OCTOBER 1984 90p

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Reviewed: masthead pre-amps and the MM 23cm transverter

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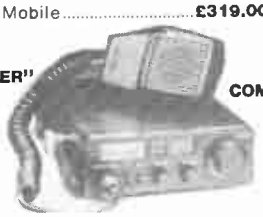

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Front cover: MM 23cm transverter and 2m masthead pre-amp reviewed this month (p22). Photo by Jay Moss-Powell G6XIB

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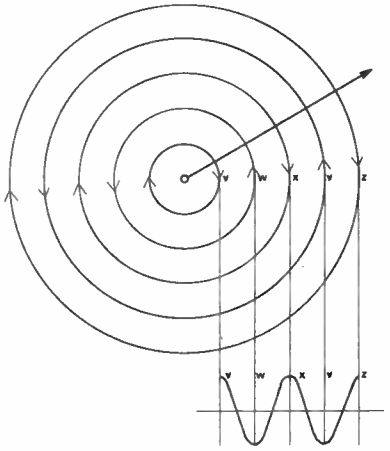

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Whenever you enter a LOWE ELECTRONICS' shop...

be it Glasgow, Darlington, Cambridge, Cardiff, 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 sets the standard for amateur radio shops and after-sales service. The shops are open Tuesday to Friday from 9.00 to 5.30pm, Saturday from 9.00 to 5.00pm and close for lunch each day from 12.30 till 1.30pm.

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 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 ouside the shop and afterwards the Botanical gardens are well worth a visit...

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 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, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 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 playgound on your left turn left again (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.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is located within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the 'Emporium' awaits you. Free street parking is available outside the shop.

LOWE ELECTRONICS' **London** shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car part where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex. (Telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amatuer 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.

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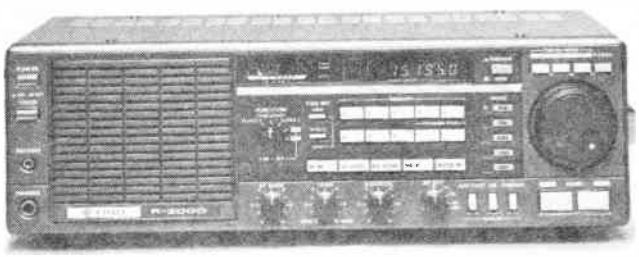
For many years I have found much pleasure in slowly tuning a receiver across the short wave bands. I remember discovering that the new wireless, just purchased by my Grandfather, had on it a short wave section. So, after the family had listened to 'The Archers' and set about the evening's activities, I was left with the set to myself, able to tune around and listen to the world. I am certain that the thing that fascinated me then is still the same today; the fact that transmissions from such exotic places so far away could be heard in my own surroundings. Perhaps I am a romantic at heart but to imagine the sights and sounds of the countries originating the transmissions was special. I find it difficult to describe the feeling. I have since spoken to many people who have shared the same experience, they too find it difficult to explain.

Since those days things have changed and many receivers have come and gone. When compared with the large pieces of surplus equipment once used by the short wave listener in his shed at the bottom of the garden, today's equipment looks 'very HI-FI'. Most of the receivers carry the description 'general coverage' meaning that it will tune without gaps frequencies from around 100kHz to 30MHz. Such wide coverage means that not only can you listen to amateurs and short wave broadcast stations worldwide, you can also hear Radios 1, 2, 3 and 4 and Laser on 558kHz. To the short wave listener this is a great advantage over rigs which only have selected bands. It is usually the band you particularly want that the manufacturer had decided you could do without. The receivers which I now describe are all 'general coverage', and I might add are each capable of giving you the satisfaction which I describe above.

TRIO R600

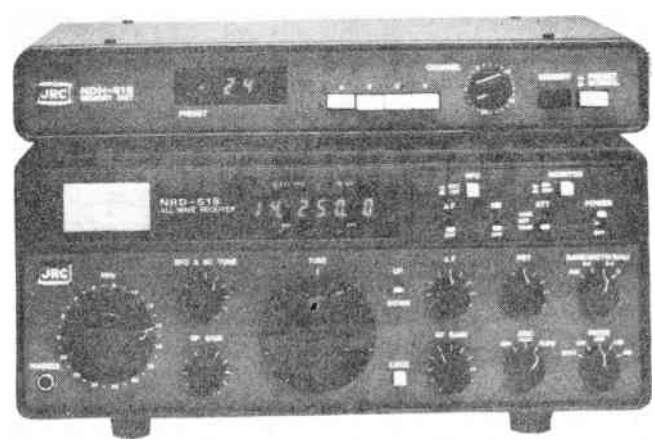
At the start of the range is the TRIO R600 which costs £272.83 including VAT. This is the receiver for the beginner, the person of limited means or the cynic who does not really believe my enthuse. The R600 is a basic receiver covering from 150kHz to 30MHz and having switched upper and lower sidebands, wide and narrow AM and CW. It has a 20 dB attenuator and a noise blanker fitted as standard. Operation is simple, select the mode of operation, turn the MHz dial to the correct band and, by using the VFO knob, tune to the desired frequency. The clear digital readout makes station selection simple. The TRIO R600 is an ideal receiver for shack, bedroom or lounge.

Moving upward from the R600 we find the TRIO R2000. The receiver covers frequencies from 100 kHz to 30MHz and has, in addition to the facilities found on the R600, a ten channel memory to hold for quick access your favourite stations. Memory operation is versatile, each memory retaining not only the frequency but the mode of operation. Each memory can be also used as a separate VFO. In addition to AM, USB, LSB and CW the R2000 is fitted with FM which, when used with the VC10 internal VHF converter, enables the amateur 2 metre band to be fully listened to. Another advantage over the R600 is that the R2000 tunes continuously up the band and not in 1MHz sections.



TRIO R2000

Three rates of tuning are provided enabling the band to be either searched diligently or quickly 'scanned'. With the optional VC10 fitted the R2000 adds to its frequency range the VHF section from 118 to 174MHz and, of course, operates on AM, FM, USB, LSB and CW. Fast or slow AGC can also be easily selected using a front panel switch. Altogether a fine receiver and ideal for today's listener. The TRIO R2000 costs £436.75 including VAT. The optional VC10 costs £117.00 including VAT and is easily fitted inside the receiver.



JRC NRD515

There are amongst us a discerning few for whom only the best is good enough. For them there is only one receiver: this is the NRD515 manufactured by the JAPAN RADIO COMPANY. The receiver is built to professional standards and is designed to give its owner the ultimate in listening pleasure. Covering 100kHz to 30MHz the NRD515 has pass band tuning, slow and fast AGC and a preselector covering the broadcast bands from 600kHz to 1.6MHz. Optional accessories include a 96 channel memory unit (NDH518 £264.00 inc VAT), a remote frequency controller giving keyboard frequency entry, plus an additional four memories (NCM515 £169.75 inc VAT) and a matching speaker (NVA515 £45.41 inc VAT). The NRD515 short wave monitor receiver costs £965.00 inc VAT.

It is rare to use a piece of equipment so refreshingly new as to be devastating. Although it has been my pleasure to use numerous receivers over the past years nothing has so captured my attention as has the AR2001 from the company AOR. Authority On Radio, AOR, sums them up exactly. In the past there have been several receivers covering parts of the HF/VHF/UHF spectrum but never before a receiver tuning continuously from 25MHz to 550MHz. Never before a receiver having, AM narrow band FM and wide band FM. Never one that could be afforded by all enthusiastic listeners. The AR2001 is the new concept in receiver design combining user friendly controls to aid listening with a carefully designed receiver that actually works. The receiver with its continuous coverage between 25 and 550MHz enables its owner to listen to a multitidue of transmission sources.

AOR AR2001

The provision of three modes, AM, narrow band FM and wide band FM, are essential when one considers the variety of information that can be received. AM for the VHF/UHF airband channels, narrow band FM for amateur radio, CB and business radio and finally wide band FM for broadcast and TV sound. Digital frequency readout is combined with visual reminders of receiver state and for night time listening the panel is illuminated. Scanning, memories, memory scan, programmable band scan are all part of the receiver and to aid operating the memory not only remembers the frequency but the mode of operation. The AR2001 receiver costs £345.00 inc VAT.

CURRENT COMMENT

This month *Amateur Radio* takes a good look at the forthcoming CQ WW Contests, so we'd like to take this opportunity to wish all our readers taking part the very best of luck. The contests are the focal point of a tremendous level of activity on the HF bands in October and November so, whether operating or listening, it should be a busy time ahead for all of us.

Right on target

Several months ago we were pleased to publish an article by Brian Kendal, *'When Germany was on the beam'*, which told the story of German wartime radio-navigational systems, and traced the development by the British of countermeasures against these systems.

This issue sees the second installment or, if you like, the other side of the coin. I'm referring to *'The RAF Fights Back'*, in which Brian Kendal describes the techniques, the politics, and some of the individuals involved in a sucession of British navigation systems: GEE, H2S and Oboe.

Brian has obviously put a great deal of time and effort into researching and writing this article. He has unearthed some fascinating facts and anecdotes from the period, along with some rare photographs, and I have no doubt that this article will be as well received as the first.

I'm sure that both the author and our readers would be particularly interested to hear the comments and reminiscences of anyone involved in the events described in the article.

More to follow

This month sees the start of two new series in the magazine.

The first is *'Aerials and propagation'* by Bill Sparks, G8FBX. This series takes a comprehensive look at the 'ins and outs' of aerial theory, explaining propagation characteristics and methods. As well as helping some readers to better understand many of the aerial designs which we regularly publish in *AR*, it should also encourage and help you to get out and design a more efficient aerial system of your own.

Where Bill Sparks is going 'back to basics' in his look at aerial theory, Bill Mantovani is going the whole way with his new series for beginners called, appropriately enough *'Back to Basics'*. After this month's introductory piece, Bill will go on to examine various aspects of the RAE course, basing much of his works on the RSGB's excellent *Radio Amateurs Examination Manual.*

Another book which should be of interest to those following the series, as well as other newcomers *and* already licenced amateurs, is the *Radio Amateurs Question & Answer Reference Manual,* written by R Petri G8CCJ.

The first feature of this book to strike the reader is that it is all set out in multipe-choice style. Although not a course as such, it has been planned in such a way that it can be used as a revision aid to supplement other RAE courses.

It is divided into 21 sections covering specific aspects of the RAE syllabus, with many of the 1100 questions covering areas of the syllabus often neglected in books and courses. In this way, the book does not just test your knowledge, but can *increase* it.

Certainly for all those a bit uncertain about taking the RAE, the book provides excellent practice in the multiple-choice format of questioning.

As appendixes, the book also contains the full City and Guilds syllabus, and a computer program to enable the reader to perform various calculations. The book is available, priced at £5.95 plus £1 p&p, from *WP Publications, 11 Wayville Rd, Dartford, Kent DA1 1RL.*

Works in practice

This month Angus McKenzie goes back into the world of 23cms to try out another transverter. As he puts the unit through its paces, we are also given the opportunity to compare its performance and features with the SSB Products transverter reviewed in August.

For those who find 23cms a bit too 'esoteric', G3OSS is also having a look at some 2m masthead pre-amps, and giving an update on what, in his view, is one of the top HF rigs currently available, the IC751 - so there really should be something for everyone, wherever their special interests lie.

Angus' tests are really something special: no manufacturer in his right mind wants to lauch a new piece of equipment with a bad review by OSS in *Amateur Radio.* Perhaps thats why so many – particulary the British manufacturers, but also as he recently pointed out, the Japanese - liase so closely with Angus even in the prototype stage, and really do take notice of what he says.

Yes, with his impressive laboratory Angus really does perform a service for us all - but don't start to think that he has the market entirely cornered.

Recently, we've published some of your comments on new, and sometimes not-so-new equipment, either through points raised in, the *Letters* page, or more fully in the form of your own 'user reports'.

The latter are always popular with our readers, so at the moment we're asking for more. If you have some opinions to pass on about a particular piece of equipment, whether they be about its long-term performance, or how to get the best out of it, or what drawbacks to avoid, or any successful mods you've tried - why not pass them on to others.

After all, the hobby itself is all about passing on information, whether it be on the air, in clubs and groups, *or* in magazines such as this.

Already, Hugh Allison's short fault-finding reviews in *Secondhand Equipment Guide* have helped many owners and potential owners of some common makes of rig; why don't *you* pass on some of what you know?

Practical Wireless

In our August 1984 issue we published an article about the Maidenhead Locator System on page 53, which was illustrated with a map comparing the new system with the old system. The map outline and grid of smaller squares was a reproduction of the European QRA Locator System published by *Practical Wireless* in 1982. We regret that we did not obtain permission from *Practical Wireless* to reproduce their material or acknowledge *Practical Wireless* as authors of the map which they made on a special projection.

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MEU21 Prog uni junction ..... 3/£1.00

TRIACS diacs 25p
TXAL228 8A 400v isol. tab ..... 2/£1.00
25A 800v ex eqpt, tested £1.50

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W23 or sim 9 watt 6 OF ONE VALUE for £1. R22, 1R0, 3R0, 6R8, 56R, 62R, 100R, 220R, 270R, 390R, 680R, 1K, 1K8, 10K.
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TIL38 Infra red LED 2/50p
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TO18 LDR 50p, RPY58A LDR 50p
LEDs RED 3mm or 5mm 12/£1, ... 100/£6.00
GREEN + YELLOW 3/5mm 10/£1, ... 100/£6.50
FLASHING RED 5mm 50p, ... 100/£30.00

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1N4148 ..... 100/£1.50
1S3740 Germanium ..... 100/£2.00
1N4004 or SD4 1A 300v ..... 100/£3.00
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Access

ELECTRONIC COMPONENTS BOUGHT FOR CASH

L·E·T·T·E·R·S

RIGHT TO REPLY

Referring to the letter by John Wilson of Lowe Electronics published in the *September* issue.

Firstly, in referring to my comments regarding Trio dealers, he seems to have missed the whole point (and a few paragraphs). Paragraph two of my article in the *August* issue clearly states *'The problem is you don't find a ham shack in every high street'* and I later stated that these were *'examples based on the available equipment in Swansea in May 1984'*. Perhaps we will soon have a Lowe agent or, better still, a choice of amateur radio dealers within reasonable distance of this city. Until then, the chap who wants to listen to short wave radio goes shopping (usually after travelling thirty miles or more into town) in the high street.

To my knowledge, I have not made any derogatory comments regarding the Trio Corporation, for whom I have the greatest respect, having marketed their hi-fi products for over ten years, nor the Lowe organisation, whose agents have supplied my own amateur radio equipment. I am sorry to think that any bad feeling should have been caused by my article or any mis-understood portion of it.

However, I repeat that if you go into the high street shop and ask about receivers, you first have to explain what a receiver is, because the salesman is hi-fi orientated or only wants to sell your wife a washing machine. Which brings the replies I received regarding the lack of ten metre coverage on the Grundig 600 into the picture. *'Sorry, sir, I don't know'* was the most honest and, *'Well it's professional so it must be corrrect, sir'* was the daftest!

The matter of German law is not general knowledge and, in any case, any company exporting equipment should be aware of the requirements of the market or he just doesn't sell the goods. I wonder how the Germans listen to ten metres? DLs please respond!

If I was living in New York I could buy a TS930 for $1620 which at 1.3 to the pound is £1246 pounds or so, and in this case I stand corrected, but recent chats with American visitors and with fellows 'on air' gives me the impression that prices here are more 'adhered to' than in the States. I certainly would *not* recommend *importing* from there!

In buying from the high street, a newcomer to radio has a limited choice as I stated, and the equipment is not of the quality of some of the recognised 'amateur radio' brands. However, many a listener has cut his teeth on a cheap 'Vega' shortwave receiver and I would hate to try and count the DX160s still in use by listeners.

I bought my own Sony ICF6700 after comparison with a well known receiver and it is still in regular use by its new owner. Buying secondhand is always risky unless it's from a reliable source and you know that repairs and spare parts are available.

Yes! I dropped one in my mention of notch filters, and the typesetter put an 's' in the wrong place, but we're not perfect, John.

Anyway, I hope this clears the air a little and puts a few misunderstandings to rights. Thank you anyway, John, at least you took the trouble to write!

Trevor Morgan, GW4OXB, Swansea

PRESS ON

John Morley, if you have paid the cash, I say carry on.

I was unlucky in being made redundant, but lucky in finding that I could take my RAE for a nominal fee. I failed on my first attempt, obtained a pass on my second paper at the second attempt, and I'm pressing on regardless in an endeavour to pass my first paper, which I sit in December. This wait gives me a chance to answer N A Bedford, G4NJP.

I have come up through the CB ranks, and I am an advocate of ANLC. I understand that 28 countries have such a system including the USA and Russia, both countries that are highly security conscious.

Of course nothing is easy, but it would at least give encouragement to those who are willing to study for their B licence. So to some of you radio amateurs with years of practice, let's have some help, not the almighty 'holier than thou' attitude. It actually gives the radio hams a bad name.

If I do pass, I shall stop with my CB club, as quite a number of us will be class B licence holders. We may even hold our own classes for CW.

J H Clifton, WS 96, Cannock.

PRAISE OF WIRE

I was interested to read Dodson's article in praise of wire *(August)*. I spent a large chunk of my time with wire–Koomans, Franklin, HAD long periodic and rhombic arrays (up to 30KW) and I see that many agencies at home and abroad still use multi-wire rhombics.

The folded terminated dipole (known as the squashed rhombic in the trade) proved useful on restricted transmitter sites, although the terminating resistor needed a bit of tweaking to get a reasonable VSWR.

Many wild claims were made for the FTD (including 10:1 frequency band) which I think can be put down to the old maxim 'a little HF goes a long way'.

Harry Nelson, High Wycombe

RSGB COUNCIL ELECTIONS

So now we know. According to the August editorial in *RadCom* the RSGB does not want the sort of person 'who has little experience of the Society (or similar body) but who never-the-less believes that he is the much-needed new blood to sort out all the problems of the RSGB at a stroke'. To this end the Society has altered the rules regarding election addresses so that the candidate can only say what he has done for the Society, not what he intends to do for you (which is much more pertinent).

For any Society to be fully representative, *all* members must have the same chance of putting up for election to Council. The change of rules already has the effect of deterring the younger enthusiast, and the editorial insults the intelligence of the voting membership. I speak purely as an individual member of the RSGB.

H M Holmden, G4KCC

INTERFERENCE

I am a CB operator studying for the RAE. I am being taught by a well known amateur who wishes to remain anonymous.

We both suffer from excessive ignition interference from vans, motorcycles and trucks. If we caused interference, we would be in trouble.

Why should the owners of vehicles *and* domestic appliances be allowed to get away with it?

There should also be a national *purge* on *all* interference from stupid CB chat which has turned lots of good CBers away from the hobby. People employed in tracing interference would also be kept off the dole.

Frank Aldous, Derby

YOUNG. . .

After reading the newspaper cutting in the *August issue* 'Current Comment' regarding the radio ham in Brighton being the youngest to hold a licence, I was wondering if he is still the youngest.

I was fourteen years old on 28 February, 1984 and I tried the RAE on 14 May at Swansea Tech. I am still awaiting the result (due in August); if I pass can you tell me if I will be the youngest to pass.

Congratulations on the 'SWL' page–keep it up, Trevor!

Steven Jones, Swansea

. . .AND OLD

I enjoy ***Amateur Radio*** and I always read the letters sent by other readers.

I have just received notification of passing the RAE taken earlier this year. As I am seventy-eight years old I wonder if there are any successful candidates older than me?

Francis Stook, Storrington

L·E·T·T·E·R·S

THE FIRST RECEIVER

The article by Bill Sparks on receivers, in the *September* issue, was most interesting. The statement that the 'Skyrider' of October 1934 was Bill Halligan's first receiver to come on the market is not correct. That honour goes to the model 'S1' (no name) which appeared in 1931. This was a four valve TRF design and was listed at $39.95.

The model names were used more than once, for instance 'Super Skyrider' graced both the model 'S9' and 'S11' in 1936 and the 'S16' and 'S17' of 1937. It was next used on the 'SX32' of 1940 and finally on the fabulous 'SX28' of 1941. The last ham band receiver was the SX140 in 1961. This was supplied ready made or as a kit of parts.

Has anyone got a handbook or circuit for the RCA 'AR80' (*not* 88) receiver?

Glen Ross, G8MWR, Coventry.

QUEEN MARY

I refer to the *August* issue of ***Amateur Radio*** page 10, 'W6RO'. The call sign of the Station Manager – Nate Brightman – is K6OSC, *not* as published. I have been to Long Beach and met Nate, and I also visited the Queen Mary.

I would also like to reply to John D Morley of Morecombe, 'Holier than Thou'. Do not abandon your efforts so far, just because of attitudes expressed by some of your local radio amateurs.

It takes all sorts to make a world and these days, *some* people have no time to spare to help others – so they tend to 'fob off' anything that might get them involved. Press on John, and show them you can do without their assistance. If I can be of any help to you by correspondence please feel free to write: G3SYD 'Syd', S Beauchamp, 1 Gosden Close, Furnace Green, Crawley, West Sussex RH10 6SE.

G3SYD, Crawley

G2NM MEMORIES

Reading in the *August* issue of ***Amateur Radio*** a letter from Leo Shapter of Wimborne, a reference to G2NM caught my eye. The callsign seemed familiar and sure enough, on consulting a local publication, I found that this referred to Gerald Marcuss, a legend in these parts.

It was he who first broadcast as an amateur the chimes of Big Ben to various parts of the Commonwealth in 1927.

I well remember as a child the sight in his garden of the then unfamiliar aerial mast which he re-sited at his new house on the Sussex coast, I believe.

Sadly, I understand he died in April 1961, his feats in HF amateur broadcasting being commemorated by a plaque on the wall of his house here in Caterham.

As a regular reader of *Amateur Radio* I get a great deal of pleasure reading letters from old timers like myself who were weaned on valves and such.

Good luck Leo and all at *Amateur Radio*.

W F Smith, Caterham

A RIGHT TO SPEAK

I am not a member of the RSGB. After observing the function of the said society I found it did not, in my opinion, promote the interests of an undetermined percentage of radio amateurs, myself included. In this age of democracy should it not be put to a vote to find out what the interests of the majority are?

There should be a referendum on major issues and stances taken by the society, perhaps once a year or so. The cost could be recovered from the increased membership arising from the feeling of belonging, a voice to be counted. Even if one's personal views are outvoted one would have had the right to speak, and forever hold your peace, until next year that is.

I realise any vote would only change the representations put to the Department of Trade and Industry, but, it would be a democratic change none the less. I and many others will only feel easy on Sundays when the news broadcasts inform us that 'The society represents the interests of the amateur radio movement in the UK'.

Perhaps others might like to comment on this. Would the influx of ex-CB operators throw a spanner in the works? (as if they would!). Would the purist element show their real power?

Whatever the outcome, it would make the society more respected than it seems to be at the moment.

Dino Bragoli, G6RBY

ANTENNA?

I have been a subscriber to ***Amateur Radio*** since the beginning of the year and have just become a SWL, which I am really enjoying.

I used to be keen on FM CB and with the use of my 27MHz SSB rig I had QSOs as far as New York on 12 watts. I thought it was really great until I heard the hams on SW and that was it, I just had to get a receiver and I am hoping to get my ticket within the next few years.

My receiver is a home brew kit which cost me about £14 to make and 2 days to complete. It is a 20m DX/Rx communications receiver working at 12 volts, and my antenna is a long wire of about 35m which I get good reception from.

My only problem is that I can get as far as Moscow on one side and Alaska and Argentina on the other, but I am unable to receive anything from NZ, Australia or Japan. I was wondering if anyone could help me solve this problem. I myself think it may be the antenna but I am still experimenting.

By the way, I think your Prefix List is a great idea.

S Wilson, Fife.

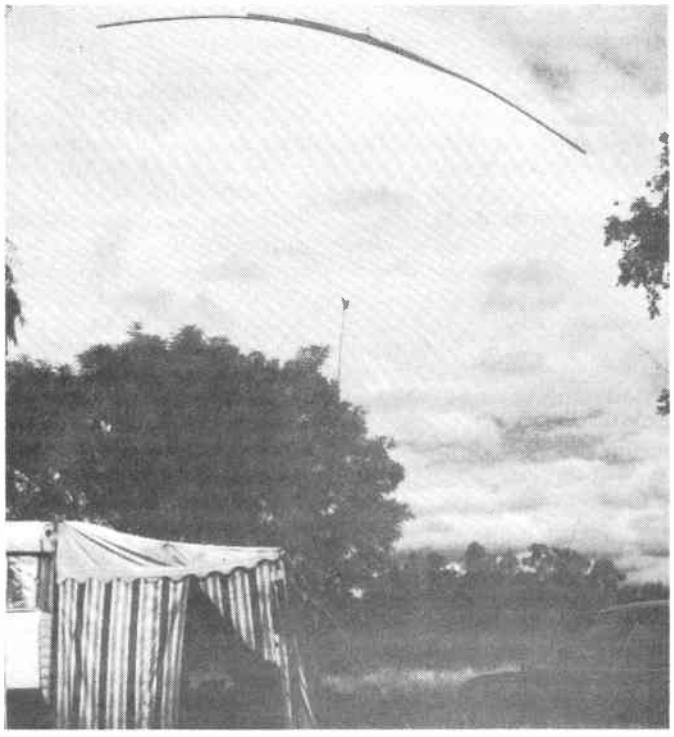
COATHANGERS

With reference to Coathanger Antennae *(August 84)* I thought you might be interested in my coathanger, snap enclosed. Although not quite the same thing, my coathanger supports two Vertical Vo 15/20 metres λ/4 into which I have been operating as VK6AJD, QTH nr Mt Newman, 800 miles north of Perth, Western Australia.

Reported by GW4NZ 57, DJ6NI 57, and EA3JE 57/8. Rig Yaesu FT757GX barefoot, and 12V battery. A nylon cord between two trees is all that is required.

A close look will reveal the standard coathanger strapped to the plastic pipes.

J Allardycer, G4YWL



STRAIGHT & LEVEL

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

BACK END

muTek Limited's new GDIF 107ub back-end processing system makes the completion of a 10GHz WBFM transceiver so much easier. It contains all the necessary audio and IF processing to turn a good quality intruder alarm module (eg Solfan type) into a 10GHz WBFM system – just add an antenna, microphone, loudspeaker and a few extra controls!

The receiver intermediate frequency is 10.7MHz. With typical modern Gunn diodes this is sufficiently high so as not to incur sensitivity limitations due to oscillator sideband noise. A low noise integrated circuit head amplifier (the Plessey SL560) takes the signal from the microwave head mixer diode, and drives a passband-defining ceramic filter.

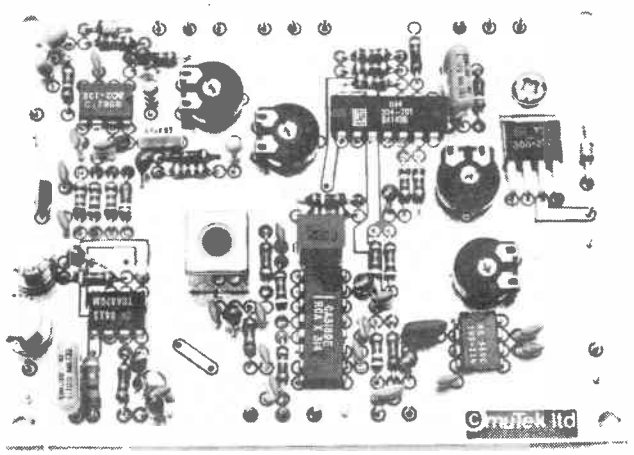
Following the filter, a multifunction integrated circuit provides limiting, demodulation, muting, drive for signal level and centre-zero meters, and AFC and dc voltage reference outputs for the Gunn power supply circuitry. An audio power amplifier completes the receive signal path.

The power supply is short-circuit protected and has been designed to allow limited tuning of the Gunn oscillator by supply voltage pushing. Typical oscillators will have a tuning rate of about 10MHz/volt within the range 5-8 volts. With the imminent amendment to the 10GHz bandplan putting WBFM operation between 10370 and 10400MHz, this is obviously quite adequate without recourse to mechanical tuning methods.

Voltage tuning allows the provision of frequency modulation and AFC by means of power supply modulation – this is all done by the GDIF 107ub. The GDIF 107ub contains both an AGC controlled microphone pre-amp and a tone oscillator for initial setting up of contacts.

The GDIF 107ub comes as a ready assembled, aligned and tested printed circuit board with very full instructions and helpful hints on how to get the whole system together. It is available from *muTek Ltd, Bradworthy, Holsworthy, Devon EX22 7TU (Tel: 040924-543)*, or from muTek agents and national distributors.

The GDIF 107ub is priced at £49.65 including VAT, plus £1.50 post and packing.



2m ATU

Traditionally, many radio amateurs have relied on the antenna pruning method to improve the VSWR of two metre mobile antennae. But now, Davtrend Ltd of Gosport, have come up with a new solution – the DRAE preset antenna tuning unit which, when placed between antenna and transceiver, gives optimum performance for any given situation.

The 30watt, 50ohm unit can be obtained for as little as £11.80 including VAT.

The ATU features SO239 type sockets, and the circuit is a 3 element low pass Pi matching network. The insertion loss is 0.2dB at 145MHz in a 50ohm system.

Two trimmer capacitors are used to optimise the VSWR of the transmit side of an individual's 2m set-up, and are then left: the unit is not intended for continual re-adjustment.

For further information contact *Davtrend Limited* at: *Sanderson Centre, Lees Lane, Gosport, Hampshire, PO12 3UL.*

MORSE MEMORY

New from WPO Communications comes the 'Universal Morse Memory', a stand-alone unit which works with any sort of key, including electronic ones. Thus the unit can be used as a memory facility for those with hand keys, reproducing the special characteristics of an individual sender without sounding 'mechanical'.

The unit simply plugs into the existing key, and offers a message time of between ten seconds and two minutes. This allows you to record for two minutes at 20wpm, and replay the message at the same speed, or at anything up to 200wpm. Conversely, you can slow down your high speed sending to see just how accurate it is!

The memory is a useful aid for CQ calling, contest sending, meteor scatter working or any form of operation involving long, repetitive messages. It also doubles as a practice oscillator and monitor for those learning Morse or wishing to improve their sending speed.

Features of the device include repeat operation, selectable sidetone on both record and replay, a memory bypass and end-of-memory indicator. Input speeds can be anything in the range 1-50wpm.

The unit is available complete in a black-finished steel case measuring 135 x 130 x 43mm, at a postal price of £49.50 inc VAT, from *WPO Communications, 20 Farnham Avenue, Hassocks, West Sussex BN6 8NS. Tel: (079 18) 6149.*

STRAIGHT & LEVEL

CQ WW

This month's AR includes an introduction to the CQ Worldwide Contests by Nigel Cawthorne G3TXF. In his article he mentions the numerous DXpeditions timed to coincide with these contests, not only to increase the number of available multipliers, but also to offer many amateurs an opportunity to work rare countries and prefixes for the first time.

Two such DXpeditions may be of interest to new (and not-so-new!) operators.

VP2

Firstly, members of the Rutherford Appleton Laboratory Amateur Radio Club (G3RRS) will be active from VP2MF during this year's contest. Operators will be G3SJK, G3UKS, GM3YOR, G4BGH, G4JVG, G4XRI and G4XRJ.

Activity will start around 20th October on CW before the contest. The combined antennae from three stations are to be used with particular emphasis on the low bands for those needing Montserrat for 5BDXCC.

An award for DX stations working VP2MF on all six bands (10m-160m) during the contest will be issued.

QSLs via the bureau, or to G3RRS. Address: *c/o Jean Mills, R20, Rutherford Appleton Laboratory ARC, Chilton, Didcot, Oxon, UK.*

The second target for a DXpedition makes really big news: Mellish Reef!

That's the location for the Down Under DXers Contest Club's assault on the 1984 CQ WW phone contest. In 1983 it was Lord Howe Island with the unique VK2LHI special event callsign. In 1984 it will be the much wanted Mellish Reef, hopefully with the call VK9MR!

In 1983 the Aussies' multi-operator, single transmitter entry from Lord Howe won the Oceania highest claimed score with over 4,500 contest contacts and more than 5 million contest points. Another 2,500 DXers had the chance for contacts with VK2LHI outside the contest period on bands from 160 to 10 metres.

This year they're out for the big one – world high score in the multi-single category. With four or five top operators on Mellish Reef and another group on Lord Howe, you might say they've organised an *assault* on this, one of the world's most prestigious contests.

VK9MR?

The Club will be sending its contest team to Mellish Reef for about two weeks in what must rate as the most professionally organised assault ever on the demand for this rare DXCC country. They hope that by their departure date in October, Australia's Department of Communications will have agreed to issue the call VK9MR. At this stage, however, the callsign block for Mellish Reef is VK9ZM to VK9ZR.

The equipment used will be three Kenwood TS830S transceivers supplied by Trio Kenwood (Australia) Pty Ltd, Yaesu FL2100Z amplifiers supplied by Dick Smith Electronics; antennae will be the 4 element, quad band yagi by TET (model HB-443), supplied by Emona Electronics.

Organisers

The organisers of Mellish Reef 1984 are Les Cullen VK2WU, Tony Gilbert VK3CE, and Jim Powell VK2CK (who went to Mellish – and came back to tell about it! – in 1978). Les and Tony will both be on the expedition team. Les is president of the Down Under DXers and one of two fast CW ops making the trip. Tony is editor of *Amateur Radio Action,* Australia's national radio magazine, and is also on the committee of the Club.

The other members making the trip are Rob McKibbin VK5ARO, Janek Wakulicz VK2CIA, an electronics engineer with a penchant for very high speed code operation and Sandy Bruce Smith VK2AD, National Communications Sales Manager for Trio Kenwood (Australia).

The group will be travelling to Mellish aboard the 35 foot ocean-going yacht *Spitfire* captained by Mr Keith Thiele, an experienced yachtsman with a desire to learn amateur radio theory. On route to Mellish, the contest team will be coaching Keith in the basics of ham radio, while Keith will be teaching the team the basics of blue water sailing (and how to overcome seasickness!).

Mellish Reef, located some 580 miles northeast of Bundaberg, Queensland in the Coral Sea is exactly what the name suggests – a reef. Some would call it 'Smellish Reef' due to the all-pervading smell of *fresh superphosphate* which is replenished daily by the Reef's large bird population! The only other inhabitants of Herald's Beacon, the 300 by 60 metre main reef, are nocturnal crabs.

The group plans to depart on 19 October 1984, and hopes to be operational from 25 October through to 6 November on all bands 160-10m.

QSLs will be handled by Les Cullen VK2WU, and all cards should be sent direct to *PO Box 31, Winmalee, NSW, 2777, Australia.*

Donations towards the enormous cost of this expedition, estimated at more than A$10,000, can also be sent to this address. All donations will be receipted and full refunds (net of bona fide expenses incurred) will be made in the event of the expedition not proceeding.

Your chance

We certainly wish those Down Under DXers all the best of luck in this most ambitious project. Good luck also to all those of you who try to contact them. To improve your chances, look for a few tips in TXF's article, and in this month's *DX Diary.*

SEAL OF APPROVAL

The British Electrotechnical Approvals Board for Household Equipment have given their seal of approval to Cooper Tools for the company's Weller SI 15, SI 25 and SI 40 soldering irons, plus the WH1 and WH2 hobby kits. These are the only soldering related products currently on the market which are entitled to display the BEAB mark.

The BEAB mark indicates that an electric appliance meets the requirement of the British Standard BS3456 and enables consumers to identify products which are of sound manufacture and are deemed safe to use. This is a particularly important form of assurance since the use of inferior electrical goods can result in serious or sometimes fatal accidents.

Features of the Weller SI range which have helped gain BEAB approval include mechanically and electrically secure connections. Stress on the connection nearest the handle is eliminated by means of a cable clamping screw which holds the lead firmly in position. The irons also have thermoplastic handles designed for comfort and a firm, safe grip.

Pictured is the SI 25, one of the Weller soldering irons which has won this seal of approval.

For further information contact: *Cooper Tools Limited, Sedling Road, Wear, Washington, Tyne & Wear NE38 9BZ. Tel: (091) 416 6062.*

CALLING YLs

BYLARA, the British Young Ladies Amateur Radio Association, is currently on the look out for new members.

BYLARA is not just open to licensed YLs and XYLs, but to all: OMs, SWLs, *(and presumably SWYLs and SWXYLs as well – Ed),* in the UK and worldwide.

Their activities include weekly nets using SSB and CW, special rally 'get togethers', YL activity days and BYLARA awards.

They also publish their quarterly *Newsletter,* giving information on YL matters.

For further information on activities and membership of BYLARA, write to Mrs Denise Wood GM4COO, *13 Scotland Drive, Dunfermline, Fife KY12 7SY* enclosing an SAE.

STRAIGHT & LEVEL

GB8JCZ

1984 marks the 30th anniversary of the Jawa CZ Owners' Club of Great Britain and Ireland, which caters for owners of Czech-made motorbikes.

Paul Thompson G6MEN, a club member, wanted to mark the birthday with a special event station.

Originally, the special call GB8JCZ was to be used at the club's big rally in King's Lynn in May, but unfortunately Paul's bike broke down on the way to the event.

So,it was that the GB8JCZ call was re-allocated for the special operation from South port on 17,18 and 19 August, 1984.

Paul has sent us the following comments on the event:

'The station was an unashamedly *black box* social affair, since what we were really doing was *playing radio and talking motorbikes.*

'Over the operating period we made 177 contracts on 2m and 70cm, from our QTH at YN35b. Our IOW into a 19 element tonna on L/32MHz got us our furthest contact with Eric G8GP, who confessed to having given up motorcycling at the age of 68.

'From the radio point of view, the most fascinating piece of operating was a contact with GB8SNP, on Snowdon, between 1340 and 1410 GMT on 19 August, with 100mW transmitter power in use each way. I don't know whether this qualifies for the 100Km/100mW award, but it was still fun to do.'

G-QRP CLUB

In 1974, George Dobbs G3RJV, using home-built low power amateur radio equipment, found that he was working several stations who shared his interest in building and operating low power amateur radio equipment. In contact with Nick Carter G2NJ, he found that there was no specialist group for QRP operators.

A letter to *Short Wave Magazine* brought replies from around thirty radio amateurs with a similar interest. At Christmas 1974, G3RJV produced a simple duplicated newsheet called *SPRAT* and The G-QRP Club was formed. The name *SPRAT* was suggested by Gordon Bennett G3DNF, from the words Small Powered Radio Amateur Transmission, and the first issue was sent to 32 people.

The club quickly adopted a badge, and the slogan 'Devoted to Low Power Communication'. The G-QRP Club defined QRP as using a power not exceeding 5 watts dc input. The club began a series of awards and trophies for achievement in low power communication.

From the first issue, *SPRAT* began to reflect the interest of members in design and construction of their own equipment. Over the years *SPRAT* has developed into an influential quarterly magazine, two-thirds of which is devoted to practical items.

In 1982 the club produced the *G-QRP Club Circuit Handbook,* which sold its 500 copies before it was printed. The book is now published and sold by the RSGB.

For many years the club grew steadily, and by 1979 there were over 600 members. But, in the two years between 1982 and the present time, the club has doubled its membership, which is now just under 3000, with members in 60 countries.

The G-QRP Club offers a range of awards for achievement, a data sheet service of circuit ideas, an internal QSL bureau, Morse training tapes, badges and other club insignia items. The club has regular HF band skeds and activity periods to enable QRP stations to work each other on the air.

Those wishing to contact the club should contact Christopher Page G4BUE, *'Alamosa', The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW.*

AMTOR

Grosvenor Software have introduced AMTOR for the Dragon computers, as a 'stand-alone' program not requiring an 'AMT-1' or any similar expensive electronics. It is a full-feature system at around one third the total cost of current alternatives. For those already on RTTY, the savings are much greater.

You can use most conventional RTTY terminal units, such as those by PNP Communications, B&J, or the ST5 (BARTG), the PAG (G3LIV), or MPTU1 etc. In addition, a crystal controlled 1KHz clock is required, and for transmission a PTT switching interface. A suitable clock/PTT unit is available from PNP Communications.

The G4BMK software supports all modes of AMTOR (FEC, ARQ and Listen) with full type-ahead plus the sophisticated memory and QSO review facilities already a part of G4BMK RTTY software. The program will also decode commercial TOR/SITOR transmissions, and the NAVTEXT weather report service on 518KHz.

The program accommodates the following modes:

a) FEC – like RTTY but with far fewer errors;

b) ARQ – full 'hand-shaking' mode with automatic error detection and correction;

c)Listen mode – monitor one side of an ARQ QSO.

Software-selectable PTT changeover time allows many transceivers to be used in ARQ mode without modification. It also features 'split-screen' operation with 2000 character type-ahead buffer: compose your reply while receiving and continue type-ahead while transmitting. The unit features automatic scrolling with no loss of incoming text.

Ten user memories of 480 characters each are offered, with full-screen text editor built in. Memories can call up other memories and pre-programmed messages. Short amounts of text, eg name/callsign, can be put into memories while receiving with no loss of incoming text.

Pre-programmed messages, including a CQ call with your callsign built in, can be supplied. A transmittable 24 hour clock is always displayed on screen. Up to 19000 characters of QSO can be stored in memory for later review/selective printing.

The unit offers mailbox facility with a choice of single or multiple reply messages.

The price, including post & packing, is £49 on cartridge, £39 on cassette, £44 on disk and £24 for a receive only program on cassette.

Grosvenor also produce other 100% machine code software enabling RTTY and CW on a variety of systems, all of which include built-in message with individual callsigns, large memories and type-ahead facilities.

For further details of all Grosvenor Software, send an SAE to *22 Grosvenor Road, Seaford, East Sussex BN25 2BS, or telephone (0323) 893378*

STRAIGHT & LEVEL

SPECIAL EVENT STATIONS

On Sat-Sun 13 and 14 October 1984, Ullesthorpe Congregational Church are running a weekend Bazaar to raise funds for the Guide Dogs for the Blind Association.

The station GB2DOG will be operational throughout the weekend, although operation on Sunday will commence at noon.

Activity is planned on most HF bands, as well as 70 cm and 2 metres, but a special effort will be put into operating during each afternoon between 2.00pm and 4.00pm on *four metres*, a band usually neglected by GB stations.

It is hoped that some blind operators and guide dog puppy walkers will be operating and a special QSL card will be printed. Enquiries about the proposed station, and any donations for the guide dogs association, can be forwarded via John Jennings G4VOZ, *'Millside', Ullesthorpe, Leics.*

Merseyside Special Event Group, comprising Terry G4VKV, Mike G4HSF, Henry G4OJK, Phil G4KIN, Frank G4YPD, Paul G4UVB, Tony G4SYW, Paul G6PZW, Tony G1DFQ, Chris G6NOO and Mike G6ICR, will be operating, for the month of December 1984, the special event callsign block, GB-BCL (Beatle City Liverpool).

They intend to operate from 00.00 1st December to 24.00 31st December 1984, '8 Days a Week' inclusive.

The group will work all HF Bands (Pre-WARC), and also 2m and 70cm, on all modes.

The special event calls are to celebrate the opening of the 'Beatle City Museum' in Liverpool.

Special QSL cards depicting the 'Beatle City Museum' and the special event status, will be available for all verifyable QSOs and all listener reports.

For further information send an sae to QSL Manager G4VKV, c/o Beatle City, PO Box 12, Liverpool.

VENUE CHANGE

Braintree ARS have informed us of a change of venue and day for their fortnightly meetings. These are now held on the first and third Wednesdays of every month (*not* on Mondays), at St Peters Church Hall, St Peters Close, Braintree.

The new venue has kitchen facilities and ample parking, with much more space for the meetings themselves.

Talk-in to the meetings is on S15.

ELHOEX '84

Hornsea Amateur Radio Club have announced their radio, computer and electronics exhibition, ELHOEX '84, to be held on Sunday 21st October, 1984 at the Floral Hall, Hornsea.

This is not really a rally, but rather a collection of stalls manned by local clubs, all demonstrating their own particular forte: ATV, RTTY, AMTOR, amateur radio and satellites.

The event does feature a junk market and bring-and-buy sale, and it is hoped that a special event station will be operating.

More details can be obtained from Norman Bedford G4NJP, *39 Hamilton Rd, Bridlington, Yorks YO15 3HP.*

PATHFINDER

In August, we published a letter from Alexander Lex-Arnold of The Pathfinder Group UK.

Alex has now written to us with details of Pathfinder Radio UK, which is the communications section of the Pathfinder Group UK.

The Pathfinder Group UK is a multi-purpose volunteer-run community projects organisation of strictly non-sectarian character, which is currently engaged in proposals with the Home Office Broadcasting Department for the establishment of a network of low power alternative localised general radio broadcasting services under the title of Pathfinder Community Radio VHF Broadcasting Network, with the West Herts Radio Project being promoted as the pilot scheme of such an alternative low powered broadcasting system.

Alex says: 'I trust that the above information may prove of some interest to those amateur radio enthusiasts having an interest in community affairs.'

RALLY CALENDAR

September 30: **Harlow District Annual Mobile Rally,** Harlow Sports Centre, Hammarskjold Rd, open 10am. Talk-in on 144MHz (S22). Bring-and-buy plus usual features. Ample parking. Details from G4TLU, G6STB.

September 30: **Welsh AR Convention** Oakdale Community College, Blackwood, Gwent. Talk-in on S22. Admission £1. Illustrated talk by Dr. England on Space Shuttle 51F. Details from R B Davies GW3KYA, QTHr.

October 7: **Great Lumley ARES Rally** Community Centre, Great Lumley, nr Chester-le-street. Open 11am. Talk-in on S22. Bring-and-buy plus usual features. Details from Ian Blackman G4OCQ, Tel (0385) 40827.

October 13: **Midlands VHF Convention** BT Training College, Stone, Staffs. Bring-and-buy plus. VHF Forum plus lectures. Admission £1.30. Free Parking. Details from Peter Burden, sae to: 18 Langley Rd, Wolverhampton WV3 7LH.

October 14: **QRP Convention** Preston School (Preston Centre), Monks Dale, Yeoville. Talk-in on S22 using G8YEO/A. Admission 50p. Details from G3GC, tel (0935) 75533.

October 20-21: **Jamboree on the Air**

October 26-27: **Leicester AR show** Granby Halls, Entrance in Wilford Road, nr City Centre. Talk-in on S22 and SV8. Admission £1. Trade stands and usual features. Details from Frank Elliot, tel (0533) 553293.

DX DIARY

News for HF operators compiled by Don Field G3XTT

October is the month when the HF contesting season gets well and truly under way. You can kick off with the RSGB 21/28MHz Phone contest on the 14th and follow up with the 21MHz CW event on the 21st. These, though, are just the hors d'oeuvres before the main course, the CQ WW SSB contest on the weekend of 28/29 October.

The major contests organised by the American *CQ Magazine* have been long established as *the* events for the serious contester, the Wimbledon or Wembley of amateur radio. But although, as with those events, the top winners will have been in preparation for months getting themselves and their stations to a peak of readiness, there are nevertheless opportunities for everyone to enjoy themselves and even to win a certificate. This contest is described at length by Nigel Cawthorne in this month's issue.

Have a go

So why not have a go? First, consider what category suits you best. Do you have a station that is good on six bands but not outstanding on any particular band? Or have you just put up a nice gleaming new monoband yagi for 15 metres? One point to bear in mind is that the contest is for 48 hours and a multi-band entrant will need to keep going for all of that if he is to achieve a reasonable score (yes, it is physically possible. I have done it. But don't expect to be in top shape by the end of the 48 hours!). A 15 metre single band entry, say, gives you the chance for sleep because the band will be dead for hours each night.

Having decided on which band or bands to tackle, work out a plan of campaign. Good preparation brings dividends. Prepare check sheets for multipliers (countries and zones in the CQ WW Contests) and, if appropriate, for stations worked.

Overhaul your station and antennae so that nothing can go wrong and have tools, soldering iron, etc at the ready for when something *does* go wrong (which, by Murphy's Law, it will). Ask the wife or girlfriend (apologies to any lady readers) to buy in some snack food which you can eat between QSOs – there will not be time for the luxury of a proper meal. Check on propagation predictions and listen to the bands for several days beforehand so that you know roughly which areas of the world you should be working at which times. Make sure you have enough pens, pencils, logbooks and scrap paper available and that your operating position is comfortable (48 hours is a long time).

Don't forget to send away well in advance for the official logsheets and cover sheet (you will not need them until after the contest but they can take a matter of weeks to arrive). Send the family away so that you will not be interrupted ...

OY7ML Martin in his shack

And then the moment comes. Some contesters like to tune the bands calling other stations. Some like to sit on a frequency and call CQ. You will probably need to do both at different stages of the contest.

Occasion

The CQ WW is an occasion for amateurs in many parts of the world to organise a contest expedition; the Caribbean is a popular destination for US groups. These groups will not be tuning around but will generally expect you to call them. On the HF bands always be conscious of the way your beam is pointing.

And when it is all over? Then the work really begins. Writing up the log is always a chore. A separate log is required for each band, with alphabetical check lists of stations worked for bands on which you have made more than 200 QSOs. Nowadays many amateurs are finding their computers a great help in getting these chores done. Eventually the great day arrives when you can put the log in the post and sit back waiting for the certificate to arrive (which, in the case of CQ, takes well over a year, I'm afraid). Time to ask yourself, was it all worth it?

For my part, the answer is usually in the affirmative. At least, I think it must be or why else do I keep doing it ...? Who knows, you too might become hooked. By the way, if you need sample log and cover sheets for the CQ WW Contests, then drop me an sae.

The Marshall Islands

When I was first licensed, KX6 stations were frequently to be heard on the bands and then, during the late 70s and early 80s KX6 became more of a rarity. Although there have always been a few amateurs on the islands, most have been Americans wanting to talk back home rather than DXers interested in working the world. In the last year or so all that has changed, with the arrival of some DX-minded amateurs on KX6, probably the most active of whom is Dave Sublette, KX6DS, on Kwajalein Atoll. Dave is mainly a CW operator and is determined to give a KX6 contact to everybody who wants one before he completes his tour of duty on the islands. QSL to the North Alabama DX Club. PO Box 4563, Huntsville, AL 35815-4563. USA. Requests for schedules can go via PO Box 1179, APO San Francisco, CA 96555, USA.

The Marshall Islands consist of two parallel chains of low coral atolls about 200Km apart. These are the 'Ratak' (sunrise) and 'Ralik' (sunset) chains. The total population of the islands is 29,700, of which 14,000 live on Majuro atoll, the administrative centre of the group (located in the Ratak chain). Majuro, incidentally is only about 60 feet wide by about a quarter of a mile long, and has such a large population for its size principally because the islanders were moved there to keep them out of the way of the missile testing range on Kwajalein. Because of the missile range, Kwajalein atoll is presently the best known location in the Ralik chain and most KX6 operation has been from there by US servicemen.

Those with long memories will, however, be familiar with Bikini atoll, used as a test site for atomic weapons in the 1950s. Incidentally, the two island chains count separately for the purposes of the Islands on the Air Award (an award administered by Geoff Watts, a British SWL, which involves working islands around the world).

The Marshall Islands were discovered by the Spanish in 1526, but were left largely undisturbed apart from the landing of a group of mutineers on Ujelangin in 1566. From 1886 to 1914 the island group was governed by Germany and from then until 1945 by Japan. After WWII it became a US Trust Territory, finally achieving independence (subject to a remaining US veto) in 1979. The name may change at some stage to Ralik Ratak, and it is possible that a new radio prefix will also be used at some time in the not too distant future.

LA5VAA/OY Geir, at OY6FRA

US phone band expansion

As I am sure you are already aware, the Federal Communications Commission (FCC) has approved a number of expansions to the US Phone bands to come into effect on 1st September. While we in the UK have voluntary band planning, US amateurs are subject to statutory band planning, with an incentive licensing scheme. Incentive licensing means that as you upgrade your licence from Technician (VHF only, similar to Class B in the UK) to General to Advanced to Extra Class you receive additional frequency privileges each time.

To date the US band plans have left substantial parts of each band clear of phone operation, which has been a godsend to amateurs in other parts of the world. Drop down below 14200KHz, 28500KHz, etc and you could be assured of a QSO without QRM from the USA. Earlier this year things started to change, most notably on 20 metres where the US phone allocation was extended down to 14150KHz. The latest changes are as follows: 3750-3775KHz is now available to Extra Class operators, 3775-3850KHz for Extra/Advanced Class, 3850-4000KHz for Extra/Advanced/General Class; 21200-21225 KHz for Extra Class, 21225-21300KHz for Extra/Advanced Class, 21300-21450KHz for Extra/Advanced/General Class; and 28300-29700KHz for Extra/Advanced/General Class. In addition, 7075-7100KHz will now be available to amateurs in Hawaii, Alaska and other areas near ITU Region 3.

I suppose it is not surprising that US amateurs have pressed for these additional privileges. After all, there are more of them than there are amateurs in any other country so why should they be more restricted in the frequencies they can use.

However, this latest decision will hardly be welcomed here in Europe. There are indications, too, that by no means all US amateurs were in favour of the change. Curiously, the most populated parts of the US phone bands have always been the Extra Class allocations. There are fewer Extra Class licensees than any other category, but perhaps they are the most enthusiastic, not only in terms of upgrading their licence but also in spending time on the air.

General Class licensees occasionally complain that DX stations fail to tune the General Class band segments, but the response from the DX stations is that when they do so they get very few takers.

Other News

The Desecheo operation eventually came off in late July although it was brought to an early end by an approaching tropical storm. The callsigns used were HI3RST/KP5 on SSB and WP4ATF/KP5 on CW. WP4ATF is the QSL route: J Maldonado Sr, Box 449, Palmer, Puerto Rico 00721, USA.

Another one to be worked during July was Lord Howe Island, activated by my DX News Sheet colleague G3ZAY (who operated as VK9LX) and by G3CWI (ex-VP8ANT, who operated as VK9LW). Propagation was far from kind to them although they were able to work successfully into the UK on both 20 and 40 metres. They found the bands very quiet out there and were able to hear Europe for many hours each day. Getting the Europeans to hear them however, was a different matter altogether! In fact they heard myself and several other G stations on 80 metres SSB, but no QSO resulted (gnashing of teeth at this end!). QSLs go to PO Box 146, Cambridge. G3ZAY reports that there are two resident amateurs on Lord Howe Island, Dick VK9LH (formerly VK2AGT) and Ken VK9LK (the island doctor).

Lord Howe Island will, in fact, be activated by an expedition again later in the year, this time by the Down Under DXers who will be there for the CQ WW SSB Contest. What is more, a second group of Down Under DXers will be active from Mellish Reef, with CW before the contest and then a major SSB effort in the contest itself. The Down Under DXers are to be congratulated on such an ambitious contest effort. We can only hope that for their sake, and ours, nothing goes awry to prevent two successful operations on their part. From the propagation point of view, my guess would be that the best opportunities will be on 40 and 20 metres following European dawn (long-path for the benefit of those with beams).

Taiwan is in the amateur radio news again. Since the opening up of licensing a number of expeditions have appeared on the bands and several Taiwanese nationals are expected to be operational in the near future. It is also anticipated that the South

DX DIARY

OY6FRA: Faroese club station

Florida DX Association will be mounting a major expedition from Taiwan in early October. What a splendid change from the long years when Tim Chen (BV0A, BV0B) was the one and only amateur operational from the island.

VK9NS

Jim Smith, VK9NS, is well known to all who frequent 20 metres in the mornings. Jim is also a much-experienced DXpeditioner. News is now in that Jim is returning to Papua New Guinea for a one year contract of employment with the Department of Civil Aviation, Jim's employer before he retired to Norfolk Island. Jim will be reactivating his old P29JS callsign and can be expected to be much in evidence on the bands. Jim's wife, Kirsti, will remain on Norfolk Island to take care of their business interests there, and will no doubt continue to be active on the bands under her VK9NL callsign.

PA3DEV was expecting to be active from the Maldive Islands (80) from September 27 until October 16, 40-10 metres, both SSB and CW. This is a relatively easy path to work, with propagation during the day on 15 metres, and in the evening on 20 and 40 metres (on 40 try around our dusk and around his dawn, as I explained last month). QSL to his home call.

Despite high hopes from various sources, no operation came about from Albania over the summer period. Robin, LA9PCA, spent two weeks in the country but had to leave his transceiver at the border. OH2BH also continues to work on the possibility of some ZA operation, so we will have to keep our fingers crossed. There have been occasional operations from Albania in the past. The moral seems to be, work any ZA stations you hear on the bands and one of these days one of them may turn out to be genuine.

The August operation of GK0JFK by the Chiltern DX Club netted over 5400 contacts in 110 countries. A big effort was made by the group, with four stations operating simultaneously to cover both the HF and VHF bands. I was fortunate in being able to visit the station and make a few contacts on 15 metres, and it was certainly an impressive set-up with two triband beams, dipoles and slopers on 40 and 80, and 3 complete HF stations. The group are already talking about when, not if, a further operation might take place! Well done to all concerned.

And so another column comes to an end. Do enjoy the contest and LF season, and drop me a line to let me know how things go? Meanwhile, 73 and the best of DX.

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* * * * *

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, moonbounce 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-02E, £239.
IC-04E, £259 (70cm).

The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E continues to be available.

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.

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!

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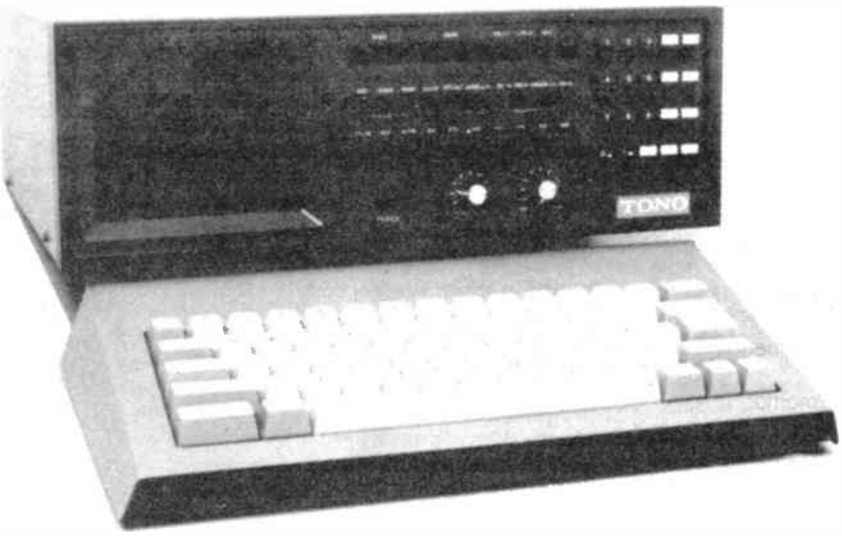
ICOM

TONO FOR RTTY.

Tono 5000E, £829.



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, £729.

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 9100E 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.

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THE ANGUS McKENZIE TESTS

MICROWAVE MODULES 23cm TRANSVERTER

Very recently I reviewed the SSB Products 23cm transverter, and here, hard on its heels, is the well known Microwave Modules one that has now been available for some years, but which has fairly recently been updated. This model is specified to give up to 2W output on 23cm for an input of 10W through an external attenuator into the 144MHz input/output socket.

Connections

The usual 5-pin locking DIN socket is provided with pins for 13.8V dc positive (pin 5), earth (pin 3), and a PTT line for external Tx control (pin 1). When this line is shorted, the transverter changes to the Tx mode, but also incorporated is an RF sensing circuit which pulls over to Tx for an input drive of approximately 1/2W into the external attenuator, or 12mW directly into the rig.

The transverter is housed in two diecast boxes which are joined together, the top one including input and output Tx/Rx switching (relay at 144MHz, and pin diode switching at 1296MHz), and the complete transmitting section, including the PA.

The bottom section includes the crystal-controlled local oscillator for Tx and Rx, and the receive converter.

The top part is fitted with an SO239 socket for Tx/Rx interconnection on 144MHz, a BNC socket for interconnection with a short BNC lead taking the IF output from Rx to the input relay, an N-type socket for interconnection with a 23cm antenna or linear, and another BNC which takes the receive signal from the pin diode to the bottom deck Rx input, again with a short BNC to BNC lead. Thus the bottom deck is BNC in and out. There are no controls on the exterior of the unit, but the Tx input at 144MHz has a variable attenuator pre-set which can alter the input sensitivity by several dBs.

Finish

Both sections are finished in black crackle, and LEDs on the front indicate power on and Tx.

The external attentuator, supplied with the rig, is fitted with SO239s at each end, although the manufacturers can supply other socket configurations by special request. The attenuator is claimed to be 15dB, and to accept and absorb 10W input power, but our measurements indicated the attenuation in both directions to be almost exactly 16dB, with an SWR in either direction of around 1.5:1.

The circuit

The transmit circuitry from input to output follows first through the input sensitivity pre-set and then into a balanced mixer using two BFR34a bipolar devices, the local oscillator injection and RF meeting on the input bases. Two resistive pre-sets can vary the bias on the bases for balancing. The collectors feed a strip line with trimmers at each end, and a second strip line is coupled to this, which then feeds an MRF559 NPN as a first amplifier at output frequency.

Further stages include an MRF816 driver into a 2SC1594 PA. The receive side starts with an NE720 GaAsFET feeding directly into a double diode mixer, two HP2835s.

The 144MHz output is amplified by two high gain 3SK51s in series, thus giving a somewhat excessively high receiver gain, only partly required to offset the loss of the 16dB pad which would be used by some.

Subjective trials

I have been using an older model of this transverter for some years until fairly recently, and I must admit that despite its shortcomings, I have been able to work some astonishing DX with it. The main problem that I experienced, both with the old and new models, is that of very bad RF intermodulation when there are tropo ducts about, resulting in an incredibly strong GB3BPO beacon, and very strong local stations almost obliterating the band when they are transmitting, through no fault of theirs.

The input noise figure is certainly good enough for normal use, but of course an external masthead pre-amp can make a major difference in improving the received signal-to-noise ratio. I always found it necessary to use a 20dB pad in between the receive output on the bottom deck and its input on the top one, but unfortunately the enormous receive amplification is already present in the bottom deck, thus causing some of the input intercept point problems. The rig is reasonably stable on receive but the HT connections, when moved around, have sometimes caused the received frequency to change slightly. The rig is rather prone sometimes to RF feedback problems, and whilst I have not had these, some other users have, despite spending much time checking power supplies which have been found to be perfect.

In order to achieve optimum linearity on transmit, I found it necessary to limit output PEP to 1.5W maximum, for whilst the rig did give 2W, the output signal was obviously very compressed, and was beginning to splatter badly on SSB. In my own system I use a Trio TS830 feeding a 2m Microwave Modules transverter set up to give low level drive into the 23cm transverter, thus avoiding the pad and keeping IM products down by underdriving the 2m PA. The system worked well by paralleling the PTT connections via diodes into my PTT line, thus pulling

MM external alternator

over both transverters simultaneously.

I found that when I received 23cm signals via the N-socket and BNC/BNC interconnection there was approximately 1.5dB signal loss as compared with a direct connection to the receiver input.

Linear

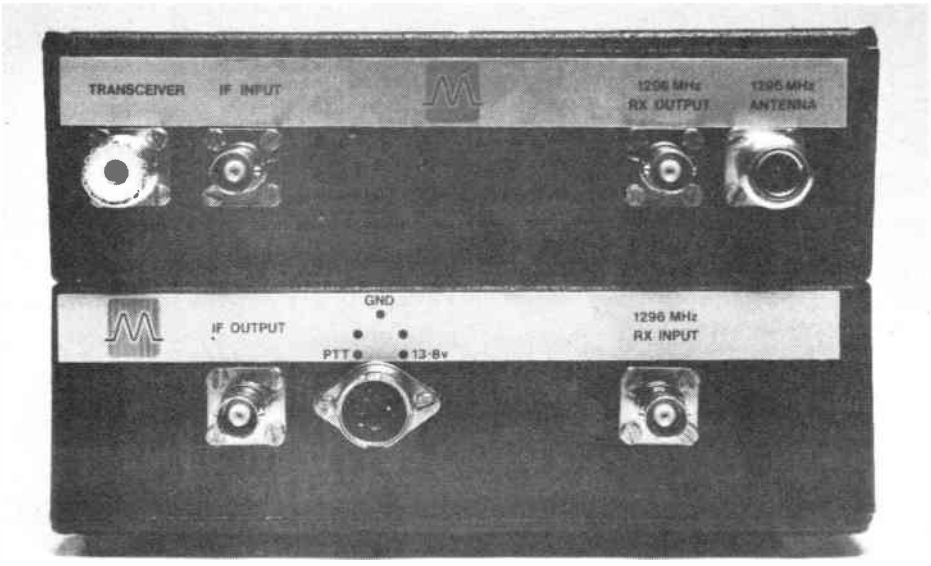
Since most users would want to drive an external linear, an external high quality coax relay would be much better anyway. Many users have had a problem when attempting to rely on the RF sensing, for it is not sensitive enough to cope with a wide enough range of speech under normal conditions from an average rig via the input attenuator. There is in fact only 13dB margin between maximum input and the level below which the rig drops out of Tx. Note that the 2m pre-amp, which I review in this issue, has around 4dB more gain in its RF sensing circuit, relating to 10W input, which is just about enough.

For this reason, some amateurs who have used this transverter with smaller portables such as FT290s have constantly had trouble keeping the rig on Tx if they don't use PTT. The manufacturers can supply attenuators of lower value, 6dB for example, which are more suitable for use with low power rigs, in which case the internal input sensitivity pre-set would have to be re-optimised. 2W in from an FT290, for example, would be half a watt into the rig, which is too much, but the pre-set can turn this down to the required input level of around 200mW or so.

Laboratory tests

The receive section proved to have an incredible 44dB gain from RF input to 144MHz output, and surely this is grossly excessive. I would strongly recommend users to bypass the second IF amplifier if they are using the separate receive output, or if they are only using a relatively small attenuator pad in series with the main transceiver. I cannot understand why the manufacturers have put in so much Rx gain, and in the wrong place, when it would have been very much better to have had slightly less gain in the first IF pre-amp, followed by around 15dB gain in the second pre-amp, which should have been placed in the circuit between the IF input on the top deck and the input changeover relay. With this configuration, those who sensibly wanted to use the receive side independently would have a far superior intercept point, and thus avoid very bad cross modulation problems.

The RFIM ratios were rather difficult to measure, as they tended to be unpredictable, depending on input level. It is thus difficult to work out a precise RF intercept point, for this appeared to vary from -28 to -18dBm in rather a see-saw fashion. I did not measure the noise figure accurately, but all tests inferred it to be around 2dB or so, taking into account the entire receiver. The device



itself at the front end is claimed by MM to give around 1.2dB, and the input could easily be as good as this. We checked the received bandwidth from input to output, and this was quite wide, 3dB down points being at 1292 and 1299MHz, just about right for most users. 20dB attenuation was given with reference to the mid-band gain at 1284 and 1308MHz, which is excellent, showing quite a high Q.

Transversion accuracy

The transversion accuracy was checked, and the IF output was well within 1KHz of the correct frequency when related to input. Drift characteristics were very good, although I did note some temperature drift over longer periods, which is hardly surprising. You might well find week to week variations in excess of 1KHz, although the latest model does seem to have improved stability over earlier samples, this being most welcome.

For testing the transmit section we used two Marconi 2019 generators feeding into a hybrid, and thence into a Marconi power amplifier which was checked at all appropriate power levels to ensure that its RFIM performance was itself good enough and much better than the transverter would be. We set each input carrier independently to give 500mW output, and thus when combined a theoretical 2W PEP, although the output was actually considerably lower than this because of compression. The third order IPs were at around -31dB which is very good, with higher order products reducing quite reasonably.

When the drive was increased to give an approximate 2W PEP output, 3rd order intermodulation was at around -22dB, and higher order products did not fall as rapidly as perhaps they should have done because of the considerable amount of compression. 7th and higher orders were also very unsymmetrical. It was felt after some experimentation that about 1.5W PEP output was an optimum between power out and IM products.

We checked the presence of various other carriers on the output including twice 144MHz plus the local oscillator frequency, output image at LO – 144MHz, and local oscillator breakthrough. I was rather dismayed that the product 144MHz above the final output frequency was only 24dB down when the rig was giving 1W single carrier output.

At the time of this measurement, the local oscillator breakthrough was at a rather alarming –22dB ref 1W, although

MICROWAVE MODULES LTD

AS REVIEWED IN THIS ISSUE OF AMATEUR RADIO

1296 MHz LINEAR TRANSVERTER: MMT 1296/144

FEATURES

- ★ GASFET RF AMPLIFIER YIELDING 1.2dB NOISE FIGURE
- ★ 2 WATTS TRANSMIT OUTPUT POWER
- ★ EXTENSIVE FILTERING ENSURES EXCELLENT OUT OF BAND SIGNAL REJECTION
- ★ BUILT-IN PIN DIODE AERIAL CHANGEOVER RELAY
- ★ RF VOX WITH MANUAL OVERRIDE
- ★ HIGHLY STABLE REGULATOR CONTROLLED 96 MHz OSCILLATOR
- ★ 13.8 v DC OPERATION

SPECIFICATION

GENERAL

Frequency coverage	:	1296-1298 MHz
Input frequency range	:	144-146 MHz
DC power requirements	:	13.8 v at 0.5 A
RF connectors	:	'N' type antenna socket SO239 144MHz input/output (all others 50 ohm BNC)
Power connector	:	5 pin DIN socket
Size	:	187 x 120 x 106 mm (7⅜ x 4¾ x 4¼")
Weight	:	1.8 Kg (4 lb).

LOCAL OSCILLATOR

Local oscillator frequency	:	96 MHz
Maximum error at 1296 MHz	:	± 6 KHz

TRANSMIT SECTION

Input impedance	:	50 ohm
Input modes	:	SSB, FM, AM or CW
Input required for full output	:	5-500 mW (or 10 watts with supplied 15 dB attenuator)
Power output	:	2 watts
Output impedance	:	50 ohm
Level of spurious outputs	:	Better than - 40 dB

RECEIVE SECTION

Overall converter gain	:	25 dB typical
Noise figure	:	1.2 dB
Input impedance	:	50 ohm
IF output impedance	:	50 ohm

DESCRIPTION

This 1296 MHz solid-state linear transverter, MMT 1296/144 is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability at 1296 MHz.
The inclusion of an RF vox network minimises the necessary connections to the drive source, and will automatically switch the transverter into the transmit mode when 144 MHz drive is applied.
The transverter incorporates two main sections: (1) MMK 1296/144, low-noise receive converter incorporating MMG 1296 low-noise GASFET preamplifier, and (2) a low distortion transmit converter and power amplifier module. This modular construction technique ensures excellent electrical and mechanical stability, and the unit is ideal for all types of communication, particularly where a high degree of stability, sensitivity and linearity are of prime importance. The transverter is enclosed in a dual compartment case, and all circuitry is constructed on high quality glass-fibre printed circuit board, with the exception of the preamplifier which is constructed on TEFLON PCB. The high power linear amplifier stage is housed in a separate internal compartment.

PRICE : £215 inc VAT (p+p £4.50)

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this breakthrough was very dependant on temperature, and it was a very hot day. We rechecked this figure some days later, when it was much cooler, and curiously the LO breakthrough was then around -35dB, although 2f + LO was still at -24dB ref 1W output.

At this stage, Mark Capstick, G4RCD, decided to have a go at realignment, and after much investigation, found that the most critical components to adjust were the two input bias pre-sets on the mixer, together with the small trimmer capacitors at either end of the collector strip line. An amazing reduction of the product 2f + LO at 144MHz above the band was obtained from –24dB to 45dB, and it was possible to improve LO breakthrough down to around -40dB, with image improving slightly to around -34dB.

Don't touch

I have no doubt whatsoever that no attempt should be made to touch any of these pre-sets unless you have access to a spectrum analyser covering the range 500MHz to 1500MHz. Mark found that having obtained substantially better rejections of all components, all the spurii degraded quite a lot when the lid was put on, but if you can get a spare lid and drill appropriate holes in it you could probably do even better than we did! It seems to me that the manufacturers need to take more care in alignment before sending these units out, although it is possible that when posted, some misalignment occurs in the hands of our Post Office!

We had a look at the input to output compression characteristics, and sensitivities. We drove the input directly from a 2019 generator, set to give 20mW output, and actually noted slightly more than 0.5W output. By 1W, we noted about 2dB compression, but some 8dB compression was present at the 2W output level. I did not want to overdrive the input with the Marconi amplifier, and under fair test conditions we noted a maximum sensible saturated output power of 2.05W, which seems to be sailing incredibly close to the wind if you compare this with the specification.

Mark made up a small die cast box with a very short lead of 3 inches to a DIN plug, and we used a PTT switch on the box which also contained sockets for power interconnection. An HP current meter was in series with the positive source, and voltage sensing leads were attached to the input of the box to ensure that 13.8V were always present on the transverter input. In pratice, most users would be dropping some voltage in the power connection leads, and might not achieve full output. I would therefore prefer to see a specified output of perhaps 1.5W, which would avoid many misunderstandings, and be more representative of the usable SSB maximum PEP under realistic conditions.

Although the manufacturers specify the output at 2W for 500mA HT current at 13.8V, we found that some 800mA were required. We took every precaution to ensure correct calibration, and used a Racal 9303 power meter and a calibrated Narda 20dB power attenuator, using

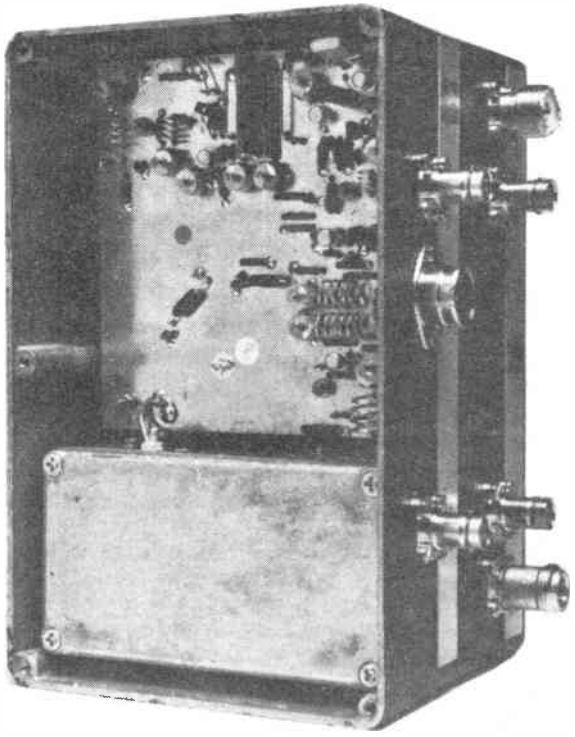
every available cal factor! We were very pleased to see that below 500mW output the linearity of the entire transmitter section was excellent, so quite clearly the transverter can give superb results if not driven too hard.

Intermod

If we return to the receiver RF intermod performance, it is in fact very good indeed when one considers the massive gain, and taking away one of the pre-amps would of course help considerably. One should look at a complete system though to consider overall RFIM into an average 2m rig, and too many of these have rather poor RFIM, for example an intercept point at perhaps -20dBm. With the transverter perhaps at masthead, there would possibly be 28dB gain,including the attenuator pad, up to the input to the main receiver, if low loss coax is used. This will mean a system intercept point of -48dBm. This means in practice that two signals within the band peaking at -78dBm each (around 30μV) would create an IM product at the same level as the system noise. 30μV is a strong signal, but not a crushing one.

If we now add a masthead pre-amp with 14dB gain and put the transverter at the bottom, perhaps with a linear, then the intercept point would be perhaps at -58dBm, (280μV) allowing for some coax cable loss. Two input signals from the antenna of only -85dBm (around 12μV each) would give a product at the noise level: but two signals 10dB higher in level would give products 20dB above noise, which could be exasperating.

If we now take the whole gain of 44dB, and with the masthead as well, and put the receive signal without attenuation into an average receiving rig, disaster befalls us, for the intercept point would then be at -74dBm (45μV). Two signals at only around S9 would produce an intermod product at noise level, etc, etc.



Breakthrough

We also checked the level of 2m breakthrough on the 23cm output, and this was at a level 32dB below 1W, which is a little on the high side. In effect, this would be considerably attenuated by the antenna itself, but I would advise the use of an external interdigital filter, which could also further reduce any unwanted breakthroughs.

Finally we checked the transmitted frequency bandpass characteristics, and output power fell off by 3dB (ie transmit-

ter section gains went down by 3dB) at 1275 and 1302MHz. Note that the transmitter section thus has a much wider bandwidth than the receive one.

Conclusions

Many stations have obtained remarkable results by putting this transverter at the masthead, and there is no doubt that with a good antenna some amazing DX can be worked.

Even if you are well away from strong local stations (Mark Capstick suggested that Appleby is a good example!) you could still possibly have a slight problem in a tropo duct. Sensible use of additional attenuators will help, but for the time being I suggest that you get your soldering iron out and bypass the second IF amplifier, and use an external relay, and perhaps slight external attenuation on the receive path which could be switched.

The basic manufacture of the rig is neat, and it is supplied with good packaging, plugs and sockets and two well made up short BNC/BNC leads. A short PL259/PL259 lead is also included for use with the supplied attenuator load.

Sealant

If you are going to use the rig at the masthead fairly permanently, you would be well advised to attack it appropriately with gasket sealant, before the weather gets at it.

The price is reasonable, but I would have preferred the transverter to have had perhaps 5W output, which would have been just about right for driving a 3CX100A5 to around 70W in a good linear. The choice between this transverter and the SSB Products is not obvious, but if you do want plenty of drive and a phenomenal overload margin, the SSB Product is to be preferred. It cannot be put at masthead though, as the Microwave Modules transverter can be.

The latter is also more easily adaptable as it has a separate receiver output, and if you don't mind putting in my suggested mods, it would be a very good buy, especially if you make your own separate linear. I strongly advise against using the 1296MHz pin diode change over for Rx though because of its loss. It is only fair to conclude by commenting that much of the 23cm activity in the UK has been due to the availability of this product for some years, and long may it flourish.

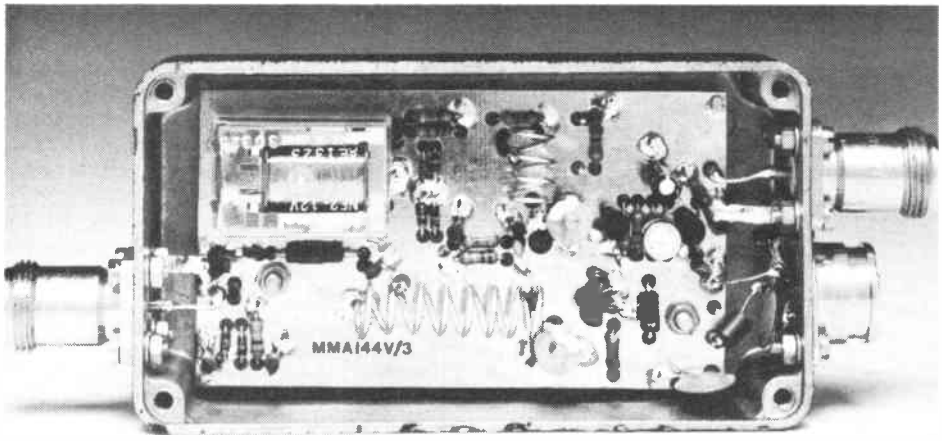
I would like to thank the manufacturers, Microwave Modules Ltd of Liverpool for the loan of the review sample, and Mark Capstick, G4RCD for the great assistance given in helping me with this review. His older brother, Myles, G4RCE worked me with one of these transverters barefoot at 1.5W PEP into a 2m dish from Appleby on SSB over a year ago, and I quote this as an excellent example of 23cm DX working with this model.

Microwave Modules MMT 1296/144 – Lab Results

Receive converter gain	44dB
Receive 3dB bandwidth	1299.5 – 1292MHz
Receive 20dB bandwidth	1308 – 1284MHz
Receive intercept point (average)	-25dBm (see text)
Conversion accuracy	within 1KHz
Approx noise figure	<2dB
Input pin diode etc, loss	approx 1.5dB
External attenuator loss	16dB
External attenuator SWR	1.5:1
Transmitter sensitivity	3mW in / 1W out
Input for 2 watts ouput	approx 300mW
Max reasonable PEP output	approx 1.5W
Breakthrough of input on output	32dB below 1W
LO + 2x IF product	24dB below 1W
LO breakthrough on output	-35/-22dB ref 1W (see text)
Total current at 13.8V for 2W carrier output	800mA (spec = 500mA)
Output image	-41dB ref 1W
RF sensing sensitivity	12mW (0.5W into external attenuator)
Tx 3dB bandwidth	1275 – 1302MHz
Tx Rx changeover method	RF sense/PTT

THREE MASTHEAD PRE-AMPLIFIERS:

The muTek SBLA144E, muTek GFBA144E, and Microwave Modules MMA144V Compared



I have looked at well over a dozen 2m pre-amps in the last year or two and I now have chosen three very good ones to compare. There can be no doubt that all three are excellent value for money, but each has its own merits, and it seems that provided the design is good you get what you pay for.

Microwave Modules MMA144V

This model was first introduced many years ago using a BF981 dual gate MOSFET as the amplifier, but now the device used is a 3SK88. RF vox sensing is incorporated, and whereas in earlier versions this sensing circuit was not quite sensitive enough, this has now been increased so that a mere 200mW is sufficient to just pull over the circuit to transmit, although at least 250mW is actually specified by the makers. As far as I am concerned the more sensitive it is the better, provided that the RF circuit will not explode with 100W throughput, which the manufacturers state is the maximum allowable for this model.

Input and output sockets on the review sample were N-types, but more usually SO239s or BNCs are supplied. There is no extra charge for N-types and I consider that this is very helpful and advisable if you want to mount at masthead, as the mating plugs are easy to waterproof. Furthermore, have you ever tried to

solder UR67 or H100 into a BNC plug?

Returning to the RF vox sensing, the relays held in until power decreased down to around 12mW. This does allow for a reasonable dynamic range on SSB speech from even a low powered rig to hold the pre-amp in the throughput mode.

Pre-set

A pre-set has been added internally to vary the hold time on Tx from almost instantaneous drop-out to a maximum of around 0.9 seconds. The changeover relay employs two lots of contacts and one pair seemed to hold on for about 0.25 seconds longer than the other pair, which was rather baffling. I noted a 33μF capacitor in the holding circuit and I feel this could, with advantage, be increased in value to perhaps 50μF to give a longer hold time, as I would prefer a maximum of around 1.5 seconds.

The old solder pads that have been used by the manufacturers for HT connections on many of their models have now been replaced by a 5-pin DIN socket, the mating locking plug being supplied. Pin 3 should be earthed and pin 5 positive dc from 12 to 13.8V. The makers can also supply a version which changes over by shorting another pin to deck, thus overcoming any RF sensing changeover. This, however, is an optional extra.

The pre-amp is now supplied in a very attractive black crackle finish diecast box with a proper label affixed to the top lid bearing the legend *low noise RF switched pre-amplifier* and naming the manufacturer as Microwave Modules Ltd, with labels being provided on it for the various connections. Despite examination with a spyglass no identification was found that it was intended for the 2m band and if they are going to produce similar looking models for other bands they should do something about this, otherwise dealers, let alone some users, will get their knickers in a right twist!

The pre-amp measures 110 x 60 x 31mm and weighs 250gms. You would probably be able to mount it at masthead without too much of a weather problem if you used some gasket sealant in between all sockets and the case and in between the lid and case. Two screws underneath, which hold the circuit boards in place, are flush mounted but would probably also need sealing.

We first measured the gain from input to output as 14dB at the centre of the band, the response across the band being extremely linear. The 3dB down bandwidth was rather wide at 24MHz width, and -20dB bandwidth was still extremely wide, covering 70MHz bandwidth. Therefore, I consider that the circuit Q was not high enough, particularly on the output. The input Q however, to be sharp, requires extremely expensive components to avoid losses so I feel it is reasonable enough. The makers claimed 15dB gain, incidentally, and in no way could this be achieved on the review sample, but I feel that 14dB gain is just about right for the model anyway, as more gain would degrade the main rig's RFIM performance by 2dB for every dB of extra gain.

Noise figure

The manufacturers claim that the noise figure is 1.3dB or better, and I have no reason to doubt this, judging by the number of tests of FM sinad improvements on some rigs tested with it. My measurements inferred that the noise figure is around 1.25dB, but in no way can I claim more than 0.25dB accuracy as I no longer have the HP noise figure meter that I borrowed in summer 1983 (I don't intend to buy one yet at around £8,500, unless pushed to the extreme by the Editor!).

We noted a through loss on Tx of less than 0.2dB and this shows the relays to be excellent. I felt it important to check the RF intercept point and intermodulation performance and this turned out to be very good for a reasonably priced pre-amp. The best obtainable measurement resulted in a calculated input intercept point of around 0dBm, when checking the IM products produced from two high level carriers spaced 500KHz apart. The intercept point calculated from the products from two lower level carriers gave a slightly inferior intercept point of -3dB which is still very good.

We checked the dc current drawn when on receive and this was 25mA at 12.5V dc which rose slightly at 13.8V. This is somewhat strange since the brochure stated it should be 75mA. On examining this leaflet (destruction page!) we noted many helpful comments and a circuit diagram which tied in with the previous model, omitting the pre-set for setting delay time, so MM should update their instructions and circuit diagrams a little more frequently. Curiously, the brochure showed a photograph of the old model.

Out-of-band

I have used one of these pre-amps on odd occasions over the last few years, and I feel that it is a very good purchase provided that you do not have extremely strong out-of-band signals in your immediate locality. My only reservation is that the bandwidth is too wide.

The noise figure which would typically be achieved for a complete system, with this pre-amp at masthead, should be more than adequate for anybody unless your system without it is awfully deaf, or if you have to use at least 100m of mediocre coax! In a typical installation with 3dB feeder loss, into a black box having a 5dB noise figure, you should see a system noise figure of around 2dB.

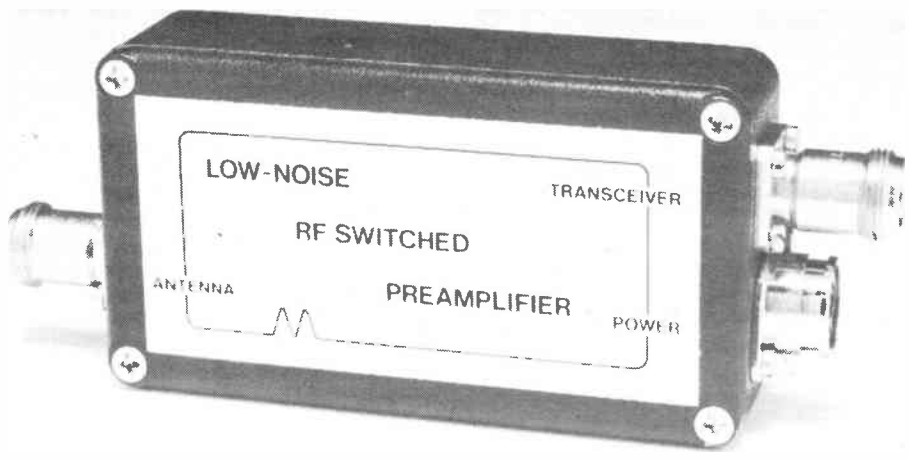
The pre-amp should cope with SSB from rigs giving as little as 3W output, provided that you keep fairly close to the mic in order to keep the average modulation level high enough to hold in the vox sensing. Rigs giving at least 10W should be fine however, even allowing for a small feeder loss. On FM, even a 1W rig should put it over adequately at masthead. In the average installation you should see a signal-to-noise ratio improvement on FM of around 4 or 5dB on any given low level signal, whilst on SSB you should notice an improvement of between 3 and 5dB. The cost is £34.90 including VAT, plus £1.25 p & p.

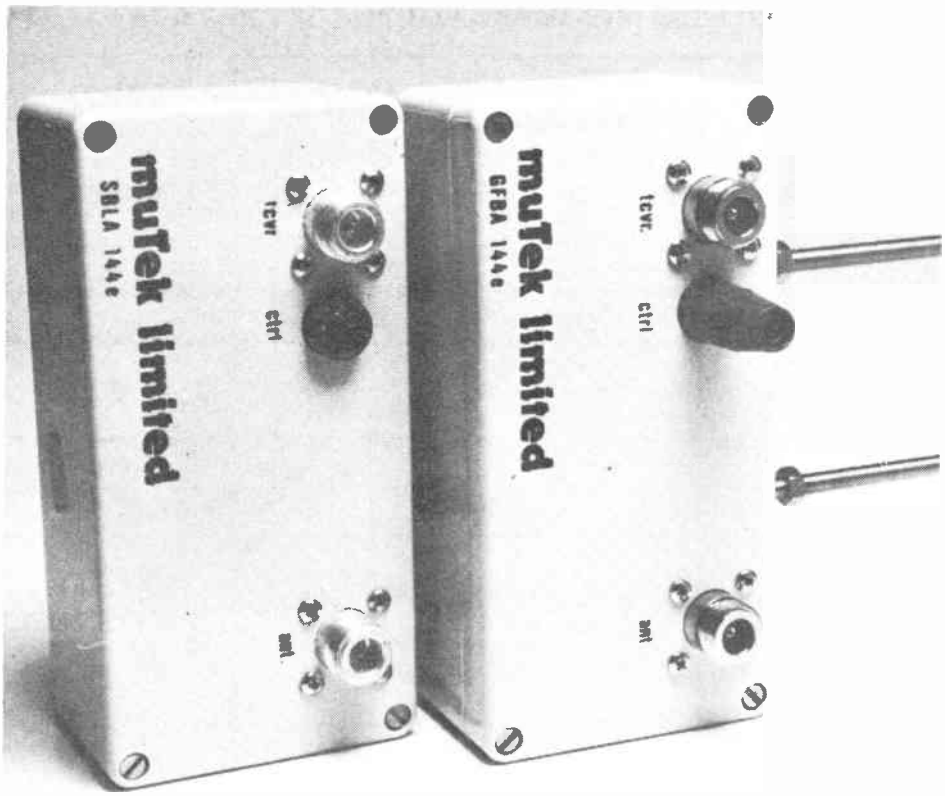
The muTek SBLA144e

This model is supplied in a heavy duty plastic weatherproof box with two large mounting bolts for easy fitting at masthead. Three interconnection sockets are fitted, N-types for the antenna and transceiver RF interconnections and a power socket with 3 pins for 13V dc nominal, earth and a PTT line, which when earthed pulls the relays over to the straight-through mode, which is also engaged if the 13V line is switched off. The pre-amplifier measures 160 x 80 x 55mm and weighs 420gms.

The connectors are properly labelled, although one has to resort to the manual to ascertain the pin connections on the HT plug (these are pin 1:+13V, pin 2:PTT line and pin 3:earth). The pre-amp contains a screen printed label identifying the manufacturer and the model, so it is unlikely to be confused with those for other bands!

The pre-amplifier circuit employs two BF981s in push/pull, and the circuit is





indeed clever, for the performance seems almost bomb proof! The PTT line is unusual as it only draws a few mA when shorted to ground, and is thus operable even with an FT290. It is far easier to adapt to almost any transceiver than is a line which takes the entire relay current.

The relay and pre-amp switching circuit uses two PNP transistors, with the relays in the collector circuit of the second one. When the relays are energised, current is drawn through the PNP transistor from the HT line, allowing the BF981s to be operative. When the PNP transistor is switched off, the relays are inoperative, and no HT is drawn by the devices.

This model also has an RF-sensed switching capability as a safety factor, although I would recommend the use of the hard switched PTT line. This sensing circuit worked extremely well with 1.5W PEP throughput on average speech and the whole time was just under one second: not quite long enough. The sensing allowed the transmit path to be selected from very low RF power levels which is excellent.

An internal link can be removed which allows the sensing to be instantaneous for FM use.

The overall gain was 13dB and the 3dB bandwidth much sharper than that of the Microwave Modules' model, measuring just 7.5MHz, whilst the 20dB bandwidth was only 15.75MHz wide. This pre-amp would, therefore, cut out many of the problems which some of us suffer from minicab/taxi interference and even aircraft flying overhead!

The through loss was around 0.25dB which is excellent, especially when you consider that the model allows an RF throughput power of 250W PEP SSB (150W continuous carrier) into a good match, but downrated to 150W PEP (100W carrier) into 2:1 SWR.

The approximate noise figure was checked and was around 1dB, which is in agreement with muTek's claim, and the rig should certainly make an improvement to almost any transceiver. The RF intercept point was remarkable for the devices used, measuring at +7.5dBm, and the linearity was almost a straight line, giving 2dB more intermod product (3rd order) for each dB of RF increase of the two input carriers spaced 500KHz apart.

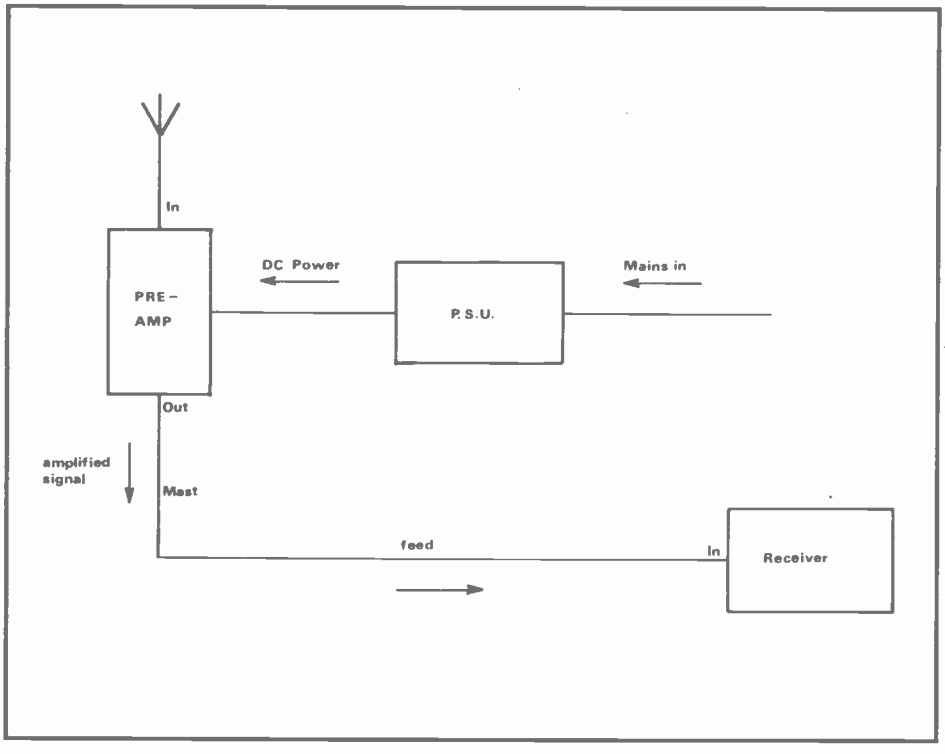
The pre-amp took 124mA at 13.8V on receive and with the PTT line shorted just 41mA were taken. The performance across the band was very flat and I have no hesitation in strongly recommending this model as one of the finest pre-amps on the market. It should be easy to install at masthead and, like the others reviewed here, should easily be good enough for anyone. Note, however, that this model is unsuitable for use with more than the maximum allowable power of 400W PEP throughput. The price is £89.90 including VAT, plus £2.50 p & p.

muTek GFBA144e GaAsFET

For those who want the Rolls Royce of 2m masthead pre-amps, this model has been designed to achieve a very remarkable performance. Chris Bartram, the designer, employs some very clever negative feedback circuitry around the GaAsFET, a Mitsubishi MGF1202, and around the second stage, a Siemens BFQ69, and achieves the amazing RF intercept point of +13dBm, the best I have ever noted on any VHF pre-amp!

The gain is set at 12.75dB, around optimum for use with a very good system. The 3dB down bandwidth is even narrower than that of the SBLA model, being only 5.5MHz wide, with -20dB bandwidth at 15MHz. This pre-amp is certainly good enough to obtain superb results on moonbounce and satellite work, and you might even try your hand at some radio astronomy, if you have a suitable dish and no neighbours within 1Km or so.

The noise figure seemed to be around 0.75dB, for it seemed to be 0.25dB better



than the SBLA model, and 0.5dB better than the MM model. The main difference between this model and the Dressler is in the intercept point measurements and narrower bandwidths, for to put it in perspective, the Dressler model tested a year ago had an intercept point of around 33dB worse!

Casing

The case is virtually identical to that of the other muTek model, and thus allows it to be mounted at masthead very easily. The method by which it should be operated, however, is somewhat different, for it has just 13V dc and earth interconnections from the control unit. It is intended that a muTek control box type ATCS500 be used in the shack, which allows the pre-amp to change over from almost any type of control, including PTT line which should be shorted to ground on Tx, or plus volts for Tx or positive dc volts on a coax inner for either Tx or Rx on some rigs, or even just RF sensing changeover.

Small switches inside the control box have to be appropriately switched for the required changeover mode. Interconnections to the box can be RF in and out (max 25W), 13V power socket for interconnection to the pre-amp, and solder pins for input supply to the box and various PTT line voltages, etc. The box also provides a 50mS delayed changeover relay control for a linear amplifier, which is most helpful.

The maximum throughput power of the pre-amp itself is rated at 1KW PEP SSB, and 500W continuous carrier. I would imagine that 1KW CW would be satisfactory provided the key was not held down, although there would probably be a limitation down to the 500W level for fast meteor scatter CW and most certainly RTTY.

No difference

The through loss was less than 0.2dB, and thus this pre-amp's insertion should not make any difference on Tx in practice. You only need to use the RF throughput connections via the control box for extracting the 13V from the coax inner, or for the RF sensing mode. MuTek recommend hard switching, but RF does have its advantages for some users. Both muTek pre-amps have diode protection across their inputs so that they are reasonably indestructible.

There can be no doubt that the overall performance is spectacularly good, setting an example to virtually every other amateur radio equipment manufacturer who also uses GaAsFETs. These devices are quite cheap now, but they are not the wondrous gadgets that many people imagine them to be, unless they are in the right circuit.

The model is most recommendable to those who want the satisfaction of knowing that they probably have the finest pre-amp in the world at their masthead, although the cheaper muTek model would be good enough, even for most DX chasers. It certainly sets a standard which will be almost impossible to better, and Chris Bartram has to be congratulated on his amazing design. It measures 160 x 80 x 55mm excluding connectors and brackets, and weighs 550gms (control unit ATCS 500 weighs 163gms). The price is £139.90 including VAT plus £2.50 p & p, the controller also being included in the price (note that the pre-amp cannot be purchased without the controller).

MASTHEAD PRE-AMPS – LABORATORY RESULTS

	Microwave Modules MMA144V	muTek SLBA 144e	muTek GFBA 144e
Gain at 145MHz	14dB	13dB	12.75dB
3dB down bandwidth	140 – 164MHz	142.25-149.75MHz	143-148.5 MHz
10dB down bandwidth	133 – 173MHz	140.75-151.5MHz	141.25-150.75MHz
20dB down bandwidth	121 – 191MHz	138.5-154.25MHz	139.25-153.75MHz
approx noise figure	1.25dB	1dB	0.8dB
RF intercept point (calc from 40dB IM ratio point)	0dBm	+7.5dBm	+13dBm
RF intercept point (calc from 60dB IM ratio point)	-3dBm	+7dBm	+13dBm
Switching method	RF + optional PTT line	RF + PTT	RF, PTT etc (control box)
RF vox hold time	Variable 0.9S max	0.9S/instant internal link	0.9S/instant via control box
Max through power	100W	150W mean (see text)	500W mean (atcs 500-25W see text)

Conclusions

Last month I made a brief mention of the Icom GaAsFET masthead pre-amp which was not recommended because of its grossly excessive gain. In looking at the three pre-amps reviewed above, the Microwave Modules one should suit most users for it is remarkably good value for money and performed very well, the main reservation being that its bandwidth is rather wide.

The muTek SBLA144e is to be strongly recommended for all installations provided that the throughput maximum allowable power is not exceeded. Although you may think that your antenna is a good match judging by the measured SWR in the shack, remember that a poor SWR at the antenna may seem an awful lot better down in a shack as cable attenuation reduces the power returned as well as the power going up. As you may want to use the pre-amp at masthead you should not be surprised to see a 2:1 SWR, in which case, you should not put more than the powers mentioned through the pre-amp with reduced ratings.

If you want to use high power, then I very strongly recommend the muTek GFBA144e with its control unit for a really super installation. I could find no problems with this model, so it must be regarded as the bees' knees, although it is very expensive.

Don't forget that you cannot put more than 100W through the Microwave Modules' model. SSB Products also make some good pre-amps and these were briefly reviewed last year in Amateur Radio, although I did not measure intercept point at the time. They performed very well but the intercept point is unlikely to be anywhere near as good as that of the muTek models, which thus have to be preferred.

My thanks to muTek and Microwave Modules for the loan of the review samples, and to Mark Capstick, G4RCD, who assisted with all the measurements.

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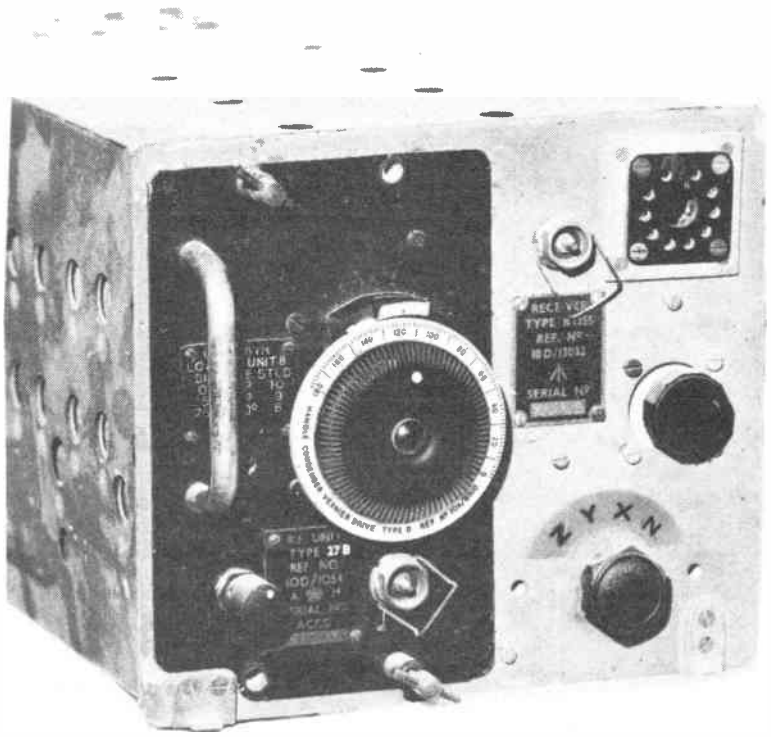
Access

THE RAF FIGHTS BACK

by Brian Kendal AMRAeS, MRIN, G3GDU



The R1355 airborne GEE receiver with RF27 tuning unit. (photograph taken with permission at Amberley Chalk Pits Museum)

The damaging raids by the Luftwaffe during 1940 and 1941 on British cities, which I described in 'When Germany was on the Beam' in the May issue, illustrated two important points. The first of these was that with the assistance of good radio navigational aids, highly accurate bombing was possible in all weather conditions.

The second was that, in time, countermeasures could completely invalidate the advantages of these radio aids. This had been foreseen by the RAF High Command many years previously and considered sufficient justification to dispense with radio navigational assistance.

This was despite an incident on the 12th December 1936 when a flight of seven Handley Page Heyford bombers of 102 Squadron, flying in formation from Aldergrove in Northern Ireland to Finningley in Yorkshire, ran into fog and icing conditions. Only one, piloted by Sgt Biddulph, safely reached its destination. The remaining six all either crashed or force landed.

Twenty years earlier in the 1914-1918 conflict, von Buttler-Brandenfels, the only German Zeppelin commander to fly throughout the war, had concluded that the elementary direction finding based navigational systems then used, despite errors of up to fifty miles due to anomalous propagation effects, were still vastly superior to any form of celestial navigation.

The factor not considered by the RAF High Command was that, provided that adequate secrecy was observed during the development phase, a period of time must elapse between the introduction of a radio navigational system and its effective neutralisation by the enemy, and during that time it *would* be effective.

In an extended conflict, the effectiveness of radio navigation would be dependent on the ability of the research team scientists to develop and the production engineers to manufacture a replacement system for each aid as it was rendered unusable by enemy countermeasures.

Despite these attitudes, a certain amount of development work was achieved and when it was realised in mid-1940 that as few as 25% of bombers actually located their target, the previous decision was rescinded and development work on the navigational and bombing aids was given high priority.

GEE

Despite the previous reluctance, once the basic decision to develop radio aids to navigation had been made, action followed with great rapidity and the first to arrive at the squadrons was GEE in early 1942.

This aid was based on an idea by Robert Dippy, one of Robert Watson-Watt's radar team. Although when first seen the system seems complex, in practice the principle is not difficult to understand.

Consider first two radio stations, A and B, spaced by about 100Km with an aircraft somewhere between. Simultaneously each station transmits a short pulse of RF. If the aircraft is equidistant from the stations, it will receive both pulses at exactly the same time. If the aircraft is closer to station A, it will receive A's signal first and if nearer to B the converse will occur. By measuring the time difference between the arrival of the two signals, the relative distance of the two stations can be determined and a line can be drawn on a map which will represent all possible positions of the aircraft.

If station A transmits again, this time simultaneously with another station C, a further line can be drawn and where the two lines intersect is the position of the aircraft. Each position line is a hyperbola (thus the term 'hyperbolic navigation aid') and the curves will intersect at *two* points. In practice this causes no difficulties, for the points are well spaced and there is little possibility of confusion.

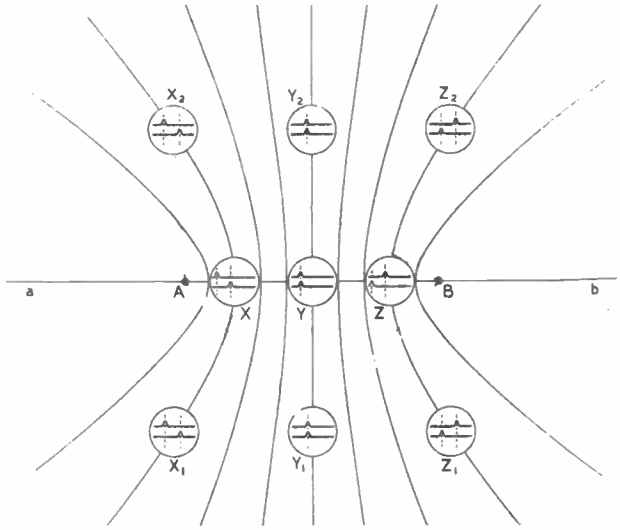
Questions

In the foregoing description, two questions arise: how does the aircraft identify each station and how does it compare the time of arrival of the signals?

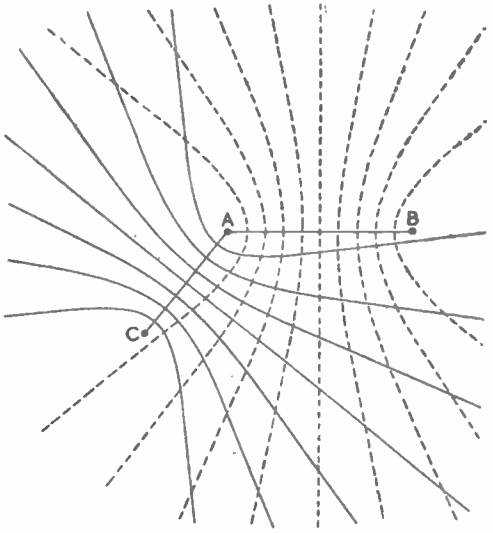
In the first case, the signal could be radiated on different frequencies but this would be wasteful in bandwidth. In GEE, therefore, time separation was selected. In this, instead of radiating simultaneous signals, the stations transmit at intervals of exactly 1/1000 of a second in the order: A (master); B (slave); A (master); C (slave). In order that each pulse may be correctly identified, the second pulse from the master in each sequence is followed by a 'ghost' pulse. The relative time of arrival of the pulses is measured on a special oscilloscope provided with highly accurate calibration markers.

At short distances from the transmitter, the accuracy of the system could be measured in yards, but at long range, such as over Germany, this deteriorated to about two miles. Such accuracy was inadequate for bombing, but for general navigation it was excellent. Furthermore, as the frequencies in use were between 25 and 90MHz, range was limited but still sufficient to cover many of the industrial areas of Germany.

As the incoming pulses were viewed on an oscilloscope, any jamming could be readily identified. Despite this, by August 1942 the level of countermea-



Diagrams of oscillograms showing time of arrival of the pulses from A (master, upper trace) and B (slave, lower trace). Along any position line, the difference of time of arrival can be seen to be constant



Using position lines from the transmissions from master (A) and two slaves (B and C) to determine position of the observer

GEE

sures was sufficient to make the aid unuseable over Germany. This was not the end of GEE, however, for it remained in use for many years as a general navigational aid; the last chain only being withdrawn from service in 1971.

Perhaps the ultimate accolade was late in the war when a shot-down enemy aircraft was found to contain a German made copy of the British airborne equipment.

GEE airborne equipment was also familiar to home constructors in the 1947-1950 period, for the war-surplus R1355 airborne GEE receiver and its associated Type 62A indicator formed the basis of the 'Inexpensive Televisor' which was many enthusiasts' first introduction to television.

By the time that countermeasures made GEE unusable, two other aids were available, each of which was highly effective. The first of these, H2S, and the later version of the other, Oboe, were dependent on one British invention – the cavity magnetron.

The cavity magnetron

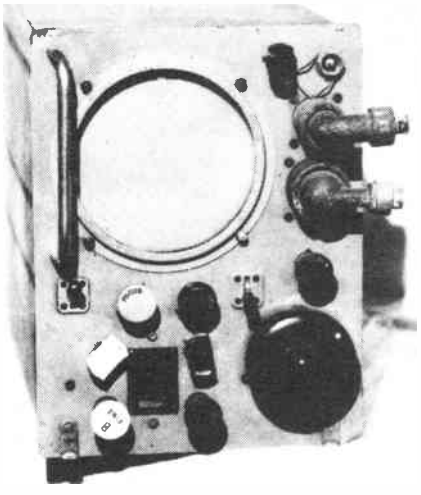
The development of high accuracy radar had been seriously retarded by the inability of scientists to develop a method of producing high RF power levels at frequencies above 500MHz. This problem had been concerning a group of scientists at Birmingham University who were mainly concentrating on developing the Klystron, which had originally been designed in the United States. This, however, only generated low power oscillations.

Two members of the team, John Randall (now Sir John Randall) and Harry Boot, came to the conclusion that the Klystron would never generate the power required and started exploring other avenues. Among these was the split anode magnetron, a device which, although capable of producing output on centimetric wavelengths, had proved too unstable in the frequency domain for practical use.

The Klystron uses two resonant cavities, known as Rhumbatrons, which at that time were thought to be necessary in the design of any centimetric valve. Randall and Boot therefore decided to combine such cavities with the magnetron principle, ie the cavity magnetron.

The basic principle of the cavity magnetron is that an emitter of electrons, ie a cathode, is located in the centre of a circular solid metal anode in which a number of cavities, resonating on the required frequency, are machined. On application of a dc voltage between anode and cathode, electrons will flow in a straight path across the intervening space. If, however, the valve is placed in the field of a powerful magnet, the electrons will take a circular path. Under suitable conditions the passage of the electrons past the machined slots would cause an oscillation to be set up.

The GEE airborne indicator unit (Photograph taken with permission at Amberly Chalk Pits Museum)



On the 21st February 1940, the prototype was ready for testing and when power was applied, Randall and Boot were amazed to find that the power output was not less than 400 watts. A source of high power at centimetric wavelengths was at last available.

H2S

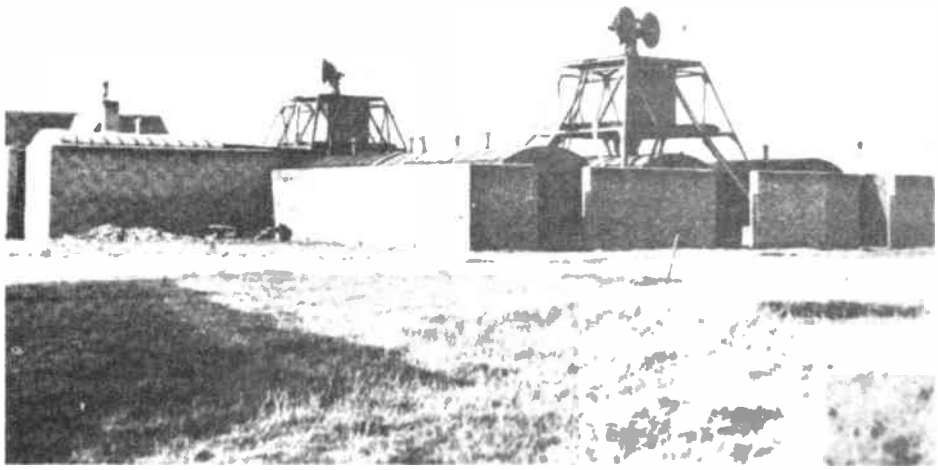
With the invention of the cavity magnetron, the first thought was for the improvement of air interception radar, a VHF version of which was already in operation.

During the early tests, however, it was noticed that if the antenna was tilted downwards, unmistakeably different returns were received from seas, rivers, towns and open countryside. In consequence, the question was raised as to whether it would be possible to construct an instrument with a downward looking, rotating aerial, displaying the results on a PPI (plan position indicator) and capable of showing a passable representation of the ground below.

For this, a team of scientists, headed by Professor Dee, was assembled to develop the equipment. Other members of this brilliant team included Sir (then Dr.) Bernard Lovell; JPW Houchin; Sir (then Dr.) FC Williams; Dr. FC Thomson and Alan Blumlein.

Blumlein was one of the greatest inventive genius' that this country has ever produced. His previous patents included a stereophonic gramophone pick-up, which only found use long after the war when vinyl replaced shellac with consequent improvement in signal-to-noise ratio.

He was also a member of the EMI team which developed a high definition television system within a period of 18 months. This system was adopted by the BBC who with it initiated the world's first high definition service in 1936, which will only be closed at the end of this year



The Mk3 (10cm) Oboe station at Winterton (Pic and bottom pic courtesy of Marconi Radar)

– 48 years later. In this work, Blumlein was mainly concerned with the development of the timebase and one such circuit was named after him – the Blumlein Integrator.

Last task

Sadly, H2S was Blumlein's last task, for whilst conducting flight trials over Wales, his aircraft crashed and he was killed. It is a measure of Blumlein's inventiveness that he held a patent for every ten days of his working life.

The development of H2S proceeded at great speed. In peacetime the development of such an elaborate system with its eight boxes of circuits would have occupied several years, but at the Telecommunications Research Establishment at Great Malvern and nearby RAF Defford, the main principles were finalised within a month.

The first version of the equipment comprised a 10cm radar transmitter/receiver feeding an aerial rotating in a radome under the belly of the aircraft. The output from this fed a plan position indicator display in the fuselage which could be switched to several ranges, the longest being used for navigation and the shortest during the bombing run to the target. Later versions of the equipment operated on 3cm and achieved even greater accuracy.

How the equipment received its designation is the subject of many anecdotes. Some people say that the letters stood for 'Home Sweet Home', but the favourite is quoted in AVM Donald Bennett's book 'Pathfinder' and is attributed to Lord Cherwell, Winston Churchill's scientific advisor. When shown the equipment he is reputed to have said 'It stinks – call it H2S!'

The operation of H2S depended on the use of the cavity magnetron – a device known only to the allies. Additionally, experiments had proved that the solid metal anode in which the cavities were machined was virtually indestructible and immune from the effects of demolition charges. It was therefore perhaps inevitable that, in order to stop this valuable item falling into enemy hands, the War Cabinet decreed that the device should not be carried over enemy territory.

This decision met with the strongest opposition from the RAF and was eventually rescinded to the considerable discomfort of the more distant enemy targets.

The success of H2S resulted in investigation of its suitability for other roles. One of these was for locating shipping, submarines and even Schnorkels for Coastal Command. In this role it replaced an earlier VHF instrument and was known as ASV MkIII.

Oboe

Whilst H2S was being evolved at Malvern and Defford, another device was being developed by its inventor, AF Reeves, assisted by Dr FE Jones. Unlike H2S, which was done in accordance with traditional procedures, Oboe was developed in the field with test installations in operational squadron aircraft.

Oboe operated on the secondary radar principle in which a pulse of RF is transmitted from a ground station. This is received by the aircraft which then transmits a further pulse back to the ground station. This station then measures the time interval from its transmission to the reception of the pulse and from this calculates the distance of the aircraft.

Two ground stations were initially used with Oboe, one located at Trimmingham in Norfolk and the other near Walmer in Kent. One station, codenamed 'cat' directed the aircraft on a carefully calculated circular course of constant radius which allowed for the prevailing wind and the tangental throw of the bomb.

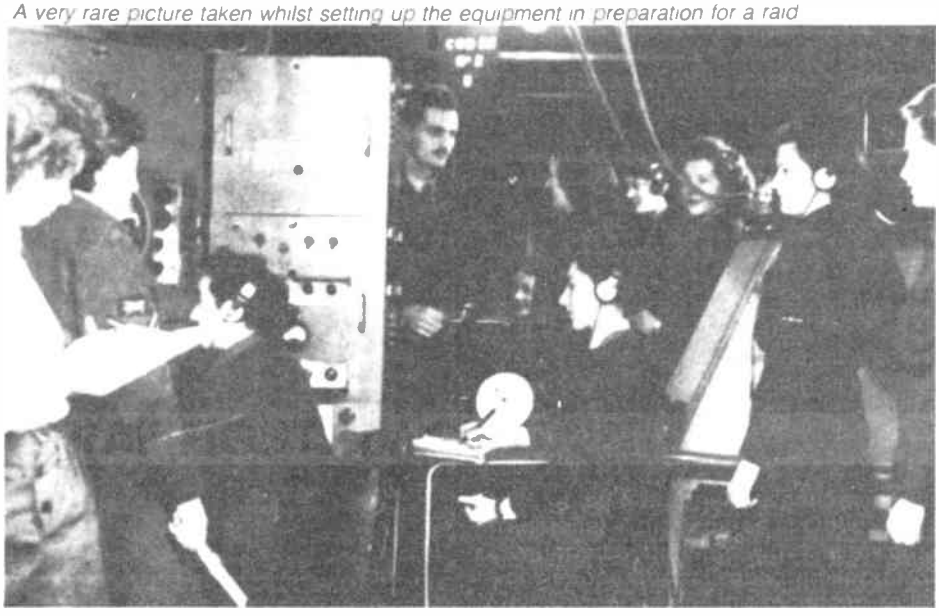
For this, directional guidance was transmitted to the aircraft on the interrogating transmission in the form of pulse space modulation on the earlier VHF and pulse width modulation on the later microwave equipment, the pilot hearing a series of dots if on one side of his course and dashes if on the other.

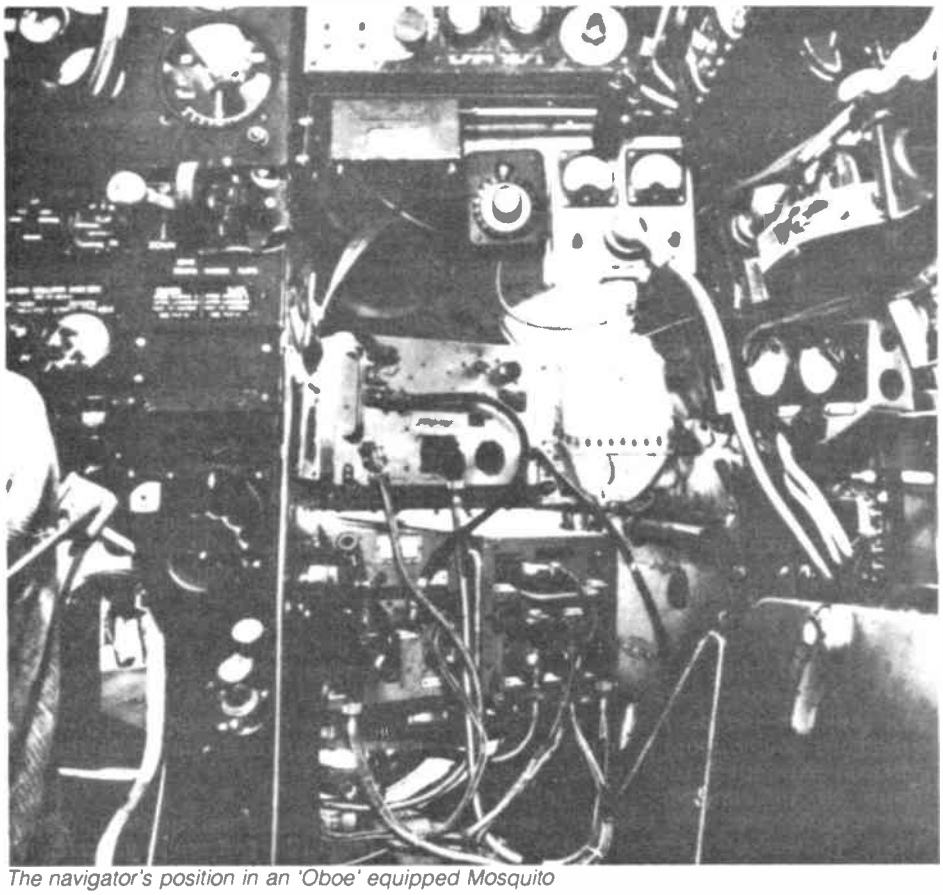
Tracking

The second ground station, codenamed 'mouse', had the task of tracking the aircraft along the course dictated by 'cat' and initiating the signal for bomb release. Prior to reaching this point, a series of precautionary signals were sent which were succeeded by a long dash. As the dash ceased, the bomb aimer pressed the bomb release. In a later development, even this was actuated from the tracking station! Both stations could operate in either the cat or mouse role.

The theoretical accuracy of the equipment was extremely high and nominally located the aircraft within fifty feet. With this incredible accuracy, one of the first results was the unexpected discovery

A very rare picture taken whilst setting up the equipment in preparation for a raid





The navigator's position in an 'Oboe' equipped Mosquito (Pic: Marconi Radar)

that there was a discrepancy between the British and continental map grids.

The first night on which Oboe was used against the enemy was the 20th December, 1942 when six Mosquito aircraft of 109 squadron led by Wing Commander HE Bufton, each dropped four, five hundred pound high explosive bombs using a coking plant as a test target.

When originally introduced, Oboe operated on a frequency of 220MHz and, as may be expected, the Germans were not slow in developing effective countermeasures. By then Oboe Mk III, which operated on 10cm, had been introduced. Nevertheless, the ground stations continued to transmit the lower frequency signals and in consequence the enemy were at a loss to understand how the system continued to operate through the heavy interference, and concentrated their efforts on even more effective jamming. As a result the 10cm transmissions were not suspected and operated unscathed.

Deficiencies

Despite its many advantages, Oboe suffered from three serious deficiencies: its range was limited to the radio horizon, ie about 250-300 miles at 35,000ft, although this still permitted operation over the heavy industrial targets of the Ruhr; it required the aircraft to make a fifty mile bombing run on a constant radius circular course to the target; and each Oboe chain could only handle one aircraft at a time.

Overcoming these potentially grave disadvantages fell to one man, the specialist force which he created and led and the one type of aircraft equal to the task – Group Captain DCT Bennett, the Pathfinder Force and the De Havilland wooden wonder, the Mosquito.

Group Captain DCT Bennett

Group Captain Don Bennett was an Australian with an impressive record in pre-war aviation. Learning to fly in the Royal Australian Air Force, he then transferred to the RAF, where he flew Siskin fighter aircraft and later became an instructor on flying boats.

Leaving the RAF in 1935, he joined Imperial Airways where he captained one of the famous Short S30 'Empire' flying boats. He then took command of the 'Mercury', a four engined seaplane which was the upper part of the famous Mayo composit aircraft. This consisted of two parts: an S30 'Empire' flying boat 'Maia' and the 'Mercury' seaplane mounted on a release gear on its back. The two aircraft took off in combination but separated when at a suitable altitude. By this means the smaller machine could become airborne with a far greater fuel and freight load than would otherwise be possible. In this aircraft Don Bennett became the first pilot to carry a commercial load across the Atlantic and later raised the distance record for seaplanes to over 6000 miles.

Soon after the outbreak of war Don Bennett was sent to Canada to organise the Transatlantic Ferry in which the larger American and Canadian built warplanes were flown directly from Gander to the United Kingdom, thus avoiding the risks from enemy submarines of a seaborne crossing.

This task complete, he re-joined the RAF as a Wing Commander in charge of 10 Squadron, then operating Whitley bombers from Leeming in Yorkshire. After a few months he was transferred to command 77 Squadron on the same airfield.

During this period, Bennett, conscious of the poor navigational and bombing results which were mainly due to lack of suitable aids, had been pressing for the formation of a specialist force for marking the target before the arrival of the main force. His efforts were successful and in July 1942 the Pathfinder Force was formed with Bennett in command.

The Pathfinder Force

Five squadrons were initially assigned to the Pathfinder Force: 7, 35, 83, 156 and 109. These used a combination of Stirling, Halifax, Lancaster and Wellington bombers, although the latter were soon replaced by either Lancasters or Mosquitos.

The latest aids, H2S and Oboe, were used from the outset, the heavier aircraft being equipped with the former and the Mosquitos with the latter. In general the system used depended upon the target, Oboe being the preferred aid. Beyond Oboe range either H2S or visual methods were employed.

The main task of the Pathfinder Force was to accurately mark the target for the following bomber force, although at other times they indulged in precision bombing on specific targets. Bennett also formed a Light Night Striking Force which used Mosquitos and was a frequent visitor to Berlin.

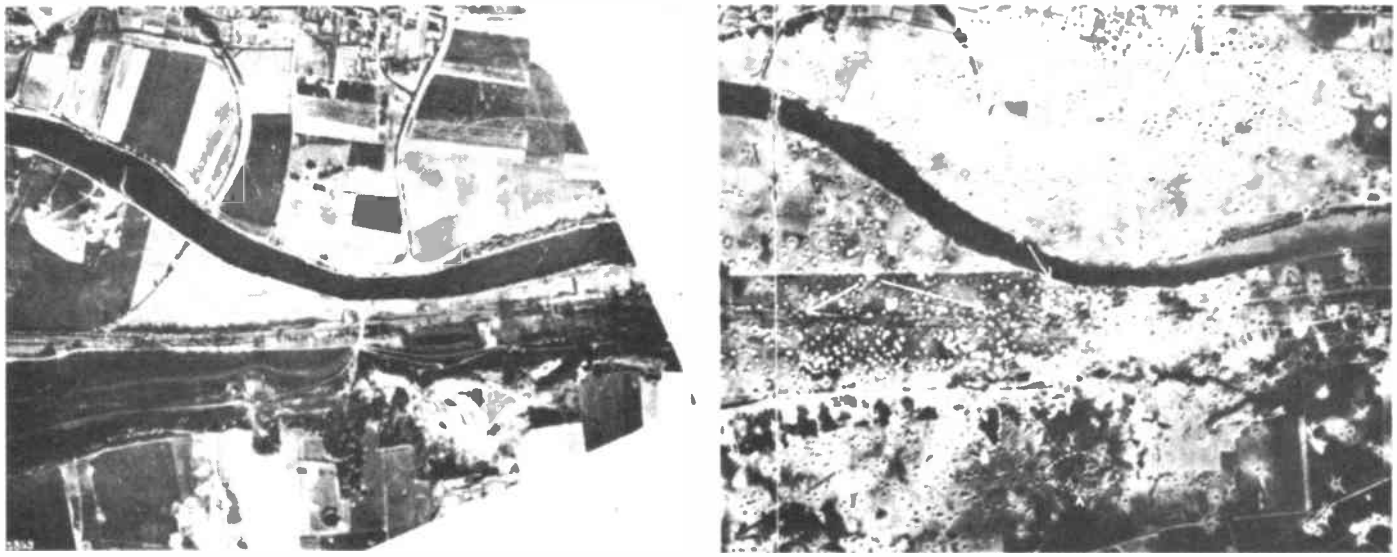
For marking targets, pyrotechnics of two different types were used. The first of these was known as Target Indicators (TIs), which comprised a large number of pyrotechnic candles. These were ignited by a barometric fuse at 200-500 feet, but the main burning period was on the ground. When the target became obscured by smoke from the bombing or low cloud, sky markers were used. These consisted of a parachute flare which could mark a spot in the sky for three to five minutes.

Markers

Either type of marker was available in various colours, with or without stars so that the following bombers could be instructed to 'bomb on the red markers' or whichever colour was appropriate. As the markers burnt out, so they were replenished from above, and if the enemy attempted to confuse the attacking force with dummy markers, a new set of a different colour could be laid.

The original Target Indicators were found to have very poor ballistic qualities, thus to a great degree nullifying the extreme accuracy of the Oboe guidance. To counter this problem one of the country's most eminent aerodynamicists,

THE RAF FIGHTS BACK



The V1 supply dump at St Leu D'Esserent before and after a raid led by 'Oboe' equipped Mosquitos (Pic: Marconi Radar)

Dr. Barnes Wallis of Vickers, who had previously designed the R100 airship, the Wellesley and Wellington bombers and later of 'bouncing bomb' fame, was called in. The redesign overcame all the previous deficiencies and made accurate target marking possible.

After D-Day, as the Allied forces swept across Europe, mobile Oboe ground stations followed, rarely more than a day or two behind the front line. This enabled highly accurate tactical bombing and even deeper penetration over the Reich. This was especially valuable for country targets which were particularly difficult to identify on an H2S screen.

Between the 18th August 1942 and the 8th May 1945, the Pathfinder Force and its associated Light Night Striking Force flew 50,490 sorties and dealt with 3,440 targets for a cost of 3,618 casualties.

It is without doubt that the Pathfinder Force made a considerable contribution to the Allied victory, and I am sure that the members of that force would be unanimous in their praise of the 'boffins' who developed their navigational and bombing aids.

Acknowledgement: I would like to thank Mr Bruce Neale of Marconi Radar Ltd for his invaluable assistance in the writing of this article.

JUSTICE, INJUSTICE AND THE WIRELESS TELEGRAPHY ACT


CURRENT COMMENT

MAKING HEADLINES

Last chance for youth in attack

Two die in CB aerial tragedy

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 hoardings 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 relatives seriousness '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

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 contrive 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

newspapers brings us something which is ultimately more important 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 instruction in the basics as possible.

ing 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 11,000 volt cables between difference 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 my fellow amateurs.

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

The tragic death of two technicians at work outside broadcasts as a result of coming into contact with overhead lines, moves the question of lack of experience in the matter which your interest amateur c fessional. The fire all times r individual regard t accident depend ever pr someo more

After seeing the August 'Current Comment' one of our readers, a radio amateur of long-standing who is also a magistrate, has sent in these thoughts on the Brighton case and some of the wider issues concerning amateur radio and the Law.

As a radio amateur and a Magistrate I was intrigued to read in the August *Current Comment* columns of the happenings in Brighton. Living nowhere near Brighton, I cannot comment upon the case regarding the £100 fine etc imposed upon the young licensed amateur there; but I must warn that Press reports of Court proceedings often give little of the true story. Newspaper column inches are precious and often only the most colourful facts emerge. Many times myself and my colleagues, having sat upon a case, will hardly recognise that case when reading Press reports. It could be that the background to the Brighton affair is much more complex than the report in the *Brighton Argus* suggests.

Let us now dispose of the criticism of the 'Telegraphy Act'. An examination of the said Act will reveal the definition of the term 'Wireless Telegraphy' in relation to that Act. Any emission of RF power, be it in the form of CW telegraphy, telephony, RTTY, slow-scan TV, data transmission or whatever, is classed as 'telegraphy' under the Act. This is logical, for whenever a new mode appears it is not necessary to re-frame the Act; it will automatically come within the provisions of that Act. When the first Act was being prepared the only emission then known was telegraphy, and this is why the name has stuck with us over the years.

Offences?

Complaints of outrageous behaviour on a few of the VHF repeaters in some places frequently appear in the amateur press, and the letter writers invariably ask why nothing seems to be being done to locate and deal with the offenders. They would no doubt be cheered if some of the 'no callsign, no QTH' bucket mouths, squeakers and growlers were apprehended and taken to Court.

The mere trotting out of filth on a repeater is not really enough to warrant a prosecution (it is difficult to imagine the charge), but transmitting through a repeater when not licensed or misbehaving on that repeater *when licenced* constitutes an offence under the Telegraphy Act. The Brighton case may involve the use of a repeater, I do not know, but it is most unlikely that carelessness in log-keeping, forgetting to inform about change of QTH or slipshod operating in neglecting to give the callsign often enough could ever result in a prosecution.

A licence holder might be given a verbal or written warning for such behaviour or even have his or her licence suspended for a period; but the use of the Criminal Law in such cases is most unlikely and would be unjustified.

Action taken

The Radio Regulatory Department will normally only take action following the receipt of a complaint. This could involve TVI, BCI or other RFI when a member of the public initiates matters. It could result from interference to another service on a shared band, or come from sustained complaints from other amateurs that grossly bad or offensive operating by a pirate, or another amateur had taken place.

The Authorities do not have the manpower or resources to maintain extensive monitoring services and they rely upon information coming in from other sources. The few cases which to date have reached Court and have been reported in the Press are just the 'tip of the iceberg'; a majority of transgressors cease their activities when they are given a warning. Legal proceedings are expensive, and the object of the exercise is to stop illegal operation, not to win cases in Court.

Guilty?

Everyone of us has at some time broken one of the many rules and regulations which constitute our amateur licence. Just as it is impossible to find a motorist who can say he has *never* infringed one or more of the myriad road traffic regulations, this holds too with the radio amateur. The important point is that we do not misbehave regularly or with malice. The omission of a callsign at the end of an over is technically a breach of the licence, but such an occasional breach will not bring the yellow van to the door. Some of our high speed CW merchants forget to send their callsigns at a 'reasonable' speed (not greater than 20 wpm), and are thus breaking the conditions of their licences. Few seem to be penalised for this offence however.

There may be a time when that little yellow van will call on you and your station will be liable to examination and inspection. Before the great proliferation of amateur activity twenty years ago, we all had regular station inspections. When completed the log was signed and dated by the visiting officer. Any minor breaches of the regulations resulted in a mild 'ticking off' which spurred the offender to mend his ways and so avoid any chance of a licence suspension. Note the word 'suspension', *not* 'cancellation'. Cancellation was and is an extreme measure only applied rarely and in the most serious cases.

Inspection procedures

Let us suppose that, rightly or wrongly, you are suspected of a licence breach or misdemeanour and are to get a visit from the boys in the yellow van. Where do you stand? An examination of your amateur licence will lead you to Section 10. Here it is stated clearly that *'the station, this licence and the log shall be available for inspection at all reasonable times by a person acting under the authority of the Secretary of State'*. The term 'reasonable times' does not imply a knock at the door in the middle of the night and it is usual for the organiser of the visit to telephone beforehand to arrange a time and date mutually agreeable.

Unfortunately this does not always happen, and I learned of an instance last winter when the Inspecting Officer, without warning, called on the XYL of an amateur during the afternoon when he was away at work. He told the lady that he and his companion would be round sharp at 6.00pm that same day to conduct the station inspection. You can no doubt visualise the distress which this caused the lady, who phoned her OM right away at his place of work. This amateur had every right to refuse entry to the officer when he arrived that evening, for it was, so far as he was concerned, not a *'reasonable time'*.

The upset and natural stress brought on by even the prospect of an unforeseen visit meant that he was not in a suitable frame of mind to exercise his right to change the time and date of the appointment.

By the way, if a Warrant to enter premises is needed this must be signed by a Magistrate who has first heard or seen documentary evidence that an offence has taken place or that the evidence, although not conclusive, points strongly to the fact that such an offence has happened.

Did you notice on the licence that Section 10 specifically states that the inspection should be done by 'a person'? This does not mean that a posse of inspectors or even two or three should necessarily attend, and an amateur is quite within his rights to insist that only a single officer enters his house to carry out the inspection. In a one-to-one situation the amateur will feel much more comfortable and will know that an inadvertent word, admission or careless phrase may then later be refuted.

Inspecting officers often carry hidden mini-tape recorders so it is always as well to keep this in mind and to say as little as possible. Much better, insist that a friend or preferably a fellow amateur is present with you in the shack during the whole of the visit. If *you* have a tape recorder, run it openly during the proceedings.

I am not trying to depict the inspecting officers as ogres but it takes all sorts to make a world. The chaps on the Radio Interference Section are there to help us and regulate operation on our precious amateur bands. They work long unsocial hours and often have to tolerate abuse from TV licence dodgers. Without the Service, anarchy would soon descend and we would all suffer.

Your rights

If you really have been naughty and have broken an important section of the Telegraphy Act (perhaps unwittingly), make sure that you obtain the services of a solicitor before you make any statements either verbally, or in writing. It is only necessary to state your name, address, age and occupation until represented. It has been said that if everyone arrested followed this simple line more than half the prosecutions brought at present would have to be dropped at an early stage. I am not encouraging lawlessness – just stating the rights of the individual.

By the way, all owners of multi-channel VHF/UHF scanner receivers are breaking the Law. The *new* Act says that listening to things one should not on the airwaves is an offence just as it was before, but now it is an offence to have equipment capable of tuning to the 'guarded' frequencies. Proof of use is not necessary to convict. Indeed, our land is teeming with criminals!

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Squelch	all modes	FM only
Memory Channels	11	10

FEATURES	FT 726R	TS780
Limited Band Scan	yes	yes
Mode Memory	yes	no
Memory Backup	lithium	AA cell
Rx Tone Control	yes	no
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RESISTANCE MEASUREMENTS

Gerard P Stancey G3MCK, BSc, with some simple ways of checking resistances when meter accuracy is insufficient, and a method for determining the internal resistance of a milliammeter.

The resistance measuring facilities of the average multimeter often leave much to be desired in that the value of resistance you want is often somewhere in the cramped first 10% of the scale. This article describes two techniques that can easily be applied in the normal ham shack and give reasonable results. With both techniques it is helpful but not essential if one has a rough idea of the value of the unknown resistor.

Potentiometer technique

With this technique one simply puts the unknown resistor (Rx) in series with a known resistance (Rk) and measures the voltage drop across each resistor *(Figure 1)*. Then by Ohm's Law:

$$\frac{Rx}{Rk} = \frac{Vx}{Vk}$$

Hence Rx can be calculated.

One or two comments are in order to ensure optimum results. Firstly, the accuracy of the result will depend on the accuracy of measuring Vx and Vk and the accuracy with which Rk is known. The author has a few 'standard' resistors which are kept just for this purpose. Their values were measured by a friend who had access to good quality measuring equipment. Failing that, it is not too expensive to purchase a few 1% tolerance resistors for this use.

The most accurate results will be obtained when Vx = Vk. When this is achieved the resistance of the voltmeter compared with the resistances of Rx and Rk is unimportant. However, if Vx is not approximately equal to Vk, it becomes increasingly important that the resistance of the voltmeter should be much greater than Rx or Rk.

The applied voltage, ie Vx + Vk, should be chosen with due regard to the values of the resistors, their wattages, your voltmeter, and safety. Apart from those considerations it is unimportant.

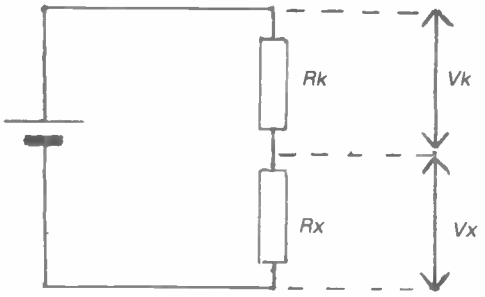

Figure 1 *Potentiometer method for measuring resistance*

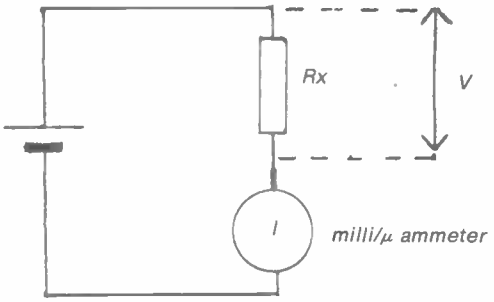

Figure 2 *Direct method for measuring resistance*

Calculation by Ohm's law

This method *(Figure 2)* is exactly what it says:

$$Rx = \frac{V \text{ volts}}{I \text{ amps}}$$

It is particularly useful for measuring high values of resistance as, with due regard for the wattage of the unknown resistor, the applied voltage V can be made large. This will ensure a reasonable current flows through the circuit.

Both these methods are simple but do take a little more time than just putting the unknown resistor across an ohmmeter. They provide practical ways of accurately measuring those odd value resistors which do not conveniently register on the normal ohmmeters. With care the techniques can be used for in situ measurements, if the applied voltages are floated, ie not earthed.

Milliammeters

It can also be useful to be able to determine the internal resistance of a milliameter. Standard handbooks show a method for finding this out which requires the use of two variable resistances, a battery, and an ohmmeter. The following method only requires two fixed resistors and a battery.

The first stage is to set up the circuit shown in *Figure 3* and choose a suitable value for Rs such that the meter whose internal resistance is being measured reads close to full scale deflection. From the standpoint of accuracy it is desirable that the meter should read as near full scale deflection as possible, but it is not essential that this condition is met. Record the reading on the meter, I.

Now place across the meter terminals a resistance (Rp) and record the new

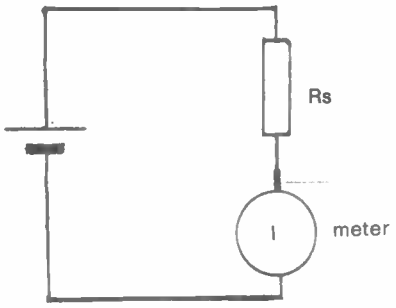

Figure 3 *Measurement of current in circuit*

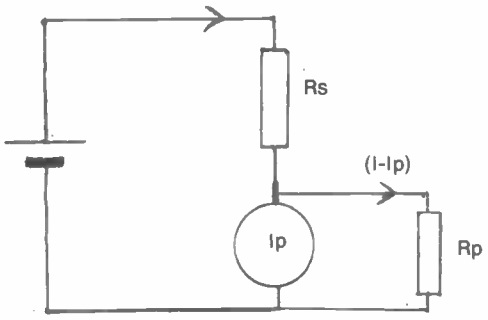

Figure 4 *Measurement of current through shunt resistor*

reading on the meter, Ip *(Figure 4)*. Again for optimum accuracy it is desirable that this parallel resistor should be of such a value that the reading on the meter falls to about half its original value. However, it is not essential that this condition is met. Some degree of trial and error may be necessary to find a resistor of a suitable value.

The internal resistance of the meter is given by the following formula:

$$Rint = \frac{Rp(I-Ip)}{Ip}$$

Note that the value of the series resistor and the applied voltage do not appear in this formula.

Apart from the measurements I and Ip, the accuracy of the result depends upon the accuracy with which Rp is known. The glib suggestion for Rp is to look in the junk box and try suitable 5% tolerance resistors. But what happens if you don't have a junk box? The answer is to go and buy a selection of 5% resistors and use them. That is the way that junk boxes start!

The internal resistance of meters varies with their make, etc but as a first try if you assume a 1mA meter has an internal resistance of 50ohms, 50μa are 1000ohms, and pro rata for intermediate values of current, you will have something reasonable to start from. Also don't forget that if you do have to buy a few 'standard' resistors, that by series/parallel combinations you can produce a great number of different resistances from say four resistors.

Two caveats need to be made:

(i) This method assumes that the scale is linear.

(ii) Rs≥Rint, ie the same current flows through the circuit whether or not Rp is connected. This condition is easy to ensure.

CQ WORLDWIDE CONTESTS

... an introduction to the 1984 event

by Nigel Cawthorne G3TXF

At 0000 GMT on Saturday morning October 27th 1984, the phone sections of the HF amateur bands will burst into life with the first 'CQ Contest' calls of the 1984 CQ Worldwide SSB Contest. For 48 hours on six HF bands there will be a level of amateur contest activity that is seen only once a year.

The CQ Worldwide Contests, one on SSB and the other on CW, are the largest international contests in the HF radio amateur's contest calendar.

Worldwide participation

A look at the results of the 1982 SSB event shows that a total of nearly 2,500 logs from 127 different countries were received by the organisers. The corresponding CW event held one month later attracted around 2,200 logs from no less than 108 countries. With the high level of participation in the CW section, who can seriously argue that CW is a dying art?

The total number of different stations active during some part of the contests is probably at least four to five times the numbers of logs received. If so, this would represent something like 20,000 radio amateurs worldwide!

The CQ Worldwide Contests are held annually on the last full weekends of October (SSB) and November (CW). Both contests run for 48 hours from 0000 GMT on the Saturday to 2400 GMT on the Sunday. The dates for this year's events are: October 27-28th (SSB) and November 24-25th (CW).

Taking part is easy

All licenced HF amateurs worldwide are invited to take part in the CQ Worldwide Contests. The objective of the contest as defined by the organisers, the American Magazine *'CQ'*, is for amateurs around the world to contact other amateurs in as many zones and countries as possible. This translates broadly into making as many QSOs on the HF bands as you can during the set periods of the contests!

Taking part in the CQ WW Contests does not have to be full-time. There is no need to try and operate the whole 48 hours! Only multi-operator stations and one or two hardened (insomniac) contest operators will attempt to be on the air the whole length of the contest. A few hours operating at the better times of propagation will provide many interesting contacts. There is no need to devote the whole weekend to get a lot of fun out of the CQ WW Contests.

Entering

For the single-operator station there are three categories of entry. The two main categories are single-operator all band where you work as much as you can on all bands, and single-operator single band, where you can concentrate on just one band. For many UK operators this latter category is very attractive for a number of reasons.

Single-operator, single band entries often allow the operator some time off during the Contest without having to miss many contacts. For instance a single band entry on either of the two highest bands, 21MHz or 28MHz, will allow the operator to sleep peacefully all night, safe in the knowledge that the band is dead and that no contacts are being missed. Similarly, a single band entry on either 1.8MHz or 3.5MHz allows time off during the daylight hours.

Competing seriously with a single band entry on 7MHz or 14MHz requires more of a full 24 hour per day effort, as these bands may be open to somewhere throughout the contest.

For the UK operator a further attraction of the single band entry is often the use of a single band antenna. With limited space a competitive antenna system can more often be constructed for just one band rather than all bands together. Many contesters put up special single band antennae just for the CQ WW Contest weekends, sure in the knowledge that there will be a lot of interesting DX to work on whatever band has been chosen.

QRP

The third single-operator category, and one that has been growing steadily in popularity since it was first introduced in 1978, is the QRPp category. Entries have increased fourfold. QRPp is defined for the CQ WW Contests as not exceeding 5 watts output. Stations in this category compete only with other QRPp stations for awards. Major contests offer the QRPer a good opportunity for working some significant DX. The artful QRPer can pick up many valuable contacts during a major contest in among all the QRO stations!

The major contests bring rare countries on the air in the form of contest DXpeditions. Countries that at other times of the year may be inactive or somewhat difficult to work regularly show up in the CQ WW Contests.

For the newer HF operator this burst of DX activity during the CQ WW Contests makes it easy to work a number of new countries. Many stations, both newcomers and old-time DXers, use the CQ WW Contests as an opportunity to 'trawl' the bands just looking for the odd new one.

The Caribbean islands, which may at other times be a little difficult to work (especially on the lower bands), are often activated by major multi-operator US contest DXpeditions. Anguilla (VP2E), St Kitts (VP2K), Montserrat (VP2M), Curacao (PJ2) and Trinidad (9Y4) show up regularly in the CQ WW Contests with DXpedition activity. Other rarer parts of the world such as some of the Pacific islands may also show up and be relatively easy to work in the CQ WW Contests thanks to contest DXpeditions.

With the CQ WW Contests running on all six HF bands, the special contest DXpeditions are likely to put in an appearance on the LF bands as well. Many new 3.5MHz and 1.8MHz countries have been worked by UK DXers during CQ WW Contests.

In recent years there have also been major contest expeditions to some of the rarer Russian countries by USSR

amateurs, using special contest calls like EW6V, RG6G or U0Y.

Contest operating

If you are used to a relaxed style of operating that involves exchange of names, QTHs, details of the rig and the weather, you will find contest operating somewhat different!

As in all contests, there is a basic form of contest exchange in the CQ WW Contests which is all that is needed for the contest 'QSO'.

The CQ WW Contest exchange is an RST signal report followed by the CQ Zone number. The world is divided into 40 'CQ Zones'. The UK is in CQ Zone 14. A typical CQ WW Contest report given by a UK station would be 5914 on SSB or 59914 on CW.

Contest logging

The details that need to be logged for a contest QSO are similar to those for the normal station log, but with some additional detail of the contest exchange: date, time (GMT), band (MHz), station worked, report and zone sent (eg 5914) and report and zone received (eg 5908).

CQ Magazine produces a sample logsheet and a CQ Worldwide Contest coversheet.

The logsheets have columns for zone and country multipliers as well as for QSO points. They are ruled for 40 QSOs per page.

The writer has a small supply of these logsheets and coversheets and would be pleased to supply a sample quantity in exchange for a stamped SAE to G3TXF (QTHr).

Scoring your contest log is straightforward. There are three levels of QSO points. A QSO with one's own country does not count for any points (but it may count for a multiplier). UK stations should note that QSOs between G and say GM are between different 'countries' and therefore do count for points, but a QSO between two G stations does not.

Points

QSOs between stations in the same continent, but not in the same country, count for one point. QSOs between stations in different continents count for three points.

The writer finds it useful to rule the 'QSO points' column on the log-sheet into three narrower columns, one for each of the three different types of QSO points. This simplifies the adding up of page totals.

The QSO points system is the same for all bands from 1.8MHz to 28MHz. For a UK station, a contest QSO with a European station is worth 1 point, whereas with a non-European it is worth 3 points. Remember that some Russian stations are in Europe (1 point) and that others are in Asia (3 points). UP1BZZ in UP2 Lithuania is 1 point, but UZ9FWA in UA9 Asiatic Russia is 3 points.

The same station may only be worked once for points during the contest on each band.

If you work a number of stations, particularly if you have a reasonable HF signal and other stations are calling you in strings (pile-ups), then you will soon realise that one of the hazards of contest operating is the 'duplicate QSO'.

Duplicate contacts must be clearly shown as such in the log and there must not be any claimed QSO points against them.

A thorough cross-check of each band log should be made after the contest to eliminate, preferably with a thick red line and a zero in the points-column, all the duplicate contacts.

Typically, up to about 5% of QSOs made in a CQ WW Contest might be duplicates and have to be shown as such in the log.

Giving your callsign frequently and clearly will go some way to reducing the number of duplicate contacts from stations calling you. In the other direction you should keep a duplicate checksheet for each band so that you avoid calling stations that you have already worked.

Time wasting

Duplicate QSOs, inevitable though they are, waste everybody's time and should be clearly identified as such in the log. Excessive duplicates can lead to disqualification of your entry.

CQ Worldwide Contest zone and country multiplier checklist. Included are the countries most likely to be worked from the UK during the Contests. Spaces have been left to fill in other countries as they are worked.

CQ Zone	1.8	3.5	7	14	21	28
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
Europe						
CT1						
CT2						
DL						
EA						
EA6						
EI						
F						
FC						
G						

Europe	1.8	3.5	7	14	21	28
GD						
GI						
GJ						
GM						
(GM Shet)						
GU						
GW						
HA						
HB9						
I						
IS0						
(IT9)						
JW						
(JW Bear)						
JX						
LA						
LZ						
OE						
OH						
OH0						
OK						
ON						
OZ						
PA						
SM						
SP						
SV						
TF						
UA eur						
UA2						
UB5						
UC2						
(UN1)						
UO5						
UP2						
UQ2						
UR2						
Y2						
YO						
YU						
ZB2						
1A0						
4U1ITU						
(4U1VIC)						
9H1						
Asia						
A4						
HL						
HZ						
JA						
JT						
UA asia						

America	1.8	3.5	7	14	21	28
C6						
CE						
CP						
CX						
FG7						
FM7						
FS7						
HH						
HI						
HK						
HP						
HR						
KL7						
KP4						
KV4						
LU						
PJ2						
PJ7						
PY						
PZ						
TG						
TI						
V3						
VE						
VP2E						
VP2K						
VP2M						
VP2V						
VP5						
VP9						
W						
XE						
YV						
ZF						
ZP						
8P6						
9Y4						

Asia	1.8	3.5	7	14	21	28
UD6						
UF6						
UG6						
UH8						
UI8						
UJ8						
UL7						
UM8						
4X						
5B4						
9K2						

Africa	1.8	3.5	7	14	21	28
CN8						
CT3						
D44						
D68						
EA8						
EA9						
FR7						
J28						
TR8						
TU2						
Z2						
ZD7						
ZD8						
ZS						
ZS3						
3V8						
5N						
5T5						
5Z4						
6W8						
7X						

Oceania	1.8	3.5	7	14	21	28
DU						
KH6						
P29						
VK						
YB						
ZL						

The bands used during the CQ Worldwide Contests are all six major HF bands (ie 1.8, 3.5, 7, 14, 21 and 28MHz). The new WARC bands of 10, 18 and 24MHz are not used for contest operating. The date of the CQ WW SSB Contest coincides very closely with the peak of conditions expected each year in late Autumn.

This year, even with the sunspot activity declining, there should still be some activity on 21 and 28MHz, although there are unlikely to be the enormous openings to the USA that have been a feature of these contests over the past few years. There will probably be plenty of DX contacts from the Caribbean, South America and Africa on these higher bands. As we descend further down the sunspot cycle these two HF bands will become used more as sources of the occasional multiplier QSOs, rather than as bands where huge numbers of QSOs with Ws and JAs can be achieved, as is the case at the sunspot *maximum*.

Both 7 and 14MHz will be major carriers of contest activity. the former will be open to somewhere or other for 24 hours a day. 14MHz will be closed during the night to all in the UK except perhaps those with large monobander arrays.

The hours of darkness will provide intense contest activity on both 1.8 and 3.5MHz. The number of countries allowed to use 1.8MHz increases every year, and the CQ WW Contests can be relied upon to produce a mouth-watering array of exotic calls on 1.8MHz.

The multiplier

There are two types of multiplier in use in the CQ WW Contests. Firstly there is the CQ Zone. For multi-band entries a multiplier point is earned for each zone contacted on each different band. A multiplier point is also earned for each country worked on each different band. For the purposes of the CQ WW Contests a 'country' is defined as the DXCC country list and the WAE country list. In practice this means that there are now five 'countries' in addition to the normal DXCC countries. Those are the countries that are on the WAE list, but not on the DXCC list: GM-Shetlands, IT9-Sicily, JW-Bear Island, UN1-Karelia and the recently added WAE country of 4U1-UN Vienna, using the callsign 4U1VIC.

To illustrate how your first contest QSO will be a 'double' multiplier, assume that your first QSO is W3LPL on 7MHz. It will count as your 'W' DXCC multiplier as well as your CQ Zone multiplier '05' on 7MHz. The report that you received from W3LPL on CW will probably have been 59905, indicating that he is in CQ Zone 05.

Working out your score

The final score is the result of the total QSO points multiplied by the sum of your zone and country multipliers. The table illustrates how the final score is calculated. Make a careful check of your multipliers claimed.

It would be a pity to miss out any multipliers from your score, as they make a significant difference to the final figure. Remember that the USSR consists of nineteen 'countries' for multiplier scoring in the CQ WW Contests and spreads into about seven different CQ Zones!

Band MHz	QSOs*	Zone Multiplier		Country Multiplier		QSO points		Band Score	
1.8			+		x		=		1.8
3.5			+		x		=		3.5
7			+		x		=		7
14			+		x		=		14
21			+		x		=		21
28			+		x		=		28
Totals			+		x		=		All Bands

* QSO totals must exclude all duplicate contacts on the same band.

Single Band Entries : Multiply the QSO Points total for the Single Band by the sum of the Zone and Country Multipliers for the Single Band.

All Band Entries : Multiply the QSO Points total for All Bands by the sum of the Zone and Country Multipliers for All Bands.

Calculation of the final score. Total up the zone and country multipliers. Multiply this total multiplier (Z+C) figure by the total QSO points to arrive at the claimed score

Your entry consists of your contest log sheets (or copies of them) and a coversheet. The coversheet summarises all the scoring information, category of competition (eg Single-Operator on a Single Band, Single-Operator on all Bands, QRPs, Multi-Operator Single-Transmitter or Multi-Operator Multi-Transmitter), contestant's name, callsign and address as well as a signed declaration that all the contest rules and regulations for amateur radio in the country of operation have been observed.

Your entry should be postmarked no later than 1st December, 1984 for the SSB section and January 15th, 1985 for the CW section and posted to: *CQ Magazine,* 76 North Broadway, Hicksville, NY 11801, USA.

The results

The adjudication of a major international contest of this size takes several months of work including, one imagines, the burning of a lot of midnight oil by the adjudicators in the USA. The full worldwide results are published in *CQ Magazine,* and the UK results appear in Radio Communication about one year later.

All logs submitted appear in the results, no matter what the score is. The number of entries from the UK is usually low in comparison with some other European countries. This means that UK entrants have a relatively greater chance of winning a certificate. Some of the single band categories might have only one or two entrants from the UK.

Each year a large number of award certificates are issued to entrants in the CQ WW Contests. For UK operators there are certificates for the top scoring station in each of the operating categories (SOSB, SOMB, MOST, MOMT and QRP). Within the SOSB category there are awards for the top scoring station on each band. Awards are issued on a country basis, and thus in the UK with there being 8 CQ WW 'countries' (G, GD, GI, GJ, GM, GM-Shetland, GU, and GW), there is no shortage of possible certificates to be won by UK participants!

Awards

It should be noted that to be eligible for an award, a single operator station must show a minimum of 12 hours operation. Multi-operator stations must operate a minimum of 24 hours. A singleband log is eligible for a singleband award only. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

For the major competitors there is also an impressive array of cups, trophies and plaques to be won. However, it should be emphasised that the vast majority of participants in the CQ WW Contests take part for the fun of the operating, making a few QSOs on the HF bands with the possibility of working a few new countries on the various bands.

To the newer HF operator a major worldwide contest provides the opporunity to work a lot of new and exciting DX. A big signal is not necessary to be able to work many of the contest DXpeditions that come on specially for the CQ WW Contests. They will be listening hard to everything they can hear on the frequency, so even if you are limited to a simple HF antenna installation and reatively low power there will still be plenty of DX to work.

Most stations taking part in the amateur radio HF contests are not out to win anything, but are there to have an enjoyable time working stations, testing out their equipment and seeing how far they can get out. The CQ Worldwide Contests being the biggest contests of the year, offer the best oppportunity for doing just that. CU in there!

News from Glen Ross G8MWR

Get away special

The next shuttle gets away on 1st October and will carry an experiment of amateur radio interest. This is known as 'Project Explorer', and has been built by the Marshall Amateur Radio Club to use NASA's 'Get away special'. This is a system of flying small self-cointained payloads for experimental purposes.

The project will provide amateurs with data on the state of the satellite and will be sent using a 'Digitalker' type system. The data will be sent via two paths, one on 435.033MHz using narrow band FM and the other via Oscar 10. This will also use FM and the frequency is 145.972MHz. All information will be sent direct from the cargo bay of the Orbiter shuttle and will use the callsign WA4NZD.

Fairly simple equipment used with aerials of about 10dB gain should get a good signal on the 70cm system but your guess is as good as mine as to what you will need to receive FM via Oscar 10.

The transmissions will be in three cycles of eight hours each, and the data will be sent as a 30 second segment, which will be repeated every four minutes.

All times are given reference the blast-off time, which at present is scheduled for 1100GMT. The first period will commence 1 day 10 hours into the mission, the second at 2 days 9 hours and 30 minutes and the third at 3 days 9 hours and 45 minutes. The experiment will be switched off at 7 days into the mission.

The latest orbital information will be available from the Space Flight Centre ARC on 14.28 and 21.365MHz. The RSGB will be carrying special news broadcasts as will W1AW and the various AMSAT nets. Another source of information will be via Oscar 10 on the Special Services channel of 145.963MHz (H2). If you want to decode the data send for information to ARRL, 225 Main St, Newington, CT 06111. Reception reports should be sent to MARC, CM21X, Marshall Space Flight Centre, Huntsville, AL 35812. Both these addresses are of course in the USA.

Super DX

Just to keep you on your toes, here is the latest news on some of the current long distance records. The man doing most of the work these days seems to be EA8XS, who is located in SO73D square. On the 5th July he made a contact on 432MHz with GW8VHI over a distance of 2803Km. On the same day he worked EA7BVD in XY64D on 2.3GHz for a record distance of 1486Km, and he also holds the 144MHz tropo record with a contact with GD8EXI of 3025Km, this being set in September 1981.

A new 1296MHz record was set on 24th June when N6CA contacted KH6HME over a distance of 3977Km. You will perhaps be surprised to see that this exceeds the 144 record by nearly 1000Km, but it shows once more that the higher bands can give results that are even better than those obtained on two metres. The 10GHz record is now approaching 2000Km and on 24GHz 250Km has been broken. Time you started to think about moving up in frequency?

Moonbounce

This is really the ultimate in long distance communication and normally you need some pretty special equipment to indulge in the activcity. The ARRL run a couple of contest weekends each year, and the next of these is on the weekend of October 20th and 21st. There are some very high power stations, in terms of ERP, involved in these contests and anyone with a decent pre-amp and an eight element beam stands at least a chance of hearing some of the action. Be prepared to spend some considerable time monitoring the bottom 10KHz of both two and seventy for the signals and do not expect S9 stuff. Your chances are better on CW but there is usually some SSB around.

If you have a choice of filter available use the narrowest you can get away with. If you are stuck with no choice then an external audio filter is very useful. Remember that reducing the passband from 3KHz to 300Hz will provide an improvement in signal-to-noise ratio of 10dB. If you are using a beam which you cannot tilt then you will only be able to operate when the Moon is 'on the beam' (sounds familiar!). If you have a spare beam available it is worth rigging it up so that you can tilt it. The beam can be practically at ground level, so the clothes post is a good start for a temporary support. We must stress that unless you know what you are doing please only listen, *do not transmit;* you could ruin a contact that someone has waited months for.

How conventional

The Midlands VHF Convention takes place on 13th October. Despite its name this convention covers everything from 144 up and beyond and is an event not to be missed by anyone within travelling distance of Stone in Staffordshire. There is easy access from the M6, plenty of car parking and of course the usual talk-in facilities. As well as the opportunity to meet many like-minded souls, there will also be a selection of talks on various aspects of VHF and up and the day usually ends with an open forum, where you can ask all sorts of awkward questions which will, hopefully, be answered by a panel of experts. You can also make your views on various aspects of the hobby known.

There is usually a large assortment of test gear available covering up to 10GHz and beyond to enable you to check your own equipment. There are also a few specialist trade stands but in no way is this a rally (posh name for 'Sunday Market'). They even have decent catering and lounge facilities. See you there?

Workshop

The Droitwich club played host to the Microwave Society and provided excellent facilities for a microwave workshop. This was intended to assist as many newcomers as possible to set up gear on 10GHz. Several established operators were there to assist and a good array of test gear was available. About forty people attended the evening and as most of them brought gear wih them, life was hectic for a while! The event ended with a demonstration of 10GHz SSB. The workshop was so well attended that the Droitwich club are making it an annual event. The Microwave Society intend to run these workshops at various venues and would be interested to hear from any clubs who would like to act as hosts.

Class B Morse?

The new schedule has recently been published and it contains a couple of interesting points. Firstly, Morse is prohibited to class B operators as was expected, however, RTTY is allowed and the footnotes state that RTTY shall be sent using the normal international codes *or* 'Morse code intended for automatic decoding'. Now, you may *intend* that what you send is to be automatically decoded but you have no real control over the operator at the other end of the link, and if he decodes it by simply listening to what comes out of the speaker you can hardly be held responsible for that!

This is really going to produce a prize puzzle. You can claim that you are sending an authorised form of RTTY and the powers that be will probably claim that you are sending CW. Who is right?

To add even more confusion, it appears from the footnotes that you *must* take hard copy of RTTY and data transmissions. This means that decoding RTTY on to a VDU would be illegal unless you also take a copy on a printer. How many computerised RTTY men have a printer? BARTG are already looking into this one and it will be interesting to see what answers they come up with.

When one considers the time that has been taken to produce the new schedule

(starting from the fiasco schedule a few years ago), it would seem reasonable to expect that the new one would not contain bugs or ambiguous statements. Can someone please produce a schedule that we can understand? Perhaps if they issued separate schedules for class A and B, instead of making one paper do both jobs, we could get rid of all those footnotes and *'thou shalt not, except if, and only if, you are left handed and it is the first Wednesday in the month'* rubbish.

Hi-fi linears?

That demon of the test gear and specifications, our good friend Angus, G3OSS, has on many occasions slated various pieces of equipment for not being as hi-fi and linear as they might be, particularly when overdriven. Judging by some of the awful signals to be heard around the bands it seems that very few people understand what he is saying, or they prefer to ignore it. For the benefit of newcomers to the bands, and some who should know better, let us spell it out.

If you try and push the last ounce out of your linear you are going to go into the non-linear region and when you do, your signal is going to sound very *lo-fi* and will spread around the band, causing discomfort to all and sundry. Also, because your signal is now distorted, it will be harder to read at a distance, so defeating the object of screaming into the mike.

A lot of the problem arises because people check the output of the linear by using FM and then reading the power on the SWR bridge. They then switch to SSB and try to talk up the power to the same level, endeavouring to keep the needle as high as possible. *This just will not do!*

The problem is that the meter cannot respond fast enough to read the speech peaks so it tends to show the average power. Although it is difficult to be specific, because meters vary, it is a good rule of thumb to talk up to only half the reading shown on FM, which should ensure a fairly clean signal. As an indication of just how low the meter reads on *average*, rather than *peak* modulation, try whistling into the microphone, or call the infamous 'ah-loooow' (but please do it into a dummy load) and adjust the mike again for maximum output reading. Now try normal speech and see how low the meter reads, and yet the peak power is still the same. Most manufacturers compound the problem by quoting a unit as a 100 watt linear when really the last 20 watts or so is far from linear.

See Angus' charts on input versus output for several of the units he has tested. Don't keep that needle hitting the end stop on speech. You are *not* increasing your chances of working that distant station, but you are making a damned nuisance of yourself for miles around. Lastly, if you hear someone with a lousy signal then *tell them about it*, or they will continue in blissful ignorance and you will suffer the splatter.

Top band

In our case, this of course refers to 50MHz. The news is that the RSGB beacon at Potters Bar is now in regular service on a frequency of 50.05MHz. It runs 15 watts ERP from crossed dipoles and is on 24 hours a day. The callsign is GB3NHQ and the society welcomes reports on reception. The bad news is that there is still no news of the extra permits, and at the time of writing the authorities say they are still waiting for applications to be received from the RSGB. Just how long does it take to sort out sixty pieces of paper?

That brings us to the end of space. There always seems to be more news to try and fit in and more letters to comment on. Contests coming up include the 432 and 1296 cumulatives and the special Microwave Society 10GHz one on October 7th. How about taking a crack at the Moonbounce one, since it could be your best DX ever at a round trip of some half a million miles. 50MHz to 24GHz, terrestial to satellite to moonbounce, local contacts to new DX records; not bad for one month's activities. News as always to me at 81 Ringwood Highway, Coventry.

BACK TO BASICS

Bill Mantovani introduces a new series for newcomers to the hobby and those wishing to pass the RAE, by asking:

WHAT IS AMATEUR RADIO?

It's funny how the times do not always change in a logical manner. For instance, it is probably true to say that some ten or fifteen years ago, if you asked the average man (or woman) in the street if they knew of amateur radio, their answer would probably be 'yes', even though their knowledge of a radio 'ham' was probably still confined to the infamous Tony Hancock sketch with which we are all familiar – or are we?

Today, it is the term CB that has become a household name, mainly due to the widespread availability of CB sets at low prices since the bottom dropped out of the market after the initial euphoria (and press coverage) had died away.

The press, however, still seem ready to dub anyone connected with radio a 'ham', which at times has led to some bad publicity for the hobby of amateur radio. Despite this, there has never been less of an understanding of what amateur radio means amongst the general public than exists today. One would think that as our technological age progressed, home computers became the accepted norm and two way radio communication became more evident in the public eye, people would become more aware of amateur radio, as they have with some other hobbies, but that just doesn't seem to have happened.

Why?

And what has brought about that conclusion? Well, ask anyone who is conducting, or sitting, an RAE course the reasons why candidates have enrolled and one of the most popular answers will be 'to see what this amateur radio business is all about'. As this article is aimed primarily at the newcomer to our hobby, it is perhaps best at this point to explain the relevance of that answer.

Those who have been in amateur radio a long time will have seen many changes take place, but none more so than in the route to the sitting of the RAE and achieving that precious callsign. The accepted path as recently as five or six years ago was for the prospective amateur to become an SWL (a short wave listener).

By becoming interested in this manner, a form of apprenticeship was undertaken and knowledge about the world of amateur radio was gained by listening on the air, becoming a member of the RSGB (the Radio Society of Great Britain) and generally getting into the hobby. One took the RAE course not to find out what amateur radio was about, but because you knew what it was about and wanted to try for an RAE certificate.

Many who enrol today have never heard of the RSGB, or for that matter of *Amateur Radio*. A recent survey by the magazine showed that many newer readers wanted amateur radio explained to them, something that may seem all too obvious to those that are a part of it but not so to even many CBers who, after all, are just beginning to scratch the surface of what has become a fascinating and interesting hobby for thousands of people.

Whilst the SWL route to becoming a licensed amateur may have faded into the background, it is fair to say that a great many future 'hams' have got to hear of the hobby through CB. That seems to be the new route because CBers now make up a great proportion of RAE classes.

Upsurge

The introduction of CB into this country, legally and illegally, did more to promote an upsurge of interest in amateur radio than anything else in recent times. Also, the use of illegal CB equipment, ie burners, SSB rigs etc, is probably what brought to the attention of some the fact that there is more to radio than just nattering with one's friend down the road.

DX on CB is often difficult, if not impossible, considering the crowded conditions, and it is by resorting to illegal

equipment that many breakers have broadened their horizons, so to speak, and managed to work DX. To them we say 'come on in', you already have some knowledge of radio and its operating techniques so why not do it properly and eventually obtain an amateur transmitting licence.

The amateur licence

Unlike CB you cannot go to the nearest Post Office and buy an amateur transmitting licence. You need to pass the Radio Amateurs Examination (RAE) set by the City & Guilds of London Institute and courses for which are held each year at many colleges.

It has been said that some people are frightened off by the idea of taking an exam, especially a techical one, but really it isn't too difficult. In fact, when the RAE exam was changed to a multiple choice format, that is where one simply has to tick the correct answer from the four possible ones given, a great deal of controversy arose because some said it was too easy.

In the UK there are two types of amateur licence, A and B. The latter you can obtain after passing the RAE without any further test, but it does not authorise use on frequencies below 144MHz nor the use of Morse. The A licence does, but to obtain this a Morse test must also be taken to ensure that the prospective licensee is proficient at sending and receiving Morse at a set speed (twelve words per minute).

Further details about the licence differences, and why one should wish to go for the A licence, will be dealt with in a later issue, but it is worth pointing out that one cannot really work the sort of DX (long distance contacts) on a B licence that you can on an A.

So, if you fancy talking to people on the other side of the world – just one of the fascinations of our hobby – then one day you'll just have to sit down and learn Morse!

How to obtain an amateur licence

There are many colleges that hold RAE courses and the exams take place three times a year. Examination dates for 1984/85 are 3 December, and 18 March and 13 May, 1985.

It is possible to study for the RAE without going to evening classes but you will have to arrange to sit the exam at an appropriate college.

Many radio magazines have published RAE articles in the past, but most assumed a basic knowledge of electronics, which many readers did not have.

Over the next few months this series of articles will be *'Amateur Radio's'* RAE course and will be aimed at the real newcomer. Rather than frighten you away by all the technical jargon we hope to encourage your interest in the hobby – so that you eventually take the exam. We are sure, too, that it will help many who thought they understood it first time round but who now realise they didn't!

RSGB

Certain topics will be covered in more detail than others, with difficult subjects presented in easy-to-understand terms. As with any RAE course the basis for study will be the RSGB publication *The Radio Amateur's Examination Manual* which is available from the RSGB at Alma House, Cranbourne Road, Potters Bar, Herts EN6 3JW.

The idea is that you can read through the book at your leisure, while the articles will try to help you through it by explaining the bits we think you may not understand.

Whilst you are about it, why not drop the RSGB a line at the above address. They can supply you with lots of information about becoming a radio amateur which in itself may give you more incentive to carry on with us over the next few issues and hopefully, one day, become a licenced amateur. You will then be one of the many thousands of people all over the world who share a common interest in radio communications, *and* you will be able to talk to them as well!

See you next month.

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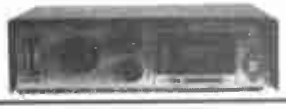

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AN240P	2.50	MC1495	3.00	TA7137P	1.00	TBA820Q	1.45	TDA2600	5.50
AN264	2.50	MC1496	1.25	TA7146	3.95	TBA890	2.50	TDA2610	2.50
AN612	2.15	MC145106P		TA7176AP	2.95	TBA920	1.65	TDA2611A	1.95
AN362L	2.50		7.95	TA7193P	3.96	TBA950/2X		TDA2640	2.60
AN7140	3.50	MC1723	0.50	TA7203	2.95		2.35	TDA2680A	2.75
AN7145	3.50	MC3357	2.75	TA7204P	2.15	TBA970	2.95	TDA2690	2.45
AN7145M	3.95	MC3401L	2.50	TA7205AP	1.15	TBA990	1.49	TDA3310	3.95
AN7150	2.95	ML231B	1.75	TA7222AP	1.80	TBA990Q	1.49	TDA4600	2.50
BA521	3.35	ML232B	2.50	TA7227P	4.25	TBA1441	2.15	TDA9503	3.15
CA1352E	1.75	MSM5807	8.75	TA7310P	1.80	TCA270	1.10	TDA3560	3.95
CA3086	0.46	PLL02A	5.75	TA7313AP	2.95	TCA270SQ	1.10	TEA1009	1.35
CA3123E	1.95	SAA500A	3.50	TA7314P	2.95	TCA650	2.50	UPC566H	5.50
CA3140T	1.15	SAA1025	7.25	TA7137P	1.00	TCA800	2.95	UPC575C2	
ETT6016	2.50	SAA5010	6.36	TA7314P	2.95	TCA830S	1.95		2.75
HA1339A	2.95	SAS560S	1.75	TA7321P	2.25	TCA900	2.50	UPC1025H	
HA1366W	2.75	SAS570S	1.75	TA7609P	3.15	TCA940	1.65		1.95
HA1377	3.50	SAS580	2.85	TA7611AP	2.95	TDA440	2.20	UPC1028H	
HA1156W	1.50	SL901B	4.85	TAA550	0.25	TDA1001	1.95		1.95
HA1551	2.95	SL917B	6.65	TAA570	1.95	TDA1002A	3.95	UPC1032H	
LA1230	1.15	SL1310	1.80	TAA661B	1.20	TDA1003A	3.95		1.50
LA4102	2.95	SL1327	1.10	TAA700	1.70	TDA1004A	3.25	UPC1156H	
LA4031P	1.95	SL1327Q	1.10	TBA120B	0.95	TDA1006A	2.50		2.75
LA4461	3.95	SN76003N	1.95	TBA120C	1.15	TDA1010	2.15	UPC1158H	
LA4250	2.95	SN76013N	1.95	TBA120T	1.05	TDA1035	2.60		0.75
LA4420	1.95	SN76023N	1.95	TBA120U	1.00	TDA1037	1.95	UPC1167C2	
LA4430	2.50	SN76033N	1.95	TBA231	1.25	TDA1044	2.15		1.15
LA4400	4.15	SN76110N	0.89	TBA395	1.50	TDA1170	1.95	UPC1181H	
LA4422	2.50	SN76115N	1.25	TBA396	0.75	TDA1190	2.15		1.25
LC7120	3.25	SN76131N	1.30	TBA440N	2.55	TDA1270D	3.95	UPC1182H	
LC7130	3.50	SN76226DN		TBA480Q	1.25	TDA1327	1.70		2.95
LLC7131	5.50		2.95	TBA510	2.50	TDA2002	1.95	UPC1185H	
LC7137	5.50	SN76227N	1.05	TBA510Q	2.50	TDA2003	2.95		3.95
LM1011	3.15	SN76533N	1.65	TBA520	1.10	TDA2010	1.95	UPC1191V	1.50
LM324N	0.48	SN76544N	1.95	TBA520Q	1.10	TDA2020	2.95	UPC1350C	
LM380N	0.95	SN76570N	1.00	TBA530	1.10	TDA2030	2.80		2.95
LM383T	2.95	SN76650N	1.15	TBA530Q	1.10	TDA2140	3.95	UPC1353C	
M51513L	2.30	SN76660N	0.90	TBA540	1.25	TDA2151	1.95		2.45
M5155L	2.95	STK014	7.95	TBA540Q	1.35	TDA2160	2.50	UPC1365C	
M51521L	1.50	STK015	7.95	TBA550Q	1.95	TDA2190	2.95		3.95
MB3712	2.00	STK043	9.50	TBA560C	1.45	TDA2521	3.25	UPC2002H	
MB3756	2.50	STK415	7.95	TBA560Q	1.45	TDA2522	1.95		1.95
MC1307P	1.00	STK433	7.95	TBA570	1.00	TDA2523	2.95	555	0.35
MC1310P	1.95	STK435	7.95	TBA641A12		TDA2524	1.95	556	0.42
MC1327	0.95	STK437	7.95		2.50	TDA2530	1.95	723	0.50
MC1327Q	0.95	STK439	7.95	TBA651R	2.50	TDA2532	1.95	741	0.35
MC1330P	1.10	STK461	11.50	TBA720A	2.45	TDA2540	1.25	747	0.50
MC1349P	1.20	TA7061AP	1.50	TBA750Q	2.65	TDA2541	2.15	748	0.35
MC1350P	0.96	TA7108P	1.00	TBA800	0.89	TDA2560	2.15	7808	0.60
						TDA2571	2.95	7805	0.65
								7815	0.65

SEMICONDUCTORS

AAY12	0.25	BC178	0.15	BD237	0.40	BFW92	0.85	TIP30C	0.43
AC126	0.45	BC182	0.10	BD238	0.40	BFX29	0.30	TIP31C	0.42
AC127	0.20	BC182LB	0.10	BD241	0.40	BFX84	0.26	TIP32C	0.42
AC128	0.28	BC183	0.10	BD242	0.50	BFX85	0.32	TIP33B	0.75
AC128K	0.32	BC183L	0.09	BD246	0.60	BFX86	0.30	TIP34B	0.75
AC141	0.28	BC184LB	0.09	BD376	0.32	BFX88	0.25	TIP41A	0.48
AC141K	0.34	BC204	0.10	BD410	0.55	BFY50	0.21	TIP41C	0.45
AC142K	0.30	BC207B	0.13	BD434	0.55	BFY51	0.21	TIP42C	0.47
AC176	0.22	BC208B	0.13	BD437	0.50	BFY52	0.25	TIP47	0.65
AC176K	0.31	BC212	0.09	BD438	0.60	BFY90	0.77	TIP120	0.60
AC187	0.28	BC212L	0.09	BD520	0.65	BLY48	1.75	TIP125	0.65
AC187K	0.28	BC212LA	0.09	BD538	0.65	BR100	0.26	TIP142	1.75
AC188	0.25	BC213	0.09	BD597	0.75	BR101	0.49	TIP146	2.75
AC188K	0.37	BC213L	0.09	BD701	1.25	BR103	0.55	TIP161	2.95
AD142	0.79	BC214	0.09	BD702	1.25	BR303	0.95	TIP2955	0.80
AD143	0.82	BC214C	0.09	BD707	0.80	BRC4443	0.85	TIP3055	0.55
AD149	0.70	BC214L	0.09	BDX32	1.50	BT100A/02	0.75	TIS91	0.20
AD161	0.39	BC237B	0.09	BDY57	1.65	BT106	1.49	TV106/2	1.50
AD162	0.39	BC238	0.09	BF115	0.35	BT116	1.20	ZRF0112	16.50
AD161/2	0.90	BC239	0.12	BF119	0.65	BT119	2.35	2N1100	6.50
AF106	0.50	BC251A	0.12	BF127	0.24	BT120	1.65	2N1711	0.30
AF114	1.95	BC252A	0.15	BF154	0.12	BU105	1.22	2N2110	4.50
AF121	0.50	BC258	0.25	BF158	0.22	BU108	1.69	2N2219	0.28
AF124	0.65	BC258A	0.39	BF160	0.27	BU124	1.25	2N2905	0.40
AF125	0.35	BC284	0.30	BF167	0.24	BU125	1.25	2N3053	0.40
AF126	0.32	BC300	0.30	BF173	0.22	BU126	1.60	2N3054	0.59
AF127	0.40	BC301	0.30	BF177	0.38	BU204	1.55	2N3055	0.52
AF139	0.40	BC303	0.26	BF178	0.26	BU205	1.30	2N3702	0.12
AF150	0.60	BC307B	0.09	BF179	0.34	BU208	1.39	2N3703	0.12
AF178	1.95	BC327	0.10	BF180	0.29	BU208A	1.52	2N3704	0.12
AF239	0.42	BC328	0.10	BF181	0.29	BU208D	1.85	2N3705	0.12
AU106	4.50	BC337	0.10	BF182	0.29	BU326	1.20	2N3706	0.12
AU107	3.50	BC338	0.09	BF183	0.29	BU326S	1.50	2N3708	0.12
AU110	2.00	BC347A	0.13	BF184	0.28	BU407	1.24	2N3733	9.50
AY102	2.95	BC461	0.35	BF185	0.28	BU500	2.25	2N3773	2.75
BC107A	0.11	BC478	0.20	BF194	0.11	BU526	1.90	2N3792	1.35
BC107B	0.11	BC527	0.20	BF195	0.11	BU807	2.25	2N4280	3.50
BC108	0.10	BC547	0.10	BF196	0.11	BUY20	2.15	2N4427	1.50
BC108A	0.11	BC548	0.10	BF197	0.11	BUY69B	1.70	2N4444	1.15
BC108B	0.12	BC549A	0.08	BF198	0.16	MJ3000	1.98	2N5294	0.42
BC109	0.10	BC550	0.08	BF199	0.14	MJE340	0.40	2N5296	0.48
BC109B	0.12	BC557	0.08	BF200	0.40	MJE350		2N5298	0.80
BC109C	0.12	BC557B	0.08	BF241	0.15	MJE520	0.48	2N5496	0.65
BC114	0.11	BC558	0.10	BF245	0.30	MJE2955		2SA329	0.95
BC116A	0.15	BC639/10	0.30	BF256/LC	0.28	MPSA13	0.29	2SA715	0.60
BC117	0.19	BCY33A	1.60	BF257	0.28	MPSA92	0.30	2SC495	0.80
BC119	0.24	BD115	0.30	BF258	0.28	MRF237	3.45	2SC496	0.80
BC125	0.28	BD116	0.60	BF259	0.28	MRF450A		2SC931D	0.95
BC139	0.20	BD124P	0.59	BF271	0.26		12.50	2SC1096	0.80
BC140	0.31	BD131	0.42	BF273	0.13	MRF453	17.50	2SC1106	2.50
BC141	0.25	BD132	0.42	BF336	0.34	MRF454	23.50	2SC1172Y	2.20
BC142	0.21	BD133	0.40	BF337	0.29	MRF475	2.50	2SC1173	1.15
BC143	0.24	BD135	0.30	BF338	0.32	MRF477	10.00	2SC1306	1.00
BC147	0.09	BD136	0.30	BF355	0.37	OC16W	1.95	2SC1307	1.50
BC147B	0.09	BD137	0.32	BF362	0.38	OC23	1.50	2SC1364	0.80
BC148A	0.09	BD138	0.30	BF363	0.38	OC29	2.25	2SC1449	0.50
BC148B	0.09	BD139	0.32	BF371	0.20	OC36	2.25	2SC1678	1.25
BC149	0.09	BD140	0.30	BF394	0.19	OC42	0.55	2SC1909	1.45
BC153	0.30	BD144	1.10	BF422	0.32	OC44	0.75	2SC1945	2.65
BC157	0.12	BD159	0.65	BF423	0.25	OC45	0.55	2SC1953	0.95
BC158	0.09	BD160	1.50	BF457	0.32	OC70	0.45	2SC1957	0.80
BC159	0.09	BD166	0.55	BF458	0.36	OC71	0.55	2SC1969	1.95
BC160	0.28	BD179	0.72	BF467	0.68	OC75	0.95	2SC2028	1.15
BC161	0.28	BD182	0.70	BF595	0.23	OC81	0.50	2SC2029	1.95
BC170B	0.15	BD201	0.83	BF597	0.25	OC16W	2.50	2SC2078	1.45
BC171	0.09	BD202	0.65	BFR39	0.23	R2008B	1.70	2SC2091	0.85
BC171A	0.10	BD203	0.78	BFR40	0.23	R2010B	1.70	2SC2098	2.50
BC171B	0.10	BD204	0.70	BFR41	0.28	R2322	0.58	2SC2166	1.95
BC172	0.10	BD222	0.48	BFR81	0.25	R2323	0.66	2SC2314	0.80
BC172B	0.10	BD223	0.48	BFR88	0.30	R2540	2.48	2SC2371	0.36
BC172C	0.10	BD225	0.48	BFR90	1.80	RCA16334	0.90	2SC931D	0.95
BC173B	0.10	BC232	0.35	BFR91	1.75	RCA16335	0.80	1SD234	0.80
BC174	0.09	BD233	0.35	BFT42	0.28	S2060D	0.95	2SD325E	1.65
BC174A	0.09	BD234	0.35	BFT43	0.28	SKE5F	1.45	3N211	1.95
BC177	0.15	BD236	0.45	BFW61	0.60	TIP29	0.40	3SK45	0.70
						TIP29C	0.42	3SK88	0.55

NEW BRANDED CATHODE RAY TUBES

A1865/20	65.00	D14-182GM 98	65.00	M24-121GH	55.00	M50-120LC	65.00
A44 120	25.00	D14-200BE	89.00	M24-121LC	59.00	M61-120LC	75.00
AW36 11	25.00	D14-200GA/50	85.00	M24-121WA	59.00	M61-120W	75.00
CME822W	19.00	D14-200GM	75.00	M28-11LA	49.00	S6AB	45.00
CME822GH	25.00	D14-210GH	75.00	M28-12GH	55.00	SE4/D-P7	45.00
CME1428GH	45.00	D14-270GH/50	78.00	M28-12LC	55.00	SE42BP31AL	55.00
CME1428W	39.00	D14-310W	110.00	M28-13LC	49.00	SE42BP31	55.00
CME1523GA	39.00	D14-320GH	85.00	M28-13LG	49.00	SE52AP31AL	85.00
CME1523W	39.00	D14-320GH/82	85.00	M28-13GR	49.00	SE5Fp31	55.00
CME1431GH	39.00	D14-340GH/KM	45.00	M28-13WA	49.00	T937	65.00
CME1431W	39.00	D14-340KA	45.00	M28-131GR	55.00	T948N	65.00
CME202GH	45.00	D16-100GH	65.00	M28-132GM	55.00	T948H	65.00
CME2024W	45.00	D16-100GH/65	69.00	M28-133GH	55.00	V3191	59.00
CME2325W	45.00	D16-100GH/67	65.00	M31-100GH	55.00	V4150LC	55.00
CME3126GH	45.00	D16-100GH67A	75.00	M31-101GH	55.00	V4254B	65.00
CME3128GH	45.00	D16-100GH/79	69.00	M31-182GR	55.00	V4274GH	65.00
CME3128W	45.00	D16-100GH79A	75.00	M31-182GV	53.00	V4283W	65.00
CME3132GH	45.00	D16-100GH97	65.00	M31-183W	55.00	V5002LD	65.00
CME3155W	45.00	D18-130GH/70	69.00	M31-184W	65.00	V5004GR	59.00
CRE1400	25.00	D18-160GH	69.00	M31-184GH	65.00	V5004LD	59.00
CV429	89.00	D21-10GH	65.00	M31-184P31	65.00	V6001GH	65.00
CV1450	35.00	D21-10GJ	69.00	M31-185GH/VR	69.00	V6006GH	65.00
CV1526	19.00	D21-10LD	69.00	M31-186W	69.00	V6007DP31	59.00
CV2185	15.00	DB7 6	35.00	M31-190GH	55.00	V6007GW	65.00
CV2191	19.00	DG7 32	45.00	M31-190GR	55.00	V6008GH	59.00
CV2193	15.00	DG13 2	45.00	M31-190LA	55.00	V6008W	65.00
CV2328	65.00	DH7 11	95.00	M31-190W	59.00	V6034WA	59.00
CV5119	85.00	DH7 91	45.00	M31-191GH	59.00	V604CLA	59.00
CV5320	85.00	DP7 5	35.00	M31-191GR	59.00	V6048F	65.00
CVX389	55.00	DP7 6	35.00	M31-191GV	55.00	V6048J	49.00
D9-110GH	39.50	DP7 11	45.00	M31-191W	59.00	V6052GH	65.00
D9-120	45.00	DN13 78	35.00	M31-192W	59.00	V6052GR	65.00
D10-210GH	45.00	F15-101LC	49.00	M31-195GH	59.00	V6064BLA	55.00
D10-210GH68B	65.00	F16-101GM	55.00	M31-210GH	59.00	V6064BP31	55.00
D10-210GH72	65.00	F16-101LD	55.00	M31-220W	59.00	V6064CLA	55.00
D10-230GH	35.00	F21-130GR	65.00	M31-270GY	65.00	V6069GH	55.00
D10-230GM	35.00	F21-130LC	55.00	M31-271P31	65.00	V6070P31	49.00
D10/293GY/90	55.00	F21-131GR	79.00	M31-271GW	65.00	V7016A	65.00
D13-27GH	49.50	F31-10GM	65.00	M31-271W	65.00	V7030	59.00
D13-30GH	49.50	F31-10GR	65.00	M36-12W	75.00	V7031GH	59.00
D13-33GM	49.00	F31-10LC	65.00	M36-141LA	75.00	V7031/67A	59.00
D13-47GH/26	55.00	F31-10LD	65.00	M36-141LG	75.00	V7035A	49.00
D13-47GH/34	55.00	F31-12LC	65.00	M36-141W	75.00	V7037GH	45.00
D13-47GH	55.00	F31-12LD	65.00	M36-170LG	75.00	V8004GR	65.00
D13-51GH/34	85.00	F31-13GR	65.00	M38-100GR	65.00	V8006GH	65.00
D13-51GL/26	85.00	F31-13LD	65.00	M38-101GH	65.00	V8010A	65.00
D13-51GM/26	85.00	F31-13LG	65.00	M38-103GR	65.00	2BP1	9.00
D13-450GH/01	55.00	F41-123LC	160.00	M38-113GH	65.00	3BP1	13.50
D13-471GH/26	55.00	F41-141LG	160.00	M38-120W	65.00	4EP1	30.00
D13-550GH	65.00	F41-142LC	185.00	M38-120WA	65.00	3H/OBM	55.00
D13-600GM	59.00	M7-120W	19.00	M38-121GR	65.00	5BP1	9.00
D13-610GH	59.00	M14-100GM	45.00	M38-121GHR	65.00	5BHP1	30.00
D13-610GM	59.00	M14-100KA	55.00	M38-121LA	65.00	5BHP1FF	30.00
D13-611GH	59.00	M14 100LC	45.00	M38-121WA	65.00	5BHP31	30.00
D13-611GM	59.00	M17-151GVR	175.00	M38-122GH	65.00	5CP1	10.00
D13-630GH	59.00	M17-151GR	175.00	M38-122GW	65.00	6EP7/S	39.00
D14-120GH08	65.00	M19-100GY	55.00	M38-140LA	65.00	13BP1	13.50
D14-121GH09	65.00	M19-101GR	55.00	M38-141LA	65.00	13BP4	17.50
D14-150GH	75.00	M19-103W	55.00	M38-142GR	65.00	17DWP4	25.00
D14-150GM	75.00	M23-110GH	55.00	M38-142LA	65.00	32J/1085	69.00
D14-172GH/84	59.00	M23-111W	55.00	M38-340P31	65.00	88D	15.00
D14-172GR	55.00	M23-111GH	55.00	M38-341GR	65.00	89B	15.00
D14-172GV	55.00	M23-111LD	55.00	M38-341P31	65.00	89D	15.00
D14-173GH	55.00	M23-112GM	55.00	M38-344P39	65.00	89L	15.00
D14-173GM	53.00	M23-112GV	55.00	M40-120W	59.00	1273	39.00
D14-173GR	55.00	M23-112GW	55.00	M43-12GM/01	65.00	1564	39.00
D14-181GH/62	65.00	M23-112KA	55.00	M43-12LG/01	65.00	1844	45.00
D14-181GH/98	65.00	M23-112LD	55.00	M44-120LC	65.00	55451GM	75.00
D14-181GJ	55.00	M23-112W	55.00	M44-120GR	65.00	9442E1	80.00
D14-181GM	53.00	M24-120GM	59.00	M47-25GR/22	65.00	95447GM	75.00
D14-181GM50	59.00	M24-120GR	59.00	M50-120GH	65.00	95449	75.00
D14-181W	55.00	M24-120LC	59.00	M50-120GR	65.00	7709631	79.50
D14-182GH	59.00	M24-120WAR	59.00	M50-120GV	65.00		

DIODES

AA119	0.08	BY210-800	0.33	1N23B	2.95
BA115	0.13	BY223	0.90	1N23C	2.95
BA145	0.16	BY298-400	0.22	1N23ER	2.95
BA148	0.17	BY299-800	0.22	1N23WE	2.95
BA154	0.06	BYX10	0.20	IN4001	0.04
BA156	0.15	BYX36-150R		IN4003	0.04
BA157	0.30		0.20	IN4004	0.05
BAX13	0.04	BYX38-600R		IN4005	0.05
BAX16	0.06		0.60	IN4007	0.06
BB105B	0.30	BYX55-600	0.30	IN4148	0.06
BT151	0.79	BYX71-600	1.10	IN4448	0.10
BY126	0.10	BZX61	0.15	IN5401	0.12
BY127	0.11	BZY88	0.10	IN5402	0.14
BY133	0.15	BZY95C30	0.35	IN5403	0.12
BY164	0.45	CS4B	4.50	IN5406	0.13
BY176	1.20	CS10B	8.45	IN5407	0.16
BY179	0.63	OA47	0.09	IN5408	0.16
BY182	0.55	OA90	0.05	ITT44	0.04
BY184	0.35	OA91	0.06	ITT923	0.15
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11 Watt 1R5-15K	0.25
17 Watt 1R-15K	0.30

ZENER DIODES BZX61 0.15

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11V 12V 13V 15V 16V
18V 20V 22V 24V 27V
30V 33V 36V 39V 47V
51V 56V 68V 75V

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VA1104	0.70
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VA1097	0.25

BZY88 0.07

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4V3 4V7 5V1 5V6 6V2
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SHORT WAVE LISTENER

by Trevor Morgan, GW40XB

I was preparing this article when the August edition dropped through the letter box. It contained so many tales of woe from the CB fraternity that I felt a comment was in order.

As well as being a long time shortwave listener, I was also a founder member of the 'Sierra Bravo' CB club in Swansea, which is still very active with a membership in the hundreds.

As the only licensed amateur in the club I was the target for many comments and the receiver of numerous requests for advice, much of which was disregarded by readers of some of the sillier items in the, then, prolific CB press.

Learn more

However, many members of that club were keen to learn more about the inside of their rigs and how their 'twigs' worked. As a result a more technical group was formed, some of whom eventually took the RAE and gained their GW6 callsigns. This, in turn, lead to the formation of the Swansea Radio Amateur Constructors Club whose members had all been CBers. The club now has a membership of 35, over 50% of whom hold class A licences with most of the others learning Morse! Keen radio operators can be found in every circle and CBers are no exception. They only need guidance.

There are bad operators in the CB world just as there are in the radio ranks. No amount of training will improve the behaviour of a 'wally' or 'squeeky'. Such people are idiots who gain pleasure from spoiling the enjoyment of others.

If the CB fraternity wish to gain the respect of long standing amateurs they must root out such individuals. By the same token, the amateurs must clean up their backyard and have no sympathy with those people misusing the privilege of amateur radio. There is only one answer. Report every one of them to the authorities!

Antennae

So to this month's topic. As I write, looking out at the shack and its mast full of aerials, I realise it is time for those chores necessary before the weather breaks and we get the usual high winds and rain.

Antennae should be checked for corrosion or damage (it's amazing how ultra violet light affects PVC insulation) especially at joints between aerials and feeders. So should guy lines and pulleys which could be fraying, and mast to boom clamps for loose nuts and bolts. There's nothing worse for neighbour relations than an antenna through the greenhouse roof!

Have a look at your receiver for faults such as sticky pots and offset tuning dials. . .and do not forget to look under the lid for lodgers, especially if your shack is outdoors. Spiders and moths lay eggs in some funny places and many a puff of blue smoke owes its existence to uninvited guests.

Earth lines and spikes should also be checked for corrosion and good joints. As this summer has been so water free in most areas, the soil is very dry and perhaps you can improve its quality using an old zinc bath buried as deep as you can. This will act as a reservoir and keep the soil quite moist, and an occasional bucket of old bath water will keep its earth qualities good during dry periods. If you sink your copper earth spikes round the perimeter you will be sure of good earth contact.

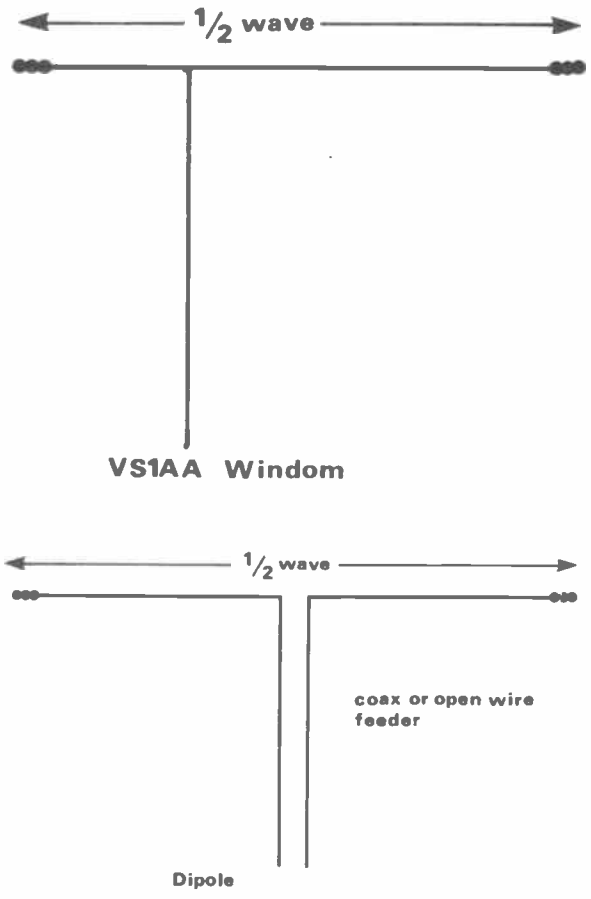
This is also the time for experimenting with those odd lengths of wire that have accumulated in the shack. The advantage of being a shortwave listener over the licensed amateur is that you can experiment and make use of practically anything metallic without worrying about blowing your rig up as soon as you switch on. The important thing is to have a good ATU with different networks for tuning wires, beams, dipoles, etc. There are some good ones around if you have the brass, but if you can make your own so much the better. However, it seems that everyone is making something these days and roller coasters and wide spaced variable capacitors are like gold dust at the rallies!

Wire antennae can be as simple or as complicated as you like and, over the years, some weird and wonderful configurations have been tried and, indeed, found to work. Without resorting to tuning up the bedframe or the garden fence (yes, they have been tried) one of the favoured sources of wire is old transformers and this wire can be cheap and, above all, almost invisible in use.

Using ex-transformer wire, you can erect aerials in places where the local council objects to beams and masts. Using insulated standoffs, you can fix an end-fed wire or dipole to the house wall that will be invisible to the passer-by and, if you follow the line of the eaves and guttering, it will give you a considerable length.

Indoors

Indoor aerials are also a good proposition using this wire and can be spread round the attic space or, if you have no attic, around the picture rail. In fact, this type of wire is



thin enough to be concealed underneath wallpaper with the feedpoint at the skirting board. Why not stick the wire to the ceiling before you put up those ceiling tiles?

Vertical antennae can be useful in difficult locations and, once again, thin wire can be used if suitably supported. A redundant fishing rod can be put to good use and a good length of copper wire wound onto an old fibreglass or cane rod can be fixed to the chimney stack using a bracket. If the neighbours object, use it horizontally under the guttering or barge board. A 'dummy' drainpipe of 1½ inch plastic pipe can conceal a vertical or obtrusive feedline.

More ambitious

For the more ambitious, wire can be used to make quad loops, rhombics, minibeams and any other shape you take a fancy to. Let your imagination run riot. Remember, the more wire you can get up, the better chance you have of hearing that weak signal.

It is easy to go to the nearest emporium and spend a fortune on an XYZ superboomer but you can get a lot more self-satisfaction from making your own.

If you can not get a decent wire up, don't feel left out as there are some very good 'active antennae' around. Or try making one. A good design is published by Radio Nederland in their series of tips for listeners. Listen to 'The Happy Station' on Sundays for details of their SWL facilities.

There are all sorts of names and numbers given to aerials and it can be confusing to the SWL who picks up a book full of designs. However, there are two places to feed an aerial, at the end or at some spot between the two ends. The simplest is the end-fed, and any random length of wire can be used tuned against earth or, better still, a counterpoise wire of a quarter wavelength at the lowest frequency, preferably outdoors.

The Windom aerial is an old, well tried and tested aerial, and consists simply of a horizontal wire of a half wavelength fed by a single wire positioned off centre. If the 'tap' is placed one third of the way along a current loop at the lowest frequency, it will operate efficiently on even harmonics of the design frequency. So a half-wave wire at 160 metres fed about 22ft 6in from one end should operate well at 80, 40, 20 and 10 metres.

Dipole

The Dipole aerial is simply a half wavelength cut at the centre with the quarter wave segments fed at the centre, using either twin feeder or coaxial cable.

The Sloper is a dipole with just one high point at one end, and shows some directivity towards the direction of the slope. It is an ideal aerial if you have a short garden as it can be run between the chimney and the end of a short post.

The inverted dipole is useful if you rely on a linepost. The centre of the dipole is placed at the top of the post and the ends placed as wide apart as possible.

An interesting variation is the Delta Loop which consists of a triangle fed at the join with coaxial feeder. As the angle of radiation changes with the feedpoint it is best, for DX use, with the feed point at the top and the apex of the triangle at the bottom.

The list of aerials is almost endless so I suggest you try different configurations around these basic ones and see what happens.

If you live in an area where aerials are frowned on, you can try running wire round your attic, pinning ex-transformer wire to the surface of the house or round the roof line etc. Almost any wire will do. The cheaper it is the more you will be inclined to experiment.

So much for aerial farming. Once you start hearing those far-off stations, you will want to send them a report and get a QSL card in return. You can write your report on any card or piece of paper you like, but it would be nice to have your own special cards. Here is an opportunity to obtain some free QSL cards. All you have to do is design a QSL card for reporting to amateur or broadcast stations containing all the essential details.

To start you off, here are the essentials. Your name and QTH. The date and time you heard the station. The frequency, the station heard and who he was in contact with. Signal reports of *both* stations. Any interference affecting their signals. What equipment you were using. Any comparative signals heard around the same time and frequency.

How you decorate the card is up to you, but a simple card is often more attractive than one covered in unnecessary frills.

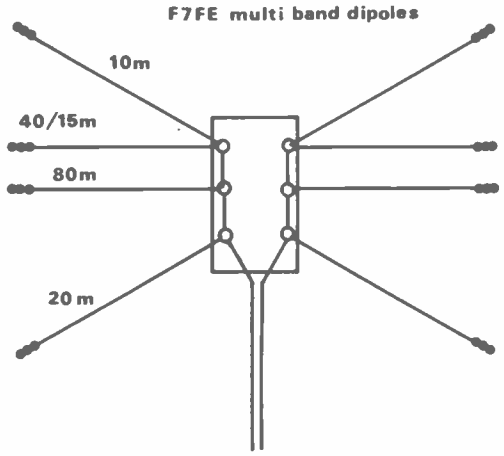
As most shortwave listeners report to broadcast as well as amateur stations, a card that can be used for both is economical, so think about it. Remember, the report for amateurs is in RST and the report for broadcast stations is in SINPO, otherwise the essentials are the same.

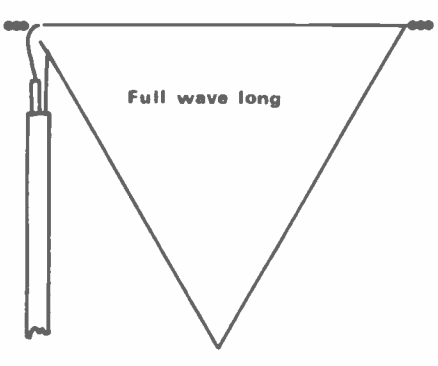
Entries must be sent to me by 1st November. The winning entry will receive 500 QSL cards to his design, the second will get 250 cards and the third will get 100 cards.

So let's have the pencils out and remember, the size must not exceed 3½in x 5½in.

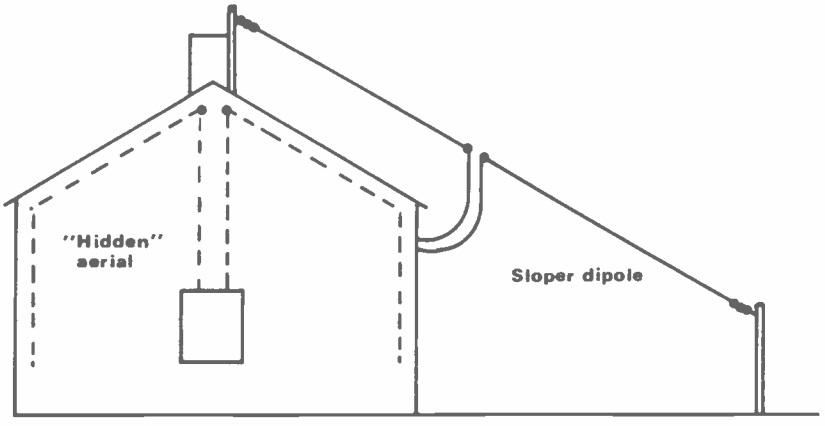
The winners will be published in our January, 1985, issue.

Next month we shall be looking at the use of computers in short wave listening and examining some of the available programs.





Delta loop – low angle



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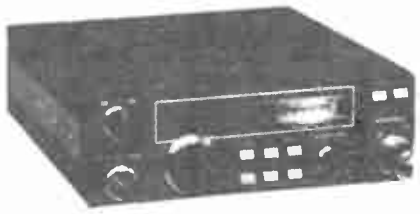

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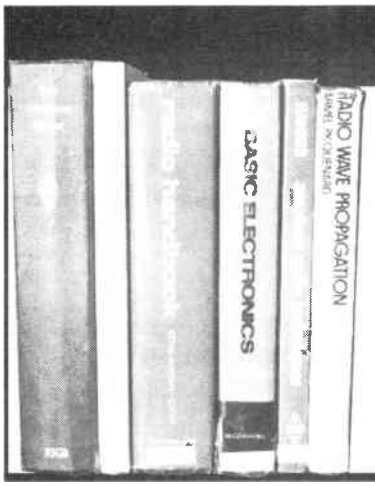

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ON THE BOOKSHELF

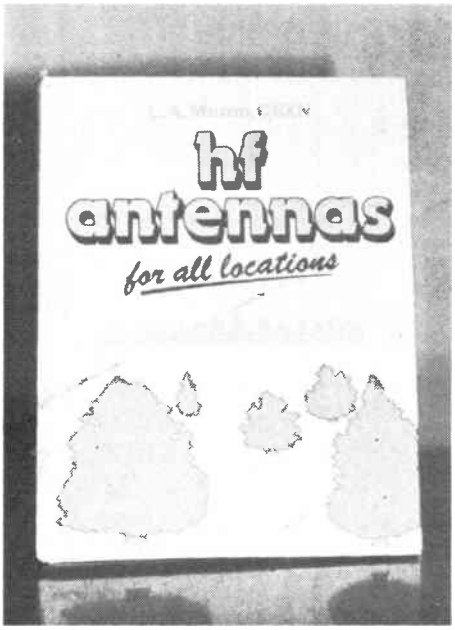
REFERENCE AND READING FOR THE RADIO AMATEUR

If the inadequacy of on-the-job training is a headache for qualified professional radio officers, it is an even bigger one for the amateur whose knowledge of radio must be gleaned as best he can. The inherent dangers associated with 'learning the trade' from those unqualified to teach include inaccurate tuition presented in a random sequence which results, at best, in a confused student and, at worst, in an inefficient operator.

RAE examination

Passing the Radio Amateur Examination in no way qualifies a student as an expert; even less does it give him the authority to teach. By and large, getting through the RAE is like passing the MOT driving test: the successful applicant has earned the recognition of a basic ability to handle the equipment – no more, no less. Like driving, he will add experience to his basic qualifications which, in the fullness of time, will broaden in scope to eventually make him an 'expert'.

Despite the fact that training courses for the RAE are available through clubs, technical institutes and even by correspondence courses, books are essential. And on the assumption that the radio amateur wants to accumulate as much knowledge as possible about his chosen subject, there awaits a confusing array of written material.



If the Navy was brought up on Devon Scrumpy and oggies, many of her trainee telegraphists were weaned on Scroggie. *Not* a combination of the two, M G Scroggie BSc, CEng, FIEE published his original *Foundations of Wireless* in 1936 through Iliffe Books: since then there have been in excess of 40 editions, the more recent of which includes electronics. Even though the techniques and paraphernalia of radio might progress, basic radio theory does not. Scroggie certainly gets down to basics, with an 'initiation into the shorthand of electronics' in the first chapter which includes the application of algebra, graphs, linear and non-linear scales.

From there, the author passes through an appreciation of waves in considerable depth, as he does electrical capacitance, inductance and currents, to discuss the various application of valves and their transistorised equivalents. Having covered the theory, Scroggie then goes on to the practical aspects of it in transmitters (with associated transmission lines and aerials) and receivers.

After devoting some 22 chapters to every conceivable aspect of these subjects over 413 pages, the author uses the remaining 87 for a full explanation of the cathode-ray tube and its uses, waveform generators, power supplies and even a chapter on computers. The book was written on the assumption that the reader had no previous knowledge of the subject matter whatsoever, and takes it from there. Without specialisation in any particular sphere of radio, Scroggie gives a good basic introduction to the subject.

Certainly Scroggie's explanation of applied algebra would be necessary, for those not into such things, to understand Armel Picquenard's *Radio Wave Propagation*. Part of Phillip's 'Technical Library', first published in 1974 by McMillan Press it is, to all intents and purposes, a propagation handbook providing sufficient in the way of theoretical explanation and empirical data to allow the radio engineer to fully understand the nature of such things. A professor at the Instituto Tecnologico de Aeronautica Sao Paulo, Brazil, Picquenard might come on a little strong with the maths, but covers the entire spectrum of his subject.

Starting with explanations of plane and spherical waves, the author moves along pretty rapidly to tropospheric propagation. From there he discusses wave propagation, both in the ground and close to the earth's surface, and so to the ionosphere and propagation in the absence of a magnetic field. Also covered are practical procedures for evaluating propagation for all frequencies from medium frequencies upwards.

The author attempts, very succesfully in a single volume, to bring together many of the isolated theoretical papers on the subject of propagation that have been published in the technical press. It is not quite a reference book in terms of a listing of specific subjects pertaining to propagation which can be consulted at random. It is a book that has to be read in consumable portions.

Antennae

Perhaps more digestible to the amateur is *The ABC of Antennas* by Allan Lytel (with a specially written chapter for the guidance of the English reader by W Oliver, G3XT). This is not to say the book is in a foreign language, but it is written with a view to reaching the more limited understanding of those who are not design engineers! If Picquenard heavily seasoned his book with formula, Lytel's abundant use of diagrams and the occasional photograph is less frightening in presentation.

Published by W Foulsham, this slim volume starts off with a fairly brief but necessary explanation of propagation in order to 'get into' the subject of antennae – the various patterns, length, gain and development, in conjunction with an explanation of transmission lines. Moving on to 'Antennae for business and amateur communication' Lytel delves into the realms of mobile aerials, their loading and associated subjects, and relay stations.

Although described under 'Antennae for other communications', the chapter concerning microwave reception and transmission *is* relevant in as much as satellite communication and the use of parabolic aerials now fall within the sphere of the radio amateur. On the other hand, his final chapter on the subject of microwave aircraft landing systems and radio navigation does *not*, but does make interesting reading for all that. Certainly, in attempting to keep all

theoretical discussion as elementary as possible, avoiding the use of higher mathematics, Lytel has succeeded admirably.

Basic electronics

Achieving a happy medium in style between the heaviness of Picquenard and what some might consider the over-simplification of Lytel, is Bernard Grob's *Basic Electronics,* now in its third edition. An instructor with the RCA Institute, Grob has produced a 694-page, modern-style 'basic text for beginning students' through the McGraw-Hill Book Company. Based on Bernard's experience as a teacher, he appreciates that readers are neither egg-heads nor idiots, and pitches his reasoning at a level accessible to all, amply backed by diagrams, tables and photographs.

Divided into 28 chapters, this book takes a step-by-step investigation into electronics, starting with a thorough explanation of exactly what electricity is. Then it is into Ohms Law, but linking it with associated subjects such as series and parallel circuits and series-parallel circuits. This technique of linking subjects not normally taught in such a sequence, but logical nevertheless, has been found beneficial by Mr Grob in the past. At the end of each chapter is a section describing common problems with the preceding subject matter and the practical application of the theory. As a further *aide memoire,* each chapter starts with an introduction stating the objective and a list of topics. At the end, there is a summary listing the key points to remember, together with some self-examination questions with the answers at the back!

In many ways, reading this book is a bit like going back to school. On the other hand, there will be those among the ranks of potential radio amateurs with the milk of the educational system still wet on their lips who will not find this a problem! One message that comes across loud and clear from reading his book is Bernard Grob's desire (and ability) to communicate.

RSGB publications

Not so much a textbook, but more a source of ideas for experimentation is *Amateur Radio Techniques* by Pat Hawker, G3VA. Having received wide acclaim from thankful amateurs after publication of the first edition in 1965, six more editions have since been produced by the publishers, the RSGB. In a book that would probably be appreciated more by the radio amateur who has a little experience under his belt, Pat Hawker has achieved the difficult task of keeping abreast of current technical progress and practice over a wide field of amateur radio topics.

Contained within the 300 tightly-packed pages (suitably accompanied by some 800 diagrams, most of them circuits) is all the amateur needs to know about semiconductors, components and construction and the different aspects of receivers. Similarly covered in depth are oscillator, transmitter and aerial topics, with excellent explanations of audio and modulation, power supplies, advice about fault-finding and the design and construction of test units.

Drawn largely from the technical press, engineering sources and amateurs themselves, the material for this book represents a collection of the best ideas available at the time of publication. That the book has grown from 100 pages to 300 over successive editions shows that they are still getting them! Pat Hawker does not presume to solve all the problems of the radio amateur, but may well give a few ideas about how to cure the few he hasn't covered. A book for the amateur radio enthusiast by a radio enthusiast *par excellence.*

Yet another RSGB publication for the amateur by an amateur is L A Moxon's *HF Antennas for all Locations.* Quite apart from being G6XN, Mr Moxon is a BSc, CEng and MIEE which gives him more than enough authority to talk about aerials! Very much a realist, he appreciates that the constraints of space inflicted by a modern environment must have a limiting influence on large components such as aerials.

In what can be regarded as a protracted preface to his book, L A Moxon spends the six pages of chapter one outlining the following 252, the need for a new approach to the subject, and the possibilities: the fact that textbooks tend to be aimed at the professional rather than the amateur, and that even amateur handbooks are orientated more towards how to construct aerials rather than why. In a word, the book is designed to give a better understanding – a practical approach giving aspects of construction to be avoided – and some opportunities for experimentation.

It is assumed that the reader will have a basic working knowledge of electricity, inductance and capacitance and energy fields: reference to propagation, on the other hand, is restricted to four pages. Fully explained are waves and fields, gains and losses, antenna feeds and bandwidth.

Excellently illustrated with diagrams, Moxon's explanations of close-spaced beams, horizontal and vertical beams, mobile and portable antennae and their construction, will leave little to be desired. One thing this book is *not* is a slick DIY guide to aerial-building. Although Moxon has made every effort to avoid the recesses of deep theory, a little elementary algebra occasionally creeps in. But in his own words, in cases of difficulty, the reader should have faith in the Moxon conclusions on the principle that understanding will grow with experience!

Amateur radio operating

The RSGB has, in fact, published a number of books including their *VHF/UHF Manual,* being the standard textbook on theory, techniques and equipment for the higher bands. On the operating side there is the *Amateur Radio Operating Manual* covering station organisation and operating aids, and the *Radio Communications Handbook.* First published in 1938, this popular publication is a comprehensive guide to amateur radio theory and practice, ranging in subject matter from basic principles to slow-scanTV and satellite communications. The American equivalent is *Radio Handbook.*

For reference, the RSGB offers their *Radio Data Reference Book* in convenient form without needless repetition of basic theory, and *Test Equipment for the Radio Amateur,* which gives full explanations of the principles of electrical and electronic measurement. However, perhaps best known of all RSGB books is the *RSGB Handbook,* and to even attempt to describe the contents of this two-part publication would fill a magazine. Suffice to say that every aspect of amateur radio is covered. It is a *must.*

Happy reading.

THE SEVEN RULES OF PORTABLE OPERATION

Kevin Fox G4MDQ with an intrepid investigation into boldly going where no man (in his right mind). . .

There are two basic reasons for going portable. One, you live in a hole in the ground 400 feet below sea level, where the only thing to escape is the harmonics and sproggies from your transmitter, and the only thing you'll be working is every video recorder, television and hi-fi for a radius of 20 miles. The other reason is that you're completely *crackers*.

I fall into the latter category. Well, it's obvious isn't it? What else could you be to forsake a centrally-heated shack with tea and coffee on tap, and the ease and convenience of a time-tested and proven base station, to go out into the (delete as appropriate): wind/rain/snow/hail/frost. No mention of sunshine? *Rule 1* of portable operation: the sun *never* shines.

Come rain or. . .

This rule is inviolable, even during an August heatwave. You get up in the morning, pull back the curtains, and the sun streams into the bedroom. 'Ah', says you, 'great day for going portable.' So you pack your spotted hankie, put on your shorts and sunglasses, and off you go.

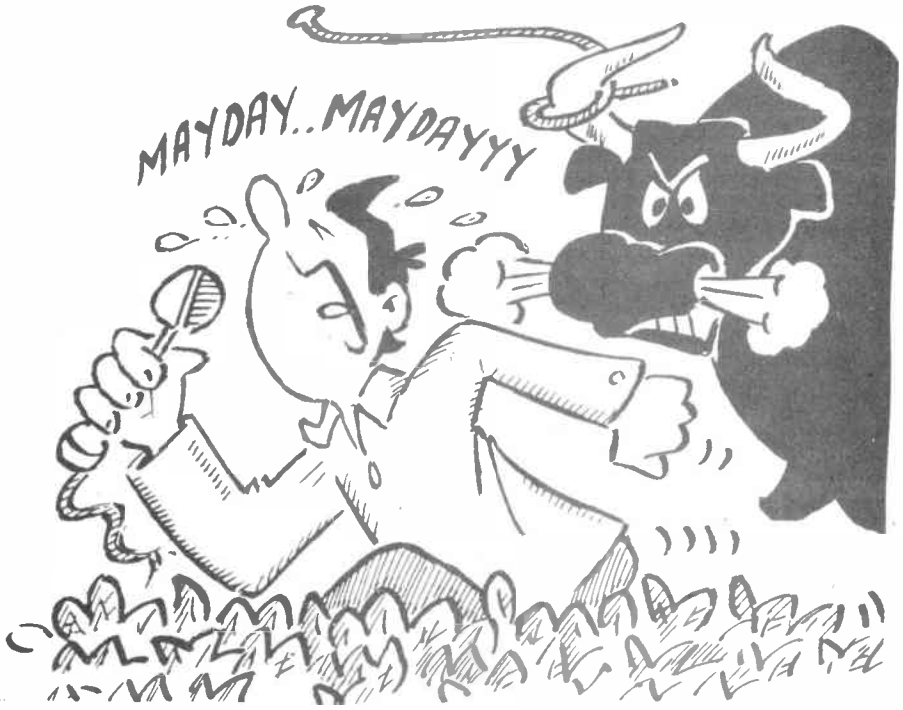
You get to your site, put up your aerial, assemble the station, and sit down in front of the rig. The sun is beating down whilst you are doing all this. You reach out, touch your key and *'BANG'*, suddenly it's windy, raining, snowing, hailing and frosty.

Which brings us nicely to *Rule 2:* a sense of humour is indispensable. When I go portable, I always go HF portable. I cannot be bothered with this short-range stuff (VHF I believe it's called). I am also reliably informed that it is on some unbelievably high frequency of 144 megacycles. *144 megacycles!* I get a nose bleed above 20 metres!

So, assuming that you still want to go portable, what should you take? *Rule 3* states that: whatever you take portable is (a) too much while you are carrying it and (b) not enough when you get there. So, take what you think you need and then add 10%.

Where to go? This will be dictated by what transport you have available. I have none. So all my portable operations are usually confined to how far I can walk before I get fed up.

The beauty of portable HF-style is that you can set up anywhere, although I do recommend you stay well clear of traffic roundabouts. The natives are usually so engrossed and fascinated by what you are doing that they tend to bump



their cars into the one in front.

Permission

Having found your site invokes *Rule 4*.On arrival at the site, if you haven't got permission, or don't know who owns the site, this rule states that: (a) if you don't have permission the site is fantastic; (b) if you do have permission the site is rubbish and, finally, (c) if you don't have permission, the owner will always wait until you have erected your aerial before telling you to clear off.

The ideal site consists of ground sloping gently towards Europe, with a small lake nearby and two trees 40 metres apart; all this no more than half a mile from my back door. The realities are: a council interpretation of an 'adventure' playground covered in 4 inches of sloppy mud with two rhododendron bushes 37 and a half metres apart. On arrival at your chosen site it is customary to perform the HF operator's opening ritual. This is performed in the following way:

(a)drop rucksack to ground,

(b)clasp hand to forehead,

(c)shout out loud 'Oh silly me', (or whatever), 'I've forgotten the rig/the aerial/who I am.' (Delete as applicable)

(d)tantrum (for authenticity).

Having composed yourself, the next stage is to erect the aerial. Now, when portable, trees and aerials go together like WH and Smith, eggs and bacon, or peanut butter and strawberry jam. So the next rule will save you a great deal of time. *Rule 5:* never pick a tree with a white cross on it.

Double-cross

On my first portable expedition I chose, after much deliberation, a site near my house. There was this tree, either dead, or just sulking: as straight as a ruler for 40 feet with a nice branch about 10 feet long sticking out from the trunk at 90 degrees: just begging for a 40 metre inverted Vee to be strung over it. 'Ah,'says I, 'some kind amateur has used this tree before, and found it so good they have painted a white cross on it so others may always know where to find it.'

So in two minutes flat, up goes the aerial, and enter the spectator. Now spectators can be spotted immediately. They have a very limited vocabulary, and they only ever say three things: (a) 'clear off'; (b) 'is it CB?'; (c) (and this is nearly always said when erecting or taking down an aerial), 'have you got your kite stuck?' But I digress.

Up went the aerial, and on came the spectator. 'Got your kite stuck?.' says he. 'No', says I, 'I am measuring this tree'. (I am a well seasoned spectator-deflator). 'Oh,' says the spectator, 'can you measure another one? I want to chop this one down.' Forget *Rule 5* at your peril.

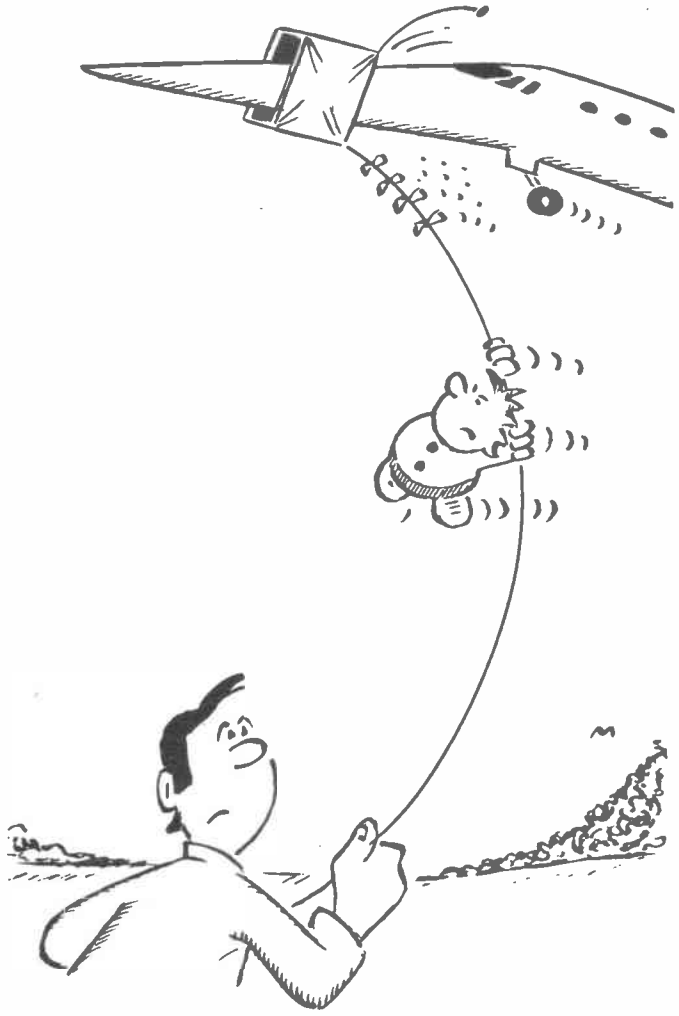
Assuming that you have erected the aerial, and assembled your station (firmly resisting any offers of help), now is a good time to introduce *Rule 6*. This states that any spectators who become interested in what you are doing will do their darndest to stop you doing it. The minute your CQ is answered 'they' start with the idiot questions. *Rule 6* is the most difficult to apply: it requires you to (a) totally ignore what they are saying whilst (b) agreeing with everything they say (both at the same time).

Experts

Such questions as 'is it CB?' should always be answered 'yes.' It takes far too long to explain the differences, and you will only make a rod for your own back by trying. Mind you, I well remember being floored by one spectator's remarks. Up he trotted, dressed in government surplus trousers, a donkey jacket, pit boots, and what looked like a blanket wrapped around his head, which on closer inspection turned out to be a wooly hat!

Now this spectator was a big chap, 6 feet 13 inches tall, muscles in his spit, and MacAlpine stamped on his forehead. I mentally ran through my list of spectator-deflators (disregarding the replies most likely to cause a re-arrangement of my facial geography). He approached, suddenly there was a total eclipse of the sun as he stood in front of me, my keying hand suddenly switching from CQ CQ to SOS SOS. I could literally see his voice rumbling up from his stomach. 'Oh look,' said he 'a homebrew 40 metre QRP CW transceiver and homebrew ATU. Have you worked any good DX?'

'No', said I, 'it's CB.'



Go fly a. . .

Unless you are really thick-skinned never, *never* use a kite to fly an aerial, it's just too much aggravation. 'Let's build a monster box kite and fly a full wave vertical on top band'. So we did. Never, *never* again. The story is too long to go into here, maybe another time. Suffice to say that the RAF were called out to investigate reports of a UFO, the fire brigade turned out to rescue some curious infant who grabbed hold of the damn thing as it went up, and shot 18 feet off the ground. The thing had so much lift we couldn't get it back down. We cut the wire and bade it a heartfelt goodbye. Even to this day, every time I see a box kite I go cold inside.

And finally

Rule 7 states that you should leave your site in the same condition you found it. Now this at first sight seems easy, but if you've operated from some of the sites I have, *Rule 7* would require: several tons of TNT, a bulldozer, two council dust-carts (loaded), several herds of best Freisian cows (loose bowels optional) and a bombing run by the RAF.

Enjoy being portable. I do!

NEW THOUGHTS ON THE IC751

by Angus McKenzie
G3OSS

In the January 1984 edition of this magazine, I reviewed the Icom IC751 transceiver, and related the complicated story of why three separate samples had to be checked. Early samples all seemed to have a problem with spurii produced on the 21MHz band and some RF feedback tendencies on 80m, whilst on the 10m band the ALC line was affected by even the smallest sniff of RF. All these problems have now been completely rectified on the latest production, and so my main reservations, in the light of events, are withdrawn. After I heard about the latest mods, mainly in the PA compartment, I sent the review sample back to Thanet for modification, which was achieved quite quickly, and I decided to purchase the unit, allowing it to become my main station HF rig, together with the IC AT500 automatic ATU and IC2KL solid-state linear.

Accessories

In this article I feel that it would be appropriate to detail some of the fixes and mention some new accessories which allow the rig to become much more flexible. A magnificent accessory is the RC11 remote controller which plugs into a socket underneath the rig. This unit is a small key pad having well spaced numbers from 1-9 and 0 plus clear entry and enter. Switches select VFO A/B and remote on/off, whilst a press button remotely controls the built-in speech option to speak frequency. Having selected the remote mode, you can rapidly access any desired frequency to 100Hz accuracy, and this is incredibly convenient in operation, especially if you are a white stick operator. It is far easier to use than similar key pads on rigs such as the Yaesu FT980, as it can rest on the table in front of the rig.

An EX-309 interface unit can be fitted to interface the rig with an Icom communication terminal type CT10. The latter unit can also interface with other Icom rigs such as the IC271 and 471 series. The interfacing possibilities include write to or read from the IC751 etc, various remote functions, as well as providing squelch information for stopping search and remote control of Tx/Rx. Various data lines supply service request and status information.

The CT10 controller is not yet available at the time of writing, and Icom also intend to produce a serial interface to interconnect the equipment to a modem.

Superb

In general use over the last few months I found the RF front end and IF selectivity perfomance to be absolutely superb, but my one particular criticism on SSB was that in practice both the transmitted and received bandwidths were a little too narrow for armchair copy contacts. The selectivity was ideal for DX working, although, sometimes I have noted difficulty in deciding whether a particular letter on the end of a word was a P or a T, or perhaps an F or S.

I decided to try the wide SSB filter which has a bandwidth of around 2.8KHz, and immediately the subjective quality of most stations dramatically improved. Intelligibility showed a marked improvement unless there was much QRM around, but listening fatigue was also greatly reduced, so that I could listen with pleasure to various stations for hours on end. I was therefore encouraged to organise switching between normal and wide SSB filters on SSB, and I find that as a result I am using the wider filter at least 75% of the time, although when I use the normal one in a QRM situation it can significantly improve readability, even if the sound is constricted.

Although the AM filter is excellent, there are many occasions where one sideband of an AM transmission is subject to a different selective fading characteristic compared with the other, producing the usual phasey and distorted AM. Switching to the normal SSB filter, and retuning in order to get a reinforced carrier, selective fading effects are significantly reduced, but the sound is obviously very fatiguing.

Switching to the wide SSB filter in such circumstances dramatically improves AM reception, which can be greatly preferred to normal AM reception. I therefore strongly recommend 751 owners to consider seriously the wide SSB filter, and if necessary abandon the AM filter. It is comparatively simple to bypass the filtering for AM by altering the wiring around the filters, and if you need a degree of selectivity for AM, switch in the wide SSB filter and use SSB to give an enhanced carrier reception of the desired side band.

Minor snags

Since I reviewed the 751 I have also reviewed at length the R71 receiver, which uses virtually identical receiver circuitry up to the audio section. Some minor snags have become noticeable,

Remote control unit

Computer interface unit

which are of particular interest as they typify problems when a receiver is required by design to accommodate all modes. The first mixer feeds into a rather wide roofing filter at first IF, and this has to be wider to accommodate FM if fitted. FM is usually supplied built in to the 751, but as I stated in the original review, the FM bandwidth, ie selectivity, is much too wide. If the receiver is used on AM with the AM filter, quite bad blocking occurs if there are strong stations on adjacent or even alternate AM channels. This situation does not seem to arise, however, if you use the SSB mode for receiving AM.

Audio distortion

After reviewing the R71, I checked the AM received audio distortion of the 751, and frankly it is about as bad as that of the R71. On investigation, the problem seems to be due to three separate problem areas, the first being that the AGC line is fed from a peak detector rather than an RMS detector for the carrier. The second is that the AM detector itself has rather high inherent distortion, whilst the third problem is that at least two IF stages operate at levels which produce quite a lot of intermodulation distortion within the IF bandwidth itself. It would therefore be a major rebuild job to improve the 751's AM distortion characteristics, and this is a pity, because as it stands received AM quality is not up to top end domestic, let alone professional, standards, whilst SSB and CW are superb.

As far as the IF stage distortion is concerned, this really should be better, but it is not a simple matter of changing biasing levels etc. The AGC line requires more amplification to reduce the IF throughput levels, and as it stands the AGC system all too readily acts on AM transmission peaks, and thus tends to follow the modulaton envelope. By fighting this, bad distortion results, particularly at lower frequencies, and especially in the fast AGC mode. You can gain a significant improvement in AM quality by switching to manual RF gain and adjusting the RF gain control very carefully, but you are still left with the AM detector distortion.

The tape recorder feed, particularly on the R71, also has some audio HF attenuation, so recordings made will be rather more muffled than those from the loudspeaker output. It would be a comparatively simple matter to reduce the HF cut capacitor in the buffer circuit, and this may be worthwhile.

Returning to the effects of the wider SSB filter, I tried switching between this and the normal filter on 160, 80 and 15m, asking many amateurs to make comments. The comparisons were absolutely fascinating, for those having rigs with a wider selectivity greatly preferred the wider bandwidth transmissions. Less difference was audible to those who themselves had a rig with a rather narrow bandwidth, provided their bandwidth was positioned at about the same spacing from the re-inserted carrier as were my own transmissions.

Some with narrowish filters claimed the transmission to be more toppy when the wide filter was selected; others found it too bassy and the tonal balance of the narrow SSB transmissions was better for them. I asked several stations to try altering their pass band tuning, particularly if their filters were narrow. After they did this, it was obvious to them how much audio they were themselves missing by employing a narrow filter.

After all these tests I have come to the definite conclusion that we are all tending to use narrower filters too frequently by choice, even if wider ones are also available. There has to be a balance between DX communication performance and a relaxed transmission and reception with wider bandwidth which offers much less listening fatigue.

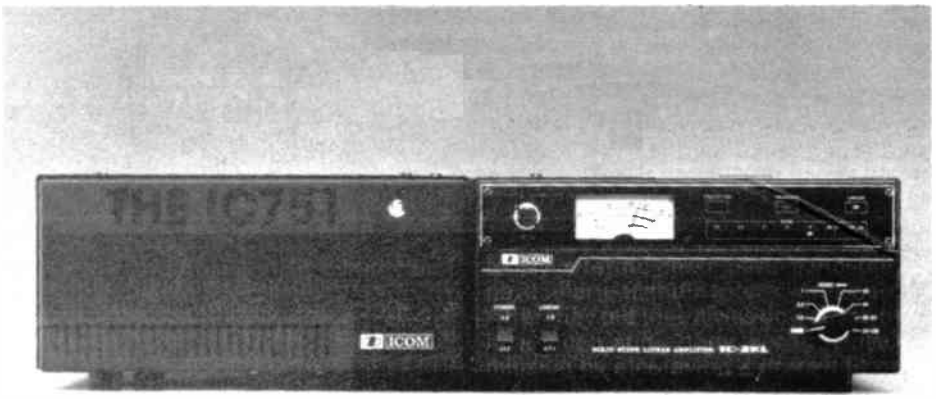
I once had a Collins 75A4 fitted with 2.1, 3.0 and 6.0KHz mechanical filters, and I remember 20 years ago usually preferring the 3KHz bandwidth unless there was a QRM problem. In retrospect though, and having carried out many tests involving filtered speech in my lab, I suggest that the optimum compromise is to have a flat received bandwidth from 300Hz to 3.1KHz, which is precisely what Icom have given us in their wide SSB filter. I consider it an advantage that when you switch filters on the IC751, the transmissions are also affected. The narrow filter allows you to create less QRM to an adjacent QSO.

Wide and narrow

What I feel we can all learn from these experiments, and manufacturers please take heed, is that rigs should really have narrow and wide filters available for SSB. Competitive models such as the Trio TS830 have variable selectivity, but the skirt is nowhere near as sharp as it is on discreet filters. I feel that expensive rigs such as the 751 should be fitted with more filter positions allowing the user a much greater flexibility, and the ideal situation would be for the special function to select normal or wide filters for CW, SSB, AM and even FM. I cannot see that this would be that much more expensive to provide, but, of course you would have to pay a good deal for the additional filters, which would be very worthwhile.

Let's now have a look at the overall market position held by the 751 and how it compares with many other HF rigs that I have checked out in the last 18 months.

Automatic ATU and solid-state linear



The IC751 has by far the best front end performance of any rig that I have tested from Icom, Yaesu, Trio and Drake. The only important rig that I have not yet had my hands on that might actually be superior is the Collins, which requires one to obtain a mortgage for purchasing.

The reciprocal mixing performance of the 751 is again very much better than its competition, and the IF selectivities cannot really be criticised in any way. CW, SSB and AM filters all have amazing shape factors and thus very steep skirts, whilst having an almost ripple free passband. Now that the 751 has been provided with the RC11 remote controller pad, its ergonomics are, in my opinion, the best of any rig tested although, of course, this is very much a personal opinion.

Ideal

It is very definitely an ideal rig for somebody with poor, or no sight, because of its superb speech frequency readout (optional extra). Of course, I can pick holes in this, for it is impossible for the speech readout to indicate memory channel and status. There are ways round this, and blind people might like to try putting 2.5MHz into memory 1 which can always be received, thus allowing you to turn round the memories until you can hear it, thereby giving you a starting point.

The audio quality on CW and SSB is reasonably good, but poor on AM, although adequate for the purpose of communication reception. In the light of experience, I find the worst snag now to be the lack of a respectable level on the transverter drive, and the fact that this is not subject to ALC when the PA is turned off by shorting the relevant pins, etc on the accessory plug.

No feedback

All signs of RF feedback have now been eliminated, and even under the worst conditions I now only get very slight breakthrough audible on the monitor speaker when I am transmitting, and usually there is none whatsoever. CW keying is superb, and break-in operation is very rapid, thus making the rig suitable for AMTOR. A particular joy for me, and many of my friends who have purchased the rig, is the interfacing with the AT500 and IC2KL linear, with band switching automatic on both the accessories, as well as almost instantaneous tuning up on all bands, if the SWR to begin with is better than around 4:1.

Considering all these facts, the IC751 is now my top recommendation as of Summer 1984 for an HF transceiver. The only remaining problem is that its cost is, of course, high, particularly if you purchase all the options. On the other hand, one must be sensible about cost, for if one inflates the original cost of a typical transceiver of the early 60s and equates it with today's prices, transceivers now are infinitely better value for money. The KW2000A, with its failings, cost not far short of £180, which now after inflation would be the equivalent of £1400 or so, a good deal more than the IC751.

I am sure I shall be very happy with the IC751 with its accessories for quite a time, but who knows what is round the corner! I hear that Trio are installing voice synthesisers and many new facilities in their new ranges of equipment, some of which will be appearing shortly for VHF and UHF. I suppose it is rather like a game of leapfrog, and I must admit that I very much enjoy trying out all the new rigs, except for the odd one that has been a great disappointment.

Thanks

I would like to acknowledge the assistance of Trevor Brook (Surrey Electronics), who has carried out much work also in analysing the causes of the AM distortion in the R71 receiver. Like me, he is very impressed with the rig on SSB and CW, but feels that Icom should have improved on their circuitry for AM in the areas criticised above. He finds that it would be too difficult to fix the problems in the same way as he has successfully done with his professional version of the Yaesu FRG7700.

AERIALS AND PROPAGATION

BILL SPARKS G8FBX

Starting a new series of articles covering all aspects of aerial theory and design

During many years experience as an instructor to RAE classes, the most closely followed subject has always been aerials and propagation. In an attempt to provide a base from which further development can take off, the series which follows is designed to explain simply the principles involved in aerial work.

The subject is covered with the objective of giving the newcomer to amateur radio an easy path into an interesting and absorbing side of the hobby, and assumes only a knowledge of basic electronics and an understanding of the sine wave. Where necessary, specific points raised in RAE questions are emphasised.

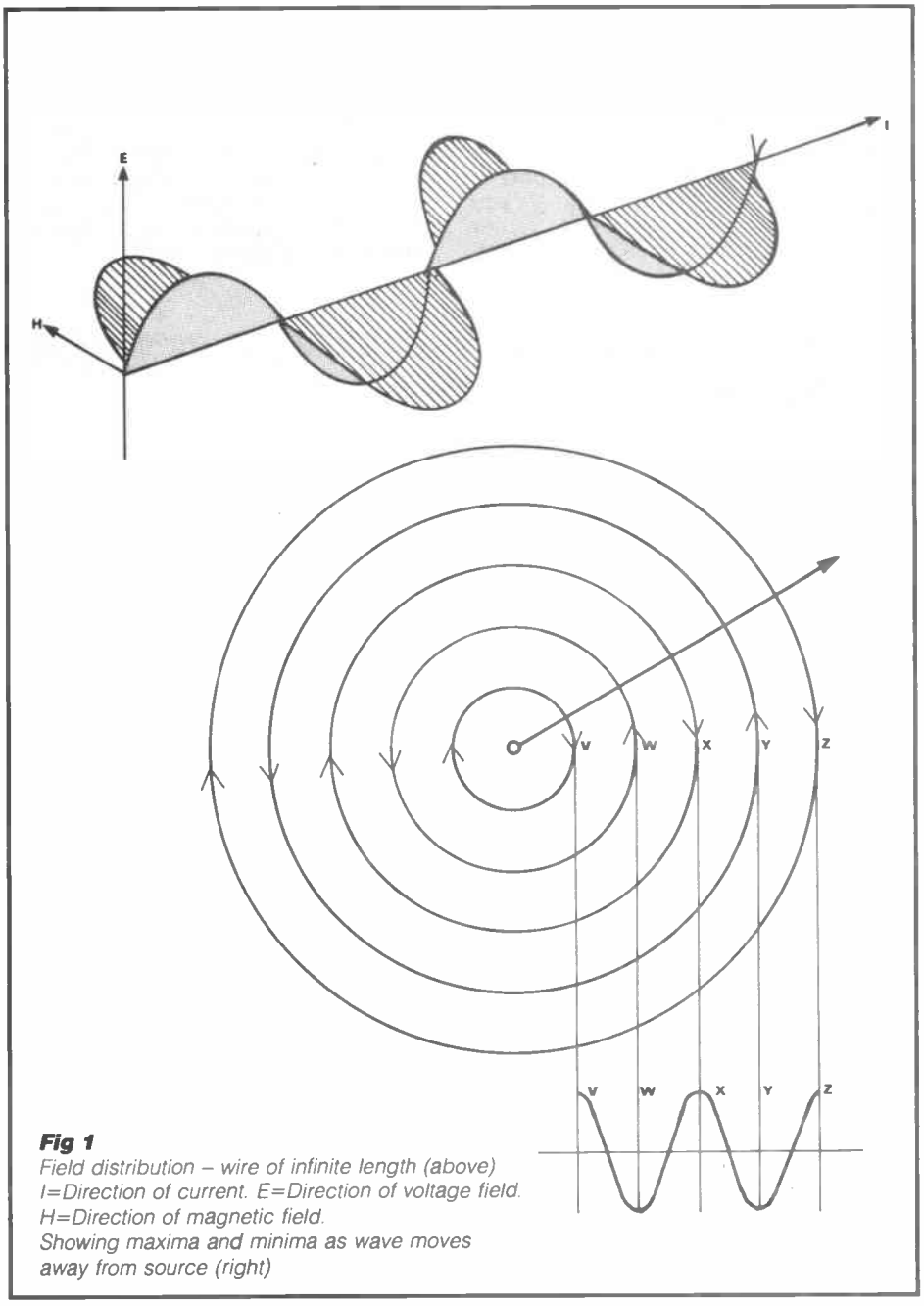


Fig 1
Field distribution – wire of infinite length (above)
I=Direction of current. E=Direction of voltage field.
H=Direction of magnetic field.
Showing maxima and minima as wave moves away from source (right)

Magnetic field

During the passage of alternating currents along a conducting wire, these currents create a varying magnetic field around the conductor. Energy is alternately stored in the field so created at a current maximum, and restored to the conductor as the field collapses during current reversal towards the formation of a field of opposite sense.

As the frequency is increased, there is a tendency for more and more of the field to be sent out into space as electromagnetic waves.

These waves are apparently pushed out by the next wave being formed before the first waves have fully collapsed, thereby creating a net tendency for a gradually increasing wavefront to be propagated away from the source. The magnitude of this front will increase at a decelerating rate until a stable condition is almost reached and then, a state of equilibrium eventually being established, a steady wave front is propagated. This is basically a radio wave (*Figure 1*).

When discussing the movement of the current along the wire, the original statement was made on the assumption that the current and voltage waves were in phase and had the same phase relationship, *and* that they were proceeding along a wire of infinite length, thereby meeting no obstruction in their path (*Figure 1*). However, a change in constants along the wire will result in a radical change in radiation characteristics.

Finite

If the aerial wire used as the conductor is terminated at a finite length, the voltage distributon along the wire can be indicated by an electric charge moving away from the start point, travelling to the opposite end and then returning to the start. If, during that period of time the magnitude of the charge has passed through one completed cycle, the double journey will have covered one wavelength. Such a wire is known to have a resonant length at that particular frequency.

It follows that since the charge has to travel from start to finish and back to the start again in a resonant length, the smallest resonant aerial to be considered will have an electrical length of one half wave.

From our original consideration of the distribution of current and voltage in a wire of infinite length we have now changed certain constants, in that we have given the wire a finite length. This means that the ends of the wire are points of very high impedance, since they limit the forward progression of current (open circuit). The pattern changes considerably since the current cannot proceed past the end of the wire and the current value drops to zero at this point. Since the current started at zero at the commencement of the wave, the current curve along the wire will be as shown in *Figure 2*.

The voltage and current charges started initially in phase and proceeded for one half wave along the wire. At this point the voltage, meeting a high impedance builds up to a high reverse value equivalent in magnitude to the peak value and moves back towards the point of origin where the same effect occurs. The result of this is to create a voltage standing wave that is 90 degrees out of phase with the current wave and shows high voltage at each end of the aerial, these voltages being of opposite sense or polarity, hence the name *dipole*.

The forward going wave meets the infinite impedance at the end of the wire and is reflected back, thus meeting the next forward or incident wave. At the ends of the wave the incident and reflected waves combine and the two respective currents cancel, thereby in theory giving us maximum voltage and minimum current. Since this occurs in a cycle fashion it follows that at the ¼-wave point, or half way along the wire, we have minimum voltage and maximum current.

From the original statement about the resultant magnetic field there must also be considered the electric field created by the voltage variation in the wire. An observer in space, if in a direct line with the wire, would see a plane surface of varying dimension approaching him as shown in *Figures 3* & *4*. This is an instantaneous presentation of the wave front passing an observer at one specific moment in time, and the dimensions of the front are directly related to the magnitude and direction of the sine wave at that point.

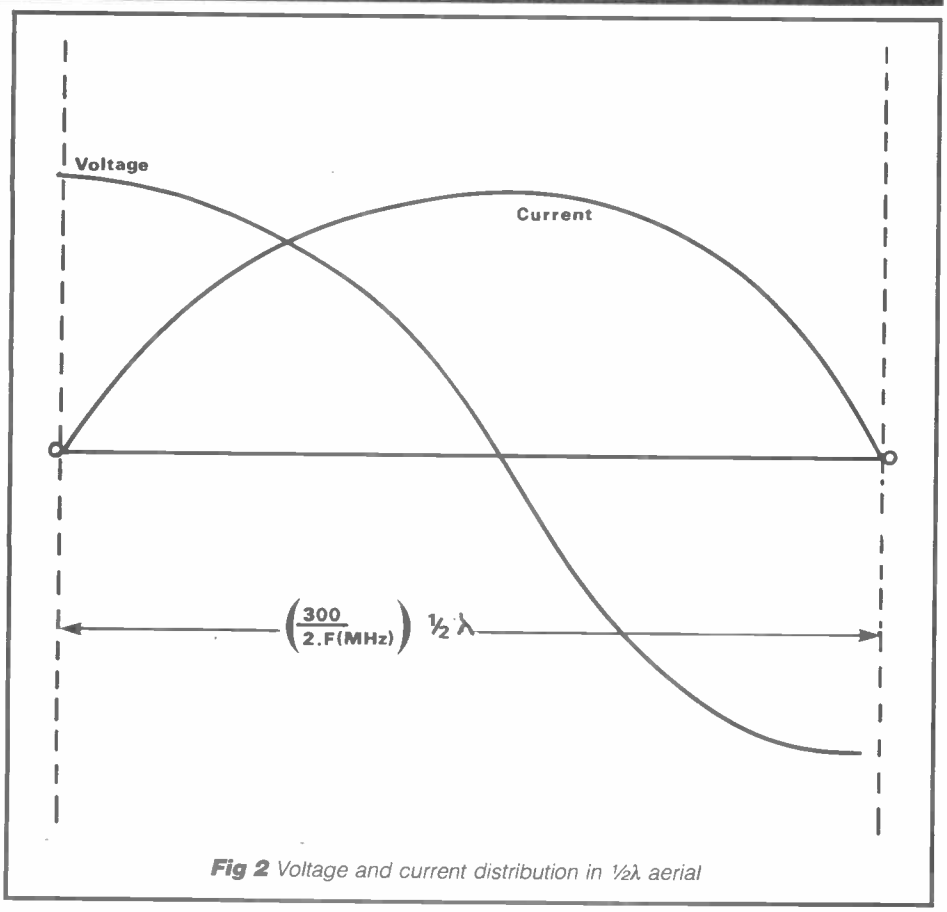
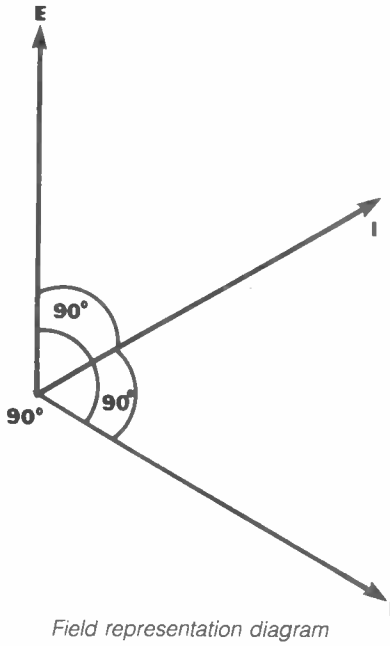


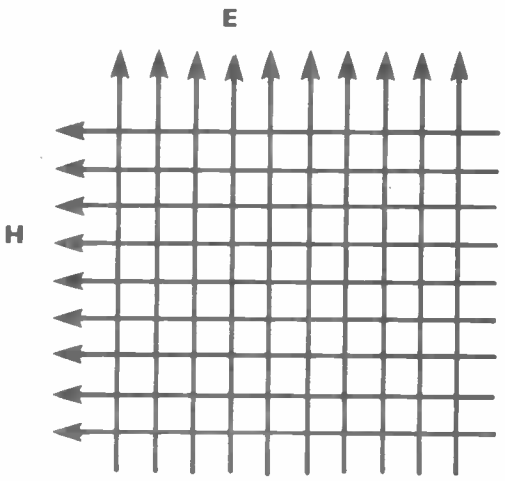
Fig 2 *Voltage and current distribution in ½λ aerial*

In other words a peak of the wave gives a maximum field of intensity and a zero gives a point of minima. This situation means that over a finite period of time a variation in the magnitude and direction of field in the wave front will be observed at the point of observation.

A wire at an angle to the field will have currents induced in it and consequently a voltage produced across its ends, thus effectively transmitting information from



Field representation diagram



Instantaneous magnitude of wave front approaching observer in line of wire

Fig 3

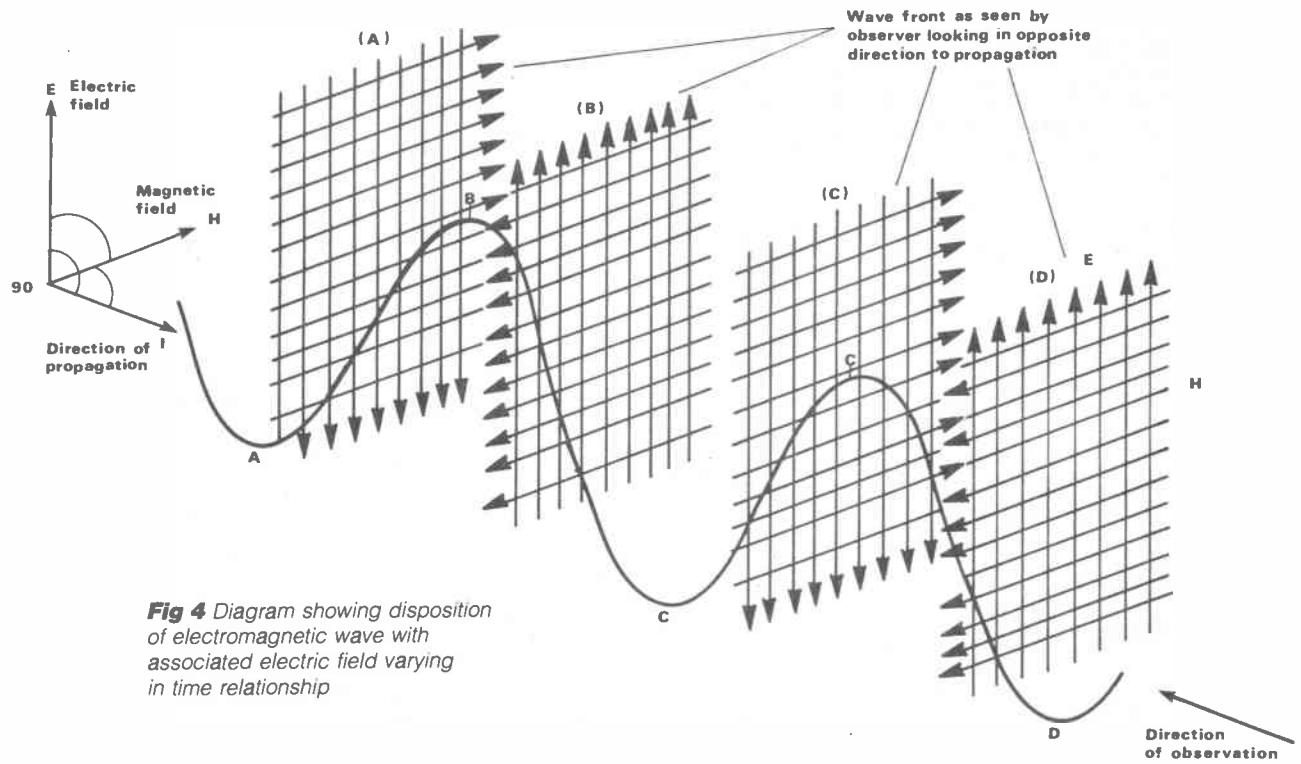


Fig 4 *Diagram showing disposition of electromagnetic wave with associated electric field varying in time relationship*

one wire to another by electro-magnetic waves. The directions of field force lines for the two fields making up the wave are always at right angles to each other, *and* are at right angles to the direction of propagation. This is shown in the field representation diagram in *Figure 3*, where I shows the wire direction, E shows the electric field directions or the direction of the voltage field and H that of the magnetic field.

From the previous statement we can establish that the electric charge along the wire and the instantaneous current created by the magnitude of the voltage create a companion magnetic field. The angular placement of the voltage field is called the polarisation, and we can say that the degree of polarisation of a radio wave in space is allied to the voltage or E field producing it.

Vertical

If the voltage field is in the vertical plane, the wave is considered to be vertically polarised. Polarisation of a wave can generally be taken as being in the place of the aerial producing the wave. A horizontal aerial will give horizontally polarised waves and a vertical aerial will give vertically polarised waves.

The physical length of a half-wave aerial is not a true half wavelength dimensionally. It is an electrical half wavelength and certain factors contribute to the length variation. Since a certain restriction to the flow of current is created in any form of conductor (ie electricity will only travel at 3×10^8 metres per second in a vacuum) the period of time necessary for a full cycle to pass is not extended, and consequently the physical length is shorter than the electrical length.

In a wire of finite length the effects at the end of the wire are again rather complex. The high voltage field creates a capacity effect to earth, and various other factors contribute to what is named the 'end effect'. These all have a disturbing effect on the physical length. A suitable correction factor to compensate for these effects is to give the physical length of an aerial in feet as nominally 492/F where F is in MHz.

However, the applications of correction factors necessary to bring real life values give a final formula of 492 (N-0.05)/F where N = the number of ½ wavelengths in the length of the aerial (note that the 0.05 correction factor is only included once since the aerial only has two ends, irrespective of its length).

The final equation for wire aerials where the wire diameter is small in consideration of overall length in feet becomes 468/F for single half-wave aerials. The effect of ratio of diameter to length is to modify the formula to 458/F for element diameters between 5/16in and 3/8in for VHF.

The aerial itself will have a varying impedence along its length due to the voltage/current relationships previously discussed. The calculated values for the impedence vary from 73 ohms at the centre (aerial in free space and at operating frequency) to many thousands of ohms right at the end. Also, since there is no change in phase relationship at the centre or at the end of the aerial, there will be no reactance present and the impedance will be pure resistance.

The impedence of the aerial is not the same as the *radiation resistance* which is not really a true resistance. A true resistance converts the energy applied to it to heat whereas an aerial converts it into electric and magnetic fields. The need for the ' *radiation resistance*' is to illustrate the effect of the aerial absorbing all the power presented to it and converting it to heat, and is that value of resistance which would absorb the amount of power being drawn by the aerial.

Obviously, few heat losses are encountered in aerials but the radiation resistance is a convenient term to use since, by measuring the current flowing in the aerial, we can say that the power in watts is 'x'watts from I^2R where R is the radiation resistance. Such details are important as calculation factors with vertical aerials.

The discussions so far have shown how we can, by the proper application of an RF current to a wire aerial, create a train of electro-magnetic waves which can be propagated into space. Intersection of these waves at a distant point can reproduce the radio frequency current in a receiving aerial. The movement of the electro-magnetic wave in space is influenced by a variety of phenonema and is still not fully understood.

Next month

In the second part of this series, I shall examine these phenomena and attempt to explain in simple terms just what we mean by 'propagation'.

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

I'm afraid that the long lead times involved in magazine preparation make it impossible to give up to the minute feedback on the rally season, and in fact by the time this is read the bulk of the season will be over, but hopefully my comments may help you decide to make an extra special effort to attend one of the better ones next year.

One rally that certainly fits this bill is the Elvaston Castle 'do'. The organisers have been attracting more and more traders over the years and it now rates, in my book, as one of the top six rallies. Here are the ones that are not to be missed for anything (and I can prove that I practice what I preach – I once went to the Leeds rally with a broken breast bone!): Woburn, Longleat, Leeds, Harlow (bias admitted!), Elvaston and Derby.

This year's Elvaston was supposed to be their biggest ever, and everyone I spoke to was enthusiastic. Comments ranged from 'now I know what heaven is like' from a newly licenced class B, through to 'if you want it and its even vaguely electronic, it's here' from an old hand. Acres of flea market tables overflowing with goodies, all added to the fun of it. The highlight of the day was, however, non-electronic. Acrobatic helicopter rides were available and the woman next to me was so scared during the flight that she kept hugging and squeezing me out of fright. Yes, it was *all* at Elvaston Castle.

A newly established rally is the one at Brighton. Originally designed to alternate with the bi-annual Maidstone, it became so popular so quickly that it now takes place every year. A good one for the family man who can deposit the wife and kids on the beach, take a slow walk past the nudist beach and then off to the racecourse (the rally site), for the day. The one moan was the lack of signposts, at the site, to the third hall. Many amateurs seemed unaware that there was another hall and only found out about it when enquiring the whereabouts of the bring-and-buy, which was located there.

Secondhand mini-review – the IC22A

This rig enjoyed a lot of popularity a few years back, and gained a deservedly high reputation for reliability. The one drawback for the newly licenced amateur is that it is crystal controlled, but one with ten channels or more shouldn't leave you too much out of the action. The receivers are sensitive enough, they don't block too badly and, a big plus in my book, there is plenty of audio coming out – very handy in the noisy van that I drive.

The transmit side produces good quality audio reports at the other end, so for £50 to £60 it has got to be a serious contender for those starting out on a limited budget. Bear in mind that crystals are still available, so a rig well loaded with channels but conforming to Murphy's Law, ie not having the one that you want in it (the local repeater or club channel perhaps), will cost another £5 to re-channel. As for standard faults, there are none. In common with most Icom gear that I have serviced (with one exception below), the IC22A is well engineered and any failure is purely random.

The IC245E

This has got to be one of the cheaper multimode secondhand transceivers about. Again it has fair receiver performance, lots of audio and a good transmitter, *when it's going!* The fault with these rigs, and I've repaired dozens, does not really lie with Icom but with the user. Provided the rig is run on a standard 13.8 volt supply, all is well. Go over this and the transmitter driver transistor, a 2SC1947, marked C1947 on most rigs, will go open circuit.

Many transistor equivalent books give the alternative to a 2SC1947 as a BLY34. In this case they are wrong, the 2SC1947 has an isolated case – in fact the case is earthed in the rig – while the BLY34 is the more usual collector-to-can type. In early repairs I tried the BLY34 with an insulating washer but the gain isn't really high enough. The good news is that Thanet (the UK Icom importer) seem happy to sell the correct device, the bad news being that they cost about £8 each.

I have always maintained that a wise man (or woman) should learn by other people's mistakes, so if you have an IC245E never run it on a supply over 13.8 volts. Before installing the rig in a car, check that the battery voltage, with the engine revving a bit and lights off, doesn't exceed, say, 14.5 volts as an absolute maximum. The station power supply should not exceed 13.8 volts, so if it does, turn it down. Its interesting to note that the 2SC1947, when used in other rigs, doesn't seem so touchy.

Another awkward and common fault on these rigs is frequency instability. Although normally only noticed on SSB when reports of unreadable signals will be received, if you monitor the carrier frequency on FM on another SSB rig you will hear a warble of up to two or three KHz.

The cure for this one is unusual. Locate the toneburst board (underneath) and admire its mounting system. The board is an oblong roughly 2in by 1in and held by a length of stout wire soldered to a mounting pillar! The repair involves unsoldering the board at the pillar, tightening the pillar and resoldering. Simple enough, but the first one took me ages to work out.

Don't let the foregoing put you off, however. The IC245E can give years of service at a reasonable price, provided you bear the above in mind. Incidentally, if *you* have repaired any amateur rigs yourself, especially if the repair was simple in the end, don't hide your light under a bushel – let everyone know by writing to me direct or via the magazine, and I'll pass the information on.

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■ Collin's receiver, .5-30.5MHz, 30 wavebands £250. Also RCA AR-88D, HRO, BC-348, R-444 VHF £45. Tuning units 36MHz-12GHz. Standing wavemeter, 300MHz-12GHz, unused £85. Signal generator 2-400MHz £85. Spectrum analyser, mint £85. Bob Wright, 249 Sandy Lane, Hindley, Wigan. Tel: Wigan 55948.

■ Belcom LS102L 25-30MHz transceiver, excellent condition, narrow FM filters fitted, digital frequency readout, £200. Tel: Bournemouth (0202) 301691 (day) 28758 (eve).

■ Trio 9R-59DS receiver in excellent condition. Complete with spare set valves. £60. Datong morse tutor £35. Tel: 01-994 8361.

■ ICOM IC-120 23cm FM transceiver, boxed in as-new condition. £325 plus carriage. Andrew Emmerson, G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Tel: (0604) 844130.

■ Rotator with NSEW control, mast and chimney lashings unused £50 complete. Also Tandy D160 5-band receiver £30. A Riddington, 91 Seven Star Road, Solihull, W Midlands B91 2BZ. Tel: 021-705 0223.

■ Icom R70 Rx excellent condition with Icom FM board and FRT7700 in original packing. Snip at £380. Will deliver 60 miles radius. Mr C P France, 72 Main St, Halton Village, Runcorn. Tel: 63964.

■ Tower 32ft with base £60, Jaybeam 6 ELE quad 2m £25, 18 ELE 70cm beam £15, colinear 2m £25, liner 2 £70, search 9 2m receiver inc PSU £30, lowe 2m FM receiver xtal controlled £10, lowe 9R59DS receiver inc speaker £45, maxcom CB, PSU, aerial, ATU, meter and power mike £35, two rolls of UR67 coax (rolls 80ft approx) £5 each. Buyer arranges-/collects. G6MOF, 24 Boma Rd, Trentham, Stoke-on-Trent, Staffs ST4 8EB. Tel: 644796.

■ Softy 2, EPROM copier, 3 months old FWO £85 ono. 2m FM Westminster xtald, R1, 4, 5, 6, S20, 21, 22, 23. Auto toneburst ex cond (10 channel fitted 8). £85 ono. Palm 4.6 channel 70cm handheld xtald, RB2, 4, 6, 13, SU16/20. New nicad fitted (waters and stanton). Ex cond with charger £115 ono. Pair PFIs with nicads xtald on RB2 (ST) with night call unit. Full wkg order. £35 ono. Buyers must collect. Christopher J Barker. Tel: (0782) 46570 anytime.

■ Ni-cad re-chargeable batteries sub-C cells, in packs of six, new and unused, stored only, made by ever-ready. £2.50 per pack. Shack project concluded forces sale, and now surplus to requirements. Many uses including FT290R ? etc. Contact John G4YVX. Tel: Telford 583637.

■ ITT 2020 Micro computer, apple II compatible with high resolution Hitachi monitor and lots of software including business, games and amateur radio programs, serial interface included to enable RTTY, modem or printer operation. Offers invited around £350 or part exchange for good HF transceiver, Yaesu FT757GX preferred but anything considered, cash adjustment either way. Tim Burton (G4UDA), 14 Rochford Close, Walmley, Sutton Coldfield, West Midlands. 021-351 7129.

■ Tonna 9 element crossed Yagi £25. Swiss Quad 2m £25. HFS with radials £35. K W E-2EE match. ATU £25. Tel: Yateley 878221.

■ Yaesu FT77, HF solid state trans, 100W version of this compact little rig, only used for SWL, a bargain at £400 considering age of only four months. Contact Mike RS84425 on 051-327 6440 between pm and 8pm only.

■ Trio TS130V 80/10m SSB/CW 25W, includes Warc. Narrow SSB filter fitted £395. External VF0120 £30. Digital frequency controller DFC230 £30. Above three items £445. MMT144/28 transverter £70 with cables. MMT432/28 transverter £110 with cables. UK101 micro, cased, 8K ram, only £25. Chinon 6000 auto slide projectr and screen with spare bulbs £25. Delivery at cost. Graeme, 19 Cowden Road, Orpington, Kent. Tel: (0689) 29230 evenings.

■ Shack and owner becoming terminal everything must go AOR 2001 comm receiver 25 to 550MHz with external keyboard and 5 meter £295. HP41/c hand computer offers. Stand alone sonic alarm system £20. UHF transverter MM144/432 with 13.8V 3A PSU £150 Welz SP400 SWR power meter B/wew £40 130-500MHz. Portable computer Tandy TR580 model 100 32K with programs printer cable and PSU. £300 cost £800. Computer video 7 inch screen. Perfect condition £35. Ring anytime. Pat 04738 5526 times short.

■ KW2000B and power supply/speaker recon new valves needs TX realignment £120 ono. JWR CB easily converted 10m, FM £10. 16 element BCX type 2m antenna good quality £20. BNDS 2m linear 3 watt drive 100 watt ouput LED power meter £120. Wanted HF linear and VHF linear valve type consider partly completed project, homebrew etc. Also Trio VFO 820, SP820, MM audio filter, HF tri bander, KW E21 match, part exchange either way. G4XEE Derek 0782 502961 Stoke on Trent.

■ Belcom LS102 multimode transceiver 26-30MHz recently realigned. In fine condition, mic, boxed. £150 plus carriage. No offers of course. Maxline ML212 linear amp. 2.5W in at 14MHz 70W out at 3MHz 160W out. Four output settings. AM/SSB switched preamp £55. Zetagi linear 26-30MHz model B70 60W AM 120W SSB £21. John G4WLD, 01-857 8096.

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■ Panasonic DR26 SW receiver, hardly used. Surplus to requirements due to purchase of transceiver £75 ono. J Stebbing, Aqaurius, Starlode Drove, W Pinchbeck, Spalding, Lincs PE11 3TD. Tel: 0775 87 301.

■ Yaesu FR101DD amateur band Rx £275 ono. Yaesu FR50B amateur bands Rx 160-10m £80 ono or will swap for Trio R820 Rx plus cash either way. J Wright, 12 Norn Hill, Basinstoke, Hants. 0256 68649.

■ Trio TS510 PSU510 and remote VFO5D with AM502 mike with built in speech comp £260 or exch for mobile 2m T/CVR at similar price G61F QTHR. Phone 0494 20733.

■ If you require service information for any electronic equipment then I may be able to help. Over the years I have accumulated a considerable private library covering all manner of equipment from vintage wireless to video recorders. From trannies to tellies, in fact practically anything electronic of any make and age. I am willing to get copies done for anyone who wants them. Please write stating what your equipment is and I will see if I can help. Please include SAE with your enquiry. Mr M Small, 8 Cherry Tree Road, Chinnor, Oxfordshire, OX9 4QY.

■ DR31 Panasonic 32 band receiver with Yaesu FRT7700 antenna tuner. All perfect £140. Cost £280! See 1983 radio and TV handbook for excellent review of this receiver. Buyer collects. Tel: 01 440 0476.

■ Nato 2000 11m transceiver and 200 PEP linear with 26dB preamp. Also Shakespeare big stik antenna sell all £165 or swap for FT290R. Phone Martin (0533) 899583.

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■ HRO two available/Hallicrafters S20R and Sky Buddy for restoration £25 each. Hallicrafters S27 VHF receiver – black wartime model £45. Heathkit DX100 U transmitter mod for SSB £40 ono. A510 Rx Tx Australian Army, 2 to 10MHz, AM SW back pack set with accesories £65. Various other sets, valves, accesories, also 1155A modified etc. John Baker, 13 Burrard Road, London NW6 1AB or Tel: 01 794 0823.

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■ Hammarlund HQ170A Rx and HX50 Tx. Both very good nick. But small fault on Tx with manuals and mic Rx covers 6m and 2m with converter supplied. Great bargain at £130 buyer collect. Phone Mike G4XBF (QTHR as G6RAI) on Wormley 3263 after 6pm. Will swap for WHY. M A Ray, 12 Sunnyhill, Witley, Godalming, Surrey. GU8SRN.

■ Trio R600 general coverage receiver 0-30MHz 6 weeks old as new accept £210. Still under manf guarantee. Buyer collects. Williams, 53 Green Lanes, Prestatyn, Clwyd LL19 7BH.

■ Datong PC1 converter 2m rig to 1-30MHz recvr £110. HRC recvr B9 valves, 7 coils, wkg £25. Heathkit Rai recvr wkg £25. Converter 2m to 4/6MHz £10. Junker precision hand key £30. Furzehill scope 3½in tube, old but wkg £30. Hi-fi spkrs IMF ALS 40 superb sound £100. Barratt, 9 Henbury Close, Torquay. Tel: 0803 37050.

■ MML 144-30-LS linear, global 6 amp PSU and Drae VHF wavemeter. All as new, hardly used. Offers (will split). James Twigg, 12 Gatcombe Close, Stretton, BOT, Staffs. Tel: Burton (0283) 62013.

■ Vic 20, colour computer, expanded to 16K comes with over £170 worth of compatible software. Total value when new – over £300. Sell for £200 or swap for gen coverage receiver (Yaesu FRG7700 or similar). Also Zetagi B70 linear amplifier and eurosonic CB unit (conforms to 27/81) both require attention. Sell at £40 written comminication preferred. Tony Sheach, 8 Struan road, Portree, Isle of Skye, Scotland IU51 9EG. Tel: 0478 2548.

■ Hooray I've passed. Anybody want a Tandy TR580 colour computer with accessories. Will swap for a working 2m handheld with repeater shift. Sell £75. J Taylor, 73 Caerau Rd, Newport, Gwent or leave message 0633 280501.

■ Heathkit ET3100A experimenter trainer kit unused and boxed cost £75 plus Heathkit learn electronics communications boxed cost £42. Will sell as package £55. A Staniforth G4ZDX, 2 Park View, Mapperley, Nottingham. Tel: Nottingham 625146.

■ Tono 9000E RTTY CW ASC11 Terminal unit with centronics printer port and light pen. Excellent condition. Only £400 free delivery 50 miles radius Manchester pay petrol expenses if further. Now using ST5 and BBC micro so Tono 9000E surplus to requirements hence low price. Khee Chan, G5MUR, QTHR. Tel: 061-225 5202 evenings.

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■ Lafayette HA700 comm rec 15-30MCS. AM CW SSB bandspread tuning S meter BFO manual circuit exc cond, no mods £60. Tel: 0222 487299.

■ Jen Synth SX1000 can make hundreds of different sounds cost over £350 new, will sell for £120 or exchange for 2m receiver or ham multi mode with mini beam. Also will except FRG receiver customer must collect please. Phone after 6pm. Russell Lee, 43 Mona Rd, Hornington, BOT, Staffs. Tel: 33526.

■ For sale Reftec 934MHz radio £200. Mr Tomlinson. Tel: Fanborough, Kent 58825.

■ Tona 9 element crossed 1 month old 2m surplus to requirements. Buyer collects £22. Tel: 01 540 3959.

■ Microwave modules transverters, MMT 144/28, £65. MMT 432/28, £65. Trio R600 Rx, £170. KW108 Monitor Scope, £60. Tel: Warwick (0926) 498388.

■ DX 302 communications receiver, 10KHz-30MHz digital read-out plus Global AT1000 ATU, both in excellent condition £140. D McGullivray, 30D Clouden Road, Cumbermauld, Glasgow. Tel: Cumbermauld 24459 (evenings).

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■ Illegal CB radios with USB and LSB wanted for modification amateur bands. Several required for my motorcycle mobileering. Going rate £0.50 paid. Collect 100 miles Reford. G3ROZ, 13 Abbey Grove, Sandy, Beds SG19 1QP. Tel: (0767) 80828 (weekends).

■ Yaesu FRG7700 Rx. FRT7700 ATU and Microwave Modules 144/28 converter. Manual, good condition, original packing. £270 ono. David, G1GCN. Tel: 0900 826461.

■ Super eight sound movie outfit, Eumig S910 carrying case, Sanyo EM60XL camera case, Rexette stripper, Fugica splicer, cine editor, folding screen, 7000 feet coloured films in twelve 600ft lots which cost £400. Offers, or swop best short wave receiver. Foley, 20 Hanover Court, Madeley, Telford, Shropshire TF7 5HT.

■ Trio TS510 and PS510. SSB and CW HF set. Checked by dealer. Surplus to requirements. Tel: G4YUG (0473) 830147 anytime.

■ Sony CRF320 32 band receiver. As new and must be seen, reluctant seller, £300 or swap VHF transceiver. Tel: Glasgow 041-551 9117 (evenings).

■ 2m Belcom LS20XE transceiver, pocket with rechargeable batteries with car charger. Two units four months old plus VOX mic, microwave linear amp 2m mag aerial £190 all. Tel: 041 429 2841.

■ Solartron CD1400 dual beam oscilloscope, 15MHz bandwidth, very good condition, £100 including probes and instruction manual. Tel: Chris, G4UTT (after 6pm).

■ TS120V, 20 watts, mint condition, can be seen working. Many QRP DX contacts in log. Offers around £330. Tel: 061 344 5484.

■ Daiwa CN520 SWR meter, 1.8 to 60MHz, 200W/2KW,£30 MFJ 900 Aerial tuning unit £35. Yaesu FTV901R transverter frame with 2m unit fitted, boxed £135. 15 amp Variag £25. FT221R workshop manual £15. Microwave modules frequency counter £50. AR30 rotator £30. Codar AT5, 80m/160m, CW/AM transmitter £30. BTI CDE rotator £65. Tel: Dursley 811454 (after 6pm).

■ FRDX500 bands Rx. 160-2m incl 4m coverage. Excellent Cond SSB/CW/AM/FM modes, £120. Datong UC/1 up converter 90KHz to 30MHz coverage £80. Tel: 0376 510664 (after 7pm).

■ AR 2001 scanner, complete cover 25MHz to 550MHz (see Feb 84 this mag for review) £250 ono. Also Marconi Atalanta 15KHz to 28.1MHz receiver £50. RAE pass forces this sale to finance 2m equipment. Don Chaney, 80 Wendover road, Chidman Park, Havant, Hants. Tel: 0705 471275.

■ FT208R handheld, two nicad packs, spkr, mic, charger, £155. Scarab RTTY i/face plus software for ZX81 £12. G4UKO (QTHR). Tel: Maidstone 859129.

■ Hammond L102 organ with tonewheel drawbars and presets. Also printed circuit making gear. Exchange for HF/VHF transceiver or separates or general coverage receiver. Can deliver. Tel: 097-422 326.

■ Racal RA117E, perfect, any trial. Tel: 029922 279.

■ Telefunken tape recorder, reel to reel, as new, bargain £45. Small oscilloscope, working but needs attention £15. Prince, 61 Middle Park Road, Selly Oak, Birmingham B29 4BH. Tel: 021 475 1272.

■ Philips N4414 stereo 7in open spool recorder in excellent condition with new record/playback heads and 27 tapes £250 ono. Buyer collects or will send by Securicor at cost. J A Oates. Tel: 0244 22039 (most evenings).

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DEADLINE AND CONDITIONS

Advertisements will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted.

■ Hokushin HF5V, five band trap vertical antenna, plus matching radial kit £50. Icom IC240, VHF FM transceiver, including 80 channel plug-in unit, microphone, mobile mounts, manual and original packing, £150 ono. Tel: Farnborough (Hants) 546966 after 6pm.

■ Radio software for Spectrum and BBC computers. Distance, bearing and contest score using QRA or Maidenhead locators. Locator program, converts latitude and longitude to QRA or Maidenhead locator. Also converts QRA to Maidenhead locator. Each program £4.50. Please state program and computer required. K H Law, 11 Springhill Road, Saffron Walden, Essex CB11 4AH. Tel: 0799 21388 (after 6.30pm).

■ HF transceiver, HW 100, SSB, PSU included. 3.5-29.5MHz. 29.5MHz band not working, otherwise in good condition £45. Tel: Braintree (0376) 44538.

■ DPCP5 trap vertical antenna, new £60. 19 ELE X Tonna, new, 70cm, plus power splitter £40. Daiwa low pass filter, FD-30m, new in box £8. FT101-Z series AM unit, new in box £10. D8-70cm double 8 slot-fed Yagi, no box £12. Plus bargain of the month, FT726R V/UHF all mode tribander, only 2m board, £500 ovno. Tel: 01-474 7133 (after 6pm weekdays).

■ Sansui QA7000 semi-pro quadraphonic amp plus TU7500 tuner £220. Might split. Also Awai AD6500 cassette deck £70. Bowers and Wilkins DM2 MK2 speakers £175 or swap for modern HF rig or good computer with cash adjustment. All mint condition. Tel: Northampton 491627.

■ KDK2030 (ten month old), SMC 2m collinear,⅞mobile antenna £200 ono. Tel: 0324 21910. (GM4SNZ, QTHR).

WANTED

■ Wanted Hygain 5-CB 26-28MHz or stalker XX home base CB – shall be interested in any multi channel. Biggs, 6 Gollands Close, Brixham, Devon. Tel: Brixham 51664.

■ Wanted AVD test matter. Mr Tomlinson. Tel: Fanborough, Kent 58825.

■ Swap mint condition cased two volume edition of the Oxford English Dictionary value £60 for a 9R59DS or E10 MkII or DX160 or WHY. L J Taylor, 1 Cadley Close, Blandford, Forum, Dorset DT11 7RY. Tel: Blandford 53933.

■ Circuit diagram handbook WHY for IC700R Inove receiver. All costs refunded. G5DQA QTHR 01 856 4123.

■ Possible convert to amateur radio wanted RAE manual 82-85. Also past test papers. 61 Tudor way, Hertford, Herts. Brian (0992) 54435 (evenings or weekend).

■ 3 element mini beam 10/11m. Also FDX 700/AX. T Waters, 42 Tregundy Rd, Perranporth, Cornwall TR6 0EF.

■ Trio VFO-30 was optional extra to Trio TR-7200G xtal Tx/Rx. Condition not important, but prefer working and good. State price and details. H Smith, 25 Newholme Crescent, Evenwood, Co Durham DL14 9RY. Tel: (0388) 834270.

■ Exchange Colonel FR360 26.965MHz-28.805MHz LSB USB AM plus Bremi BRL 200 linear and turner MTz/U mic for either PDL11 and rotator or good GEN coverage receiver FRG7 if possible. Mr Bishop, PO Box 106, Colchester, Essex.

■ Swap. Four pairs of Pye PFIs un-modified complete with charger unit and manual for 2m linear. Valve or solid state. Tel: 0482 859445.

■ Early valves any quantity; especially medium, high output power triodes. Interesting, early examples of Amateur Radio Equipment, Military Sets, Commercial and Broadcast recievers. Any clandestine, suitcase radio sets – incomplete or non-working also wanted plus any manuals or accesories. Leak, Williamson, Dynatron, Dynakit valve amplifiers, tuners, radiograms and the original Quad Amplifier. Please contact John Baker, 13 Burrard Road, London NW6 1AB Tel: 01 794 0823.

■ FT780R Yaesu, good condition. J Fletcher. Tel: Bristol (0272) 643277.

■ Please can you help? I have recently bought a Trio 7800 25W FM 2m transceiver secondhand without an instruction manual. Could anyone photostat me a copy. I will pay all costs. John, G6SXR, 41 Edgar Rd, Yiewsley, Middlesex UB7 8HN. Tel: West Drayton 445940.

■ TI99/4A extended basic module, must be in good condition. 'Redheugh', West Main Street, Blackburn, West Lothian, Scotland EH47 7LS. Tel: Bathgate 56429.

■ Anything to help enthusiast studying for the ticket. Books, mags and cheap equip. Small amounts of cash available as I am on DHSS and have family. All post will be repaid. Anything will be helpfull. Paul Quinney, 172 Ibstock Close, Winyats, East Redditch, Worcs.

■ Urgently wanted, any info, circuit daigrams and especially manual, anything at all, on Trio JR 60U Rx. This is the one that covers .55 to 30MHz and also 2m. Beg, buy, or borrow to copy. Also wanted, 2m convertor with IF output at 2 to 4MHz if poss, but any will do. All letters answered. E Parkes, 1 Silk Stone View, Platts Common, Barnsley, S Yorks.

■ Short wave receiver, prefer modern digital read-out and memory facility. Tel: Bradford (0274) 583343.

■ Yaesu FT290R with or without accessories, m/mount, charger, etc. Will pay transport. Also wanted aerial rotator for light VHF beam, for scout group. G6OLK, So'ton (not QTHR). Tel: Botley (04892) 6591.

■ Avanti Sigma 4 or similar, must be 7/8 wave, for use with 26 to 30MHz equipment, up to £25 paid. Please send letters to Graham Gilbertson, 22 Wistowgate, Cawood, Selby, N Yorkshire. No visitors please.

■ CB radio gear wanted, antennas, cables, plugs, SWR meters, power supplies, rigs. Anything CB. D Martin, 29 St Johns Close, Leatherhead, Surrey. Enclose SAE for price offer.

■ FRG 7700 memory unit, must be in perfect condition. Good price paid. D T Scott, 114 Rowan

FREE CLASSIFIED ADS

WANTED

Avenue, Harraton, Dist 13, Washington, Tyne & Wear, NE38 9AQ. Tel: 4178840.

■ 101 HF rig. Must be reasonably priced and in good condition. Pete, Highfield Drive, Sutton Coldfield, West Midlands. Tel: 021 373 0060.

■ A receiver for 130MHz to 170MHz portable, also Tandy handheld CB TR1001. Reasonable price. Beard, 13 Park Road, Stanwell, Staines. Tel: Ashford 44361.

■ Europa B transverter 10m to 2m, must be in good working condition. Also needed rotator for 2 meter beam. Cash waiting. Contact Tony. Tel: 0632 661310.

■ Drum kit. Swap for Debrie 16mm sound projector, Bellhowel 16mm silent projector, PSU 5 amp, 13-8V, 1800' sound film, 8-track car stereo unit with radio value, £275. G8BSK, 290 Priory Road, St Denys, Southampton SO2 1LS.

■ Trio R2000, mint condition. Tel: 0326 290485.

■ FM board for Yaesu 101ZD Mk 3, good price paid, also Shure 444 mic. Barry, 9 Paisley Ave, Eastham, Wirral, Merseyside L62 8DL. Tel: 051 327 6548.

■ Four jaw chuck, any other tools for Myford ML7. N Sparrey, 3 Summit Rd, Clowstop, Ridderminster. Tel: 029922 279.

■ Late model HRO receiver. Prefer one with octal valves, all coils and PSU also book wireless transmission by Camm, RSGB Bulls mid-1944 on. GW6AYM, 28 Mumbles Road, Blackpill, Swansea. Tel: 0792 204146.

■ Yaesu FT-290R with nicads and charger wanted in good condition with accessories. Adrian Jones. Tel: 021-743 4039.

■ Radio and electronics world back issues for January and February 1982. Possibly able to collect. 41 Tollgate, Peacehaven, East Sussex BN9 8ED. Or phone Bob on 07914 2823 evenings or weekends.

■ Revco, antenna for use with SX200N scanner. Must be reasonable for disabled person. Phone 0282-59320 anytime.

■ Circuit manual for Eddystone EC10, also battery holder for same model. Micheal Mickels, 3 Gorslas, North Cornelly, Bridgend, Mid-Glam, S Wales CF33 4NG. Tel: 0656 745527.

■ Test report or review of Yaesu FT480 2m radio will refund postage and costs of any duplicating etc. Mr K Mott, 191 Joyners Field, Harlow, Essex CM18 7QD. Tel: 26647.

■ Exchange oscilloscope televet airmec type 259 and sentinal 2 metre converter for an airband receiver. Nash, 39 Fleet Street, Holbeach, Lincs PE12 7AD. Tel: Holbeach 22649.

■ Exchange Hammond T500 tone wheel organ in nice condition for Trio TS430s and matching power supply or Yaesu FT757GX and power supply. Other rigs considered. L J Brown, 2 Olive Court, Northdown Ave, Cliftonville, Kent CT9 2NN.

■ Wanted Trio R820 receiver. Tel: (0256) 686490. J Wright.

■ Service sheets for Philips T/V 191G173A. Decca colour T/V CS2213. Hudson Tx/Rx VHF. Pye vanguard high band. P G Robins, 290 Priory Road, St Denys, Southampton SO2 1LS.

■ Manual for Belcom LS102L, also mobile bracket for same. Peter Reid, 18 Lugton Court, Irvine KA12 8ER. Tel: (0294) 72253.

■ Power transformer for Heathkit oscilloscope model 10-103. C P Riddle, 16 Colwyn Road, Rumney, Cardiff CF3 8JS. Tel: (0222) 790463.

■ Signal R517 airband receiver, must be in good condition. Fisher. Tel: (0484) 663681.

■ Yaesu FT7B or similar Rx/Tx plus G whip with LF coils if possible, and base mount. Derek. Tel: (0482) 825719

■ Exchange Hameg HM203 dual beam scope with component test facility, for FT290R (preferably with mutek front end), or other 2m multimode. Mr R Smart, 21 Fernwood Drive, Rugeley, Staffs. Tel: 08894 79393 (evenings and weekends).

■ Computer users! Help required, any information on my 'Cobra MX' CP/M based computer. Uses 'rade' single board, two ½MB disc drives Z80A based. Any information or software ie wordstar, spreadsheet etc, would be appreciated. Write to: 181 Argye Road, Ealing, London W13. Tel: 01-998 4936 (evenings).

■ Wanted Drake SCC4 5NB. Swap new TT21 for TT22. SAE lists valves and offers. Trowell, 'Hamlyn', Saxon Avenue, Minster, Sheerness, Kent. Tel: (0795) 873100.

■ HF multiband vertical antenna 40-10m. HF VFO Heathkit VF-IU or similar. Circuit diagram labgear scope model 2W. Ham band HF xtals. Wally Topley. Tel: (0377) 70705.

■ Yaesu FRGT receiver, any other receiver of this price range considered. G F Samson, 1 Bellever Close, Princetown, Devon PL20 6RT.

■ TA33 JNR or TA32 JNR or similar 3 band Yagi. Must be in good working order and would prefer to see antenna in operation. Will collect within 50 mile radius. Bob McTait (G2BKZ), 22 Nodes Drive, Stevenage, Herts SG2 8AJ. Tel: (0438) 721418.

■ Any information about the first Samuel Morse telegraph. (Morse code printed on a paper tape). I wish to build a replica, could return after photocopying. Patrick Garcia, 134 Avenue de Paris, 94300, Vincennes, France.

■ AR88 manual, circuit diagram also R1155 manual, circuit diagram. Please state price required. D W Blanchard, 141 Dunes Road, Greatstone-on-Sea, New Romney, Kent.

■ ATU and memory units for FRG 7700. Tel: (0436) 71181.

■ Manual for WS19. MK3. Also pwr input and o/p plugs junction box etc, spare valves, rotary converter. Would exchange 1155N GWO plus 1155A complete but not working, early RAF wavemeter for WS22 or WS19 working station. Pete (G4LQZ). Oxon. (0235) 34037 (evenings).

■ Exchange Super Star 360FM transceiver 11m hi mid low CW AM FM USB LSB. Slight distortion on sideband, otherwise OK. Also dual beam oscilloscope type 13A dc to 5.5MHz. No probe leads but easily made up. Exchange for 2m portable Tx/Rx multimode if possible, or WHY. John Vernon, 215 Anglia House, Longsight, Manchester M12 4AF.

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Name/Address Postcode/Telephone							

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Amateur RADIO

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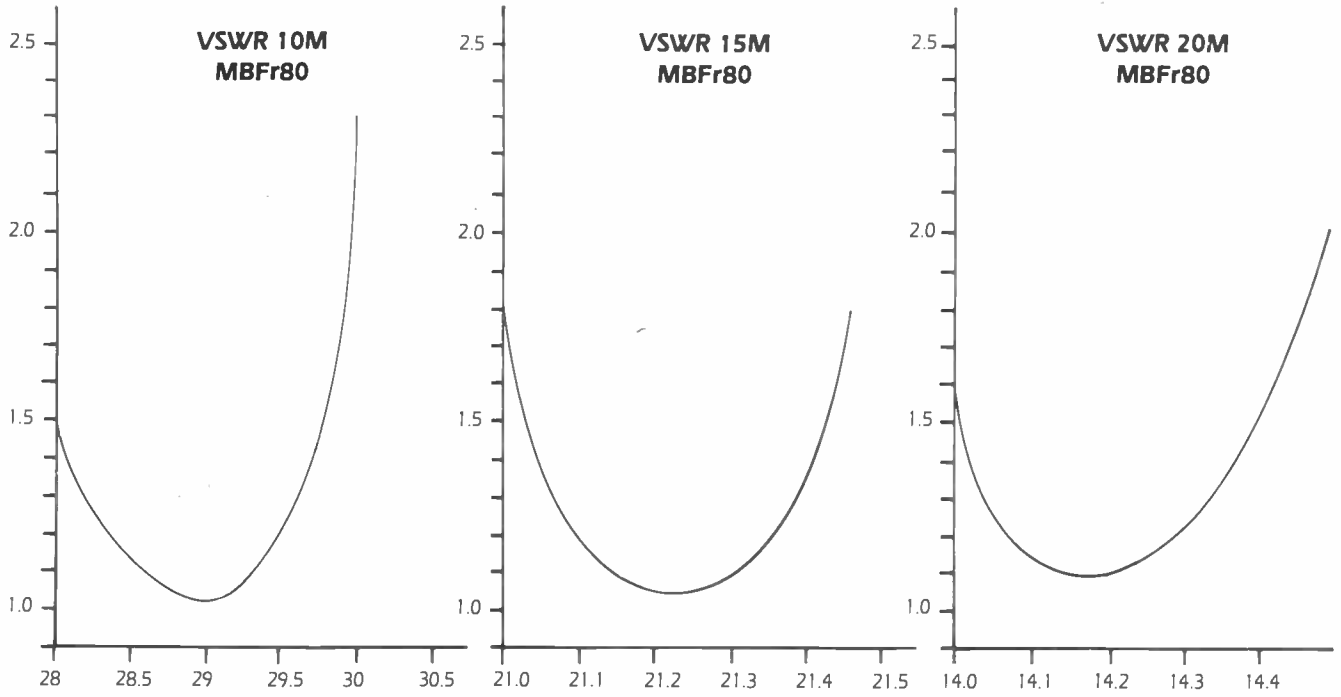

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