BU105/02	1.56
BF458	0.36	BU108	1.80
BF459	0.44	BU124	1.75
BFR39	0.22	BU126	1.25
BFR40	0.22	BU133	1.80
BFR41	0.22	BU204	1.35
BFR51	0.30	BU205	1.30
BFR61	0.32	BU206	1.70
BFR62	0.28	BU208	1.55
BFR88	0.34	BU208A	1.63
BFR90	1.72	BU208/02	2.05
BFT41	0.38	BU326S	1.75
BFT43	0.36	BU407	1.65
BFW10	0.79	BU407D	1.80
BFW44	0.76	BUX80	3.70
BFX29	0.28	BUY20	1.75
BFX30	0.30	BUY69A	2.60
BFX80	3.56	BUY69B	1.98
BFX84	0.24	DBY101	0.48
BFZ85	0.26	BY118	1.10
BFX86	0.26	BY122	0.68
BFX87	0.26	BY126	0.12
BFX89	0.65	BY127	0.10
BFY50	0.21	BY133	0.16
BFY51	0.21	BY135	0.25
BFY52	0.21	BY164	44
BFY57	0.40	BY179	0.88
BFY90	0.90	BY182	0.87
3FY90S	1.34	BY184	0.40
BR100	0.20	BY187	0.72
BR101	0.44	BY189	4.75
BR103	0.58	BY198	0.44
BRC443	1.76	BY199	0.47
BRY39	0.38	BY206	0.24
BRY56	0.42	BY207	0.24
BRY61	0.86	BY210/400	0.25
BSS17	0.56	BY210/600	0.26
BSS27	0.92	BY210/800	0.30
BSX19	0.34	BY223	1.20
BSX20	0.34	BY227	0.26
BSX59	0.62	BY229	0.30
BSX76	0.29	BY238	0.68
BT100A/02	0.94	BYX10	0.24
BYX36/150	0.22	TIP32	0.40
BYX36/600	0.28	TIP32C	0.60
BYX48/300	0.72	TIP33A	0.63
BYX49/300	0.47	TIP34A	0.72
BYX55/350	0.29	TIP41C	0.46
BYX55/600	0.33	TIP42A	0.52
BYX71/600	1.18	TIP47	0.60
BYZ12	0.42	TIP110	0.88
C106D	0.80	TIP2955	0.60
E1222	0.40	TIP3055	0.60
E5024	0.30	TIS43	0.32
GET872	0.48	TIS88	0.40
ITT44	0.04	TIS90	0.25
ITT2002	0.11	TIS91	0.28
ME0402	0.20	ZTX108	0.12
ME0404/2	0.24	ZTX109	0.12
MEU21	0.60	ZTX212	0.28
MJ400	1.25	IN4001	0.05
MJ2955	0.90	IN4003	0.05
MJ3000	1.98	IN4004	0.06
MJE240	0.60	IN4006	0.07
MJE340	0.54	IN4007	0.07
MJE370	0.88	IN4148	0.05
MJE520	0.48	IN5400	0.12
MJE2955	0.99	IN5402	0.15
MJE3055	0.70	IN5405	.16
MPSLO1	0.28	IN5406	0.18
OA47	0.10	IN5408	0.20
OA90	0.08	IS920	0.08
OA91	0.09	2N697	0.55
OA95	0.18	2N706A	0.33
OA200	0.06	2N2904	0.28
OA202	0.15	2N2906	0.24
OC25	2.10	2N2926G	0.10
OC26	1.70	2N3053	0.22
OC28	1.50	2N3054	0.56
OC29	2.47	2N3055	0.45
OC35	1.75	2N3702	0.10
OC36	1.75	2N3704	0.10
OC42	0.72	2N3708	0.10
OC42K	1.40	2N3772	1.90
OC44	0.72	2N3773	2.70
OC45	0.58	2N3904	0.16
OC71	0.50	2N3906	0.16
OC72	0.52	2N5294	0.48
OC81	0.68	2N6107	0.71
OC200	2.45	2N6126	0.68
OC202	2.20	2SB337	1.60
ORP12	0.85	2SC1172Y	2.90
R2008B	1.50	2SC1173Y	0.82
R2010B	1.52	2SC1302	1.40
SHG1 5	0.40	40251	0.95
TAG1 100	1.40	40361	0.58
TAG3/400	1.78	40362	0.50
TIC44	0.40	40411	3.72
TIC45	0.45	40530	0.80
TIC46	0.48	40673	0.80
TIC47	0.70	40964	1.54
TIC106A	0.70	Quantity prices available on all listed items	
TIP30A	0.46		
TIP31C	0.54		

VOLTAGE REGULATORS

Type	Price (£)
78L05	0.30
78L08	0.30
78L12	0.30
78L15n	0.30
78M05	0.50
78M08	0.50
78M12	0.50
78M15	0.50
78M24	0.50
7805	0.55
7808	0.55
7812	0.55
7815	0.55
7818	0.55
7824	0.55
7905	0.65
7912	0.65
7915	0.65
7918	0.65
7924	0.65
CA3085	0.95
723C	0.36
LM317K	3.50

CONVERGENCE POTENTIOMETERS

5, 7, 10, 15, 10, 50, 100, 200, 500W — 38p each

SPECIAL OFFER

30, 120, 270, 470 all at 20p each

CAPACITORS

Metallised Paper

2n2F 1500V DC	60p
2n2F 600V AC	24p
3n6F 1700V DC	60p
4n7F 1500V DC	60p
10nF 1000V DC	22p
10nF 500V AC	80p
15nF 300V AC	30p
22nF 300V AC	32p
100nF 1000V DC	48p
470nF 1000V DC	85p

HV Disc Ceramic (†)

1kV 1 5nF	18p
3kV 1 5nF	20p
8kV 10, 47, 56, 82, 100, 120, 150, 180, 200	30p
220pF	39p
270, 300pF	87p
10kV 1nF	

VALVES

Type	Price (£)
DY802	0.88
DY86/87	0.75
ECC81	0.85
ECC82	0.65
ECC83	0.75
ECC84	0.65
ECL86	0.98
EF80	0.65
EF86	1.65
EF183	0.75
EF184	0.75
EH90	0.54
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.55
PCF801	1.45
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.58
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	7.50
PY88	1.80
PY500A	2.40
U26	1.90
UCH81	0.30
UCL82	1.70
6J5GT	1.75
6SJ7	2.20
30FL12	1.60
6JB6A	4.00

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ZENER DIODES

400mW Plastic 3V-75V **8p each 10/75p**
1.3W Plastic 3V-200V **15p each 10/£1.40**
1.5W Flange 4.7-47V **£1.26 each**
2.5W Plastic 75-75V **87p each**
20W Stud 75-75V **£1.31 each**

INTEGRATED CIRCUITS

	(£) EACH		(£) EACH
AN240P	3.42	SN76530P	1.40
AN214Q	3.88	SN76533N	1.60
AN7150Q	2.90	SN76650N	1.05
CA3065	1.75	SN76660N	0.75
CA4031P	2.88	SN76666N	0.80
CA4102	3.30	STK015	6.50
CA4250	3.50	TA7108P	3.20
CA4400	2.98	TA7120P	2.20
CA4422	3.07	TA7129AP	3.65
LC7120	5.33	TA7130P	1.65
LC7130	5.26	TA7172	1.80
LC7137	5.16	TA7193	5.50
LM380N	0.80	TA7172P	1.80
LM1303N	2.52	TA7176	2.50
HA1151P	3.12	TA7202P	4.18
MC1307P	1.85	TA7204P	1.86
MC1310P	1.85	TA7205AP	1.50
MC1312P	2.25	TA7208P	3.25
MC1327P	1.75	TA7210P	.50
MC1330P	0.83	TA7222P	1.88
MC13449P	1.85	TA7223P	3.68
MC1350P	1.20	TA7227P	5.60
MC1351P	2.50	TA7310P	1.80
MC1352P	1.50	TA7609P	4.28
MC1357P	.88	TA7611AP	2.88
MC1358P	1.30	TAA263	2.46
MC1496L	1.15	TAA310A	2.66
ML231B	2.10	TAA550	0.50
ML232B	2.10	TAA570	1.99
ML237B	2.30	TAA611A12	3.50
NE555	0.25	TAA611B12	2.85
C-mos 555	0.88	TAA630S	3.90
NE556	0.80	TAA661B	1.70
SAA1024	5.35	TAA700	2.80
SAA1025	8.40	TAA840	3.38
SAS560A	2.80	TAD100	2.80
SAS560S	1.85	FM FILTER	1.20
SAS570S	1.85	TBA120A	1.00
SAS580	2.85	AS,S,SA,SB	1.30
SAS590	2.82	Q,T,U,UQ	1.32
SC9503P	1.10	TBA120B	1.30
SL432A	4.00	TBA231	1.45
SL901B	5.20	TBA281	2.65
SL917B	6.25	TBA395	1.20
SL1327Q	1.10	TBA480Q	1.50
SN76003N	2.44	TBA400	2.30
SN76013N	1.90	TBA510	2.80
SN76023ND	2.90	TBA510Q	2.80
SN76033N	2.45	TBA520Q	1.60
SN76110N	1.12	TBA530/Q	1.30
SN76115N	2.00	TBA540/Q	1.40
SN76131N	1.65	TBA550/Q	1.52
SN76226DN	1.80	TBA560C	1.70
SN76227N	1.10	TBA560CQ	1.60
TBA570	1.50	UPC1156H	4.20
TBA641BX1	4.50	UPC1158H	0.76
TBA651	2.80	UPC1163H	0.98
TBA673	2.40	UPC1181H	1.60
TBA700	2.85	UPC1185H2	3.75
TBA750	2.80	UPC1212C	1.30
TBA800	1.60	UPC1230H	3.90
TBA810P	1.10	UPC1350C	4.25
TBA810S	1.20	UPC1367C	3.40
TBA820	1.60	UPC1378H	4.40
TBA890	3.88	UPC2002H	2.80
TBA920/Q	3.00		
TBA950/2A	3.05		
TBA970	4.05		
TA7108P	3.20		
TA7120P	2.20		
TA7129AP	3.65		
TA7130P	1.65		
TA7172	1.80		
TA7193	5.50		
TA7172P	1.80		
TA7176	2.50		
TA7202P	4.18		
TA7204P	1.86		
TA7205AP	1.50		
TA7208P	3.25		
TA7210P	.50		
TA7222P	1.88		
TA7223P	3.68		
TA7227P	5.60		
TA7310P	1.80		
TA7609P	4.28		
TA7611AP	2.88		
TAA263	2.46		
TAA310A	2.66		
TAA550	0.50		
TAA570	1.99		
TAA611A12	3.50		
TAA611B12	2.85		
TAA630S	3.90		
TAA661B	1.70		
TAA700	2.80		
TAA840	3.38		
TAD100	2.80		
FM FILTER	1.20		
TBA120A	1.00		
AS,S,SA,SB	1.30		
Q,T,U,UQ	1.32		
TBA120B	1.30		
TBA231	1.45		
TBA281	2.65		
TBA395	1.20		
TBA480Q	1.50		
TBA400	2.30		
TBA510	2.80		
TBA510Q	2.80		
TBA520Q	1.60		
TBA530/Q	1.30		
TBA540/Q	1.40		
TBA550/Q	1.52		
TBA560C	1.70		
TBA560CQ	1.60		

BRIDGES

1½A 50V	0.27
100V	0.28
200V	0.32
400V	0.40
600V	0.50
800V	0.58
3A 100V	0.52
200V	0.55
400V	0.61
600V	0.67
800V	0.60
6A 100V	0.66
200V	0.68
400V	0.74
600V	0.80
800V	0.86
10A 50V	2.20
100V	2.24
200V	2.35
400V	2.50
600V	3.50
25A 50V	2.05
100V	2.25
200V	2.40
400V	3.20
600V	3.95

SERVICE AIDS

ALL SERVISOL PRODUCTS

Switch Cleaner	0.88
Circuit Freezer	0.96
Foam Cleanser	0.84
Aero Klene	0.78
Silicone Grease (Aerosol)	1.00
Antistat Spray	0.82
Plastic Seal	0.88
Excel Polish	0.76
Fire Extin 640g	2.80
Video Head Cleaner	0.88
Silicone Grease (ICI) 75g tube	1.00
Solda Mop (Std)	0.72
Solda Mop (L Gauge)	0.72

Additional P&P on above 30p

RESISTORS — CARBON FILM 5%

¼W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
½W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100
2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

RESISTOR KITS — each value individually packed

¼W pack 10 each value E12 — 10R to 1M 610 pieces	4.80
¼W pack 5 each value E12 — 10R to 1M 305 pieces	2.75
½W pack 10 each value E12 — 2R2 to 2M2 730 pieces	5.25
½W pack 5 each value E12 — 2R2 to 1M 365 pieces	3.00
1W pack 5 each value E12 — 2R2 to 1M 353 pieces	15.00
2W pack 5 each value E6 — 10R to 2M2 317 pieces	18.00

RESISTORS — WIREWOUND Generally 5%

2-5W 0-22 to 270R Available in preferred values	0.20
4W 1Ro to 10K Available in preferred values	0.21
7W 0.47R to 22K Available in preferred values	0.25
11W 1R0 to 22K Available in preferred values	0.29
17W 1R0 to 22K Available in preferred values	0.37

VEROBOARD 0.1in. CLAD.

2½2x3¾4	.85
2½2x5	1.00
2½2x17	3.25
3¾4x3¾4	1.05
3¾4x5	1.15
3¾4x17	4.10
4¾4x17¾4	4.95
Pkt of 100 Pins	.50
Spot Face Cutter	1.48
Pin Insert Tool	1.83
Vero Wiring Pen	-
Spool	3.50

VEROBOARD 0.1in. PLAIN

3¾4x5	.95
3¾4x17	2.70
DIP Board	3.85
VERO Strip	1.25
HAND HELD CONTROL BOXES	.75
72x50x25 Boxes	.52

NI-CAD

Universal Ni-Cad charger charges PP3 AA C D Price £5.00

PLUGS & SOCKETS

Metal Co-ax Plug	0.18
Plastic Co-ax Plug	0.14
Single Junction Socket	0.80
Plastic Phono	0.10
F M Plugs	0.20
PL259	0.38
Reducer	0.15
2 5mm Plug Meta	0.15
2 5mm Plug Metal	0.16
2 5mm Chassis Socket	0.10
3 5mm Chassis Socket	0.10
2 pin ¼in Mono Chassis Socket	0.14
4 pin ¼in Mono Chassis Socket	0.20
6 pin ¼in Mono Chassis Socket	0.30
4mm Banana Plug	0.15
4mm Banana Socket	0.15
PP3 Battery Connectors	0.08
PP9 Battery Connectors	0.16

Terminal Blocks

2amp 12way	0.19
5 amp 12way	0.20
15A	.46
32A	.92

Soldering Section

ANTEX 15W IRON	5.00
ANTEX 18W IRON	5.00
ANTEX 25W IRON	5.20
ANTEX ELEMENTS	2.00
ANTEX BITS	0.95
ANTEX STANDS	1.90
SOLDERSUCKER	4.50
500gm SOLDER	6.80
SOLDA MOP	0.70
ANTEX SOLDERING STATION complete with Iron — 30W or 40W	49.95
Spare nozzles for Soldersucker	0.45

ALL LISTED ITEMS. TEL SALES DESK.

FUSES

1¼in Quick Blow 100 150 250mA £1.30 1 1.25 1 5 2 5 3 10 15A **55p**
1¼in Time Delay 100mA **£3.50** 150mA **£2.25** 250 300 500 600 750 650mA **£1.84** 1 1.25 1 5 1.6 2A **£1.84** 2 5A 3 3 15 3 5A **£2.82**
20mm Quick Blow 100 125 160 200 250 315 400 500 600 800mA 1 1 25 1 5 2 2 5 3 5 4 5 6 3A **40p**
20mm Time Delay 100 125 150 200mA **£1.80** 750 300 400 500 600 800mA **£1.00** 1 1 25 1 5 2 2 5 3 3A **85p**
1in Mains 2 3 5 7 10 13A **85p**

Manufacturers please note — we can offer very competitive quantity prices of 20mm Quick Blow & Time Delay range — please apply for quotation

TRANSFORMERS

SII 240v Primary 4 5 0-4 5v 400mA **50p** 6-0-6 100mA **58p** 6-0-6 500mA **65p**
Postage and packing **45p** per transformer
Competitive bulk prices on request

EUROPEAN ADAPTORS

These very high quality British made two pin European adaptors are ideal for driving Radios, cassette recorders, TV games, calculators etc. The adaptors fit in the UK shaver socket

REF	Voltage	Current	1 -	10 -	100 -
		DC			
EOB	4 5V	200m/a	50p	45p	32p
EM3	6V	200m/a	£1.00	80p	55p
EO9	6V	400m/a	£1.50	£1.25	85p

(Postage & Packing 45p per adaptor or £1 60 per 10 £4 50 per 100)

MULTIMETER SPECIAL

Russian type U4324 — (20,000OPV)
DC Volts 0.6, 1, 2, 3, 12, 30, 60, 600, 1200
AC Volts: 3, 6, 15, 60, 150, 300, 600, 900
DC Curr M/A 0.06, 0.6, 6, 60, 600, 3000
AC Curr M/A 0 3, 3, 30, 300, 3000
DC Resistance 0 2, 5, 50, 500, 5000K
level dB. — 10 to — 12

Supplied with rechargeable batteries

PRICE £12.00 INC OF P/P & VAT

Fuseholders

20mm Panel Mounting	0.28
20mm Chassis Mounting	0.06
1¼in Panel Mounting	0.35
1¼ Chassis Mounting	0.342
Carline 1¼in Mounting	0.10

"D" CONNECTORS

	9 way	15 way	25 way
Male			
Solder	75	1 00	1 50
Angle	1 40	2 00	2 40
Female			
Solder	1 00	1 45	1 85
Angle	1 50	2 00	2 40
Covers	80	80	80

IC SOCKETS Dil to Dil

8	pin	0.08	0.70/10
14	pin	0.10	0.95/10
16	pin	0.11	1.00/10
18	pin	0.14	1.60/10
22	pin	0.21	1.95/10
24	pin	0.25	2.25/10
28	pin	0.30	2.75/10
40	pin	0.34	3.10/10

BT Approved Telephone Plug & 4-core Lead **£3.10**
BT Approved Telephone Secondary Socket **£3.20**

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MML 144/200-S: 144 MHz 200 WATT LINEAR AMPLIFIER

NEW!

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- 200 watts Output Power
- Linear All Mode Operation
- Suitable for 3, 10 & 25 watt Transceivers
- Ultra Low-Noise Receive Preamp — Front Panel Selectable
- Relative Output LED Bar Display
- Equipped with RF Vox & Manual Overide
- LED Status Lights for Power, Transmit, Preamp on and Input level

£245 inc VAT (p&p £4.50)

144 MHz HIGH PERFORMANCE RECEIVE CONVERTER: MMC 144/28 HP

NEW!

FEATURES

- Excellent strong signal handling characteristics
- Gasfet RF amplifier
- High level double-balanced mixer
- Harmonic-free, regulated oscillator

Input frequency range:	144-146 MHz	**Image rejection:**	60 dB
Output frequency range;	28-30 MHz	**Input/output impedance:**	50 ohm
Typical gain:	20 dB minimum	**Power requirements:**	13.8V at 75mA
Noise figure:	2 dB	**Power connector:**	5 pin DIN socket
3rd order intercept point:	+ 19 dBm (output)	**RF connectors:**	SO239 or BNC, please specify

Size: 110 x 60 x 31 mm (4⅜ x 2⅜ x 1¼")

£42.90 inc VAT (p&p £1.25)

1296 MHz GaASFET PREAMPLIFIER — MMG1296

NEW!

This GaASFET 1296 MHz preamplifier is constructed on high-quality Teflon glass-fibre pcb and includes a microstripline filter which provides excellent rejection to mixer image frequencies and out of band signals. It has a power gain of 15dB and a noise figure of 1.2dB. The power requirements are 13.8V at 35mA and the unit is fitted with 50 ohm BNC sockets.

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MMC50/28S — 6M CONVERTER

This new Converter has switched oscillators to provide coverage of 50-54 MHz on a 28-30 MHz receiver. The design utilises MOSFETS in the RF amplifier and mixer stages, and the local oscillator is regulator controlled.

INPUT RANGES:	50-52 MHz 52-54 MHz	**OUTPUT RANGE:**	28-30 MHz
OVERALL GAIN:	30dB	**NOISE FIGURE:**	2.5dB

£34.90 inc VAT (p + p £1.25) NEW!

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