March 1984 90p

Amateur RADIO

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The first amateur DX

Inside the Radio Interference Service

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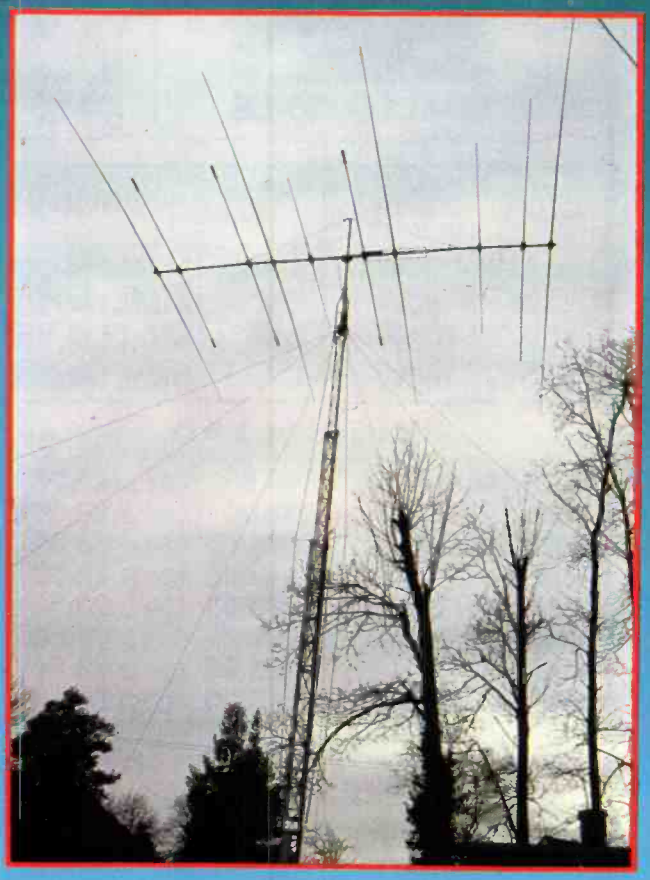

On test: JRC JST-100

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To suit the many New Generation transceivers having 25 Watts output

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INPUT POWER	OUTPUT POWER (R.M.S.)	MODES OF OPERATION	PRODUCT	PREAMPLIFIER GAIN	PREAMPLIFIER N.F.	POWER REQUIREMENTS	RF VOX	CONNECTORS
1 or 3W	30W	SSB	MML144/30-LS	12dB	<1·5dB	13·8V @ 4A	✓	SO239
10W	50W	FM	MML144/50-S			13·8V @ 6A	✓	SO239
10W	100W	AM	MML144/100-S			13·8V @ 12A	✓	SO239
1 or 3W	100W	CW	MML144/100-LS			13·8V @ 14A	✓	SO239

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MML144/100-HS	: £149.95	(p+p £3.50)
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This advertisement represents a cross-section of our extensive range of linear power amplifiers currently available for the 144 and 432 MHz band.

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INPUT POWER	OUTPUT POWER (R.M.S.)	MODES OF OPERATION	PRODUCT	PREAMPLIFIER GAIN	PREAMPLIFIER N.F.	POWER REQUIREMENTS	RF VOX	CONNECTORS
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10W	50W		MML432/50	12dB	<2dB	13·8V @ 8A	✓	INPUT—BNC OUTPUT—'N'
10W	100W		MML432/100	—	—	13·8V @ 20A	✓	INPUT—BNC OUTPUT—'N'

MML432/30-L

MML432/50

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Amateur RADIO

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We are pleased to announce that the company has recently been appointed U.K. distributors for the TELEREADER range of equipment. Those of you who have seen TELEREADER products will know that outstanding performance allied with ease of operation are the hallmarks of this particular company. The three models in our range are the **TELEREADER CWR685E** combined transmitter and receiver and the **CODE MASTER CWR610E** which not only receives CW and RTTY (Baudot and ASCII) but doubles as a morse tutor.

The **TELEREADER CWR685E** has many outstanding features: CW, Baudot and ASCII receive and transmit: CW at 3-40 wpm, RTTY at 45-300 bauds (six speeds): ASCII transmission/reception of both upper and lower case letters. Built-in 5" green phosphor screen giving a clarity and brightness that I have not seen before.

An external QWERTY keyboard housed in a substantial metal case and supplied with 3 feet of connecting cable. Not a "... key or plastic faced touchpad" but a true moving ... 6 Memory channels (63 character capacity ... total memory capacity can be allo... addition the 4 standard test ... characters. ASCII all ... memory and can ... formats. 48... includ...

As reviewed later in the magazine the JST100, a superb transceiver £998.00 inc. VAT carriage £6.00 (for a limited period a free PSU with each rig)

... x 2 for printer ... DC operation
... VAT, carr. £6.00
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THE POCKE TRA, A NEW DIMENSION IN PORTABLE AMATEUR RADIO

A RIG FOR YOUR TOP POCKET, THEREFORE PERFECT FOR THE ACTIVE RADIO AMATEUR

***The rig you will forget you are carrying ...**
With overall dimensions of 140mm high, 69mm wide, 26mm deep and weighing only 260 grams (including aerial and batteries), the LS-20XE fits easily into your pocket giving perfect portable communication.

***Long range communications ...**
A newly developed dual gate MOS FET is used in the RF stage of the transceiver which considerably improves receiver performance. The internal 50mm diameter speaker ensures clear audio under difficult portable conditions.

***Full coverage of 2 metre amateur band ...**
The transceiver covers 144 to 146 MHz in 5 kHz steps and has repeater shift and automatic tone burst.

***Switchable output power for extended operation ...**
In order to extend portable operation, transmission power level is switchable. 1 W, 500 mW and 100 mW, so depending on the terrain and conditions the most economical level can be selected.

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

LS 20XE

£139.00 inc VAT carriage £2.50

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

what to buy,

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

where to buy it,

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

help,

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

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

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Tel: 01-837 6702

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Tel: 041 945 2626

The North East Lowe Electronics Ltd.,
56 North Road, Darlington, Durham.
Tel: 0325 486121

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

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

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

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

TR9130 TWO METRE ALL MODE TRANSCEIVER

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

TR9130 ..... £442.52 Inc. VAT

TS780 DUAL BAND BASE STATION TRANSCEIVER

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

TS780 ..... £795.00 inc. VAT

TR7930 TWO METRE FM MOBILE TRANSCEIVER

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

TR7930 ..... £312.11 inc VAT

R2000 GENERAL COVERAGE RECEIVER

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

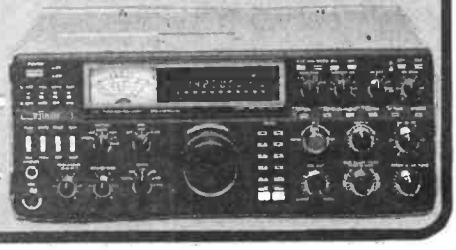
R2000 ..... £421.36 inc VAT

TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE FACILITIES

Much has been said about the TS930G transceiver and it now has a place high in the affection of those amateurs fortunate enough to own one. Indeed it has become the "flagship" of the TRIO range. Providing full amateur bands plus a general coverage receiver (150KHz to 30MHz), the TS930S has every conceivable operating feature for today's crowded frequencies.

TS930S ..... £1,150.00 inc. VAT

NEW PRICE



TR2500/TR3500 HANDHELD TRANSCEIVERS

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

TR2500 ..... £237.82 inc VAT
TR3500 ..... £256.45 inc VAT

TS530SP HF AMATEUR BAND TRANSCEIVER

A logical progression from the reliable TS520 series the TS530S was the most popular HF rig in the range. I use the term "was" because TRIO decided to cease production and supplies were no more. However, the demand from radio amateurs worldwide for the transceiver has continued and TRIO have re-introduced the rig. A standard HF valve transceiver without the frills but providing today's amateur with all necessary facilities for reliable world wide communications, the TRIO TS530SP

TS530SP ..... £638.00 inc VAT

TW4000A DUAL BAND FM TRANSCEIVER

I have been waiting for this rig for the last three years. Now it is here and I am using one, words fail me. Send for details.

TW4000A ..... £469.00 inc. VAT

just a part of the range

Send 90p for full catalogue

CURRENT·COMMENT

The RSGB's licensing advisory committee has invited comments on the UK amateur licence. Here goes.

1. Allow third party traffic. This will encourage efficient communication, ie. the transfer of the maximum amount of information in the minimum amount of time. At the moment many operators seem to do the reverse. Recently a G2 responded to my CQ and didn't let go of the push-to-talk for 40 minutes. Is this a record? I digress.

2. Get rid of this ludicrous nonsense of Raynet playing war games, and limit them to peacetime emergencies. Anybody with a nanogram of grey matter realises how fatuous the Government's civil defence plans are. Radio amateurs ought to know better.

3. Relax the rule that RTTY must be in the antique Baudot system, and allow a selection of modern formats as well.

4. Allow facetious phonetics, because everyone uses them anyway.

5. Allow amateur TV stations to idenfity by a video caption or an announcement in sound (intercarrier sound, that is, not a separate talkback channel). The business of adjusting to the "centre of the video channel" is, er, quaint.

6. "Inspection. 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." I'm not too keen on having unexpected strangers in my home on Norman Tebbit's say so. They ought to either give advance notice or get a search warrant.

Introducing you to this month's issue

Back to reality

There are lots of interesting features this month, starting with one on aerial rotators. Alan Barraclough G3UDO explains how to calculate the strain that aerials put on a rotator. Then it's a relatively simple matter to choose one that's tough enough for the job by using the manufacturer's data. Alan is a chartered mechanical engineer, and the designer of Allweld Engineering's range of masts and towers. So he should know what he's talking about.

The Radio Interference Service provokes a mixed reaction amongst the amateur fraternity. To the 'old school', they're the helpful British Telecom engineers who go to great lengths to sort out the neighbour's TVI trouble. To some of the 'new school', they're the Buzbies who nicked them for being naughty on 27MHz! Either way, the job of the RIS is both important and fascinating. Keith Townsend, G4PZA, puts the spotlight on the service, which has for many years discretely remained in the background.Soon BT will hand over the job to the Department of Trade and Industry. Meanwhile, the individual engineers in the RIS are having to choose between moving to the DTI, or staying in BT and doing a different job. There aren't many employers requiring their unusual skills, although by the time that this appears in print there could be a lot of vacancies at GCHQ in Cheltenham!

John D. Heys has taken a temporary rest from writing about aerials, and has used the time to uncover some intriguing tales about "the first amateur DX". Much of the information has only recently surfaced, and many of the QSL cards shown are of historic significance.

There are two constructional projects this month. One is an add-on audio filter. This will improve the selectivity of many receivers. It's a passive design, using modern, off-the-peg inductors, and offers a shape factor of about 1.3.

The other project this month is really a collection of ideas for simple oscillators for aligning receivers with. OK, so an old tobacco tin doesn't look brilliant, but at least it's cheap. You can stick these test units in diecast boxes with gold-plated BNCs if you want.

Our main review this month is of the JST-100 HF transceiver, made by the Japan Radio Company. This box is rather different from Trio/Yaesu/Icom in its design philosophy. JRC seems to place emphasis on performance, ruggedness and ease of maintainance, rather than providing countless facilities. Needless to say, Angus McKenzie G3OSS finds a few things wrong with it!

Turning to a much faster sort of frequency, Andy Emmerson G8PTH continues his 24cm amateur TV epic. This month he looks at the commercial equipment available for this mode. There's more of it about than I thought. Hopefully, future parts in this series will reflect the home-brew side as well, and we plan to publish some designs for 24cm equipment.

After last month's look at the Pye range of private mobile radio equipment, and modifying it for the amateur bands, this month we take a look at a Burndept UHF hand-held, as an alternative to the Pye Pocketfone for 70cm.

This issue seems to have a slightly mechanical flavour. As well as the feature on rotators, there's a light-hearted story from Colin Stevenson G6XZD, who has adapted the low technology of his home made wheelchair to amateur radio, in the shape of an aerial mast that can be raised and lowered from in the shack.

Deadlines

A number of club secretaries have written to me asking for deadlines for "Club calendar". Sorry I haven't replied, but I've been up to my neck, and I might as well print them here instead. The deadline for the May edition of "Club calendar" is Monday 19th March, and for the June issue Monday 16th April.

73 de Richard Lamont

L·E·T·T·E·R·S

Receiver sensitivities

In the recent review of the Icom 751 in *AmRad*, receiver sensitivity is given as being about -122dBm, 12dB SINAD for SSB.

In the giant test, issue No. 3, the Icom 740 receiver's sensitivity is given as 0.14uV, preamp in. How on earth are we expected to compare one with the other? I feel that the least you can now do is to publish a conversion table for us uniniated.

Nevertheless, many thanks for an excellent magazine.

R. Jenkins, Christchurch, Dorset.

Good point. We'll stick to microvolts in future issues. Anyway, a dBm (decibel with respect to a milliwatt) is equal to 0.224V RMS across 50ohms, so -120dBm corresponds to 0.224uV. That puts - 122dBm at about 0.18uV. For a more comprehensive explanation of dB and dBm see any of the standard handbooks. I can't offer a conversion table at the moment as I am the proud owner of three duff calculators: one with a kamikaze nicad, another with an intermittent keyboard and the third just plain bananas. Score: Rockwell 1, Texas Instruments 2. I'm in the process of re-discovering my trusty old slide-rule, but haven't worked out how to do decibels on it with enough confidence to print the answers yet! - Ed.

Not mad

In reply to G3BDQ's article "Calling frequency madness" I would like to point out that most (if not all) stations in Scotland monitor 144.3MHz when busy in the shack.

Whilst I agree that sweeping the band for weak signals is a very good idea, here in Aberdeen I can sit on 144.3 all night and hear no stations at all some evenings.

As we do not suffer from the problem of band overcrowding the calling frequency works very well for us in Scotland - and my chances of raising a QSO would be a lot less if I were to call CQ on 144.280 for example. During a lift, however, I agree with the point he is making.

I am very keen to arrange skeds with stations in the London or Kent area - I have a coastal site, very good to the south, and I run 80 watts to a 19-ele which has been adapted to work vertical as well as horizontal polarisation. Sked details to PO Box 49, Aberdeen.

Re: Oct '83 letter from "Middle-aged Bluebeard". I am also a marine radio officer. I used my Radio Amateurs Certificate and Morse as an entry qualification, as I had no O-levels, to get a place at college and sit (and pass) my Marine Radio General Certificate (MRGC). And I found the experience of propagation very useful for the second paper!

Tom Waller GM4HIG, c/o PO Box 49, Aberdeen.

PS. If any readers, like me sadly miss the North Atlantic chart at 6pm on BBC1 TV, then I suggest they write to the Editor, "Sixty Minutes", BBC TV Centre, Wood Lane, London W12 7RJ. The more letters the better. I have to wait until 9.25pm to see where the next high pressure is coming from!

FM bandwidths

A number of general coverage receivers now provide an FM facility, but while the typical bandwidth provided by the manufacturer is adequate for handling VHF signals via a converter, it seems inadequate for the reception of FM signals at HF. This is borne out by Angus McKenzie's review of the Icom 751 in the January issue. The general coverage receiver section of what was described as a "top of the range" model was said to be inadequate at coping with 10 metre FM signals spaced 10kHz apart. On the general topic of band congestion the editor also said that most equipment is incapable of working with 12.5kHz channel spacing.

The Sale of Goods Act stipulates that items offered for sale should be "fit for the purpose intended". It seems reasonable to expect a receiver covering 10 metre FM to be able to cope with the standard channel separation. Would it not be a good idea for distributors to urge manufacturers to include an FM wide/narrow facility on all receivers, both to cope with current conditions and possible changes in the future?

As a would-be purchaser looking for a comprehensive general coverage receiver I should be interested to know if a model exists having variable bandwidth on FM as well as AM.

Mr Hilary Humpries, Newmarket, Cambs.

In the past the main reason for having FM on an HF rig was so that you could transvert to VHF - where 25kHz channelling is the norm. 10kHz FM spacing has only arisen because of the recent introduction of modified CB rigs to 10m. The only way a receiver will be able to cope properly with both standards is to have two filters, at correspondingly greater cost. - Ed.

Reflections

After reading the article on SWR and power meters by your contributor G3OSS in the October issue of your magazine, I feel that some comment is necessary in order to clarify some rather inaccurate and misleading statements.

G3OSS has done a marvellous job by investigating and making available the characteristics of many SWR and power meters, for which we should all be grateful. Faced with this evident professionalism, I offer criticism of some parts of the article with diffidence.

The points at issue concern the conditions on a mismatched transmission line, and in particular, the possibility of reflected power arriving in the transmitter circuits. G3OSS is not the only one who has gone into print with what might be confused, but are certainly confusing ideas on this subject. On the other hand, Pat Hawker, G3VA, in *A Guide to Amateur Radio* (pages 106 and 107) has given an admirable exposition of the matter, with which I am in full agreement and in view of this, I am a little surprised that G3OSS's article appeared as it did. I ought to say that I am not personally acquainted with either of these gentlemen.

Some of the difficulty arises with the concept of 'power', which is properly defined as the rate at which energy can be transferred from a source to a sink: it expresses a capability of doing work. Notions such as the power radiated by an antenna, or lost in a feeder, while inaccurate, are understandable. It is also understandable to speak of a power flow along a transmission line when an energy source is connected to one end and a load to the other. What is unacceptable is the idea of power being reflected from a mismatched load (for example, an antenna), back along the feeder to the transmitter output and causing trouble there.

Without going into mathematics, the fallacy can be appreciated by considering the case of a lossless transmission line short-circuited or open-circuited at its further end. An energy source, such as a transmitter, connected to the input of such a line would see a pure reactance, with no resistance term, and would be unable to feed energy into the line, whatever the applied voltage. While such a reactance across the output terminals of the transmitter might, in the limit, cause a disaster, it could hardly be maintained that this was due to energy from the transmitter being reflected back from the termination.

To take the point further, let us suppose a real antenna is connected to the feeder, but which does not match the characteristic impedance of the latter. We could cut

L·E·T·T·E·R·S

the feeder at any point, and looking towards the termination, we would see an impedance, R ± jX, depending on the actual value of the termination and the distance from it at which the cut was made. If instead of cutting the feeder, we look into its input end which would be connected to the transmitter, and again we would see an impedance of the form of R ± jX. We could substitute for the combination of feeder plus antenna a set of lumped components, that is, a resistor and a capacitor or inductor, which we would choose and connect so as to measure an identical R ± jX value to what we measured at the input to the feeder, and if we connect this to the transmitter, there would be nothing to indicate whether it was working into the feeder plus antenna, or the substitute components. It is unthinkable that such a set of components could return power to the transmitter and cause trouble there, although there might of course be difficulty in adjusting the transmitter circuits so that all the available output energy could be transferred into the R term. In principle, this difficulty can always be overcome by a simple arrangement of reactances to cancel out the X term and/or transform the R term to a suitable value.

Confusion arises because of the existence of forward and return waves of voltage and current on a mismatched transmission line. These waves are quire real in the sense that they can be separated, and they can be indicated by a reflectometer or an SWR meter, and the actual standing waves caused by their combination can be demonstrated, for example, with a slotted line. But on a two-conductor transmission line, whether coaxial or balanced, this combination is inevitable, and at any cross-section of the line, only one voltage can be measured between the conductors, and only one current flowing in them, and energy flows exclusively from the source, that is, the transmitter, towards the sink, that is, the load, which is probably the antenna.

The description of the way power is returned from a mismatched load to the transmitter, and then perhaps back again to the load, in the centre column of page 16 of G3OSS's article, while having grains of truth in it, is fanciful. No matter what mismatch exists between the antenna and the feeder, or what impedance the feeder presents to the transmitter, no power (or strictly energy) is returned into the transmitter output circuits, and any increased heating or breakdown there is due entirely to increased currents or voltages resulting from the transmitter seing an impedance other than that for which its circuit elements were intended. The fact is that if you can adapt the transmitter output circuit, perhaps by means of a so-called ATU, to deal with the impedance presented to it by the feeder, you can deliver the whole of the available power of the transmitter into the feeder.

This is not to say that you should do nothing about standing waves, and in passing, it should be pointed out that putting an ATU between the transmitter and the feeder merely deceives the transmitter. The proper place for an ATU is between the antenna and the feeder.

As is correctly pointed out in the article, the additional loss in a good quality transmission line caused by the standing waves is usually quite small. With very high power transmitters, and particularly with amplitude modulation, flash-over is sometimes a consideration, but this is not likely to be troublesome at the antenna powers allowed to amateurs.

SWR meters are now widely used, and it was clever marketing to insist that every CB user should have one. With the short feeders (in wavelengths) used for CB, adjusting the antenna to improve the SWR is quite valid, but it should be appreciated that here again the problem is one of getting the output from the transmitter, and not of improving the antenna. The antenna will radiate whatever energy is fed into it, and a few inches up or down, and whether or not it is "resonant" (whatever that means!) makes negligible difference to its radiation efficiency.

The disadvantage of an SWR meter is that while it may tell you that something is wrong, it does not directly tell you what to do to put matters right. If the line attenuation is low, or the length is short, the meter reads the same at the termination or at the input. Does anyone in the amateur world use a Smith chart to help in antenna and feeder matching? Such a chart with a few lumped reactances or even lengths of feeder readily indicates what to do.

There are other points in G3OSS's article I would like to discuss, but this letter is long enough.

C. Gillam, Colchester.

An interesting letter. Faced with this evident professionalism, I not only offer criticism of some parts of it with diffidence, but also offer it only after a quick refresher from Pat Hawker's book!

First, I'm unhappy with the notion that power radiated by an antenna etc. is inaccurate. Energy is certainly radiated - you can pick it up with a crystal set and make it drive a pair of headphones. Farmers near Droitwich can pick it up and make it drive a light bulb. Given that energy is radiated, it must be radiated at a finite rate. That rate, by your definition, is the power. One joule of energy per second is the same thing as one watt of power. So surely power really is radiated.

I agree that reflected power does not exist in reality: it is merely a mathematical model to explain the effects of a mismatch. I am, however, rather confused by some of your reasoning. A capacitor does store energy (as an electric field between its plates, or charge). An inductor stores energy as a magnetic flux.

The idea that a transmitter can be damaged by reflected power is of course untrue, and as you say, the damage is a result of the transmitter trying to operate into a load impedance for which it has not been designed - Ed.

Good magazine

Thanks for a good magazine at long last. I got introduced to your mag last November, and have sacked my previous one now.

I read it from cover to cover and find it very enjoyable indeed, and very informative.

Thanks for giving interest and enjoyment to a 70-year old youngster.

Bill Sheppard, Telford, Shropshire.

Microwave unit

I am a new reader of your publication and the article on page 50 of the Yearbook has revived my interest in microwaves, which I hellped to pioneer in 1940 with the Government research team at Swanage and Malvern.

A third type of Gunn-diode mixer/horn unit is mentioned as being available at £10. I need one for experiments and another for a microwave intruder alarm, and I should be grateful if you could suggest a supplier. A design or kit for microwave intruder alarm would be of interest. I see that a firm is offering a reduced-price ready-made 3-unit system for £100 but as a DIY man I think I can do better than that.

E.H. Osborne MA, G2TS, Scarborough.

Surplus units, made by the American company Solfan, in good condition but sold 'as seen' are available from T.W. Wraith, 33 Colebrook Road, Swindon, Wiltshire for £11 including postage. Spare Gunn diodes are available from J. Birkett in Lincoln for £1.30. More details are available from the Microwave Society, c/o - Glen Ross. His address is in this month's "On the beam" - Ed.

Praise

I write to you this evening in

L·E·T·T·E·R·S

praise of a well known manufacturer and the Post Office for speed of service that must surely be almost unheard of.

Last Friday evening, the 25th November, my Datong Morse Tutor packed up, through my own fault, but I prefer not to go into that. On Saturday morning I posted the Morse Tutor back to Datong Electronics in Leeds, asking them to repair it for me urgently - and - this evening, Tuesday 29th, the repaired unit had been delivered to my home.

Cost? £5 plus VAT.

Whilst there might perhaps have been service that could have been equalled, surely, it can never have been beaten for both speed and cost.

Incidentally, the Datong Morse Tutor not only enabled me to pass the test within a year, but I now read at about 25 words per minute, and most members of my Morse class (I teach after 18 months learning) have also bought one and are getting on very well.

Fred Henschel, Chislehurst, Kent.

Blind spot

Re. the item on page 9 of your November issue titled "Up the pole" from D.J.R. of Sidcup.

It appears that radio amateurs and amateur radio magazines are always ready to have the inevitable dig at CBers. If D.J.R. had not been so smug and enquired from the CBer why he had a rotator on a vertical antenna, he would have gained a little more knowledge, or is it too much to expect from G????

The antenna in the photograph is an American Avanti Sigma 4. It is about the best omnidirectional antenna is not uniform in 27MHz (albeit illegal). The radiation pattern of this antenna is not uniform in that it has a "blind spot" and the best way to overcome this is to fit a rotator. It appears that the CBer does know more than D.J.R. and is not a victim of a super slick salesman. It seems rather a waste of half a page of an otherwise rather good magazine to publish snide remarks about CBers, without either D.J.R. or the magazine getting the facts right first.

I don't suppose for one minute any of this letter will be published as after all it is in defence of a CBer "up the pole". I feel that D.J.R. could at least apologise to the CBer concerned. Incidentally I am not a CBer but a member of the RSGB.

B.C. Curtis, Benfleet, Essex.

Latest models

I enclose a photograph of "The CB Centre" in Hastings taken earlier this year. In the window can be seen some of the latest models that no CBer should be without.

Gordon Kittridge G8SBW, Sawbridgeworth, Herts.

RALLY CALENDAR

April 1: White Rose Rally at the University of Leeds. Opens 11am, talk-in on 2m and 70cm, free parking, entrance 50p children and OAPs free).

April 8: Buxton Rally, at the Pavilion Gardens, Buxton. Open 11am to 5.30pm (10.30 am RAIBC). Admission 50p, children under 14 free if accompanied by adult.

April 8: Swansea Rally, at Patti Pavilion, Swansea (next to St. Helen's Cricket Ground on A4067 Swansea-Mumbles coast road). Open 10.30am-5pm, talk-in, S22.

April 28/29: RSGB National Amateur Radio Convention, National Exhibition Centre Birmingham.

May 6: Anglo-Scottish Rally at Kelso. Weekend accommodation available.

May 27: Plymouth Rally, at Devonport Secondary School, Park Avenue, Devonport, Plymouth.

June 17: RNARS Rally at HMS Mercury near Petersfield in Hampshire. Open 10am-5.30pm, Talk in on 2m and 70cm.

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

September 23: Lincoln Hamfest, organised by the Lincoln Short Wave Club, on the Lincolnshire Showground (4 miles north of Lincoln on the A15). Open 11am-5.30pm. Talk-in S22 and SU8, caravan and camping facilities, facilities for the disabled.

STRAIGHT·AND·LEVEL

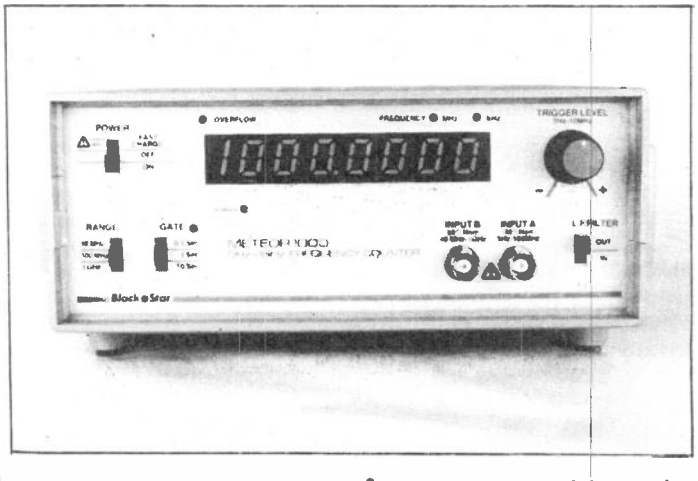
Space Shuttle - follow up

Space Shuttle astronaut Dr. Owen Garriott W5LFL heard about 290 amateurs from aboard *Columbia*, most of them in the USA. Although a few CW contacts were made, he found FM best because doppler shift was less of a problem, and because the capture effect helped him to hear one station at a time. Five UK callsigns appear on his logging tape: G4UYL, G6DEF, G6EGY, GM8NXC and GW6OJK.

Speaking at a press conference, Dr. Garriott hinted that NASA is pleased with the results of the amateur radio experiment, and may try similar activities on future missions. According to the RSGB, a second astronaut, W0ORE, is keen to take part.

It seems unlikely that amateur radio has any great scientific value to NASA. The amateur activity did, however, provide a great deal of extra media coverage for NASA at a time when it was trying to win support for its permanently-manned space station project, announced by President Reagan in his State of the Union speech.

The ARRL is completing a 28-minute video called "The Newest Frontier", a compilation of news reports about W5LFL on the Shuttle from 40 television stations around the world. Among the clips is footage of JY1 and GB3RS. Copies of the tape will be available in VHS and Beta formats.



Frequency counters

The Meteor series of frequency counters made in Britain by Black Star is now available fitted with a temperature compensated crystal oscillator (TCXO) for extra accuracy and temperature stability.

According to Black Star, the Meteor 1000X measures typically from 2Hz to 1.2GHz with 50mV sensitivity at 1GHz, and features a temperature stability of ±0.5ppm from -10°C to + 40°C, an ageing rate of ±1ppm per year, and 'setability' of ±0.2ppm.

The other models in the range, the Meteor 100X (2Hz - 100MHz) and Meteor 600X (2Hz - 600MHz) are available with the same TCXO. All models are battery or mains powered and are fitted with a trigger level control, a low pass filter and offer three gate times (0.1 sec, 1 sec and 10 sec).

The Meteor 'X' series of counters are complete with mains adaptor/charger, instruction manual and a year's guarantee. A wide range of optional accessories is available.

Black Star Limited, 9A Crown Street, St. Ives, Huntingdon, Cambs PE17 4EB. Tel: (0480) 62440.

Third-party pressure group

The Amateur Radio Third Party Action Committee (ARTAC) is a new group of Australian radio amateurs who feel that a number of countries, especially Commonwealth ones, should allow radio amateurs to carry third-party traffic. A press release from the group says that this would remove "a long standing, most unnecessary and highly 'political' stranglehold on the amateur radio service".

The statement continues with characteristic antipodean frankness. "In some countries the third-party restrictions are so severe that it is illegal for members of the amateur radio service who are operating within a legal radio network to relay messages, or even signal reports, to other amateur stations in the net who are having difficulties in receiving certain stations due to interference or poor conditions. It is, therefore, illegal for stations under these rules to become involved in international 'DX' nets. Authorities in many countries are so 'neurotic' about third-party, they insist that under no circumstances shall anyone's voice, except that of the licensed operator, be conveyed over the air. The restriction is so severe that the licensee of the station may expect to receive, from the authorities, an infringement notification for having his microphone gain set a little too high, thereby allowing so-called unlicensed background noises and voices to be transmitted over the air.

"These restrictions are not only unnecessary but are a direct insult to the amateur radio service which is, and always has been, one of the community's most responsible organisations. Members of the amateur radio service are always ready and willing to provide their skills and equipment free of charge for the benefit of the whole community.

Internationally the amateur radio service provides one of the stabilising factors for world peace, by breaking the political, racial and prejudicial barriers."

ARTAC ends its statement by asking, "Why should the international amateur radio service be treated like irresponsible children by authorities in so many countries, when in fact they are, in most cases, more responsible than many of those countries' leaders?".

The Secretary of ARTAC is A.D. Tregale, VK3QQ, 38 Wattle Drive, Watsonia 3087, Australia.

Co-axial centenary

In a letter to Ludwig Löffler, dated February 10th 1884, Werner Siemens described for the first time a method of constructing an induction-free cable. "It consists of individual conductors covered by a sheath which forms the common return conductor." This concept was patented in German Reichspatent No. 28978 of March 27th 1884, and solves the problem of "induction-free cables of lightweight design."

This type of cable, with the outer conductor concentrically surrounding the inner conductor, is nowadays called a coaxial cable. With its invention, Werner Siemens was far ahead of his time for it was not until the Olympic Games in 1936 that such a cable was used - between Berlin and Leipzig. With the aid of carrier signals it was possible to transmit 200 long-distance calls and one television programme.

A PLAIN MAN'S GUIDE TO ROTATORS

By
Alan Barraclough G3UDO

More and more amateurs today are venturing into VHF and HF DX operating as well as satellite operating, all of which will require some form of steerable directional antenna system, which in turn calls for some form of rotating device. There are a number of different rotators currently available, ranging in size from the very large and expensive down to the small TV aerial types. These can be simply manually operated to rotate to a desired direction, or, at the other end of the scale they can be fully automatic with microprocessor control. It is not surprising, therefore, that many amateurs experience difficulty in choosing a rotator that is suitable for their application, particularly where loading is concerned. Manufacturers' literature, when you can get it, gives a variety of specifications, which can be quite confusing and result in either a rotator being grossly overloaded, or a rotator that is far too large for the array or mast being used; a definite case of overkill. I hope that this article may help shed some more light on the subject.

Rotators can be of one of four general types as shown in Figs 1 to 4. These are offset mounted, on to a vertical mast with vertical output as in Fig 1, concentrically mounted onto a vertical mast as in Fig 2, base mounted onto a flat plate such as at the top of a lattice tower (Fig 3), and offset mounted onto a vertical mast with horizontal output as in Fig 4.

In general a rotator consists of a drive motor (usually low voltage AC) driving either a hollow shaft or the upper part of a housing through suitable gears. See Fig 5. The hollow spindle and the rotating housing are usually supported on ball bearings which take the thrust and side loads imposed by the aerial. On larger rotators, some form of electromagnetic friction brake is generally fitted, sometimes with an additional mechanical lock as in the heavy duty Ham IV variety. On smaller rotators, there may not be any mechanical brake; the retardation is produced by the inertia of the high ratio gearing when the power to the motor has been turned off. This can work quite well with smaller aerials, but the rotator may freewheel with larger ones. The direction in which the rotator is pointing can be indicated at the control box by a calibrated meter. This shows a directional bearing, and is fed from a variable resistor located inside the rotator and mechanically linked to the rotating shaft or housing.

On the more sophisticated rotators an automatic following indicator is used on the controller, so that the pointer actually travels a full 360°, following the direction of the rotator exactly. This allows the operator to see which direction the antenna is pointing in more easily.

When considering how much a rotator is capable of carrying, there are a number of factors that have to be taken into account.

This is simply the dead weight of the aerials and any supporting hardware acting axially down on the centre of the rotator. Generally, most rotators can support a weight in relation to their physical size. However, heavy aerials tend to be large and therefore would also have a large surface area and side load.

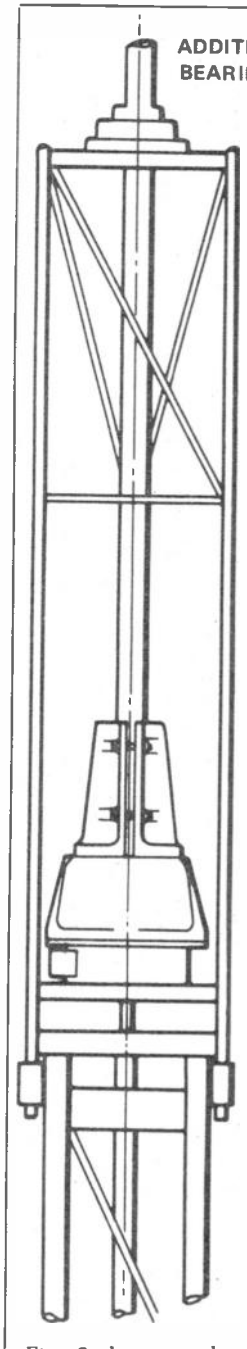


Fig. 3: base or plate mounted

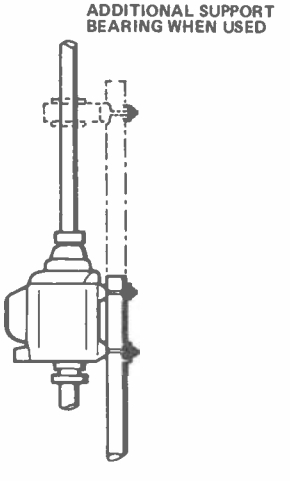


Fig. 1: offset mounted

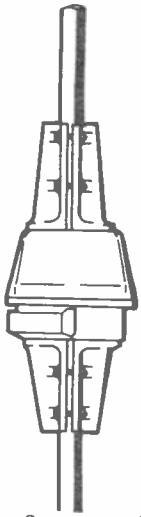


Fig. 2: concentrically mounted

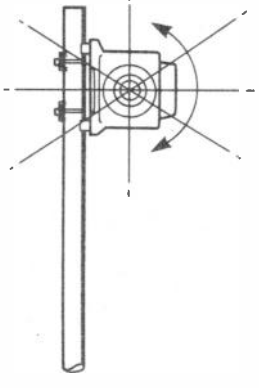


Fig. 4: offset mounted horizontal output

This is the horizontal force acting on the rotator and is directly related to the wind load of the aerial and its supporting structure, and the height of the aerial above the rotator. The bigger this distance is, the bigger the bending load on the rotator for a given wind speed. The extension mast also induces a side load on the rotator because of its own wind resistance.

If the rotator is to carry aerials that are not supported at their centre of gravity, then there will be some additional side or bending force imposed on the rotator due to the out-of-balance of the aerials: see Fig 7.

All of these side loads also cause a bending load on the mast that supports the rotator, as does the wind load on the rotator itself. These should be taken into account when choosing a mast. Generally, while rotators can carry quite a large vertical load, their limiting factor is often the amount of side load that they can tolerate. The side load on a rotator can be reduced by the addition of a support bearing at some distance above the rotator. See Fig 1. This enables a longer extension to be used, or larger aerials to be supported without exceeding the side load limitations of the rotator. However this is not a licence to simply add bigger and bigger aerials: a limit will soon be reached. Support bearings can reduce the loads acting on the rotator, but they will not reduce the loads on the mast that is supporting the rotator.

Rotator manufacturers generally state in the specifications how much surface area of aerials can be carried with and without a support. It is advisable to keep within these limits.

Fig 7 shows a typical installation with a concentric rotator mounted onto a fixed mast. Assuming that the aerial is supported at its centre of gravity then the weight of the aerial is acting axially down the extension tube onto the rotator. The bending or side forces on the rotator can be found by using the simple expression:

$$(W_1 \text{ x length F}) + (W_2 \text{ x length E})$$

Length E is one half of the exposed length of the extension. Depending on how rigidly the mast is supported a small amount of the side load on the rotator may be absorbed, but for our purposes, assume that all the side load is on the rotator.

Similarly, there is a 'total' side load trying to bend the mast itself above the first fixing, ie. assuming it is not guyed. This side load on the mast can be found by using the following expression:

$$(W_1 \text{ x length A}) + (W_2 \text{ x B}) + (W_3 \text{ x C}) + (W_4 \text{ x D})$$

These values are usually expressed in terms lb.inches, lb.feet or in metric units such as kg.cm. It can be seen from this that changing one set of parameters, such as the size of the aerials or their height above the rotator, can greatly alter the loads that can result.

Since all rotators rely on some form of gearing to drive the aerial system around,

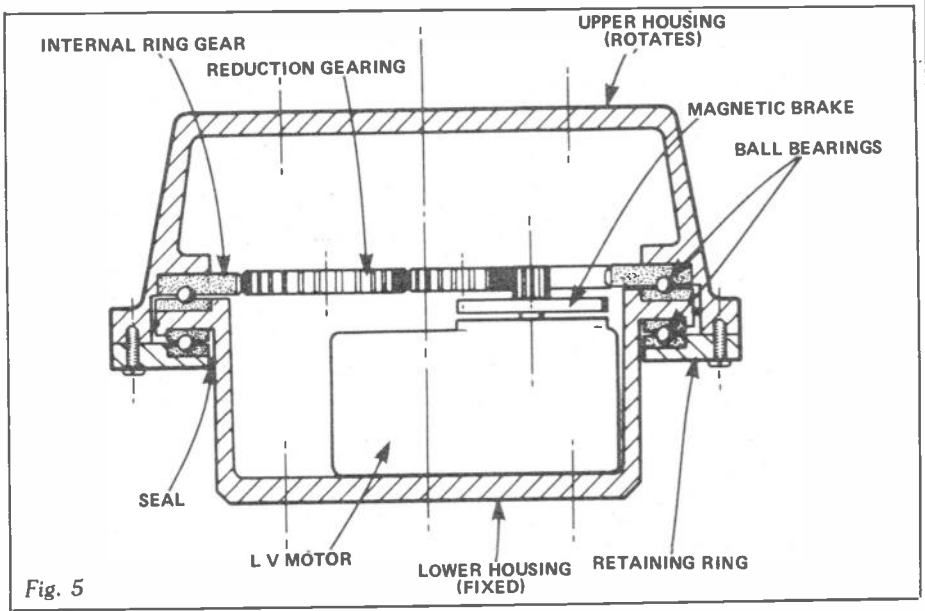


Fig. 5

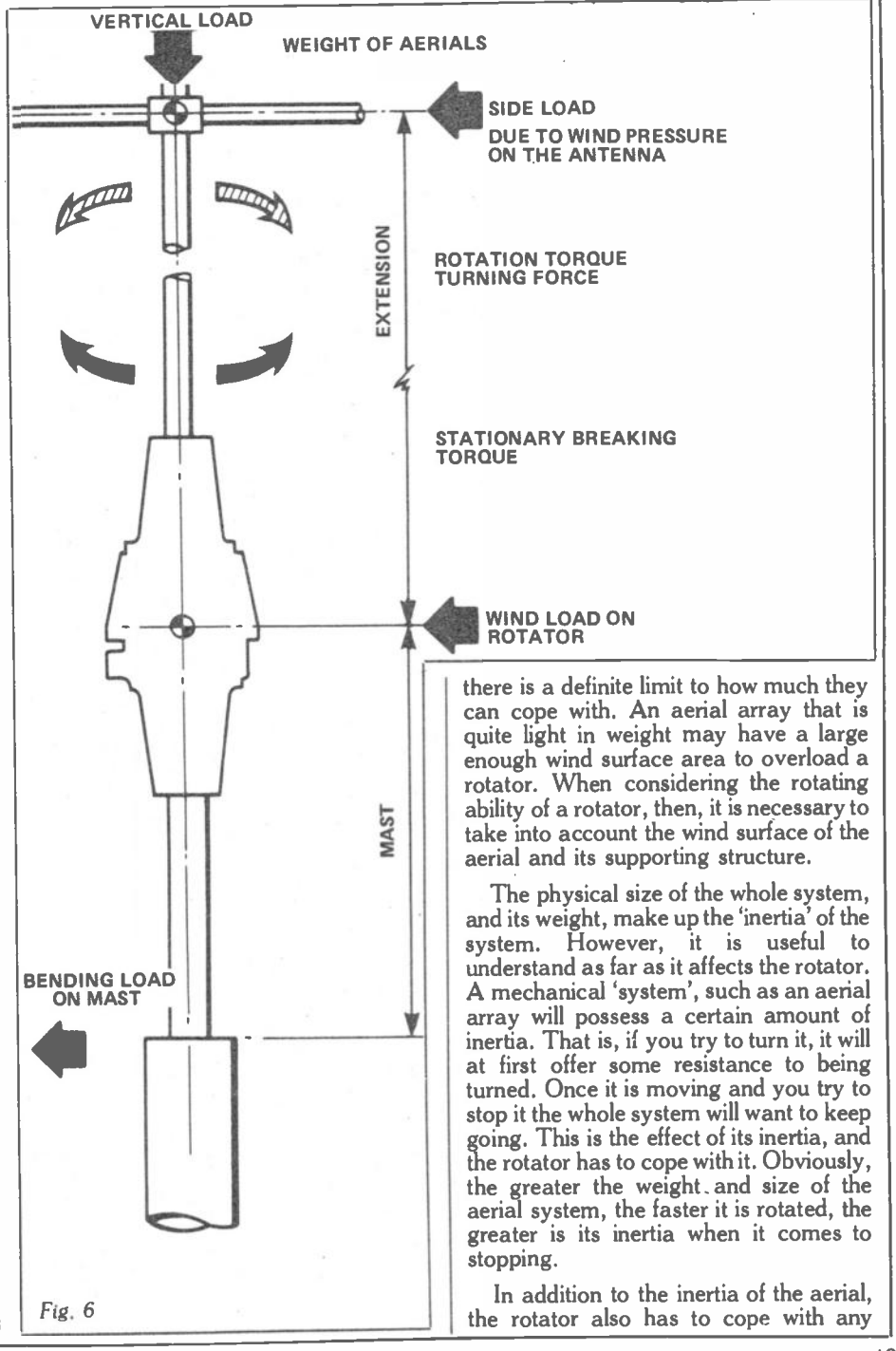


Fig. 6

there is a definite limit to how much they can cope with. An aerial array that is quite light in weight may have a large enough wind surface area to overload a rotator. When considering the rotating ability of a rotator, then, it is necessary to take into account the wind surface of the aerial and its supporting structure.

The physical size of the whole system, and its weight, make up the 'inertia' of the system. However, it is useful to understand as far as it affects the rotator. A mechanical 'system', such as an aerial array will possess a certain amount of inertia. That is, if you try to turn it, it will at first offer some resistance to being turned. Once it is moving and you try to stop it the whole system will want to keep going. This is the effect of its inertia, and the rotator has to cope with it. Obviously, the greater the weight and size of the aerial system, the faster it is rotated, the greater is its inertia when it comes to stopping.

In addition to the inertia of the aerial, the rotator also has to cope with any

'turning' loads that the wind can generate, such as when the wind strikes one point of the aerial more than others, thus trying to 'weather cock' the aerial.

Rotator specifications usually state a value for rotation torque and another value for stationary braking torque. (Torque = turning effect of a force). The first one is applicable when the rotator is turning, ie. in motion, and the second value applies to the ability of the rotator to resist turning by an external force such as weather cocking. Generally, rotators with a built-in mechanical brake, or a physical rotation lock (not an end stop) will have a much greater stationary braking torque than a smaller rotator without a brake.

It may be helpful to give a brief explanation of torque. This is a value of force usually expressed in terms of foot pounds, pound inches or kg.cm. (See fig 9). A torque of 400lb.inches is equivalent to a force of 10lb at a distance of 40" from the pivot, or a force of 40lb. applied at a distance of 10" from the pivot. They are equivalent to the same torque.

When using elevating aerials, such as aerials used in satellite working (see Fig 10), the rotator is mounted so that the rotating shaft (extension) is horizontal. Usually this is through an offset-mounted rotator with two or more aerials mounted on the extensions. When mounted in this way, the rotation torque of the rotator has to overcome the inertia of the aerial array plus any torque being induced by out-of-

balance loads. Similarly, the stationary braking torque of the rotator has to hold the aerials in a given position against the turning effect of any out-of-balance loads. Therefore when using elevating aerials, it is important to make sure that the aerial system is mounted so that it is balanced. Also, any out-of-balance load due to the aerial system will impose a further bending load on the stub mast that supports the elevating aerial as well as the main directional rotator and mast. When planning such large multi-aerial arrays the increased wind surface area of the aerials, extra rotator and supporting structure must be taken into account as well as the inertia of the whole system being handled by the main rotator. It is important that weight and wind surface area are kept to a minimum to avoid increases in the size and cost of the main rotator and mast or tower that supports it.

Rotators are of course electrical devices and as such will need a supply of power from the control unit. Depending on the type of rotator you use, anything from a three-core to eight-core cable will be required. Most rotators are driven by low voltage motors, generally 12 or 24 volts AC. Although they do not usually require a high current, any long lengths of cable will result in some voltage drop at the rotator. In order to minimise this drop it is advisable to use cables under 60 feet long, with a cross-sectional area of at least 0.5mm² per core strand. Cheaper cables may not have sufficient cross-sectional area to prevent a voltage drop which can cause difficulty in operating.

The type of rotator best suited to your application will depend largely on its load-carrying capacity, and of course how much you are prepared to spend. Generally though, some sort of compromise has to be reached between what would be ideal and what is most practical in terms of cost and capacity. In some cases it may pay to separate the aerial systems and use two set-ups, rather than mount everything on one rotator with increasing lengths of extension and bending moment. Simply supporting the extension with a bearing or making it from steel tube (not advisable) will only transfer the loads from the rotator to the mast or other supporting structures. It won't eliminate or reduce them. The majority of failures in masts, towers and rotators are due to overloading. A little common sense and compromise will prevent that.

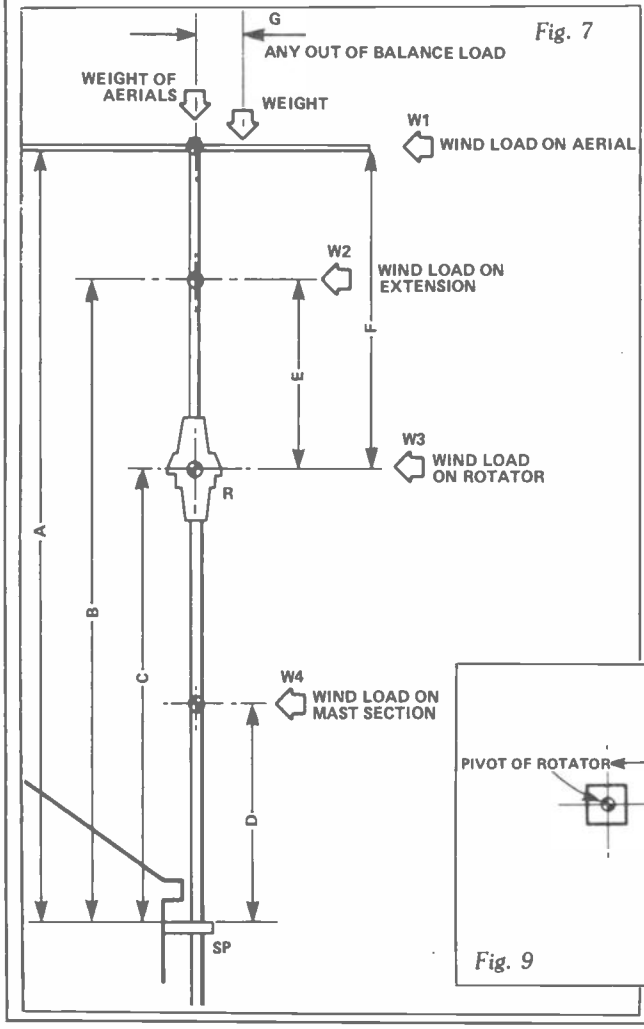


Fig. 7

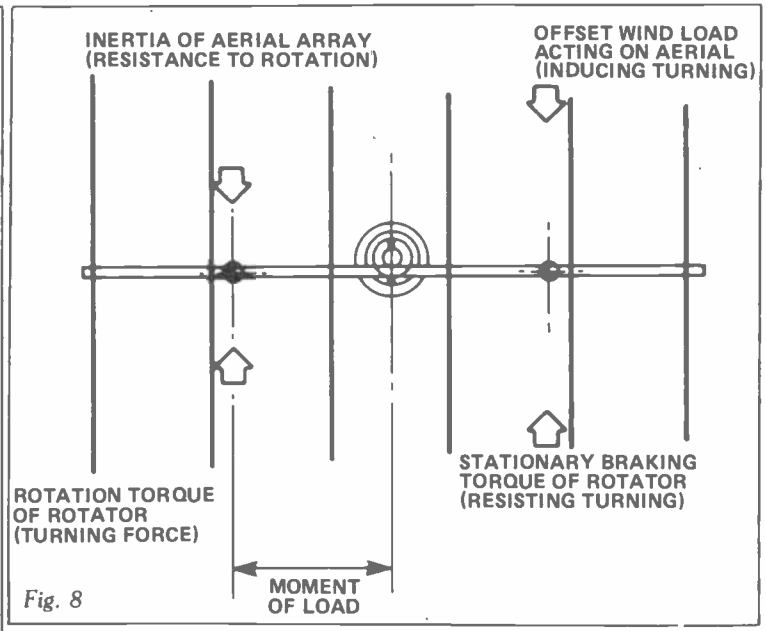


Fig. 8

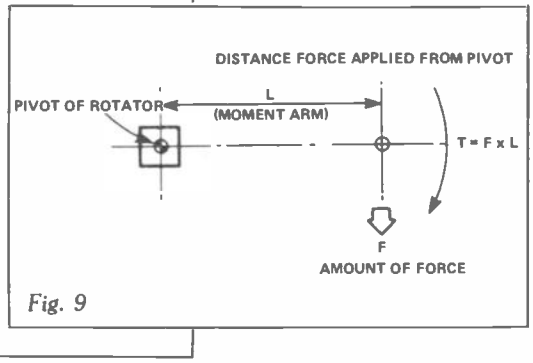


Fig. 9

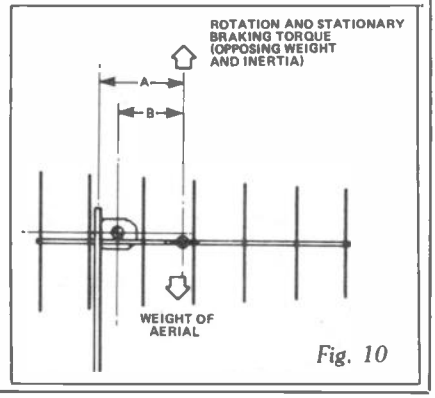


Fig. 10

Inside the Radio Interference Service

Keith Townsend G4PZA explores the world of the detector van and the people who drive them

Since the very beginning of my interest in radio, one single aspect has fascinated me above all others. Interference. We all know it happens. Sometimes the cause is obvious but as often as not the unwanted presence of RF energy calls for more than mere technical understanding. The sheer range of devices and equipment which are capable of either generating RF or detecting it quite often gives rise to problems beyond the competence of the average radio amateur, so how must an uninitiated member of the public feel when faced with a television screen full of wavy lines, or Radio 1 overlayed with a high-pitched whine? Where does he go to to get expert advice and how does he solve his problem?

Often a television engineer can help but what about those cases which defy easy solution? Fortunately for the 'man in the street' the need for specialist advice in this area has been recognised for over sixty years, and a highly skilled group of professionals, known as the Radio Interference Service, spend their working day attempting to ensure the uninterrupted reception of *Coronation St*, *Top of the Pops* and *The Archers*. Nor is this all they do. Charged with overall responsibility for ensuring the quality of nearly all forms of radio service, the RIS, currently a department of British Telecom, must, first and foremost, look after the interests of the 'safety of life' services. Transmissions by the Fire, Police and Ambulance services must, so far as is humanly possible, be free from interference for the protection of the community, whereas broadcast reception, designed basically for our entertainment, is intended to be free of all major and prolonged forms of interference.

As amateurs it is easy to feel, at times, that we do not get the degree of service which we deserve from the RIS but we should, perhaps, bear in mind the sheer volume of radio traffic and the complexity of frequency allocation when wondering why the local squeaky has been allowed to operate for over a fortnight.

The origins of the modern RIS can be traced to a form of 'gentlemen's agreement' made in 1922 between the BBC and the Postmaster General, when it was decided to offer, within reason, the interference-free reception of broadcast signals for which a licence fee was being charged. Domestic radio being in its infancy, the work involved was not all that great, and complaints were usually investigated by Post Office telephone or telegraph engineers working overtime. Often working either on foot or by public transport, which entailed carrying a box of tools in one hand and a receiver in the other, these gentlemen were often wireless enthusiasts who had gained their considerable experience with valves while working on amplifiers in telephone lines.

Their most common problem in those days seems to have been the result of fairly uncommon. Most receivers were many a domestic set to go into self-oscillation in their attempt to achieve maximum amplification, leading to all sorts of noises from any other receiver in the vacinity. Another common problem was the suppression of early electrical devices such as vacuum cleaners, though the domestic mains supply was, as yet, fairly uncommon. Most receivers were battery powered and this in turn led to a fair degree of interference from the rotary converters then commonly used for charging the batteries.

And so the situation continued until, in 1932, it was decided that the growth in the number of complaints of interference warranted a full-time specialist service, manned by specially trained officers. Titled "investigation officers", the first such specialists began training in 1932 at Dollis Hill in London. By 1933 the service was being kitted out with the most up-to-date tracing equipment.

They were no longer obliged to walk the streets in pursuit of an elusive sproggy. Specially adapted vans, many of which had non-metallic bodies to allow for internal aerials, were provided and soon earned the affectionate nickname "Leaping Lena" among their crews.

Inside the Radio Interference Service

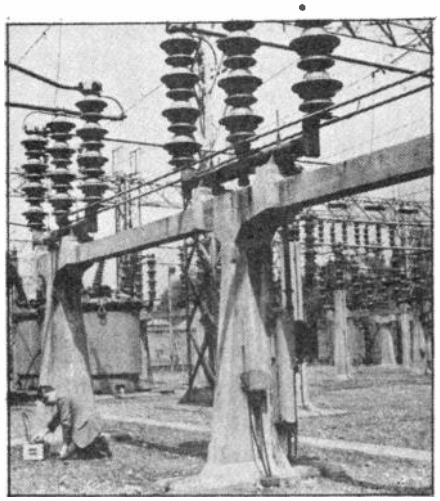
By this time public interest in broadcast reception was becoming widespread and, since this interest coincided with a dramatic growth in the use of mains electricity to power homes and factories the number of interference complaints rose steadily.

As well as their own tools and tracing equipment the investigation officers carried a comprehensive stock of the most common suppression devices which, though intended primarily for demonstration pruposes, were available for sale to anyone whose equipment was found to be causing interference. One of the most effective cures in use at that time, especially in respect of interference to stations within the long and medium wavebands, was a combination of two 2uF capacitors, connected live to neutral and neutral to earth.

Although it had been around for quite a few years by this time, amateur radio created very little work for RIS officers. It was not necessary to pass an exam to become an amateur in those days. All you had to do was provide the names of two referees and offer the Post Office Engineering Dept. a reasonable outline of the type of experiments you wished to conduct. All transmissions at that time were by CW. Although the 'make and break effect' of the key might cause some initial interference it was easily traced and just as easily remedied.

All amateurs could expect an occasional visit from an RIS officer, to ensure that the equipment at the station was not causing any problems. These visits were often the excuse for exchanging information and experience since, then as now, many of the officers were amateurs themselves.

A radio interference officer seeks the source of interference in a high voltage sub-station



The number of amateur licences in force actually went down quite significantly in 1929. From the 1st January it had been decreed that frequency determination, previously a somewhat inexact science, must be achieved either by means of crystal controlled transmitters or a crystal controlled frequency meter. Since this demanded considerably more effort on the part of the licensee, many considered their interest just not worth it. It was a few years before the number of licences increased again.

Television

The first experiments in transmitting television pictures started in 1929 but, since the pictures themselves were small and the coverage area of the transmissions very limited there was no great public interest in the idea and it was not until the introduction of a new, high definition service in November 1936 that the first trickle of complaints of TVI occurred. Records for the years immediately before the war show an annual average of 40,000 complaints of BCI, compared to only 100 complaints of TVI. Even this small number came to a sudden halt with the outbreak of war, when television transmissions were suspended.

It was in the late thirties and early forties that the emergency services began to realise the potential of radio and this was to lead to a new direction for the RIS.

Eddystone Radio had begun the development of VHF police radios by 1938. London police had been transmitting CW on 160m for some time, and both they and the Lancashire Constabulary had been experimenting with simplex mobile systems. But it was 1942 before even large cities like Birmingham had their first VHF systems for base to mobile communications, using the 5m band.

Since the introduction of this type of service, its protection from other forms of RF has been a primary duty of the RIS. It is also interesting to note that the development of police radio was almost entirely due to the efforts of radio amateurs from within the various forces.

Wartime roles

Contrary to popular belief the war did not bring glamour to the job of the RIS officer. True, he was responsible for a certain amount of listening but his day was not spent chasing spies all over Dartmoor. For obvious reasons the vast majority of such work fell to a military organisation called the Radio Security Service and, with the closure of the infant television service, the RIS worked to ensure the best possible reception of the BBC's Home Service, which had become, for most people, their major source of news.

With the end of the war RIS duties became more and more complex. TV transmissions were resumed in 1946 and their coverage area expanded. The war itself had ensured the future of broadcast radio and by now there can have been very few households without a receiver. Despite post-war austerity an ever increasing number of people had television sets. Also, the range of domestic electrical appliances was going up. Items such as refrigerators gave rise to a number of interference complaints as thermostats arced; another common source of trouble was leakage from 11kV overhead lines. Transformers also caused some difficulties.

So heavy was the post war demand for technology that by the early fifties the average annual number of interference complaints received by the Post Office had risen to 77,000 for sound broadcasting and 28,000 for television.

Mobile radio

The development of the radio services since the fifties has been staggering; and the increased demands on frequency allocation have placed even greater demands on the RIS. We now have an ever-expanding land mobile radio system. Television has moved from VHF to UHF and colour. What with additional channels the amount of spectrum it needs has dramatically increased. FM broadcasting, once decried as totally unnecessary, is now a fact of life; and the massive potential of radio as a navigational aid has ensured that large chunks of the spectrum rate very highly in terms of protection from interference.

An ever-increasing public awareness of the value of communications makes these demands more difficult to meet. Pirates, in one form or another, have been with us since the dawn of radio and, in the main, the RIS has done a great deal to discourage them in the most constructive manner. Until probably the mid-seventies most pirates were known, usually by the local amateurs, and in most cases a friendly warning was all that was required.

Overmodulated CB

The beginnings of CB created a few extra difficulties. The early 27MHz enthusiasts might have remained undetected for considerably longer if they had been using modern radios. After all, no-one was listening to 27MHz in those days and it only came to the attention of the RIS as the result of complaints of interference

Above: hunting interference fifties-style, with a portable DF receiver. Left: a TV detector van, parked on a yellow line. These are not operated by the Radio Interference Service, but by the Post Office for the National TV Licensing Rewards Office.

from the medical services who carrier activated paging equipment fell within that band. It was soon established that their difficulties resulted from overmodulation of AM transmitters.

Routine visits

As their workload has increased RIS officers have been obliged to give up their routine visits to amateur stations, most of whom will probably come into contact with the interference service only if interference occurs in their area. I think most experienced amateurs would share my view that we are the losers in this respect. The wealth of experience of specialists in a complex field was of immense value and, despite the fact that a visit might, in some cases, lead to the suspension of a licence these gentlemen were welcomed eagerly into the home of the average amateur.

But what is it about the job that gives such obvious satisfaction to those who do it? It is, to some extent, a lonely existence and, apart from the obvious skills the average RIS officer must also be something of a diplomat. It is not an easy task to convince a viewer that his television set is behaving unreasonably when it worked perfectly until his neighbour passed the RAE. Neither is the job a matter of routine. Interference often occurs outside normal working hours and, even when the source is obvious, the cure may not be easy.

One thing is cler, however. We are going to continue to rely on the expertise of Radio Interference Service staff for the proper functioning of many of the services which we all take for granted. British Telecom no longer wants the job and we can only hope that the Department of Trade and Industry will continue the tradition begun over sixty years ago, of quietly and unspectacularly offering a first class service.

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Shown with FL7010 optional amplifier

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Don't throw away those valuable watts by using poor quality feeder. Remember approximately 20M of UR67 will have an approximate attenuation of 3dB at 432 MHz. This means if you invest around £250 for a 100W P.A. you will only end up with about 50W at the antenna.

UR67	att 3.9dB per 25M app	**£0.69 p/m**
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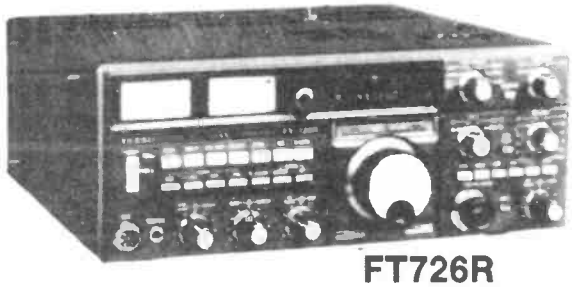

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FT726R(2) Transceiver c/w 2M	**£739.00 inc**
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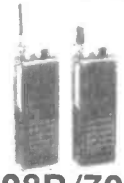

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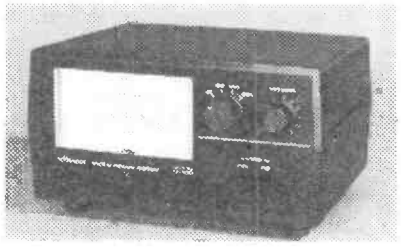

HANSEN FS 300H

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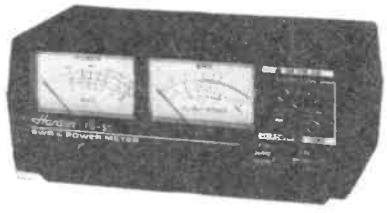

FS 5S

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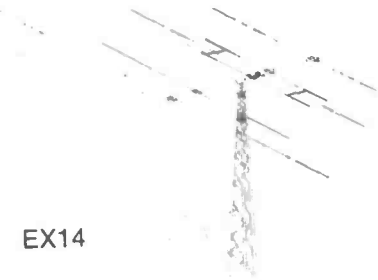

EX14

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TB3

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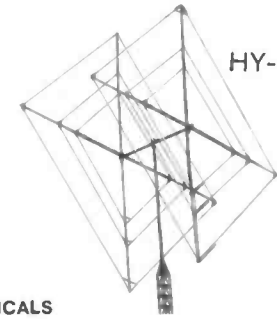
402BA	2 Ele Yagi 40M	£249.00	£6.50
18TD	Dipole Tape 10-80M	£121.90	£2.80



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SMCSOCA	Cable assembly 4M	£5.35	£1.50
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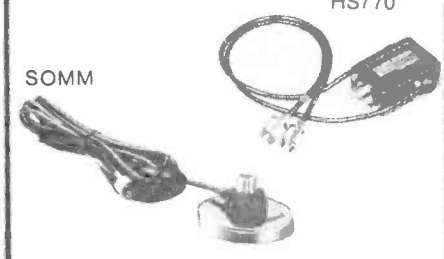
HS888K	Bumper mounted extension for 144 MHz ant.	£20.30	£2.00

HS770

SOMM



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Scanning Steps: 5. 10, 125 and 25KHz VHF (10, 125 and 25KHz UHF)

Channels: 40 programmable memories

Modes: AM or FM selectable

Scan rate: Approximately 18 channels per second

Scan delay: 2 second

Priority sampling: 4 second

Audio output: 1.2 Watts

Selectivity: Better than - 60dB at ±25KHz

Power supply: DC 12V - 16V/0.6A max

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Antenna: Telescopic antenna or External

Loudspeaker: 25" x 4" oval speaker

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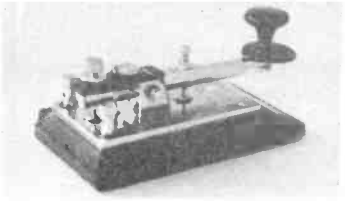
MORSE EQUIPMENT



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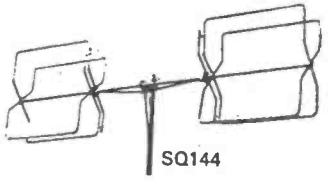

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SQ144	2M Swiss Quad Vertical Mounting	£63.25	£2.65
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GP144W	2M 2 x ⅝ colinear 6.5dB ¼	£29.90	£2.65
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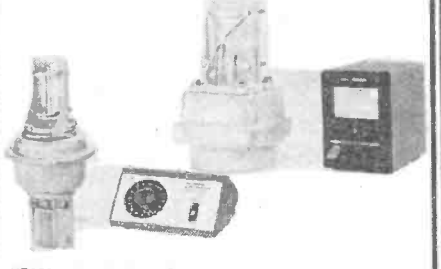

KP250	Bell	6 Core	Lighter Duty	£54.91
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RC6W	6 Way	**55p metre**	carriage £1.90
RC8W	8 Way	**59p metre**	carriage £1.90
KCO38	Lower Mast Clamp KR400 600	£12.65	carriage £2.50
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JST 100 HF Tranceiver

Angus McKenzie G3OSS reviews the Japan Radio Company's up-market HF transceiver.

The Japan Radio Company have already produced a number of semi professional transmitters and receivers, and the JST 100 follows the same line of development. The rig is a CW, SSB and RTTY transceiver giving a nominal 100W output on all amateur bands from 160m to 10m. The equipment is superbly finished and is one of the best constructed of any that I have encountered for some time. Internally, it is of modular construction which makes it easy to service. All parts seem much more rugged than on many rigs, and the VFO knob rotates beautifully smoothly, with a finger hole big enough for western fingers. This is one of those little ergonomic points that I consider important. In addition to the normal VFO tuning, at 10kHz per rev., up and down buttons are provided which tune the rig very rapidly at around 100kHz per second. When these buttons are held down, the rig sweeps down or up the band continuously in a cycle. Eleven memories are incorporated, which store mode as well as frequency. Unlike the Yaesu FT980, you can change mode from memory, which is convenient. Two VFOs are incorporated, but you can also VFO from memory directly. Push buttons also provide split VFO between A and B for RX/TX or TX/RX. A VFO A = B button is also provided. A shift button enables the difference between VFOs A and B to be indicated, making it easier to use one of the VFOs for receiver incremental tuning, a facility which is not otherwise provided, which is a pity. The shift indication only works when both VFOs are on the same band. Additional push buttons select frequency lock, noise blanker (with NB level pot above it), receiver notch filter (large notch rotary miles away from it on the bottom with no centre indent, which is annoying), memory read, memory recall and memory write. The 12-position memory switch below these buttons switches memory operation in one position to an external memory socket. A row of small pots adjusts display illumination, mic gain, compressor level, VOX gain and VOX delay. AF and RF gains are unfortunately separated with the AF gain bottom right of the tuning knob, while RF gain is to the top left. To the left of the latter, are four up/down, 3-position toggle switches selecting PTT/MOX/VOX, processor/'cal' ('cal' puts TX on except final PA stage for checking purposes, allowing TX VFO to be set as required without power output), - 10dB/-20dB aerial attenuator and AGC off/fast/slow. A meter switch can monitor PA voltage, PA current, output power, compression level and reflected power. The same meter is used for the S-meter on RX. Along the bottom are the mic input sockets (8-pin locking, an adaptor being available from Lowe electronics for it to take Trio microphones etc), headphone jack, RF power control (below 0.5W to 100W), and mode switch selecting RTTY, USB, LSB, CW wide, CW medium and CW narrow (CW medium and narrow filters are optional extras).

The rig is metal cased and there is a loudspeaker in the top panel. This rattled like hell to start with, until we would that one of the screws was loose. Tightening this fixed it successfully! Also on the top panel is an adjustment hole under which is the VOX anti-trip preset.

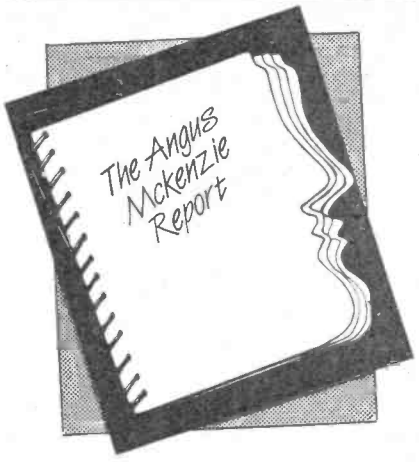
Back panel

Right across the top of the back panel is a massive heat sink which allows the PA a 100% duty cycle for RTTY. Bolt holes are provided for adding an external fan if required. The antenna output is on an SO239, and at the bottom of the panel are three multi-pin oblong sockets for (a) auxiliary connections, (b) remotely controlled ATUs and linears, and (c) a computer or external pad for frequency and mode control. The 13V power connector has 6 pins, some of them for voltage feedback. A lead is supplied with the external PSU for this, but an additional plus is provided with the rig if you wish to use another PSU. A 30 amp fuse is fitted just above the power connector. Also on the panel is a sidetone on/off switch, a separate RX antenna socket, a 455kHz IF output taken from after the filter at a level of approximately 5mV/75ohms, an audio output at constant gain taken from before the audio gain control for feeding RTTY terminals, recorders etc, and a speaker output capable of driving into speakers from 4 ohms to 16 ohms. A normal quarter inch key jack is provided, and an earth binding post. The rig measures 348 x 145 x 347mm and weighs 10kg. Fig. 1 is the block diagram, reproduced from the JRC manual.

Subjective tests

I used the rig for a few evenings into my normal aerials and found it a delight to operate, once I had become acquainted with the controls. The VFO tuning was magnificent to use and as smooth as any that I have ever encountered. Memories and all other VFO functions were simple to operate and easier to understand than usual. Furthermore, I found that I could get my large fingers around everything without having to use surgical tweezers to switch functions! The VOX control was easy to set and worked well, and I was pleased to see MOX provided as well to save sore thumbs on the mic. The compressor seemed to keep modulation well up and sounded quite reasonable, improving intelligibility quite noticeably, while apparently not sounding too nasty. It was useful to be able to switch in 10dB attenuation to optimise RFIM on lower frequencies, and I did not find the 20dB attenuator necessary even under very strong signal conditions, unless I switched the ATU out, in which case some MW intermod problems did arise (I am extremely close to both BBC Brookmans Park and two of London's independent radio transmitting stations). I liked the AGC characteristics, the pen chart showing these to be well controlled. I rather admire the absence of some bells and whistles which would only very rarely be used, but which can confuse a front panel layout, and JRC seem to have got their priorities right in determining what the majority of potential users would regard as important built-in facilities, although I do regret that FM was not included.

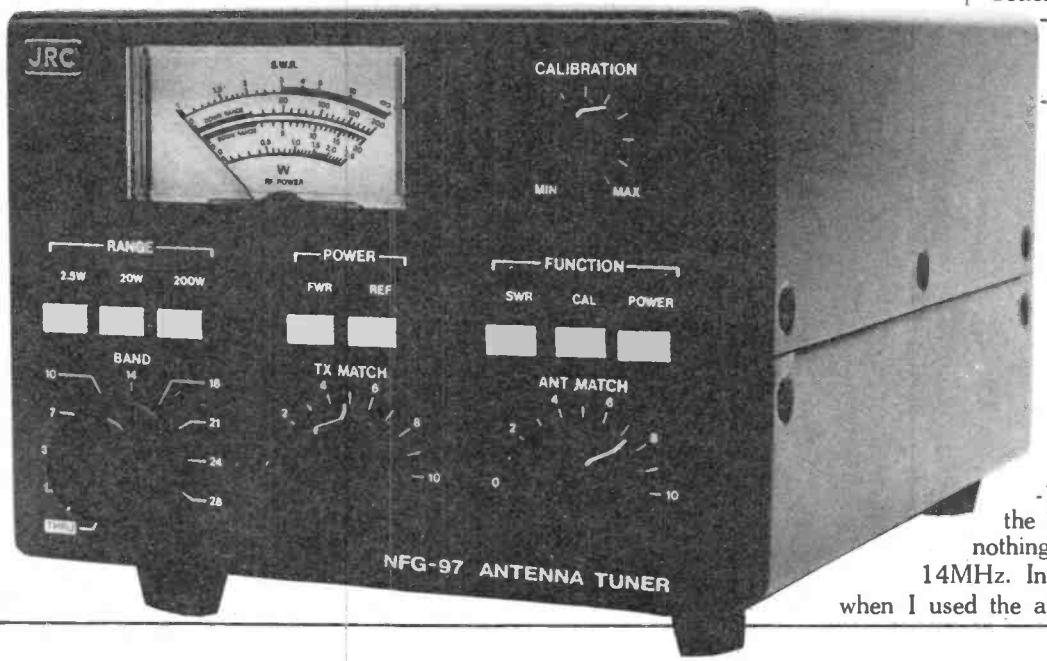
Tuning across the LF bands, with antenna attenuation where appropriate, showed that the receiver seemed cleaner than much of its competition, and there was less crackling than usual on 80m. I put this down to good reciprocal mixing performance. The RFIM performance was not outstandingly good, but could be improved dramatically by using the antenna attenuator. Since the RF sensitivity was rather better than usual, the RFIM performance was not really poor. The passband tuning control



fortunately does have a centre indent, and it was a delight to use, allowing one to place the passband exactly where you wanted it for any specific purpose. Audio quality was better than average and seemed reasonably clean, up to the clipping point of the amplifier. However, the built-in speaker seemed less sensitive than usual and so you could not turn the volume up to a loud setting without clipping, although there was adequate drive to an external speaker. Tuning across all the bands revealed very few extremely weak birdies, and this is most commendable; the worst one being around S1/2 at 14.32MHz. The notch filter attenuated whistles within the passband reasonably well but I would have preferred more rejection here.

Transmit quality was excellent, both with the Trio hand mike supplied and a Heil microphone available from Amcomm in Harrow, Middlesex. The Heil microphone was much preferred for communication and when heavy QRM was about, as it had a useful cutting edge to it, although the Trio microphone was preferred if I was being received strongly without any interference. The transmission was very narrow and was praised by several stations, some making a comment without being asked to, which usually only happens when I am putting out a particularly good transmission. Despite the minor criticisms in one or two ergonomics areas, consider the rig better than usual for ease of operation.

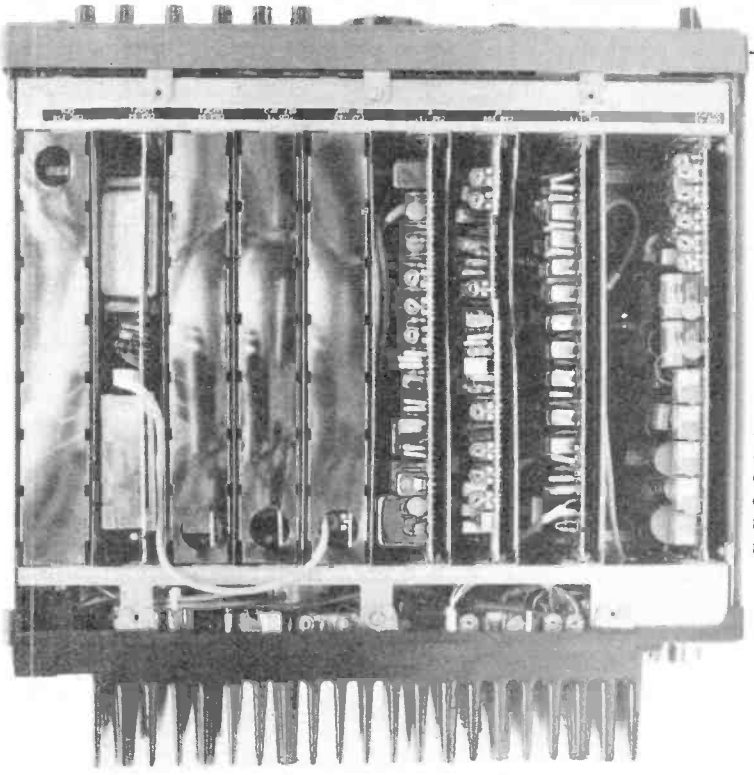
The NFG-97 antenna tuner is straightforward and solid, but quite pricey too.



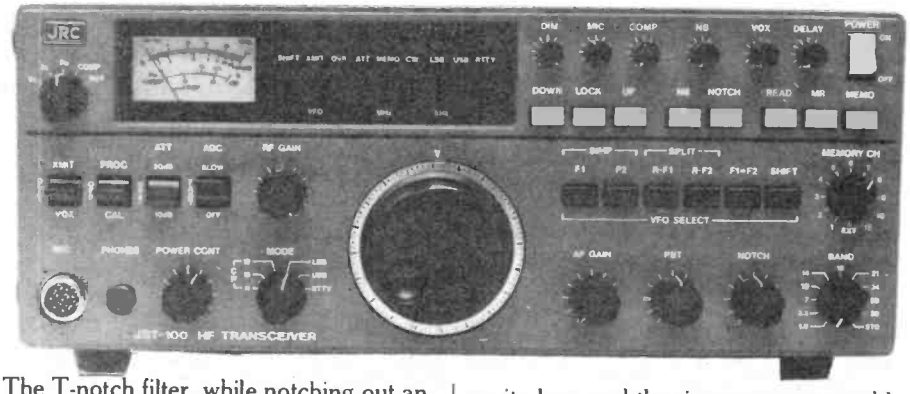
Laboratory tests

The RF input sensitivity for 12dB SINAD from 80m to 10m was very good indeed, and only slightly inferior on Top Band where you don't need sensitivity anyway. Narrow CW sensitivity was excellent, measured at 10dB S/N, and very weak CW signals could be picked out easily with the narrow filter amongst a bevvy of QRM. The RFIM measurements were good but not outstanding on all bands, but bear in mind that the intercept point of around --1dBm improves to +9dBm when the 10dB attenuator is switched in, and nothing is lost by doing this on bands below 14MHz. In practice I did not notice RFIM when I used the attenuators sensibly. The reciprocal

JST 100 HF Tranceiver



The JST-100 is built on a mother and daughter board system, making maintenance much easier than usual. Bottom: the sockets on the back panel, going from left to right, are for DC power, accessory, coupler, memory, key, speaker, line out, IF out, RX ant. The main antenna socket is shown top right.



mixing performance was extremely good, both close in and far out, although we noticed one oddity; modulation (50kHz with harmonics) on the local oscillator at an extremely low level. This produces additional carriers across the band, but only from incredibly strong input carriers. This was only noticed because in all other respects the reciprocal mixing performance was so good as to let this effect show through! Reciprocal mixing tests were carried out at 20kHz, and higher spacings were offset by 5kHz to avoid the 50kHz problem. Thus other measurements were taken at 55 and 105kHz etc. We checked selectivity as usual, using both the special Mutek crystal controlled carrier source and the Marconi 2019 generator. Both methods agreed. The 3dB bandwidth was narrower than usual, with 6dB about where 3dB usually is. A 60dB bandwidth at 3.2kHz shows the filter to be quite sharp, but because of the narrow bandwidth for the 3dB point, the shape factor did not come out all that well at around 1.8. The -80dB bandwidth can normally only be checked using the crystal controlled generator, and this proved to be rather wider than expected.

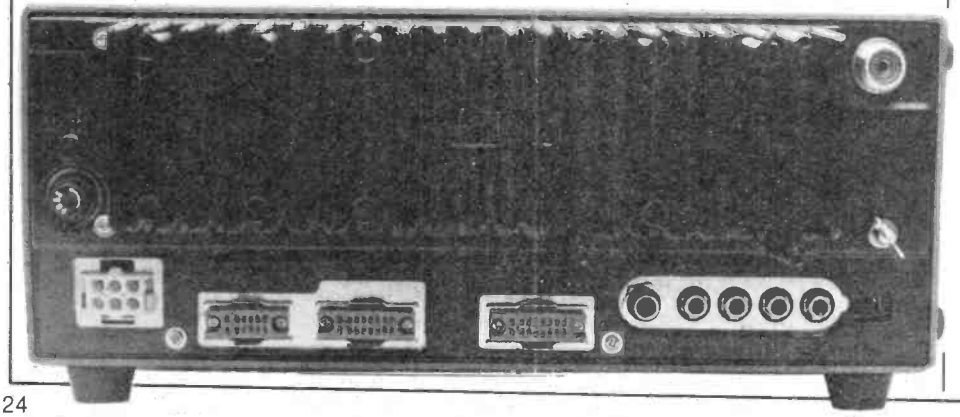
The CW narrow selectivity at around 350Hz (3dB bandwidth) is about optimum, although the skirt was not quite sharp enough, opening out noticeably at below -60dB. The medium CW filter bandwidth was just under double the narrow filter bandwidth, but had the same problem at -80dB. The wide CW filter bandwidth was virtually identical to the SSB bandwidth, although audio filtering was provided which is a great help on CW.

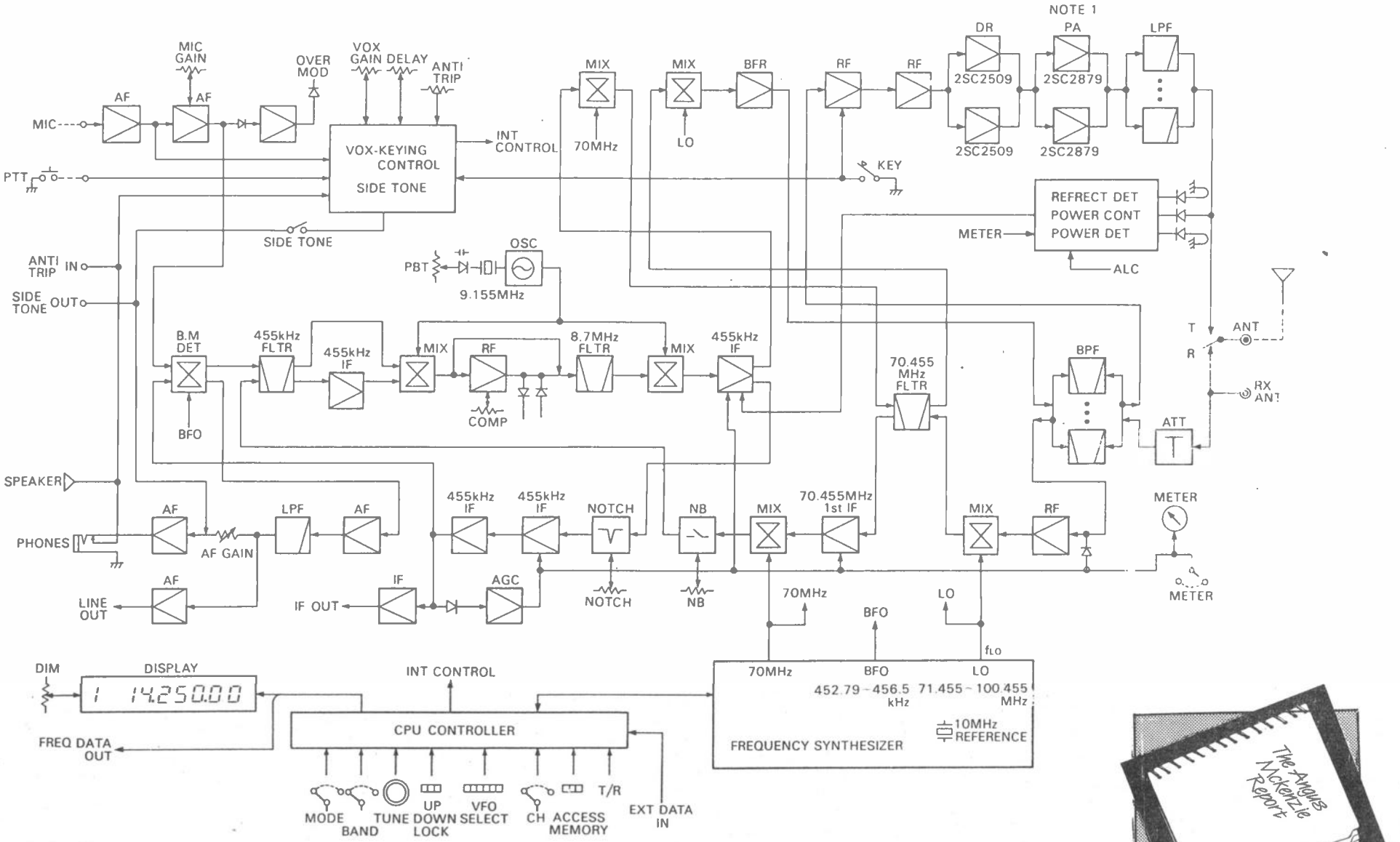
The S-meter was superb between S3 and S9, and one of the best I have encountered, although the difference between S1 and S3 was, surprisingly, only 1.5dB. Another curiosity was that there was only around 9dB difference between '9' and '9'+20dB, although +40 and +60dB were reasonably accurate. The received frequency accuracy was exceptionally good, SSB being only 40Hz out, and CW -150Hz, so you're hardly likely to miss your sked if your friend's transmitter is equally accurate.

The T-notch filter, while notching out an on-channel carrier very well without any other carriers present, it rejected a carrier with reference to another one in the passband rather less than I would have liked. Separations between two carriers ranged from 25dB at best to 13dB at worst. I have to insist here that one method - using the S-meter to determine rejection - does not tie in with subjective performance. What has to be measured is the rejection of an annoying carrier as a ratio to wanted modulation in the same IF passband. Thus I carry out the test with carriers spaced 600Hz apart at equal amplitides and check the differences between them on an audio spectrum analyser as the notch filter first notches one and then the other.

The product detector distortion was quite low, and the rig gave a reasonable output for 10% distortion into 8 ohms. This output increased considerably into 4 ohms, so you might find a 4 ohm speaker more useful with this rig if you want to hear it in the next room! The current drawn by the receiver was around 2A at 13.8V, and I feel this is a little high if you want to use the rig mobile and accidentally leave it switched on overnight!

There was plenty of gain in the microphone amplifier, and the audio response effective from mic input to RF output was about ideal, as it was reasonably flat. The filter seemed to be placed in just about the right position, although the actual transmitted speech bandwidth was a little narrow for many peoples' tastes, corresponding of course with the RX IF bandwidth. Maximum PEP output was given on HF bands, while the lowest output was on Top Band. 90W exceeds your licence regulations anyway! CW power was just very marginally below SSB PEP. Transmitted frequency accuracy was stunningly good, CW being only 10Hz off the indicated frequency. This was so accurate that we used our 8-digit Marconi 2305 transmitter test modulation meter, locked to a Rugby standard, to check our other frequency counters! This is the most accurately set SSB rig that I have ever encountered.





Block diagram of the JST100.

JST 100 HF Tranceiver

It was very useful to be able to alter transmitter power on both CW and SSB. The residual carrier at full output, including noise, was at an extremely low level. This suggests excellent quality control. We checked harmonics on all bands; most were virtually free of any problems at all, although on 14MHz we did notice a second harmonic at -42dB, and the 10MHz band showed up second and third harmonics in the -50 to -55dB range. No spurii at strange frequencies were noticed at all.

The total current drawn on transmit was 23 amps which, frankly, is rather on the high side if one considers mobile operation, or a PSU other than the JRC one.

Accessory sockets

I like to look carefully into the provisions of accessory sockets, for so many of us like to be able to control external equipment and employ some of the additional functions. The accessory socket has 12 pins, with provisions as follows: pin 1 is audio earth, for pin 7 which is phone patch or recorder input. Pin 2 is RTTY input which requires low level for mark and high level for space. Pin 3 is external relay control, which is earthed on RX and open circuit on TX, while pin 9 is earthed on TX and open on RX. These two pins can take up to 0.5A at 13V DC, or 0.1A at 100V DC, thus providing linear TX switching for almost all available models. There are two separate ALC inputs, positive going on pin 4 and negative going on pin 10. This again allows almost any linear to be used with the rig. Pin 5 is anti-VOX input, for when the rig is used with a separate receiver. Pin 11 is sidetone output. A 13V output is available, with the positive on pin 12 and negative on pin 6, at up to 1A for driving external equipment. Various data lines and functions are available on both the memory and coupler sockets which may be found useful, giving external control of frequency from BCD logic, and control of external ATUs etc with data inputs from the rig.

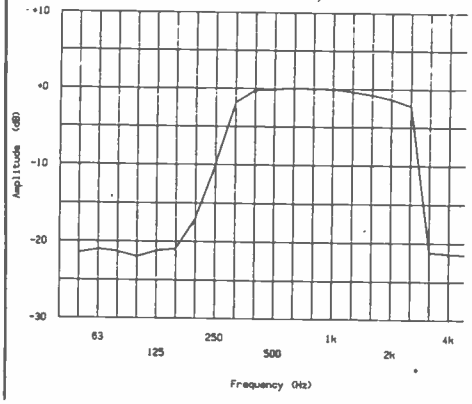
Conclusions

I very much like this rig, but its big problem is that it is not cost effective when one looks at the competition. Its marketed price of just under £1000 includes VAT, but excludes microphone, CW filters, or even a DC PSU, and is thus far too high. So I had to consider very carefully how the price might be justified for some buyers. The photographs show the superb construction and internal layout, and this, together with the very smooth VFO action, is one of the factors affecting cost. It is very reliable indeed, and should be simple to service, so you are not so likely to be faced with horrific service bills after the guarantee has run out. The only technical parameter that I have regretted not being a little better, was the RFIM performance, although some users might also criticise the SSB filter as it is a little narrow on TX and RX. The rig is particularly suitable for CW enthusiasts as AGC can be switched off, and the filters are very good, and three positions allowing great flexibility in operation. The audio response after the product detector was very flat indeed from 300Hz to 3kHz, which no doubt contributed to the good received sound quality. This is in contrast to another receiver I looked at recently that sounded very woolly, and proved to be 9dB down at 2.5kHz with respect to 500Hz within the audio amplifier on SSB! This is another point that needs watching, and I cannot abide woolly audio!

At its price then, I cannot recommend the rig as good value for money for average users, but I have no doubt that some will justify the cost for the generally good performance, and superb construction in a rig which is virtually semi-professional in many of its design features. It would clearly work very well with AMTOR and RTTY. Styled in rather a military fashion, it nevertheless looks quite smart.

The accessory ATU, type NFG97, costs £149.50 and is very simple. On the back panel are just SO239s for input and one output, together with an earth wing nut. On the front panel are three rotary knobs switching bands or straight through, TX and antenna matching capacitors. A power/SWR meter is included, 200W maximum through it. A calibration FSD pot is provided for setting SWR readings, together with pushbuttons for SWR, CAL and power indication. Two buttons select forward or reflected power while another three buttons select 2.5, 20 or 200W FSD power reading. The ATU was quite effective matching normal antennas, but is, in my opinion, rather too basic for the money asked. Power loss through it was minimal and no problems were experienced. It seems most surprising that JRC could not offer a remotely controllable ATU with logic interfacing with the main rig, but maybe this will come along later. I don't think that this rig will set retailers' sales figures on fire, but it would attract some purchasers, and it is worth considering, because there was nothing that I could really severely criticise.

SSB received audio response



Laboratory Results

Receiver Measurements

Sensitivity for 12dB SINAD, USB (1kHz beat note)

1.85MHz	-120dBm
3.70MHz	-124dBm
7.05MHz	-123dBm
10.15MHz	-123dBm
14.20MHz	-122dBm
18.08MHz	-124dBm
21.20MHz	-123dBm
24.89MHz	124.dBm
29.10MHz	-123dBm

Selectivity, SSB:

3dB bandwidth	1.8kHz
6dB bandwidth	2.2kHz
60dB bandwidth	3.2kHz
80dB bandwidth	10.8kHz

Shape factor, SSB: 1.8

Sensitivity for 10dB SINAD, CW narrow -130dBm

Selectivity, CW:

	Wide	Medium	Narrow
3dB bandwidth	1.8kHz	0.6kHz	0.35kHz
6dB bandwidth	2.2kHz	0.7kHz	0.40kHz
60dB bandwidth	3.1kHz	1.9kHz	1.65kHz
80dB bandwidth	9.6kHz	6.6kHz	6.4kHz

RFIM: input level required to give S9 product (-80dBm):

20/40kHz spacing: -20dBm
Calculated RF intercept point: -0.5dBm

RFIM: input level required to give 12dB SINAD product (-123dBm):
20/40kHz spacing: -42dBm
Calculated RF intercept point: -1.5dBm

Reciprocal mixing performance, USB:

Spacing	Reciprocal Mixing Ratios (ref. 12dB SINAD	(ref. noise floor)
20kHz	89dB	100dB
50kHz	88dB	99dB
55kHz	92dB	103dB
100kHz	94dB	105dB
105kHz	92dB	103dB
150kHz	96dB	107dB
200kHz	98dB	109dB

S-meter readings; RF level required:

S1	-115.5dBm
S3	-114.0dBm
S5	-104.0dBm
S7	-91.5dBm
S9	-79.5dBm
S9+20	-70.0dBm
S9+40	-53.5dBm
S9+60	-30.0dBm

Receive frequency accuracy, SSB: +40Hz
Receive frequency accuracy, CW: -150Hz

Transmitter measurements

Output powers	CW	SSB (PEP)
1.85MHz	85W	90W
3.7MHz	99W	100W
7.05MHz	106W	100W
10.1MHz	100W	105W
14.3MHz	110W	110W
18.1MHz	100W	105W
21.2MHz	107W	110W
24.1MHz	105W	110W
28.5MHz	105W	110W

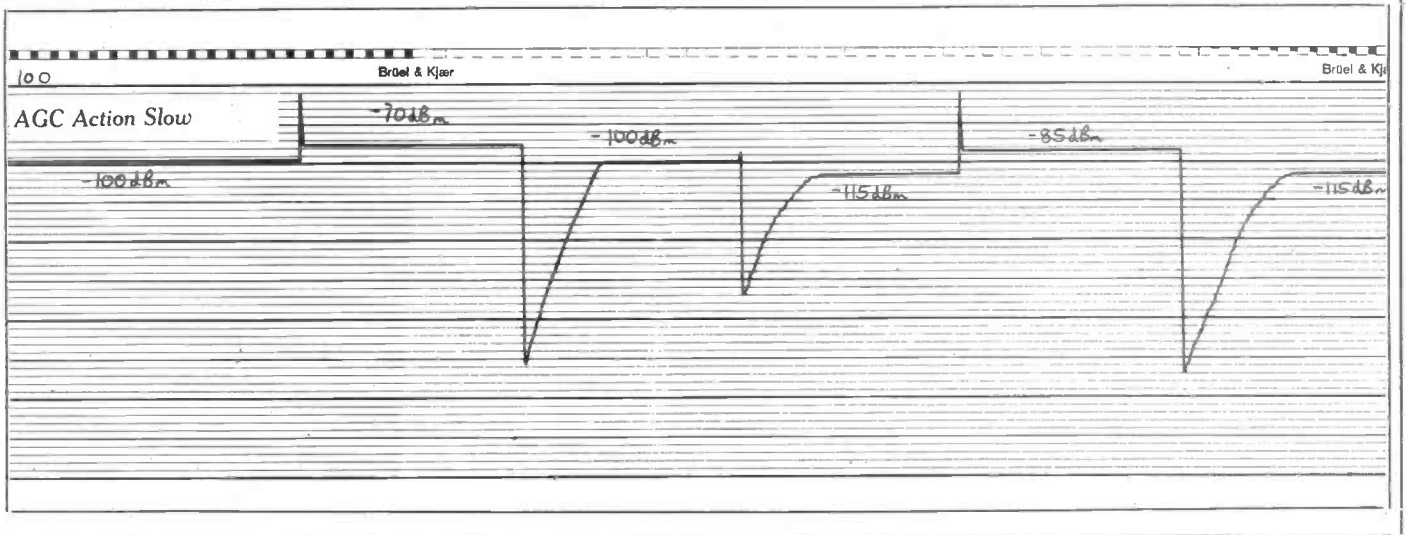
Carrier frequency accuracy at 28.5MHz, CW: -10Hz
Minimum RF output power, CW: 0.5W
Residual carrier and noise, SSB:<-50dB ref full output.
Harmonic output at full power:

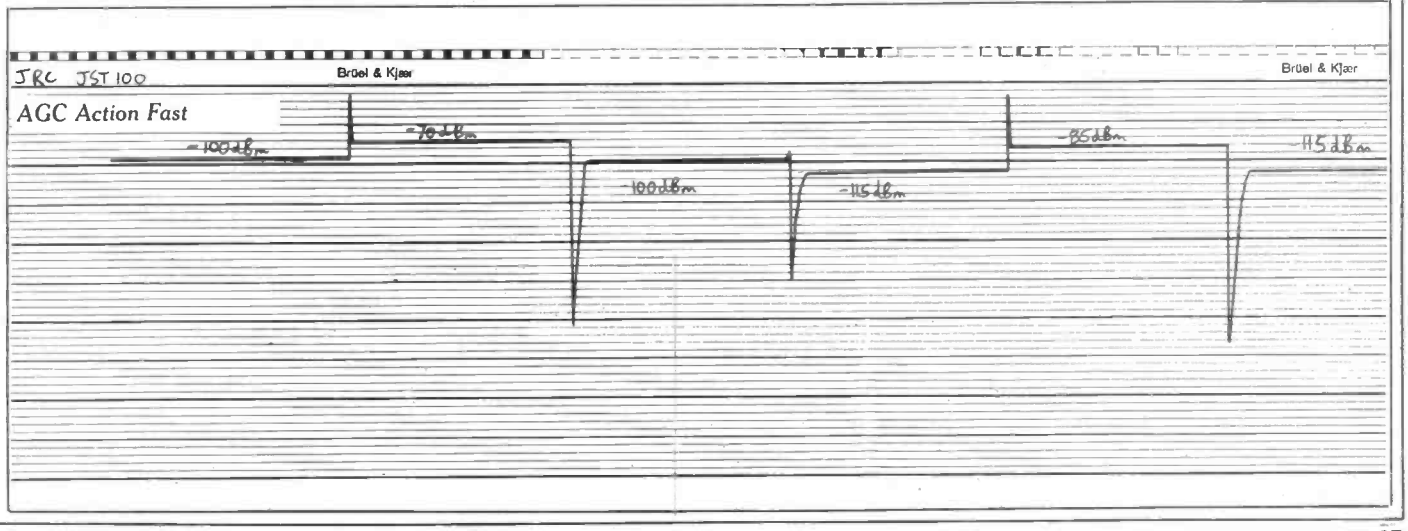
Band	2nd Harmonic	3rd Harmonic
1.8MHz	-65dB	-65dB
3.5MHz	-60dB	-60dB
7MHz	-60dB	-60dB
10MHz	-52dB	-50dB
14MHz	-42dB	-60dB
18MHz	-60dB	-52dB
21MHz	-54dB	-60dB
24MHz	-60dB	-60dB
28MHz	-60dB	-60dB
29MHz	-60dB	-60dB

Current drawn on standby: 2 amps
Current drawn at full power: 23 amps
Audio output for 10% THD into 8 ohms: approx 2.5W
Audio distortion at 125mW (8 ohms): 1.5%
SSB transmitted response (ref 1.6kHz, 0dB)

200Hz	-40dB
300Hz	-23dB
400Hz	-7dB
475Hz	-3dB
600Hz	-2dB
700Hz-1.6kHz	0dB
1.7kHz	-1dB
1.8kHz	-1dB
2.0kHz	-2dB
2.5kHz	-3dB
2.7kHz	-5dB
2.8kHz	-20dB
3.0kHz	-40dB

Our thanks to Lowe Electronics for the loan of the review sample.





23cm

Amateur TV

part 2

In this month's episode Andy Emmerson G8PTH covers transmitters, PAs, receivers, preamps, antennas, feeders and connectors. As well as theoretical considerations there is a survey of commercial equipment, which exists in greater variety than you might think.

Transmitter techniques used for FM TV at 24 centimetres break down into just two basic designs. The simpler (and cheaper) one employs a modulated 70cm power oscillator feeding an amplifier of some 5 to 15 watts output. This is then fed to a varactor tripler and 24cm filter to produce some 3 to 8 watts at 24cm. Several designs of oscillator have been devised (F3YX, RSGB Microwave Committee, etc.) but the most accessible one is by Peter Blakeborough, G3PYB. This is sold as a kit by Wood & Douglas (UFM01, £17.95; £24.80 assembled) and produces some 50mW on any frequency between 390 and 440MHz. Although no AFC circuitry is provided, drift is minimal if good construction techniques are followed. A similar DIY design is described by Trevor Brown G8CJS in Volume 2 of the BATC's *ATV Handbook*.

Amplifier stages to follow the master oscillator can be to your taste; at one time the obvious choice was the Motorola 'blue brick', which was on sale cheaply surplus and gave 15W out for 150mW in. This, alas, is no longer available cheaply, but there are similar TRW 'black bricks' around or you could use a Wood and Douglas kit. The advantage of this general technique is that you can develop a decent power level at 70cm, where power componets are not too expensive and constructional techniques are not so demanding. Against this it must be said that any error will be tripled at 24cm and varacter triplers *were* expensive and then difficult to find, after Microwave Modules stopped production. Fortunately Wood and Douglas are selling the diodes and intend to produce a ready-built tripler with some on-board filtering. Do not be deluded; aligning and matching a filter is a waste of time without access to good test gear; you can lose a lot of power in a varactor diode!

The alternative technique is to run the oscillator at the final frequency, and this is the technique adopted by the other commercial manufacturer, Fortop. This firm makes a high performance transmitter as a ready-to-run unit (the TVT1300). It takes video and audio in and produces 2.5 watts or more on a choice of two switchable crystal frequencies. Optional pre-emphasis is also provided. The sole disadvantage of this approach is that power amplification is more expensive, and one stage may not satisfy the keen QRO merchant. Fortop's unit was illustrated last month; it costs just under £200.

Power amplifiers

Power amplifiers for 24cm follow naturally, and the choice is between solid state and thermionic. If a high power thermionic final stage is intended an intermediate transistor stage may be desirable to reach the 10 or 15 watt mark. LMW Electronics of Ratby, Leicestershire, have announced their intention to provide such a device, and Thanet Electronics have advertised Japanese Puma amplifiers. Good old valves come into their own at 24cm, however, and experience tells us that there are only a couple of good designs. (I said old valves, but new ones go better!)

To get some power we need to look at the 2C39 type of triode, preferably the newer ceramic versions such as the 7289, 3CX100 and 2C39AB. The old glass ones are usually pretty naff and tend to blow up under the strain of continuous operation. Valves with small radiators originally used in pulsed radar sets or in testgear should be replaced by the normal variety; we don't want our little friends to overheat. A lot is said about buying new tubes (£20 to £35), but even these can be 'poisoned' if they are old stock (look for the date code: 6932 means made in week 32 of 1969). Surplus valves are bought as seen and may be useless; more often they are taken out of radar equipment as a matter of course after, say, 2000 hours and slung out regardless of condition. I know someone whose gainiest 3CX100 cost a couple of pounds at a rally. If you can buy a handful for a fiver at a rally you stand a chance of getting one good one...

Most of the 'traditional' 23cm PA designs are outdated or unsuitable for FM TV at 24cm. We need a wide bandwidth and a broad tuning range. So forget the RSGB *VHF Manual* design and (unfortunately) the very nice commercial offering by L-Wave. 'The' design is that by Rod Timms, G8VBC, and was described in issued 119 and 120 of *CQ-TV*. Subject to availability of space, we will publish it here in a later issue. Rod's design is a complete rework of the original *Handbook* one by G2RD; the diecast box is replaced by one of folded brass (or cut from PCB material) and allows easy tuning. There are no components requiring 'tricky' handiwork. This amplifier will give at least 30 watts, up to 40 or more if driven hard.

If you desire more power a twin tube design will do the trick. The German-made EME 20150, reviewed in the January edition of this magazine is stated to have a bandwidth of 8MHz, and should therefore be useful. It will produce 150W easily from an input of 15 watts or so, though it will probably be advisable to keep 'overs' fairly short to extend the life of the tubes. Price is just over £200, from Piper Communications. Do-it-yourselfers will find constructional details in the German *UHF Compendium* available from the RSGB.

Receivers

Turning to receivers are are again spoilt for choice, but ideas centre around an RF mixer to produce a downconverter to an intermediate frequency of approximately 70, 50 or 35MHz (TV IF). The downconverter can be a modified TV tuner and the actual FM demodulator could be the *CQ-TV* design (issue 122), for which the BATC supplies a PCB.

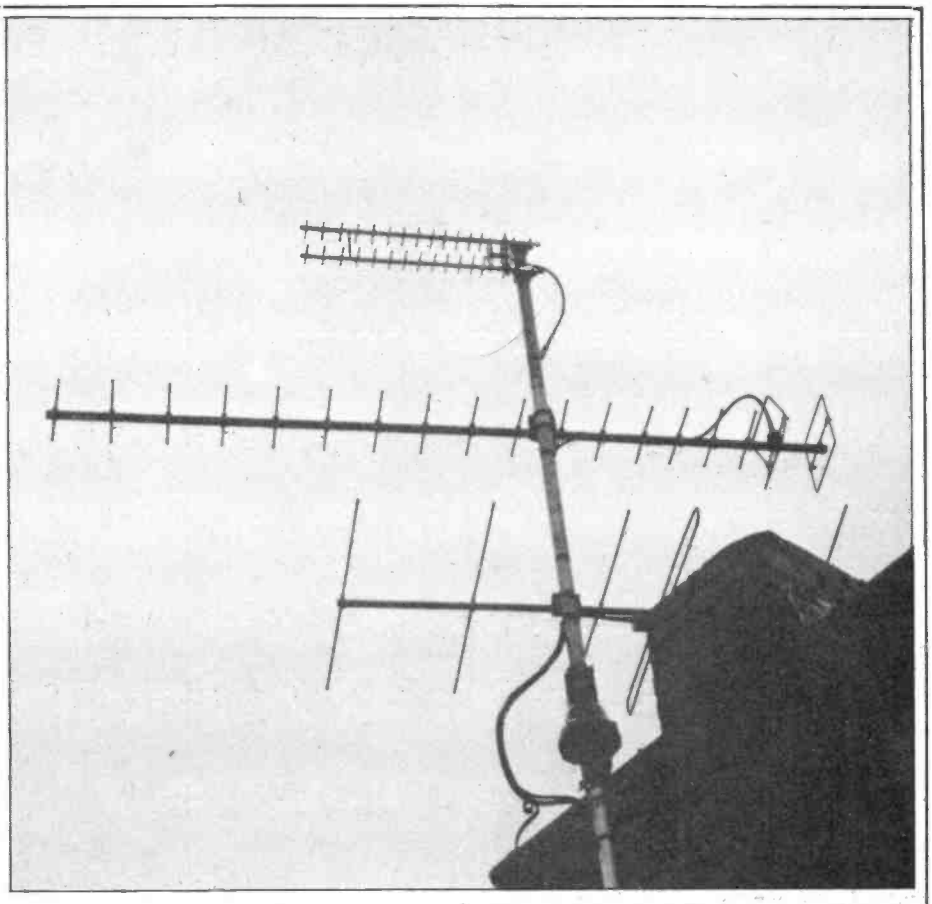
Alternatively you can buy the Wood and Douglas VIDIF FM demodulator as a kit (£38.95) or assembled (£52.65). Fortop have also announced their intention to supply a receiver: this will be a tunable unit with switchable pre-emphasis. It will probably be launched at the 1984 ATV Exhibition in the Post House Hotel, Crick (Northants), on Sunday 13th May. Just as an aside, all the receiver designs give raw video and audio out, ready to feed into a monitor, but of course you can add an ASTEC video/audio modulator (from Ambit) to make a channel 36 UHF (AM!) signal to feed into a normal TV.

Preamplifier circuits have been published in several articles, though to achieve good results you need to use top quality PCB material. Mutek make a very nice uncased preamp (£24.50) which they will tweak for optimum at your chosen frequency if you ask, and the Microwave Modules low-noise preamp is also praised by users. If you feel like saving money and supporting cottage industry you could get the LMW 1296PP0 components and do it yourself. G8LMW also supplies all parts for a masthead version at £32.95. At 24cm a masthead preamp is extremely desirable to overcome losses in the feeder; if a separate downlead is not employed a bypass relay will also be required and Piper Communications supply a very superior weatherproof unit which contains relays and GaAsFET preamp.

Feeders

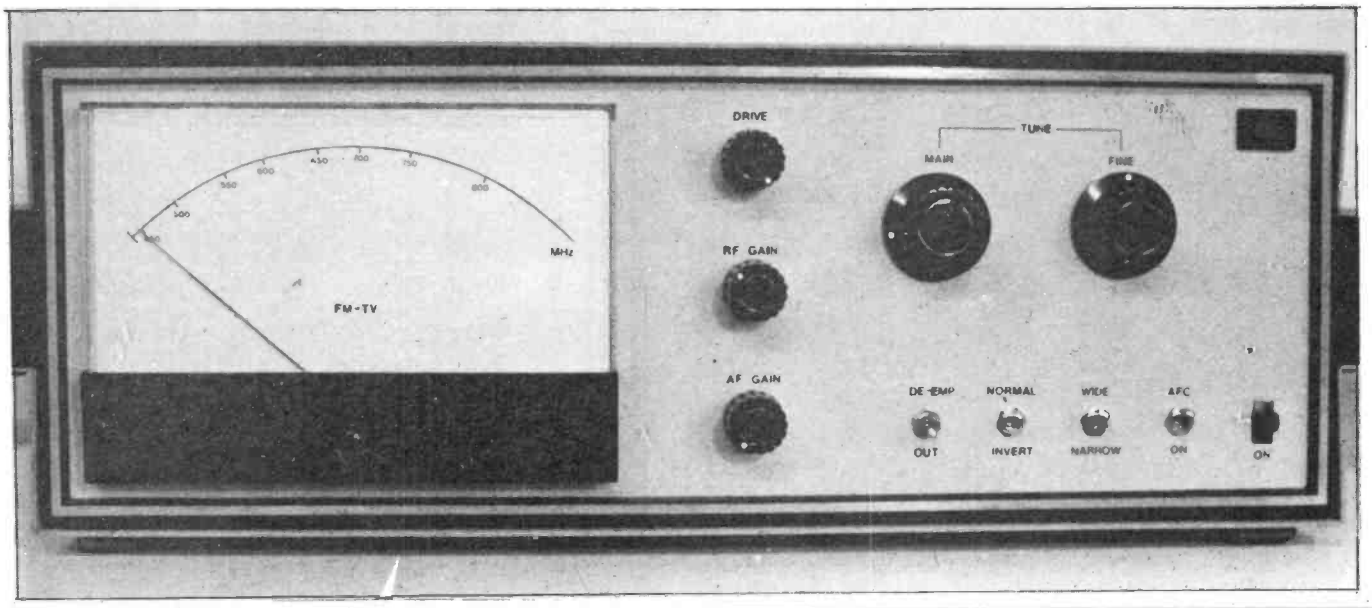
Having mentioned feeders, we might as well consider these properly. The quarter-inch 'bootlace' coax tends to act as an efficient attenuator at 24cm and the half-inch variety is infinitely preferable, apart from very short lengths. Most people then think of Heliax, decide they cannot afford it and buy UR67 instead. The latter is lossy but affordable, while the former is just too good to come inside the budget. A halfway house, which I and several others are pleased with, is the new(ish) H100 cable by Pope, which you can get from W. Westlake and others.

H100, though superficially similar to UR67, has a much higher specification and an acceptable price (80 pence a metre). Attenuation is only 1.5dB in a 10 metre length at 24cm. H100 is lighter than UR67 but still takes the normal N-type connectors. The sole inconvenience is dressing the end of the cable when you fix the connectors (the sheath is very tough and the braiding is rather fragile and filing down the centre conductor to fit the pin of the plug (not necessary with Greenpar examples and not really desirable at any time, but needs must). Connectors must be N-type (or C-type) to



A simple but effective aerial system: J-Beam D15/1296 for 23/24cm, plus conventional beams for 70cm and 2m.

Carefully constructed home brew equipment deserves a neat case and front panel treatment. Receive converter by G3YQC.

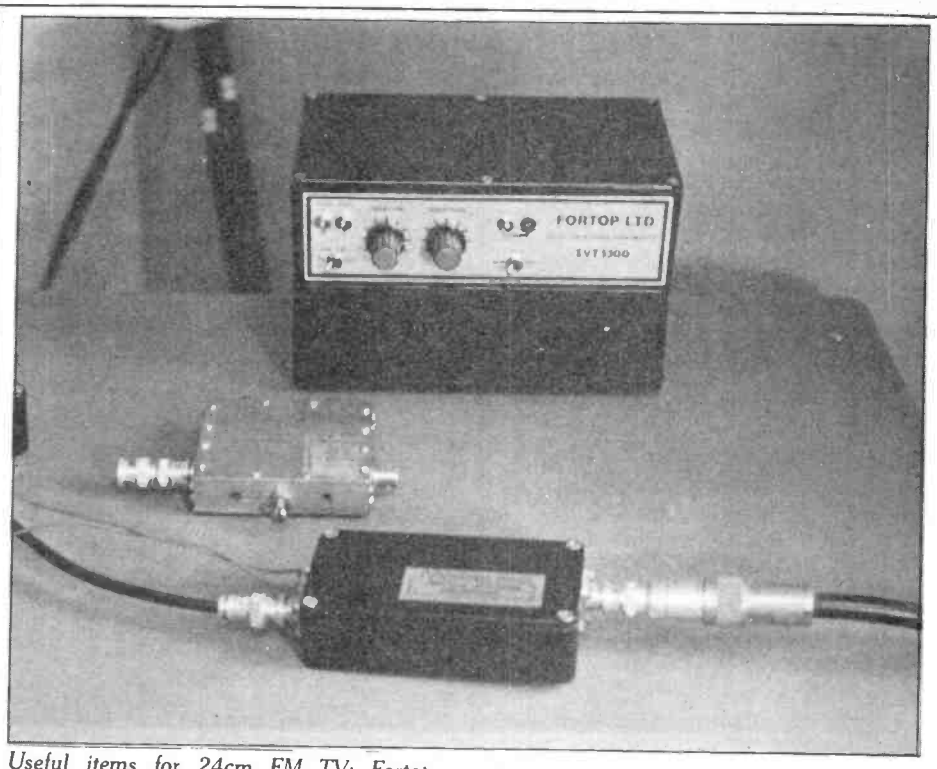


handle any power. BNCs are just about OK but UHFs are definitely out!

Antennas

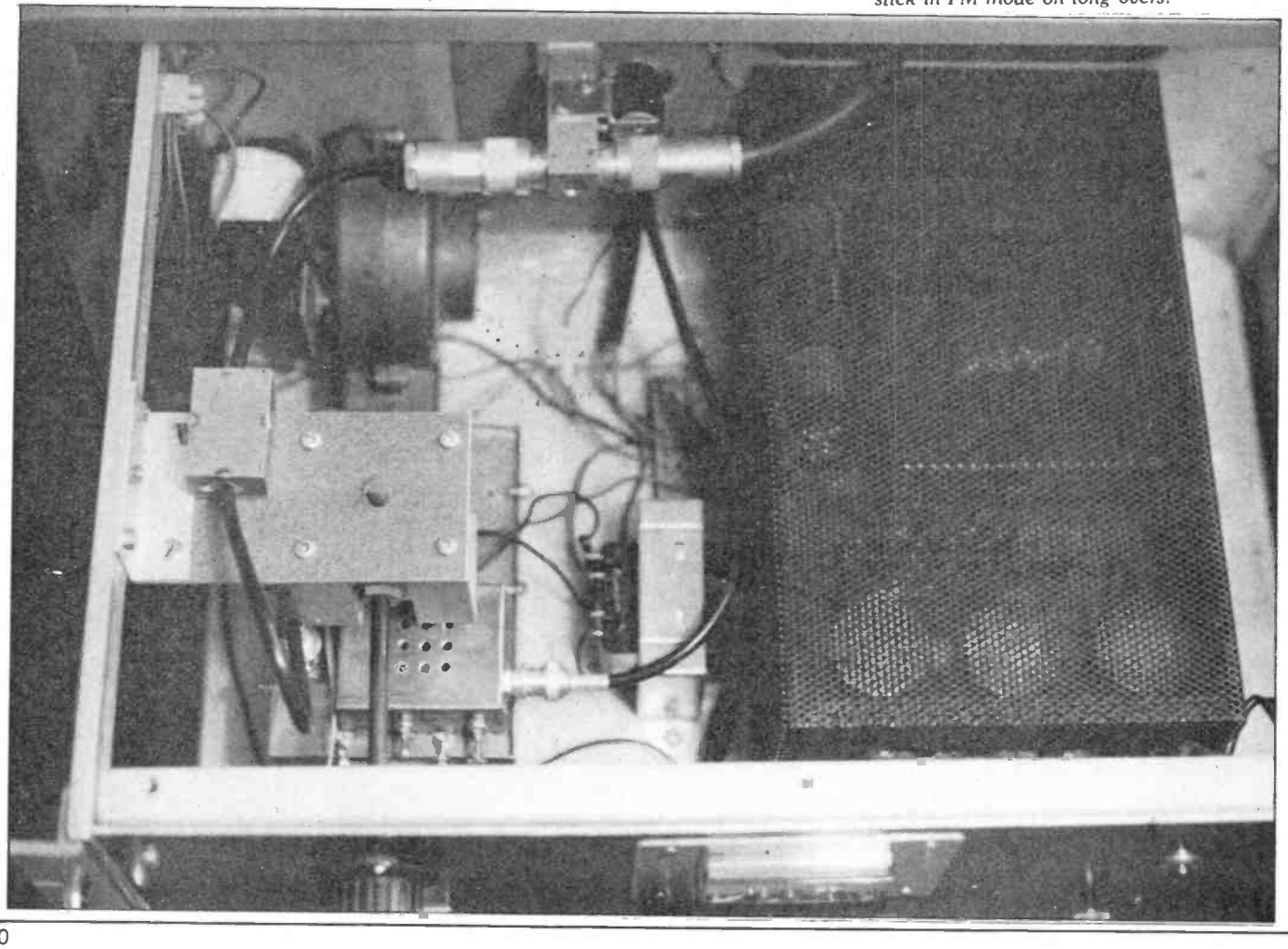
Last of all, we come to the bit of the system which does as much work as any other, the antenna. The selection is varied, depending on your goal. For reasonable gain coupled with some directivity a form of Yagi is hard to beat, examples being the slot-fed 15 over 15, the long Yagi, loop Yagi and quad Yagi. Of these the first two tend to be more narrow-band, the latter two broader. Combining forward gain and wide bandwidth we have the helical, and forward gain alone the dish. Sacrificing a bit of gain and directivity in favour of wide bandwidth and ease of DIY construction, we come upon the stacked colinear and the corner reflector. For omnidirectional use (eg. repeaters) the Alford Slot is the one to choose.

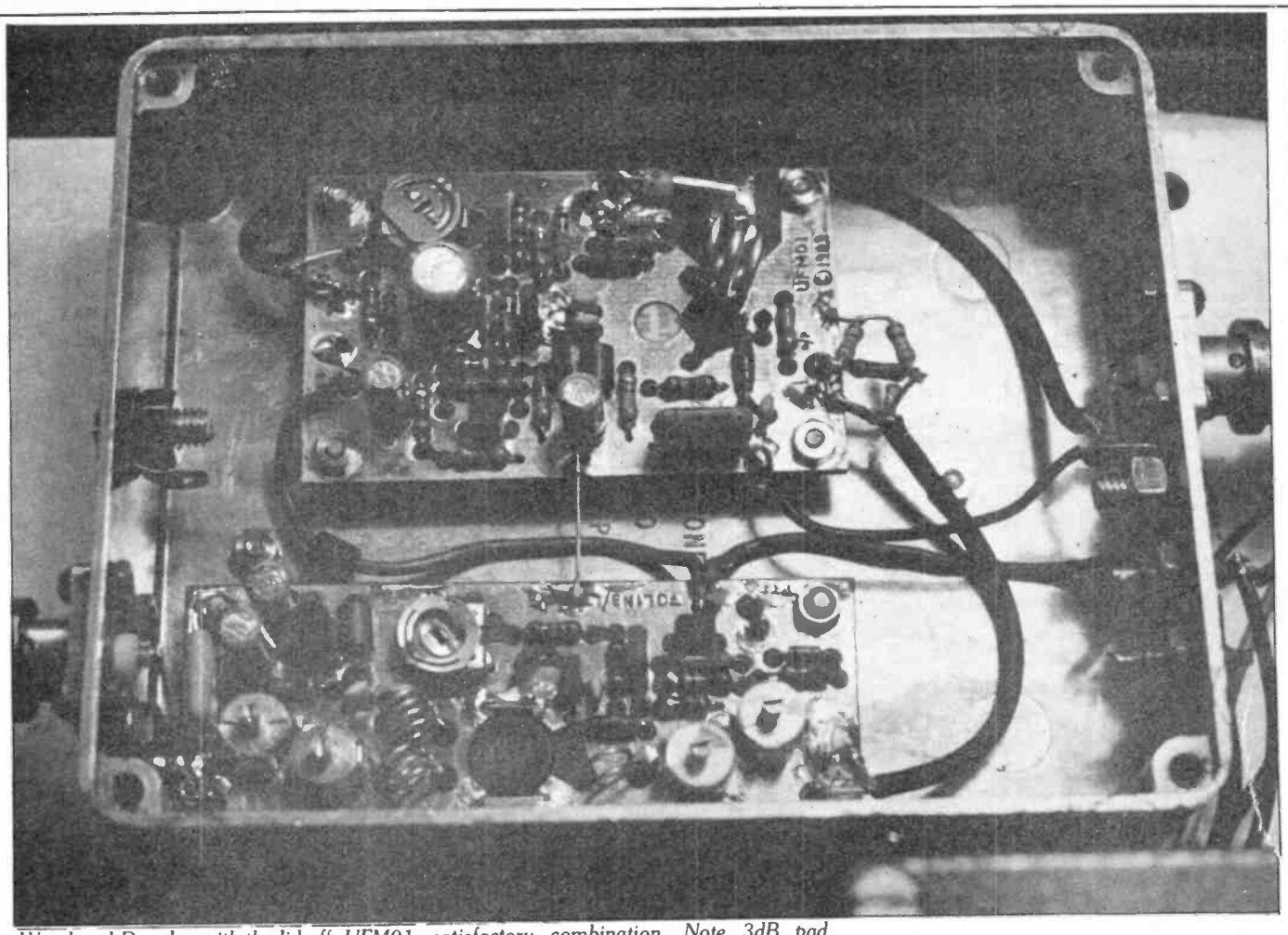
Picking these off one by one, the 15



Useful items for 24cm FM TV: Fortop transmitter, home brew bandpass filter and Microwave Modules preamplifier.

Single 2C39 power amplifier developed by Rod Timms G8VBC and constructed by John Wood G3YQC. The design requires no lathework and produces 35 to 40 watts RF. Note shielding around power supply, essential with anode voltages of 800V or more, also the powerful ventilation system for anode and cathode. The valve gets a lot of stick in FM mode on long overs.





Wood and Douglas with the lid off: UFM01 power oscillator and 70LIN3 amplifier, assembled by G3YQC who fir[illegible] a very satisfactory combination. Note 3dB pad between oscillator and amplifier stage to ensure stability.

over 15 is an old favourite. The commercial version by J-Beam is sturdy and certainly works well, but is now out of production. The gain is about 14dBd at 1300MHz but down to 10dB or so at 1250. Quite a few operators find this acceptable.There is a version cut to 1252.5MHz which is still available in Germany; this was made specially for the *VHF Communications* people.

Long Yagi

The long Yagi is characterised by the F9FT (Tonna) design. Several operators use this (or a chinese copy) and appreciate the 15.5dBd gain. Versions are made for both 1255 and 1296MHz, but the bandwidth is only 20MHz, which means one antenna may not cover operation at the top and bottom ends of the band very well. Mutek supply - 23 and 46 - element long Yagis made in Germany.

Loop Yagis and quad loop Yagis are almost the same thing; only the shape of the elements differs. A commercial loop Yagi used to be sold here and still is elsewhere; it would make a good choice. The helical aerial is a DIY job and was described in *CQ-TV* 122, while dishes are dealt with in the RSGB *VHF Manual*. I hope to describe a proven broadside colinear array later in this series; while the corner reflector is the new J-Beam offering. I haven't met anyone who has tried the latter yet, but it ought to do the job well. The Alford Slot is covered in volume 2 of the *ATV Handbook*.

For the newcomer the Tonna or J-Beam is probably the best choice; for the DIY merchant a colinear array or better still, a helical.

That's it for this month: next month look out for a discourse on power meters and detectors, filters, transmission line matchers and some surplus goodies to look out for. Following that I hope to include some practical construction designs courtesy of the Worthing repeater group (hint!) and details of progress with repeaters, also relay and crossband working, together with activity in neighbouring lands.

DX

A final thought: 24cm is definitely not inferior to 70...P5 pictures have not been received from France deep in the Midlands (F3LP to G8VBC, nearly 400km).

Please note that all prices and availabilities quoted are subject to revision: please contact the firm concerned for full details.

Addresses: (please enclose SAE with any enquiry)

BATC PUBLICATIONS, 14 Lilac Avenue, Leicester LE5 1FN

FORTOP, 13 Cotehill Road, Werrington, Stoke-on-Trent, Staffs.

LMW ELECTRONICS, 102 Stamford Street, Ratby, Leics. LE6 0JU.

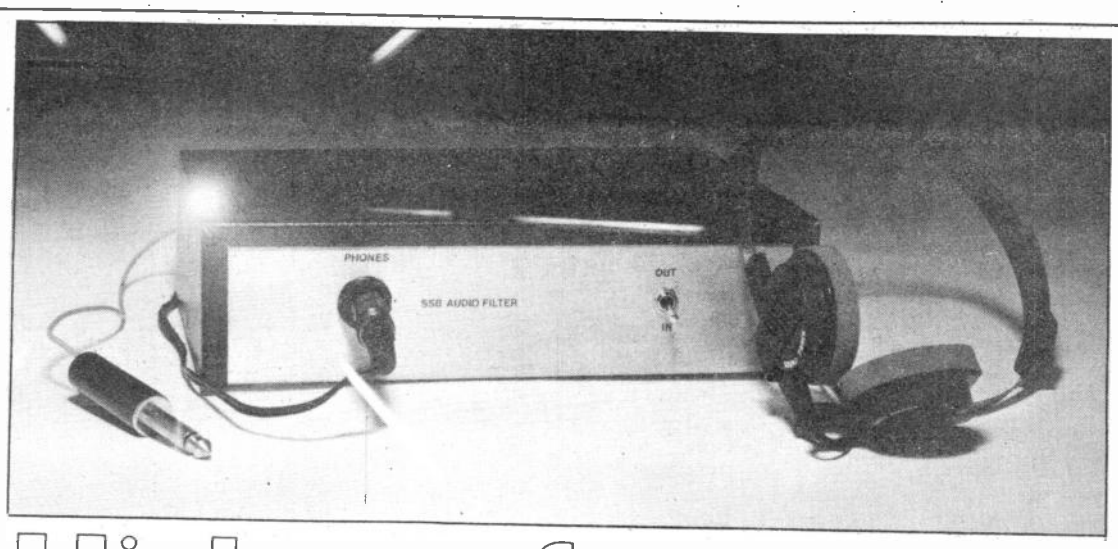
MICROWAVE MODULES, Brookfield Drive, Liverpool L9 7AN

MUTEK, Bradworthy, Holsworthy, Devon EX22 7TU.

PIPER COMMUNICATIONS, 4 Severn Road, Chilton, Didcot, Oxon OX11 0PW.

W.H. WESTLAKE, West Park, Clawton, Holsworthy, Devon EX22 6QN

WOOD & DOUGLAS, Unit 13, Young's Industrial Estate, Aldermaston, Berks, RG7 4PQ.



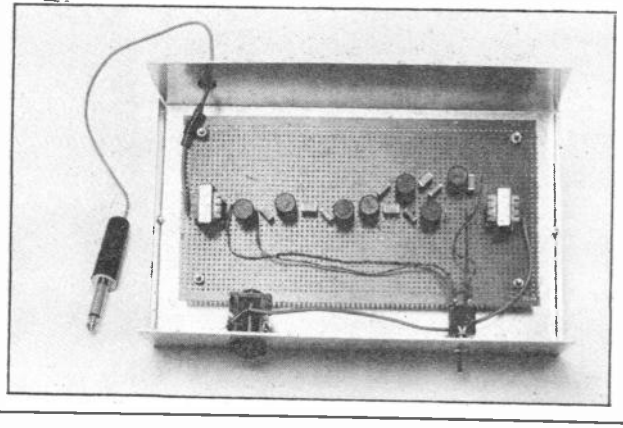
High performance SSB filter

Receiver not as sharp as it could be? This add-on unit will filter out out-of-channel signals. By S. Niewiadomski M.Sc.

In his article in the October 1983 issue of *Amateur Radio*, Rev. George Dobbs G3RJV described the construction of a passive CW filter suitable for plugging into the headphone output of a receiver or transceiver. The design used American 88mH telephone line loading coils, available to amateurs in this country through the G-QRP Club. Though an excellent design, these line loading coils are not the most convenient components to use. They are bulky, and their use involves removing turns from the windings unless the filter has been specially designed to use multiples and sub-multiples of 88mH.

The aim of this article is to describe a passive audio filter for SSB. Again, the design allows the filter to be plugged into the headphone socket of a receiver, but miniature ready-wound inductors are used rather than the line loading coils.

So the aim of this article is not just to produce a shape with cut-off frequencies at approximately 300Hz and 3kHz. All the frequencies necessary for intelligible speech lie in this range, but the audio output of a receiver usually also contains frequencies outside it. These unwanted frequencies include hum (50 and 100Hz) and hiss introduced by the non-perfect performance of the receiver's audio stages. Also there may possibly be unintelligible shifted-frequency SSB signals from adjacent channels which have not been eliminated by the receiver's IF filter. The effect of these unwanted signals is to make the wanted signal more difficult to understand. Of course, there may also be interfering frequencies which are within the 300Hz to 3kHz range and there are techniques using notch filters for removing single fixed frequencies in this range. However, these are beyond the scope of this article.



View of the filter constructed on Veroboard. Keeping the input and output sections well separated reduces leakage past the filter.

For some reason unknown to me, the amateur radio community seems to be convinced that the only pre-wound inductors available in the UK are the telephone line loading coils from America. In fact, there is a range of inductors manufactured by Toko and marketed in this country by Ambit International. The 10RB range consists of values from 1mH to 120mH and at present cost 42p each. The 10RBH range has values from 150mH to 1.5H and cost 70p. These inductors are only 10.5mm diameter and 14mm high and have a lead spacing of 5mm. This small physical size makes them easy to mount on PCBs or veroboard.

There are two potential problems with these inductors which may explain why they have been largely ignored. First, they are available in E12 series values and secondly, their Q is low when compared with physically larger inductors with thicker wire. For example, the Q of the 100mH inductor at 1kHz is 7.7, and at 100Hz is 0.77. The commonly held view on the first point is that highly accurate inductance (and capacitance) values must be used to produce predictable and acceptable filtering action, and second that only high Q inductors can be used. The feeling seems to be that Q stands for quality and therefore low-Q inductors are of low quality and hence unusable for good quality filters. The Q of an inductor should simply be treated as a measurement of its electrical properties and not a direct implication of its suitability for use in a filter.

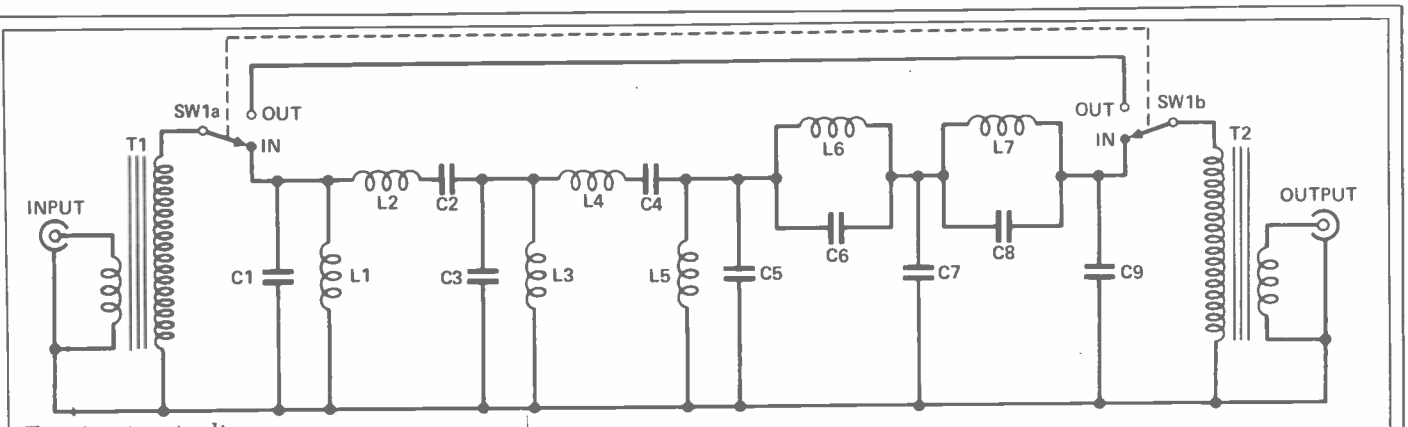


Fig 1: circuit diagram

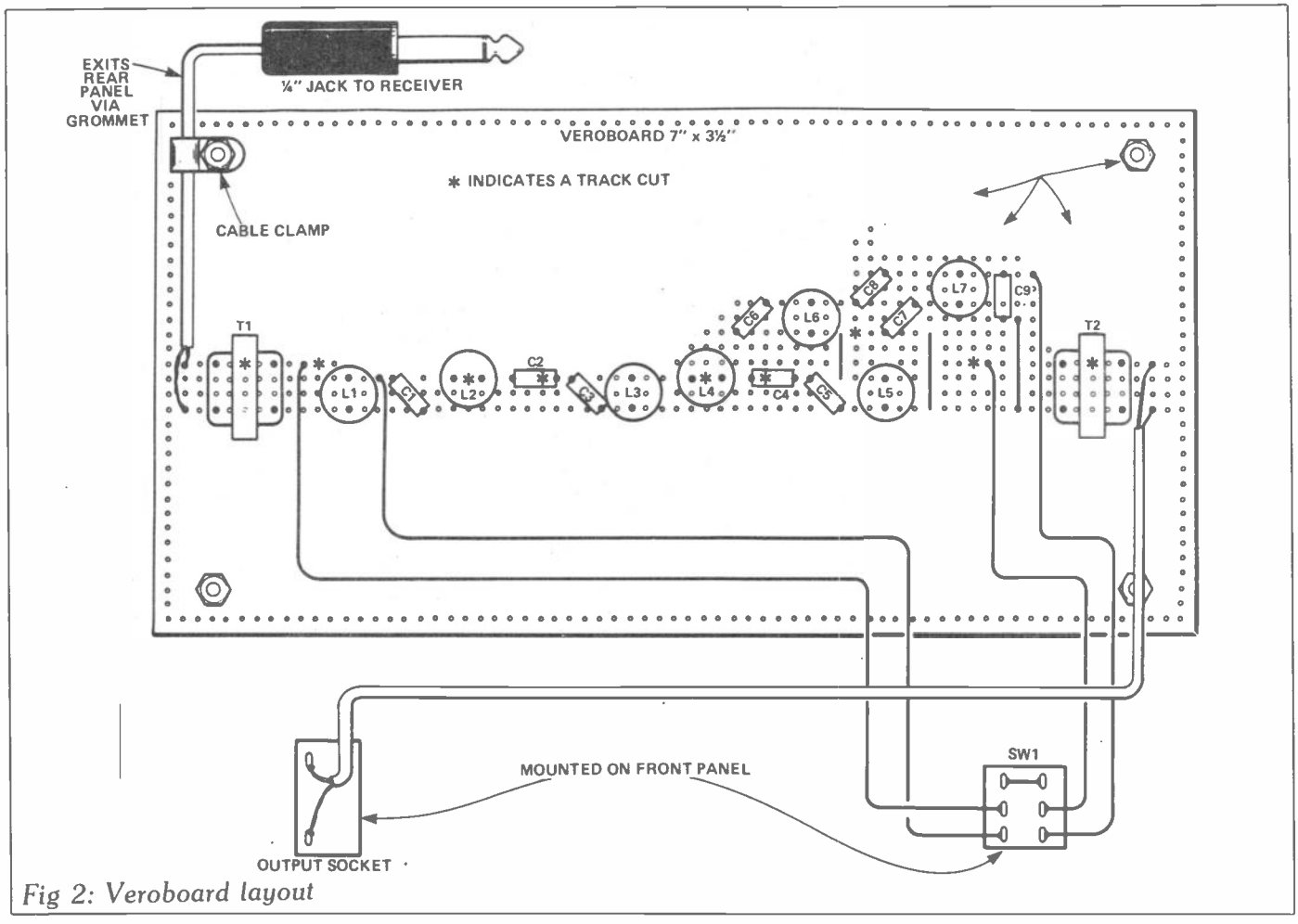


Fig 2: Veroboard layout

Again, misunderstandings exist as to what tolerance is allowable on the inductance and capacitance values in a passive filter, while maintaining acceptable results. We are all familiar with calculating resistance and capacitor values for other circuits and then rounding each value to the nearest preferred value. We seem to be afraid to do this with the components in a filter, hence the use of 88mH inductors (sometimes with turns removed—) or hand-wound pot cores and paralleled or bridge-measured capacitors.

So the aim of this article is not just to produce a working design, but also to show that the Q of the inductors and the exact values of all the components in a passive filter are not as critical as is commonly thought.

The circuit diagram of the complete filter is shown in Fig. 1. T1 and T2 are miniature audio output transformers identical to those used by G3RJV. Either the Radio Shack part number 273-1380 (available from Tandy) on the eagle LT700 can be used.

The filter circuit

T1 matches the low output impedance of the receiver to the higher input impedance of the filter. T2 converts back to a low impedance to drive headphones. The filter is designed for 1k ohm input and output impedances, and T1 and T2 have secondary impedances not too far from this value. The centre tap on the high impedance winding of T1 and T2 is not used in this application.

S1 is a two-pole change-over toggle switch which allows the SSB filter to be switched in and out of circuit. This is handy for assessing the improvement produced by the filter.

If you're familiar with passive filters, the filter itself can be seen to consist of two basic configurations cascaded together. The first section is formed by C1-C5 and L1-L5. This is a bandpass filter and has been derived from an ARRL design published in the 1983 issue of the ARRL *Radio Amateur's Handbook*. The ARRL circuit was designed for input and output impedances of 206 ohms, and the new component values have been scaled to impedances of 1k ohm. To do this, the capacitor values have been multiplied by 206/1000 and the inductors by 1000/206. The 206 ohm impedance arose because the ARRL design used the same 88mH telephone line loading coils as G3RJV used in his filter.

The ARRL design had cut-off frequencies of approximately 350Hz and 2.8kHz. By scaling the component values to produce a different input and output impedance, the frequency performance of the filter stays the same.

The second section of the unit is a 7th-order elliptic lowpass filter, which improves the roll-off of the bandpass section at frequencies above 3kHz. C5 is a combination of the final capacitor in the bandpass section and the first capacitor in the lowpass section.

Elliptic filters possess the fastest roll-off rate of any filter type, but this is obtained at the cost of ripple in the passband and a certain minimum, rather than a continually increasing, attenuation in the stopband. In practice, these two properties do not limit the performance of the filter. It has been shown that ripples of 3dB are undetectable by the human ear and very high theoretical attenuations are unachievable in practice because of leakage around the filter.

Table 1 shows two sets of values for the capacitors and inductors. The theoretical values are what are obtained using the textbook approach to filter design. The practical values are obtained by simply choosing the nearest preferred value for each component.

The prototype filter was built in Veroboard as shown in Fig. 2. No attempt was made to produce a very compact final unit as the author had an aluminium box to hand and tailored the Veroboard to fit into the box. The box used was an Electrovalue type SB3, whose dimensions are 205 x 134 x 51mm.An excelelnt, inexpensive range of aluminium cases is available from Minffords of Sun Street, Ffestiniog, Gwynedd, LL41 4NE. Their case number J2 ($4\frac{1}{2}$" x $2\frac{1}{4}$" x 2") would appear to be ideal for a compact version of this unit.

S1 and the headphones socket are mounted on the front panel. A small hole fitted with a grommet in the rear panel allows the input lead (screened audio cable) to enter the case. This lead is fitted with a $\frac{1}{4}$" audio jack for plugging into the receiver and should be long enough to place the filter unit at a convenient position with respect to the receiver.

Four 6BA screws hold the Veroboard in the case, with nuts spacing the board from the bottom of the case. Finally, four stick-on feet are added to the case to prevent the metalwork from scratching surfaces.

If you want to alter the Veroboard layout to enable a different case to be used, there should be no problems. To minimise signal leakage around the filter, it is best to keep the input and output of the filter well separated. The use of the Toko inductors and Siemens polyester capacitors enables a very compact final unit to be produced if desired.

It is possible to incorporate the filter into the low level audio stages of a receiver rather than to add it to the audio output. T1 and T2 should be omitted and the correct drive and terminating impedances should be provided. The easiest way to achieve this is to drive the filter from the collector of a common emitter amplifier with a collector resistor of 1k via a 100uF capacitor. The capacitor will prevent any DC current from flowing through L1 which might cause saturation and reduction of the inductance value. Termination of the filter is best provided by

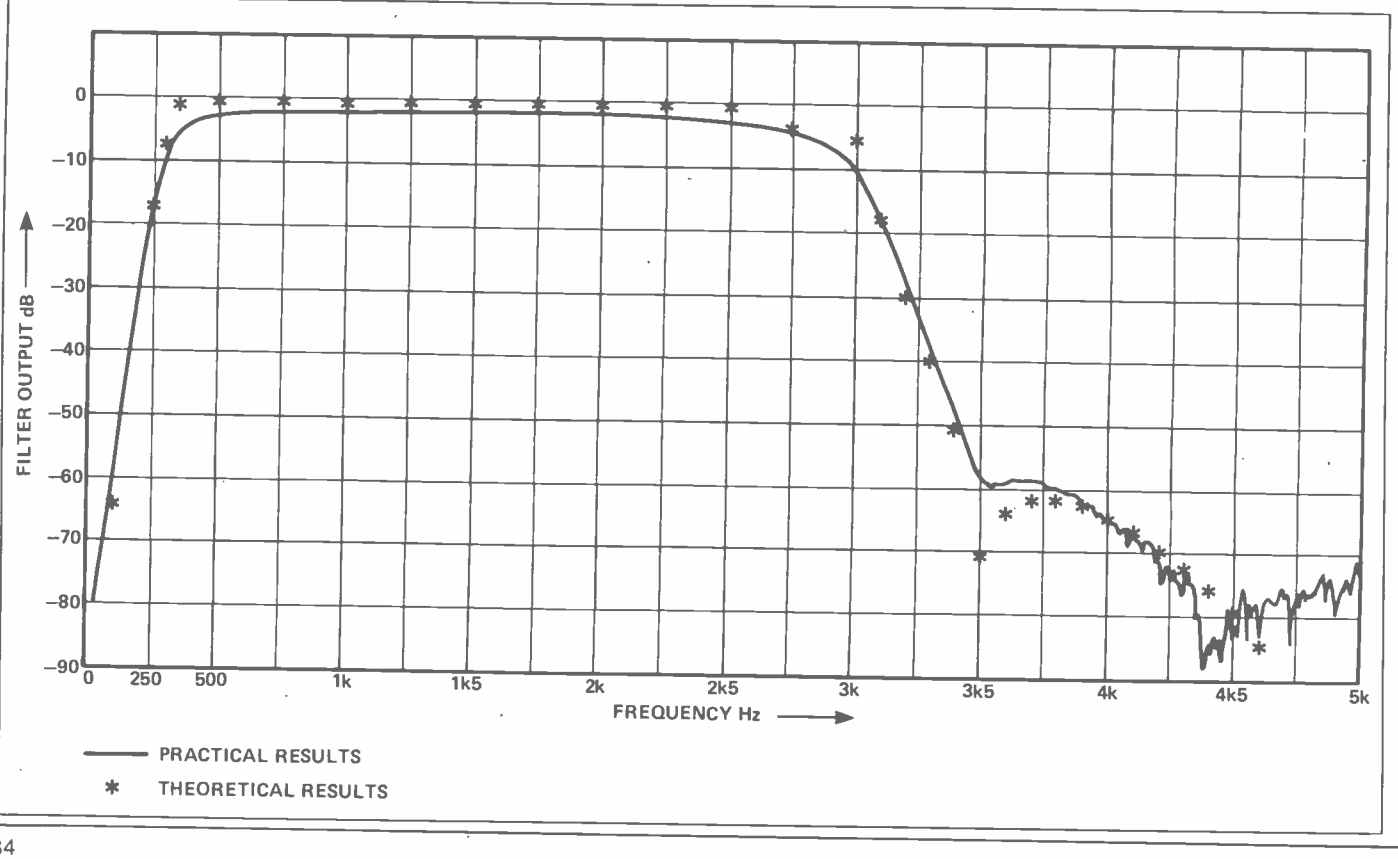


Fig 3: theoretical and practical frequency response curves for the filter.

a 1k resistor between the output terminal and earth, and then feeding into a high impedance (say, greater than 10k) audio amplifier.

Results obtained

The practical results obtained from the filter with preferred-value inductors and capacitors are shown as the solid line on Fig 3. Note that this is the response of the filter without the matching transformers, but with the correct impedances provided by 1k resistors. This has been done because the transformers are likely to degrade the performance because they do not provide the correct impedances across the entire frequency range.

Also shown on Fig 3 (as a series of crosses) is the calculated response of the theoretical values of Table 1. This was obtained by modelling the filter using a circuit simulation program on an Apple II microcomputer. The difference between the two graphs are therefore due to the effects of the preferred component values and the finite Q of the inductors. Note that the frequency axis of Fig 3 is plotted on a linear, rather than the more usual logarithmic, scale. This helps to show more detail at higher frequencies, especially near the upper cut-off frequency.

The first thing that can be seen about the practical response is that the filter shows a non-zero insertion loss at all frequencies. This is one effect of the Q of the inductors and in this case is approximately 2dB. To compensate for this loss, the volume control of the receiver will need to be increased slightly. Another effect of the Q of the inductors is the rounding of the response edges near the cut-off frequenices.

The combined effect of the bandpass and elliptic lowpass sections should be to produce a continually increasing attenuation in the stopband, but in practice the attenuation flattens out at approximately 70dB. This level of attenuation is maintained at frequencies up to several Megahertz.

Though differences do occur between the theoretical and practical results, to the ear they will be undetactable. The overall conclusion is that the filter using miniature inductors and preferred value components gives excellent results and listening tests have confirmed this.

I hope that this article has shown that excellent results can be obtained using miniature inductors and preferred value components. These techniques make audio filter design and construction very simple and I hope that they will encourage interest in passive designs which seem to have been largely superseded by active circuits..

Table 1: theoretical and practical component values

Component	Theoretical value	Practical value
C1	65.7nF	68nF
C2	262nF	270nF
C3	131nF	120nF
C4	262nF	270nF
C5	160nF	150nF
C6	25.2nF	27nF
C7	105nF	100nF
C8	78.9nF	82nF
C9	67.7nF	68nF
L1	426.8mH	390mH
L2	106.7mH	100mH
L3	213.4mH	220mH
L4	106.7mH	100mH
L5	426.8mH	390mH
L6	43.9mH	47mH
L7	25.9mH	27mH

Table 2: components list

C1,9	68nF	5%	25V
C2,4	270nF	5%	100V
C3	120nF	5%	100V
C5	150nF	5%	100V
C6	27nF	5%	250V
C7	100nF	5%	100V
C8	82nF	5%	250V

Siemens polyester layer (available from Electrovalue)

L1, 5	390mH	Toko	10RBH
L2, 4	100mH	Toko	10RB
L3	220mH	Toko	10RBH
L6	47mH	Toko	10RB
L7	27mH	Toko	10RB

Available from Ambit International, Brentwood, Essex.

T1 Eagle LT700 or Radio Shack 273-1380 (see text)

S1 double-pole change-over toggle switch.

Veroboard approximately 7" x 3½" (see text)
Case (see text)
¼" jack and socket

Fixing screws, nuts
Cable clamp, grommet
Screened audio cable
Wire

This month should bring the Clipperton Island expedition, and as background you will find some information about the island and its history later in this column. Operation is expected to start at around 9th March and to last for at least five days.

The ZL2AAG net which meets daily on 7084kHz from about 0730 has been producing some exotic DX recently. ZK1DA, ZK2RS, YJ8RG and others have put in regular appearances, though the star attraction of late has been the occasional appearance of ZL8AFH on Kermadec Island. Unfortunately the net starts rather too early for best propagation between the UK and New Zealand, but UK stations have been able to get in on the action by calling the net controller a little later.

Nothing was seen or heard of the proposed expedition to Desecheo. Perhaps the finance wasn't forthcoming. However, the sudden spate of activity from the Laccadive Islands under the callsign VU7WCY has been a welcome surprise. The first group were operational in December and QSLs should go to the Andhra Pradesh Radio Society, 5-B P S Magar, Hyperabad 500457, India. QSLs for the second group (active in January) go to VU2GDG, PO Box 3755, Coimbatore 641018, India. The second group were able to take better antennas and were worked in the UK on the five main HF bands. Both groups deserve a special mention for the way they handled this expedition to a very rare spot. The operation was mounted entirely by Indian nationals with little or no expedition experience, but this was more than compensated for by sheer doggedness and determination. Surely there can be no one left in Europe who wanted a QSO with VU7 and failed to achieve one.

The AZ5ZA operation which I mentioned last month came off as planned, and was worked from the UK on no less than seven bands (ie. 1.8 and 10MHz in addition to the five main HF bands). Those who still need a contact with Burundi will be interested to know that Bull, 9U5JB, has a schedule with his QSL manager ON5NT at 0830 on Sundays on 21410kHz. Bull has plans for some big LF antennas and should put out a big signal if his past activities are anything to go by. I remember working him under his earlier TYA11 call on 80 metres, to be told that he was trying out his new 80 metre quad!

A final note on the expedition front is that K2FJ, a member of the Royal Naval Amateur Radio Society, is off to the Pacific for about a month from Mid-February to mid-March. His itinery wil include KH8, 5W1 and 3D2. Frequencies will include 14030, 14052, 14145, 14230, 21030, 21052, 21240 and 21355kHz. Let's hope there is some reasonable propagation to the UK. Just of late AH9AB (Wake Is) has been showing up on 20 metres around 0800 with fair signals into Europe, so perhaps all will be well.

DX DIARY

News for HF operators, compiled by Don Field G3XTT.

Awards

For many amateurs the pursuit of operating awards and trophies gives an incentive to their activities. There are many, many operating awards with new ones being introduced all the time. Often special events, such as World Communications Year or the Olympics, inspire awards to mark the occasion; local clubs introduce awards to encourage people to seek out and work the club members; national societies sponsor awards to encourage operating excellence among their members or to encourage overseas interest in the country which they represent. There are several publications giving more or less comprehensive lists of awards and several clubs and organisations which exist specifically to cater for the requirements of award chasers.

Most people find only occasional interest in award chasing, but there are a handful of prestigious international awards which almost every amateur would like to see on his shack wall. Principal among these is the DX Century Club (DXCC) award, sponsored by the ARRL. DXCC is, in fact, an award programme of several awards, ie. mixed DXCC, Phone DXCC, CW DXCC, RTTY DXCC, 160-DXCC, and five band DXCC. All are based on working 100 countries, and the various award titles should be self-explanatory. What makes the Mixed, Phone and CW awards particularly popular is that they are 'on-going' awards, in other words further credits can be obtained for confirmed contacts with countries additional to the basic 100. Thus, until you have contacted every country in the world, there is always something to strive after. Of course, there is unending controversy about what constitutes a 'country' and the list which is applied by the ARRL is somewhat arbitrary. Its real significance lies in the fact that it has gained international acceptance in the amateur community as a standard of comparison. To achieve DXCC Honor Roll status (which requires confirmed contacts with all but nine or less of the currently accepted countries total) takes many years of patient and skilled operating and is regarded by many as the ultimate achievement for a DXer. The amount of work involved in running the DXCC awards programme is massive and probably the US national society is the only organisation of its kind which could afford to run such a programme. The day-to-day work is handled by two full-time members of the ARRL staff. Decisions on the addition or deletion of countries (to reflect political and other changes), or on other matters of policy, are taken by the ARRL after being recommended by the DX Advisory Committee (DXAC). From time to time there have been requests for the five-band DXCC to be made open-ended in the way described above, but the work involved in processing the inevitable amount of paperwork would be beyond even the ARRL's resources. Another major award sponsored by ARRL is the Worked All States award, which is exactly what its name suggests. A five-band version is also available, which is one of the hardest awards for a UK amateur to gain (principally due to the difficulty of working all the US states on 80-metres).

An alternative to DXCC

One of the recurrent problems with ARRL awards is actually shipping the QSL cards to the USA (and back). This is both expensive and worrying (just imagine all those rare cards you have worked so long and hard to get becoming lost in the post). If you can persuade a friend who is off to the US to take the cards with him, then so much the better. Ideally, there would be a checkpoint in each country to avoid

having to send your cards on such a long journey, but the ARRL is afraid such a scheme would compromise the integrity of the award. There is, however, an alternative. *CQ Magazine*, which sponsors the major CQ Worldwide contests, runs an awards programme of its own. This programme includes two awards which are almost identical in their requirements to the ARRL Phone and CW DXCC awards, and which are also open-ended and based upon the same countries list as used by the ARRL. The advantage of the CQ awards programme is that cards can be checked in one's own country (the UK checkpoint is G3FKM) and are therefore much less likely to go astray.

CQ also sponsors the well-known Worked All Zones awards. These are based upon a division of the world into 40 zones, with no regard to political boundaries. Awards are available by mode and by band, and the five-band WAZ award has become one of the most coveted awards of them all. Unfortunately, for this last one the cards do again have to be sent to the US. The other awards programme run by *CQ Magazine* is the Worked Prefixes (WPX) programme, which has a fascination all of its own because new prefixes often appear on the bands quite unexpectedly. A handsome total can be acheived by dedicated operating even by those who lack the big signal needed to crack the pile-up for rare countries or zones.

Clipperton Island

Most people's idea of a Pacific Island is a beautiful blue lagoon surounded by waving palm trees below which attractive young girls dance the time away in peaceful co-existence with nature. Not so Clipperton Island. Clipperton certainly is a remote atoll, almost 3000km due west of the Panama Canal and 1500km from its nearest neighbour. The name derives from John Clipperton, an English pirate who, with about 20 others, made the island his home in 1705. Accounts differ. Some say that the group had mutinied and put to sea in a small boat looking for somewhere to establish a hideout. Other accounts suggest that the group were forcibly put ashore on Clipperton as a form of punishment. The first French presence was in 1711 when two French frigates anchores offshore, though France didn't actually lay claim to the island until 1858. Both the United States and Britain also enter Clipperton's history at about this time in connection with the rich phosphate (guano) deposits on the island. Not to be outdone, Mexico established a garrison on the island. Though the poor soldiers and their families were abandoned in 1912 when Mexico found itself in the midst of civil war, and many of those left on the island died of scurvy. At one stage a small group set sail to try to reach help, but were never heard of again. Later, he keeper of the lighthouse murdered the remaining men and tried to enslave the few women who still survived. One of them killed him with an axe on 18th July 1917, just a day before the *USS Yorktown* called at the island and rescued the surviving three women and eight children.

29,000 contacts

The opening of the Panama Canal gave Clipperton a new importance, and France went to the International Court in 1906 to re-establish its claim. A decision was finally made in 1930 and Mexico reluctantly handed control of the atoll back to France. Clipperton was inhabited briefly during the Second World War, firstly by the Japanese who set up a radio station there to link their US agents back to Japan, and later by the Americans who established a munitions dump on the island.

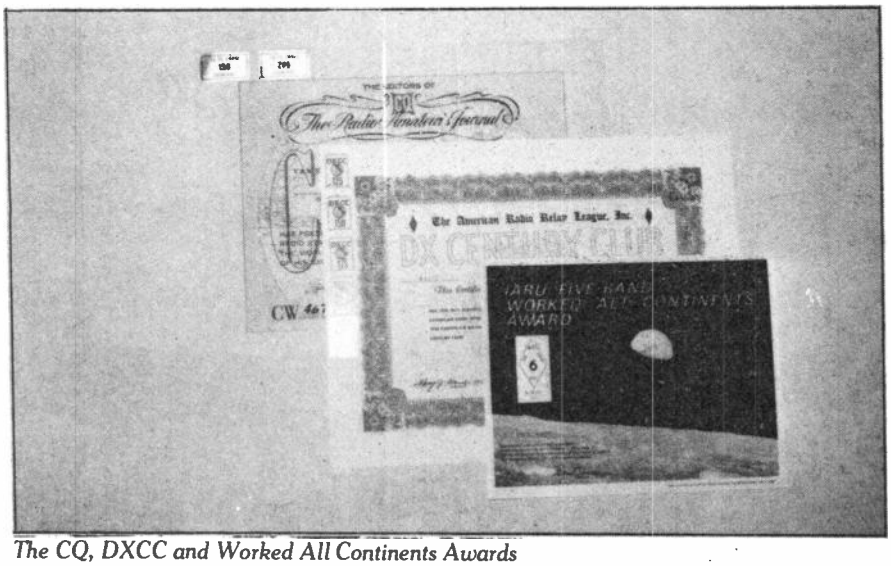
Clipperton has little plant or animal life and the weather, which is generally hot, humid and windy, is hardly conducive to a comfortable existence. Nevertheless, since the widespread acceptance of the 200 mile sea zone extending from any continent or island, France has had a particular interest in retaining Clipperton. This is why, while many amateur radio groups had sought permission to operate from there, the first major amateur radio expedition to be permitted was organised and led by a group of French amateurs. This, the last amateur radio operation from Clipperton Island, took place in March/April 1978 and set a new record for the number of contacts made by a DXpedition. The group made 29,000 contacts, using all the HF bands and also working through the Oscar 7 and 8 satellites. The expedition met with good propagation and many of the contacts were with Europe. Nevertheless there are many new amateurs on the bands who would dearly like to work this one and the 1984 expeditioners are likely to find themselves in for a busy time.

Bits and pieces

For those with the urge to travel, the Visalia DX Convention takes place at the Holiday Inn, Visalia Airport, California, April 13-15. This is an annual gathering of about 1000 enthusiastic DXers, many of whom travel from all over the world to be there. The speakers at the Convention are always of the highest calibre and this year are expected to include 9N1OAT, 1A0KM, XU1SS, HK0TU, TT8BC, KL7RA/P and others. Last year there were four Gs at the Convention and all thoroughly enjoyed the US hospitality. A much bigger event, which caters for all amateurs and not just the DX fraternity, is the Dayton Hamvention in Dayton, Ohio, which takes place over the weekend of, I believe, 28/29 April. Many UK amateurs seem to get this one each year. If you need further information on either of these events, then drop me a line.

If the above whets your appetite, but is beyond your purse, then at least get along to the RSGB's major event at the National Exhibition Centre on 28th/29th April. Associated with this event is a one day HF Convention on the Saturday with an interesting programme of lectures lined up. I shall be there the whole day and look forward to meeting as many of you as possible.

I hope you have found something to interest you in this month's column. If there are nay specific topics you would like to see covered, any grumbles, groans, questions or comments, news, views etc etc, then do write to me at *63 West Drive, Caldecote, Cambridge, CB3 7NY.*



The CQ, DXCC and Worked All Continents Awards

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The new IC-02E
Push-button Perfection

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

Some of these features include: scanning, 10 memories, duplex offset storage in memory & odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included.

Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. The IC-02E has an easy to read custom LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions.

A battery lock, frequency lock and lamp on/off switch are also featured, as is an aluminium case-back, providing superior heat sinking.

A variety of batteries will be available for the IC-02E, including new long-life 8.4 volt and 13.2 volt packs. Top panel connector for 13.8 volts which will power transceiver operation.

The IC-2E continues to be available, and its complete range of accessories work with the new IC-02E.

The IC-02E comes with the BP3 Nicad battery pack, BC25E wall charger, flexible antenna, wrist strap and belt clip as standard equipment. A truly excellent product destined to a great future.

IC-02E Accessories

IC-CP1 Cigarette lighter cord plugs into socket to charge BP3. IC-BC35 Battery Charger charges BP3 in 15 hrs. BP2 or BP5 in 1½ hrs. Also serves as handy stand while charging. IC-HM9 Speaker/Microphone plugs into transceiver and clips on lapel or pocket. has PTT button. IC-BC25E Wall Charger charges BP3 pack standard with transceiver. IC-BC16E Wall Charger charges BP7 & BP8 packs. IC-LC11 Rexine Case. IC-HS10 Headset & Mic. IC-HS10SB PTT Switch box & Preamp. IC-HS10SA Vox unit. Various battery options are available including two high-power battery packs.

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IC-745, Latest HF Transceiver

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The IC745 is another superlative set in the ICOM range, see it in our retail shop at 95 Mortimer Street Herne Bay Kent, or contact our Reculver Road address for more information. Your own local ICOM dealer will be able to help you too.

IC-27E, Latest and smallest FM Mobile

And we thought that the IC25E was small! ICOM have now produced a new and even smaller 25W FM 2 meter mobile the IC27E.

We have little information on the IC27E at the moment, but by the time you read this they should be available.

Briefly, the IC27E offers two VFO's, 9 memories, priority channel and scanning. The easy to read LCD displays frequency, memory channel, power, S-meter and functions. All this is packed into a case W140 × H38 × D177mm, and weighing only 1.2 Kgs.

The price has not yet been announced but give us a call for this and other information.

We do not sell any sets until we know them inside out. A bold claim, but true. Our engineers have been trained by ICOM in Japan, and can guarantee the best after-sales maintenance service available.

As well as the 02E, 751, 745, 271, 471, R70, 290D, 490E, 25H, 45E, 2KL, AT100, AT500, 27E, 120, 2E, 4E in the ICOM range we also stock such famous names as Tono, Telereader, Cue Dee, Versatower, Yaesu, Jaybeam, Datong, Welz, G-Whip, Western TAL, Bearcat and RSGB Publications. Thanet Electronics can offer you the most comprehensive and thorough service.

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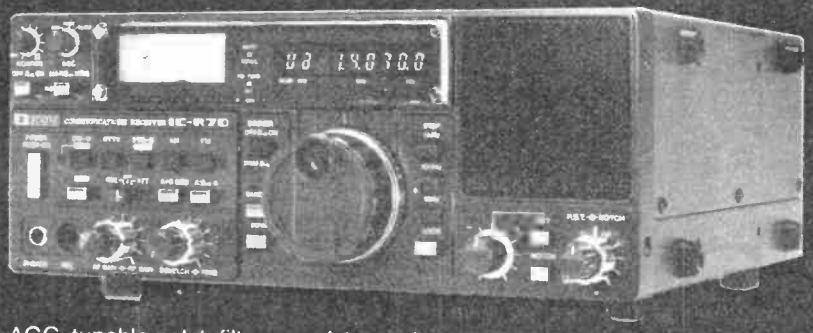
IC-R70, HF Receiver



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 dynamic range of 100dB. 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-751, HF Transceiver

The IC-751 supercedes the already popular IC-740. Improvements such as the addition of 36 memory channels, doing away with mechanical bandswitching and adding full HF receive capability (0.1-30 MHz), which is even better than the IC-R70, gives you some idea just how sophisticated the IC-751 is. The IC-751 is fully compatible with ICOM auto-units such as the AT-500 and IC-2KL. A computer control option can be added. There is also a digital speech synthesizer option which is ideal for blind operators. Power supply options are the IC-PS35 internal, or the PS-15/PS20 range for external use.

As you would expect, the IC-751 has a built-in speech processor, switchable choice of a J-FET pre-amp, straight through, or a 20dB pin diode attenuator and two VFOs allowing split frequency operation. More information on request.

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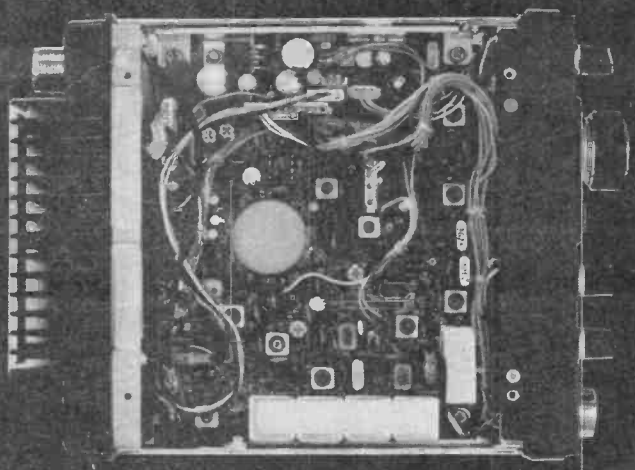

IC-271E/471E, VHF Multimode Base Stations

The IC-271E (2 meter VHF) and IC-471E, 430-450 MHz are the 'terrific twins' in Base multimodes at the moment. The design is based upon a new CPU chip that is easy to operate and offers the maximum number of functions available. Power can be adjusted up to 25W on all modes, squelch works on all modes and a listen-input facility has been added for repeater work. RIT shift is shown on the multicolour fluorescent display. 10Hz tuning facilities are included on both machines. Options for the 271E and 471E include – switchable front-end pre-amp, SM5 desk microphone, speech synthesizer announcing displayed frequency, 22 channel memory extension with scan facilities and an internal chopper PSU. If you would like to learn more specific details for the 271E or 471E, don't hesitate to ask for a brochure.

IC-290D/490E, VHF Multimode Mobiles

The IC-290D is proving to be an extremely popular 25 watt 2 meter mobile. It boasts a bright green display, 5 memories, scan facilities on either memory or across the whole band, an instant input for repeaters, there is also a tone-call button on the microphone. The IC-490E is the 70CM version and has similar features, but only a 10 watt voice in this case.

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BARCLAYCARD VISA

S·W·L

By Trevor Morgan GW4OXB

Having survived the Christmas and New Year celebrations, I dare say some of you are beginning to get the hang of using that nice new receiver. I hope my previous articles have been helpful. Anyway, although it's a bit late, I hope 1984 brings you all you wish for.

One important piece of news has come to notice recently from the Department of Trade and Industry (the Government body that deals with amateur licences). Apparently it is not illegal to use a radio transceiver for reception without a licence. This bit of the Wireless Telegraphy Act needed clarifying as it seemed a bit stupid that an aspiring amateur could not use his equipment to listen on. Anyway, the full legal bit is covered by Regulation 3 of the Wireless Telegraphy (Broadcast Licence Charges and Exemption) Regulation 1970: "Installation or use of wireless telegraphy apparatus used only for the reception of messages sent by telephony from authorised broadcasting stations broadcasting for general reception and messages sent by telephony or telegraphy from licensed amateur stations" is exempt from the need for a licence.

So, it is now OK for you to install that FT101 providing you don't attempt to transmit with it!

One of the things you learn when setting up and using a listening station is how to tune your aerial for the best reception. It is amazing how many licensed amateurs insist on transmitting a carrier, usually over a current QSO, in order to tune their aerials. Judging by the quantity of contacts one hears interferred with by bad operators who tune up on frequencies already occupied, there are a lot of amateurs (and they're not all beginners or Italians!) who don't know how to use their equipment. They can't be bothered to check the frequency first either!

However, let's leave the grouses to one side and concentrate on the more enjoyable side of the hobby.

Let's have a look this month at the lower frequencies as, due to the lack of sunspot activity, the higher frequencies are not so active at the moment.

Top Band

Top Band, or the band covered by 1.8 to 2MHz, is excluded from many receivers and transceivers, especially cheaper ones. However, most good quality receivers, widely known as general coverage receivers, tune from about 0.5 to 30MHz.

AM signals can still be heard on Top Band but SSB is used more often as transceivers with SSB on Top Band are being produced. In this country and the rest of Region 1 the power limit on this band is only 15dBW, compared with 26dBW on the other bands. But this limitation does not prevent excellent contacts being made over thousands of miles.

Top Band is also used by the maritime transmissions which can drown even the most powerful amateur stations.

In daylight hours signals at these frequencies are absorbed by the D-layer of the ionosphere, but as it gets darker the D-layer disappears and the E-layer acts as a reflector. This sends the signal bouncing back at some distance from the point of origin, ranging from a couple of hundred to a few thousand miles. In some circumstances the signal may bounce twice or even more, giving rise to 'multiple skip' reception from one side of the world to the other, although with some loss of signal strength due to absorbtion at the reflection points.

You will find that the Morse code is used extensively for Top Band long distance working, so this is an ideal opportunity to learn the code. Even if you do not intend becoming licensed, your listening pleasure will be heightened by the ability to log CW contacts.

Contrary to opinions of some 'B' licensees (and a few others!), Morse code is not an outdated mode of communication. It is an extremely useful method of getting a signal through ever-increasing noise and I, for one, can see the day when the majority of long distance contacts are made this way once more. The use of SSB becomes increasingly difficult, because of the high powers used by an increasing number of amateurs.

The Morse code in itself is not difficult to learn but you also have to learn the many standard abreviations used by the amateurs and the Q-code. For instance, a typical transmission may read: "G4SUP de GW4OXB. MNI TNX FER RPT OM. UR RST RST 599 599. NAME HR IS TREVOR. QTH IS SWANSEA SWANSEA. WX HR WET. TEMP ABT 20C. TNX FB QSO TONY. BEST 73 ES DX. HPE CUAGN"

Now you may be able to read that fairly easily with a bit of thought but when it's being sent at 12 words a minute it is a good idea to know the key points for your log and report. (Incidently, Tony is my brother).

Many contacts consist of simple exchanges of report, name and location. Contest workers use just a report linked with a serial number, but these stations are not worth sending cards or reports to as they know they are putting out whacking signals anyway and they are only interested in the number of contacts they can make in a given period. Log them anyway, as the callsigns are of interest if you are working for prefix awards where cards are not important.

QSO Pattern

There are also stations in the non-English speaking countries that work from a basic QSO pattern that consists of the key points of interest: name, location, report, equipment etc. Any variation of the pattern tends to be greeted with "thanks and goodbye!" For instance, most Russian stations stick to the basics, but I have had a quite long chat with one, so the theory that the reason is political doesn't always ring true. The problem seems to be that, like most of us, they learn enough English to carry on a quick contact but if you stray onto personal things their English, or lack of it, breaks down. Just like us on holiday in France or Italy... you ask for the loo and get a plate of frogs' legs!

80 metres

This band extends from 3.5 to 4MHz for the listeners, although the amateur in Region 1 loses the top two Megahertz for transmission. This band is also subject to interference from fixed and broadcasting stations sharing it.

This is the main band where you will meet the 'old timers' (and I use the term with respect) having a ragchew on how to modify the KW2000, or comparing the attributes of the G5RV compared with the W3DZZZ, or the use of a bug key against an up-down key, and all this between exchanges of information on the latest farm prices and details of how Fred's aerial went through his roof last weekend in a storm!

This is the band where you'll find the scores of club 'nets' where the members of such organisations as the Royal Corps of Signals, The Rotarians, The Radio Amateurs' Invalid and Blind Club and amateur radio clubs throughout the country hold their weekly chat or daily 'call-in'

It is by listening to these nets that you can pick up those snippets of information that have been almost forgotten in this age of high technology. Wrinkles and fiddles worked when low power operation was the order of the day and one relied on sheer good technique and well matched aerials to pull in the signals.

I've heard a few comments over the years on those "stick in the mud" old timers but I've yet to meet an old timer who wasn't prepared to spend considerable time teaching a youngster the tricks of the trade!

As I said at the start of this article, with the lack of sunspot activity, the lower frequencies are very active and European stations can be heard very well during the day.

The late evening brings in the more distant stations.

With the higher powers available on this band Americans are prolific at the upper end (around 3.7 upwards) and Australians can even be heard on a good day before dawn. So even on the lower frequencies the world can be heard with a bit of patience.

Remember, a good length of wire, end-fed via an ATU is all that is needed for good reception and the higher up you can get it the better.

When mentioning "DX" in the last issue, I stated my preference for the term "desirability". I think the most perfect example of this is to be heard on eighty and, in particular, around 3.760 where you will find, on most days, members of the Worked All Britain group.

I can imagine some of you thinking that if Australia can be heard on eighty, what's so interesting about working all Britain? Every listener has his or her range of interests in the overall hobby. In the WAB group the idea is to work or hear as many areas of the British Isles as possible. For this purpose the British Isles is divided into squares of 100km sides represented by letters, and again into smaller squares which are represented by numbers (my location is in area SS69). Now, with the British Isles being the same as any other country in that some areas are uninhabited or consist of mountains or rocky coastline etc., it needs special expeditions to activate these areas. On the WAB nets you can hear mobile stations operating from places that would otherwise never be heard on the air. Portable stations and special set-ups are also organised to put squares on the air, and news of these is usually announced on the nets.

Sometimes it takes a lot of patience and hard listening to get the exchange of reports necessary to constitute a contact but it is great fun and keeps you on your toes as far as equipment goes.

If you want to have a go at this sort of 'DX hunting' I think I should tell you that there are, in fact, awards available for working from 600 areas including twenty counties (for the Basic award) up to 2650 areas including 77 counties (for the Sapphire award). So if you reckon you are a good listener...try that lot!

Incidentally, the WAB group work all bands, not just eighty metres.

Once again, this band has a strong CW following and offers excellent DX potential when conditions allow, but it is also subject to a lot of television interference.

You can also hear lots of 'chirping' from RTTY (Radio Teletype) which is a method of transmitting messages mechanically. The teletype machine resembles a typewriter, but instead of typing out a sheet of paper it sends a coded series of pulses. These are transmitted via radio, and decoded at the receiving station into normal typewriter form or on a long strip of paper tape. Nowadays, computers are being introduced to RTTY, and programmes for transmission and reception are now available for home computers such as the ZX81.

By far the cheapest means of receiving RTTY is probably the use of secondhand teleprinter machines. These can be found at rallies. It seems that very few of the dealers handle them. There are also RTTY readers at around £150 that give you a readout either on a standard television set or on a built in screen. They also read fast Morse.

The obvious advantage of the teleprinter or computer is the availability of 'hard copy' for later reference. However, if you are considering trying this side of listening you would be well advised to contact a local amateur who has had experience in the field.

There are various types of RTTY and machines are not always adaptable for amateur use, either for reception or transmission. Also, some computers are expensive to equip with the necessary hardware. Get one of the specialist books on the subject and chat to knowledgeable users.

There is one more mode that hasn't been mentioned and that is television. Amateurs have been sending pictures to each other for years in both black-and-white and colour. Pictures are sent using either slow-scan or fast-scan techniques.

In the slow-scan method, a television picture is slowed down so that it can be sent within the 2.8kHz bandwidth normally used in amateur radio. The slowing dowm process results in a 120-line picture (compared with the fast-scan 625-line modern colour transmissions) which takes about 7.2 seconds to complete one frame. An ordinary tape recorder can be used to record the picture straight from the receiver. No special video recorder is needed. A special monitor is used for reception and, as with RTTY, advice should be sought from experienced operators on what equipment is suitable.

There is also interest in the reception of visual images from satellites and other sources using a system called 'Facsimile' or 'FAX'. This is a method using an image produced on paper, using

MORSE CODE

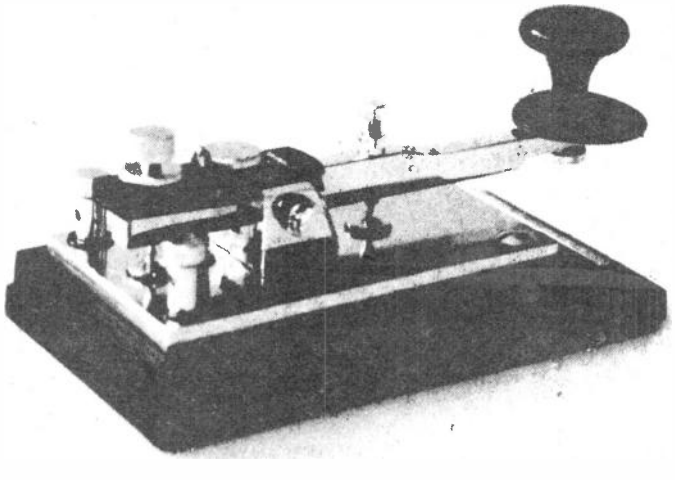
A·–	B–···	C–·–·	D–··	E·	F··–·	G––·	H····
I··	J·–––	K–·–	L·–··	M––	N–·	O–––	P·––·
Q––·–	R·–·	S···	T–	U··–	V···–	W·––	X–··–
Y–·––	Z––··	1·––––	2··–––	3···––	4····–	5·····	6–····
7––···	8–––··	9––––·	0–––––				

Full stop·–·–·– Comma ––··–– Question ··––·· Stroke –··–·

Break –···– End of message ·–·–· Start transmission –·–·–

End transmission ···–·– Error ····· Transmit(open) –··–·

Transmit(only station in contact) –·–·–



either a stylus or a photographic process. However, equipment is very expensive and secondhand equipment is hard to come by, but it is yet another facet of the SWL hobby.

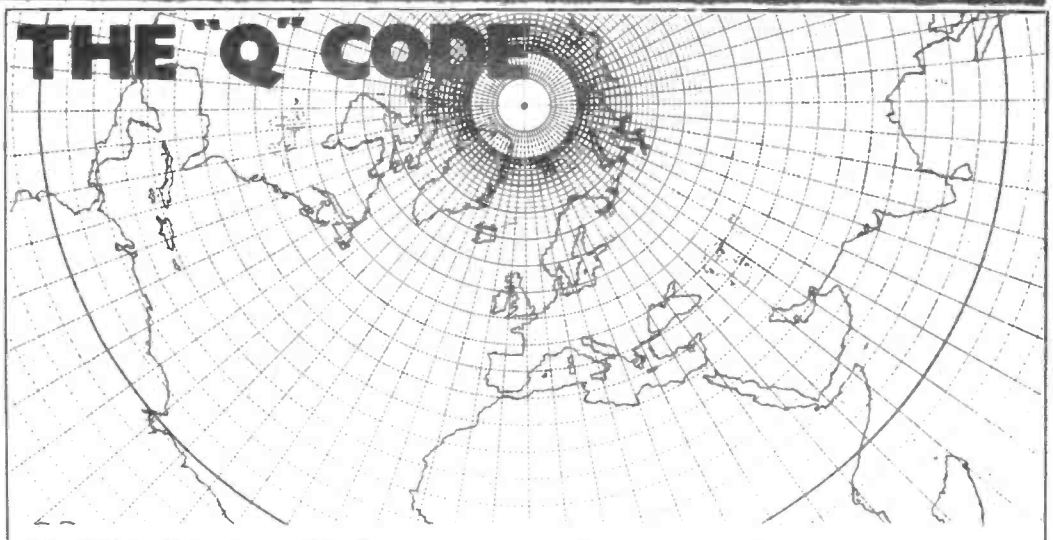
I have mentioned the QRP-ers before (these are the boys who make contact using flea-power). Some of them can be heard on eighty metres, mostly around 3060MHz, although it's a job sometimes to be heard using full legal power! However, keep your ears open and you may hear some of these lads using transmitters home made at a cost of a couple of quid and using milliwatts, yet still getting out to amazing places.

Well, that's it for another month. I expect many of you will be making plans for the holidays soon and it's a good chance to have a listen from a new location, even in the UK. Portable receivers are very useful on holiday especially if the weather cuts up a bit rough.

Anyway, good listening until next month when we'll be looking at the 7,14 and 21MHz bands.

73 Trevor.

THE "Q" CODE



The "Q" code varies slightly between countries but the commonly used codes are;

QRG...frequency
QRH...does freqency vary
QRI...what is my tone like
QRK...what's my readability
QRL...are you busy
QRM...manmade interference
QRN...static
QRO...increase power
QRP...decrease power
QRQ...send faster
QRS...send slower
QRT...stop sending
QRU...have you anything for me
QRV...are you ready
QRX...when will you call again
QRZ...who is calling me

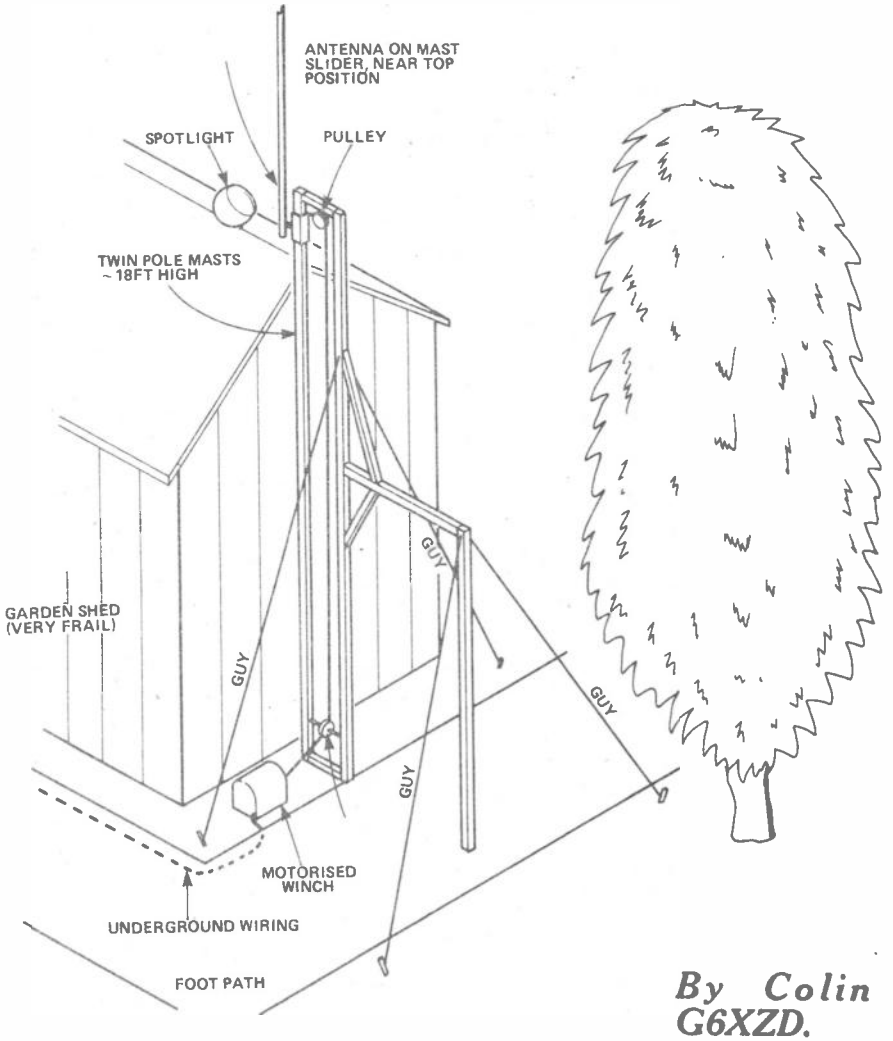
QSA...send signal strength
QSB...fading
QSD...defective keying
QSL...acknowledgement
QSO...communicate
QSP...please relay
QSV...send line of Vs
QSY...change frequency
QSZ...please repeat
QTH...location
QTR...time

AMATEUR ABBREVIATIONS

There are some variations but these are infrequent. These are the common ones.

ABT...about
ADR...address
AGN...again
ANT...antenna
BC...broadcast
BCI...broadcast interference
BCL...broadcast listener
BCNU...be seeing you
BD...bad
BFO...beat frequency osc.
BK...break in
BUG...semi automatic key
CANS...headphones
CC...crystal control
CK...check
CLD...called
CNT...cannot
CO...crystal osc.
CONDX...conditions
COSER...counterpoise
CRD...card
CUD...could
CUAGN...see you again
CUL...see you later
CW...continuous wave
DF...direction finder
DR...dear
DX...distance
ES...and
FB...fine business
FER...for
FONE...telephony
FREQ...frequency
GA...good afternoon
GB...goodbye
GM...good morning
GN...good night
GND...ground
GUD...good
HAM...amateur
HI...laughter
HPE...hope
HR...hear or here
HRD...heard
HVY...heavy
HW...how
II...repeat
LSN...listen
MNI...many
MOD...modulation
MSG...message
MTR...metre
NR...number
OB...old boy
OC...old chap
OM...old man
OP...operator
OT...old timer
PSE...please
PWR...power
RCVR...receiver
RPT...report
RX...receiver
SED...said
SIG...signal
SKED...Schedule
SN...soon
SRI...sorry
SUM...some
SW...short wave
SWL...short wave listener
TFC...traffic
TKS...thanks
TMW...tomorrow
TNX...thanks
TRX...transceiver
TVI...television interference
TX...transmitter
U...you
UR...your
VY...very
W...watts
WID...with
WKD...worked
WKG...working
WL...will
WUD...would
WX...weather
XMTR...transmitter
XYL...wife
XTAL...crystal
YF...wife
YL...young lady
73...good wishes
88...love and kisses

MOTORISED MAST



By Colin Stevenson G6XZD.

A friend peered through the window at an eighteen foot hawthorn bush that marks the bottom of our garden. From the bush a blue rod slid silently skywards and stopped when the tip was thirty five feet from the ground. "Sheer poetry" exclaimed the friend as I spun the homebrew power chair and purred back to a favourite parking space. In happy anticipation of gasps of admiration, I removed the cover from a brand new R2000 but all I got was a hard look. "You should tell someone about the powered mast" he said.

Those events happened a week or two ago. The words have bugged me ever since. Perhaps my £25 mast could make someone's life a little happier. Perhaps people who wave remote controls at TV sets might be interested. There is only one way to find out.

Three things motivated the project: a desire to raise aloft the experimental aerials my hands so loved to build, a determination not to clutter my nice neighbour's skyline and a spare £25 that was frightened of being spent on the mundane.

The site (and its problems) chose itself by being the only screened part of the garden. It is beside a path that separates a flimsy shed from the hawthorn bush. There is running sand under the area, so concrete had to be ruled out. The shed does well to hold itself up and the idea of attaching things to living bark was not even a starter. Added to this was a need to keep the pathway clear. If these snags could be overcome I should be left with the minor problem of getting a mast slider to come down to chair or ground level.

Slowly, the structure shown in Fig. 1 came to mind. It stood up to the tests that my calculator applied, so I ordered the steel tube.

Odin (or was it Thor?) knew something when he chose a large hammer as a prime tool. Flattening short peices of tube for the struts I lost a few inhibitions as well as perspiration. When the structure was complete I landlined a yell for help and Vic, a radio friend, arrived at the double. He gave my efforts a dubious look but agreed to snip off some high overhanging twigs. Then he lifted the mast into position with a "now what?" expression. Little did he know that I had carefully inserted a house brick at each peg location on the advice of my calculator. 18" long pegs made of 1½" angle driven in behind a brick take some shifting. This proved the case when I secured the extra heavy guys. Vic gave the mast a gentle shake followed by a hearty one. Then he swung on the cross member. The structure was not going to give in. The XYL escorted Vic back to his car and returned smiling. "He called you a young something-or-other - I couldn't quite catch but it might have rhymed with sugar" she reported. Though deploring the use of strong adjectival nouns before ladies I enjoyed his reference to my youth. Sixty year olds always do.

I could now attach and maintain my

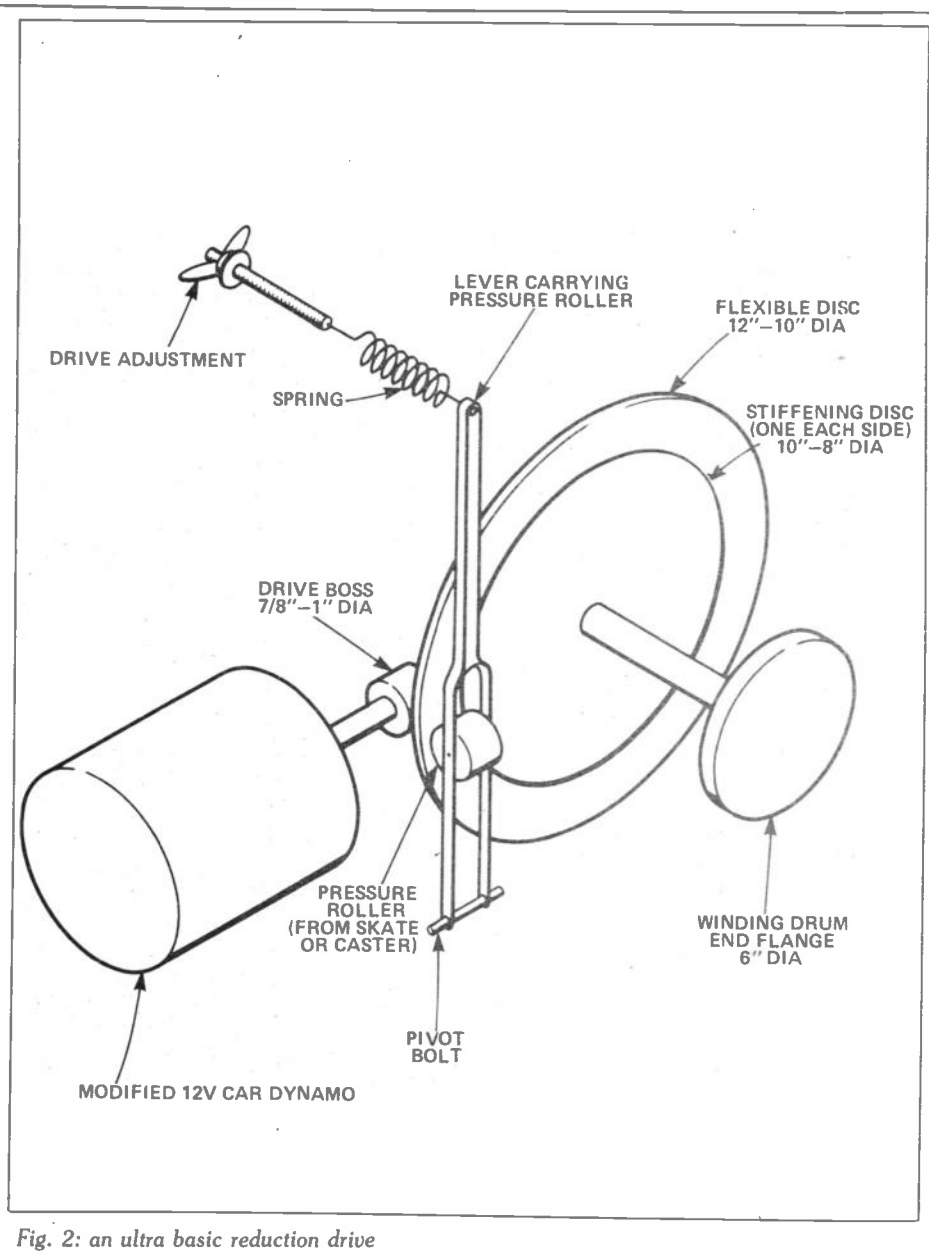


Fig. 2: an ultra basic reduction drive

aerials but the forty foot trip down the garden was not something that I undertook lightly. More and more, I found that my wife was doing the raising and lowering bit. That had to stop so work started on building a friction drive winch that I already knew would be utterly reliable. This confidence stemmed from the fact that such a drive has pushed me about the home for eleven years without a failure or disc replacement.

Fig 2 shows at a glance how the drive works, but a hard look at the adjustment nut will show that the amount of drive can be set to do the job and no more. Any snarl-ups cause the motor to slip happily and harmlessly. This means that complicated overload and override do-dahs can be forgotten; with them go a great deal of wiring.

A secondhand 12-volt car dynamo is needed to make the winch. Free the end plate and use a slightly oversize drill to remove the rivets securing the earthed brush holder. Re-assemble with a very thin peice of insulating strip under the holder using bolts whose shanks have been insulated. One bolt should be extra long to serve as an outside terminal. Nuts over insulating washers on the outside complete the modification, and produce a motor that will reverse at will. Not wanting one of my works of art to be lobbed into the High Street, I stuck to a 12 volt supply even though such a motor will delight in double that voltage. The drive boss should really be turned but one can be laminated by slipping bits of tube into one another with lashings of fibre glass resin. Such a make-do will end up slightly off-centre, but a carefully held file will allow the motor to correct the problem.

Prior to discovering that the chemical industry use $\frac{1}{8}$ inch rubber sheeting for big pipe gaskets I experimented with some odd materials to produce a flexible disc. Layers of medical sheeting stuck together, old groundsheets and even canvas with rubber sealing compound rubbed into the weave. They all worked providing an $\frac{1}{8}$" thickness could be achieved. No such problem existed with the stiffening discs. Marine ply is both easy to work and under paint lasts for ever.

Those rich in cycle wheel hubs and welding tackle could make a splendid winding drum. I consoled myself by thinking that 100rpm was no big deal and used a piece of $\frac{5}{8}$" outside and $\frac{1}{2}$" dia. inside steel pipe to which the discs were 'fibre-glassed'. One cannot get more basic than that.

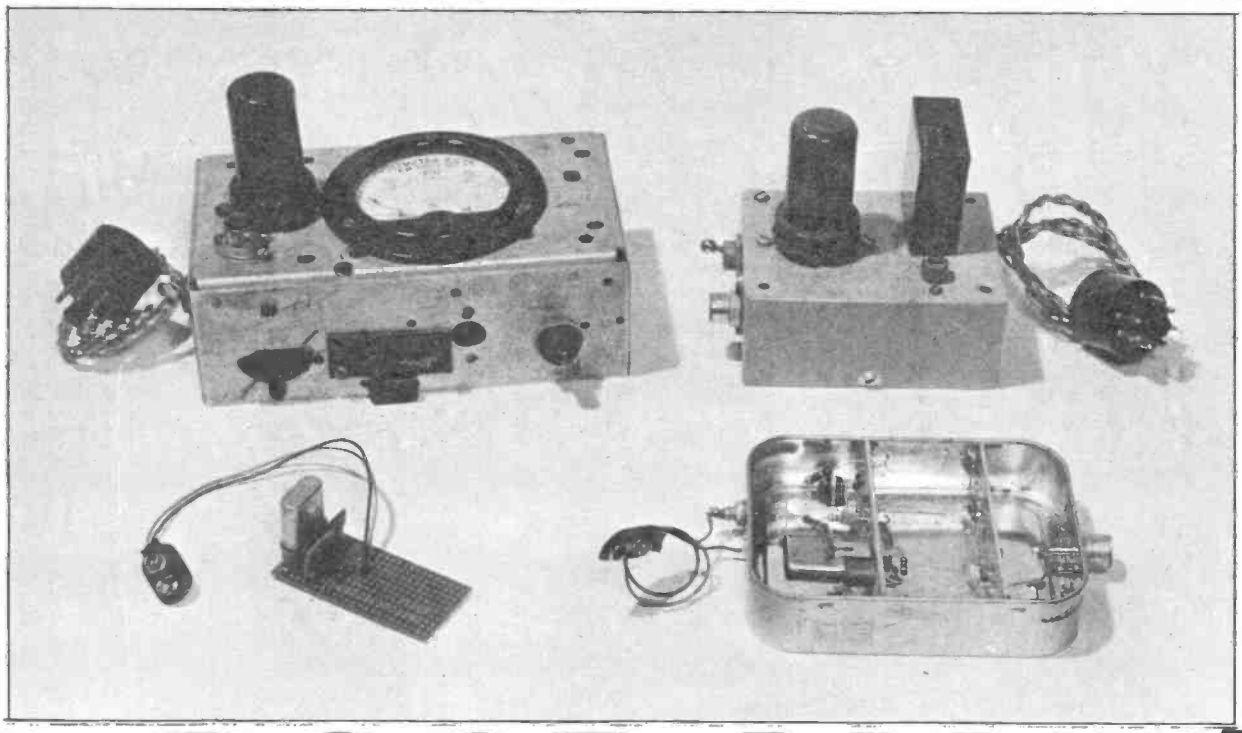
Steel strip from our daughter's pushchair had been waiting for twenty years to find a use. It thanked me with happy memories as I shaped it into a 'Y' bracket to carry the pressure roller. Junk boxes are better than journals and a sight more useful. *(I have a very long memory! - Ed.)*

A frame on which to mount the motor and drum can be made from hardwood, though steel is better. The drive is good-natured about engineering standards but it does expect to be aligned correctly. That is to say, the motor shaft and pressure roller axes must be parallel and at right angles to that of the drum while all three should be exactly in the same plane. (Any reader making sense of that should be a wow on RAE mind benders.) An alliance of hand and eye make such descriptions redundant.

Water being a lubricant for rubber, I made a quick rain cover by cutting the ends from a small oil drum and opening it up to form a metal cloche. "Paint will cover a lot of sins", hinted the XYL, so I did quick brush. It is now near to the colour of her eyes which should attenuate further comment.

Fire risk and DC will forever be associated in my mind, so I buried the supply wiring and wrapped cooking foil bandages on wires above ground (all this even though a fuse is bolted to the battery positive lug). He who has never sat over 150 amps trying to gallop through 20 amp wiring would do well to remain ignorant. Worse than fraught, it is ridiculous!

A 10 amp push button switch might be found in some junk boxes but I had to make my own. (Morris 1000 starter pull switches are getting a bit scarce too.) A reverse polarity switch was easy, being a mains lighting double two-way job (about £3). I foxed it by sticking a small metal plate over the two push buttons so that they were mechanically locked together. Some will rightly point out that such a switch should be kept to 5 amps, but only dead circuits are involved so there is no 'splash' to burn the contacts. Anyone who tries to reverse a spinning motor deserves the interesting results they will certainly get. A point of interest was that if no spare cord was left on the winch when the slider was at the down position it went back up without changing rotation. Reverse is therefore only necessary when the slider is at the top.



A POOR MAN'S SIGNAL GENERATOR

Many articles on receiver construction assume that the reader has access to a signal generator. For many people this is enough to make them decide that receiver construction is not for them. For some jobs a signal generator is certainly needed, but for many applications simple home made equipment will do just as well.

Gerald Stancey B.Sc, G3MCK describes three simple, low cost, test oscillators.

Firstly, let's look at the features provided by a really good signal generator. The most important are:

a) Wide frequency coverage
b) Frequency stability
c) Accurate calibration
d) Variable and known output level
e) Different types of modulation
f) Excellent screening (to reduce the effects of stray radiation at low power levels).

The fact that these are available in many combinations makes a high quality signal generator an expensive and complex piece of equipment. I don't deny that all these facilities are desirable, and in some cases essential. However, what I would question is the amteur constructor's need for them. In other words, do they need them all? Which of the features listed are essential?

For many amateur requirements the answer to the first question must be no. When people accept this, and realise that aligning a receiver is very different from measuring its performance (eg. image ratio), then a very simple solution appears. This is to use a family of crystal controlled oscillators, with each oscillator performing one or two unique functions. For example:

a) a crystal calibrator will provide frequent alignment signals as well as a means of calibrating the receiver.
b) a general purpose crystal oscillator with a few crystals will generate loud, well spaced, easily identifiable signals. (If these are not quite where you want them it is an easy matter to locate the nearest 1MHz on a 100kHz signal from the crystal calibrator.)
c) a well screened crystal oscillator of known power output, with a few home made attenuators, will enable the receiver sensitivity to be estimated. It is useful to have an idea of this figure to avoid striving for unnecessary improvement.

Suitable circuits

Many excellent circuits of crystal calibrators have already been published so I do not propose to repeat the details. They all consist of a master crystal oscillator followed by a chain of dividers to produce lower frequencies and their harmonics. A very common configuration is shown in Fig. 1.

However, other master frequencies and division ratios can be used and may be better suited for your needs. For example, someone interested in making

HF amateur receivers might find the layout shown in figure 2 more appropriate. This will give strong unique signals at the low frequency edges of five amateur bands.

For the general purpose oscillator the sole requirement is that it should oscillate with crystal alone, ie. no tuning or other adjustments have to be made. Either valve or transistor circuits can be used. The choice depends on which technique you are happier with and the contents of your 'junk box'. The circuit shown in Fig. 3 has proved to be quite satisfactory.

Calibrated output

A similar circuit, shown in Fig. 4, is used for the calibrated output oscillator. However in this case it is necessary to regulate the supply voltage in order to stabilise the output level as the battery ages. It is also essential to build it into a well screened box to reduce the level of unwanted stray radiation. A further addition is the attenuator which reduces the output to a low level and also ensures that the receiver sees that it is being fed by a 50 ohm source. Construction is straightforward and the unit will easily fit into a tobacco tin. Suggested layouts for both the board and the tobacco tin are shown in Figs. 5 and 6.

Incidentally the board can be made by simply scratching the copper away with a sharp tool, eg. a broken hack-saw blade, to leave the pads. After testing to see that it works, solder the lid in place to ensure an RF-tight fit.

As my main interest is 3.5MHz I used a 3.5MHz crystal. A 3.579MHz CCTV crystal is a cheap way of acquiring a crystal in the amateur band if neither the junk box nor rally stands can produce the goods.

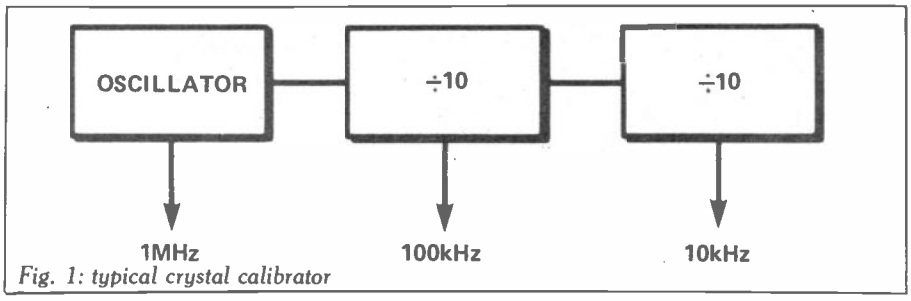


Fig. 1: typical crystal calibrator

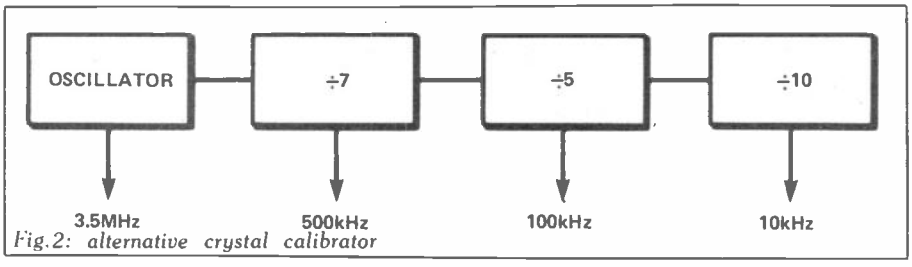


Fig.2: alternative crystal calibrator

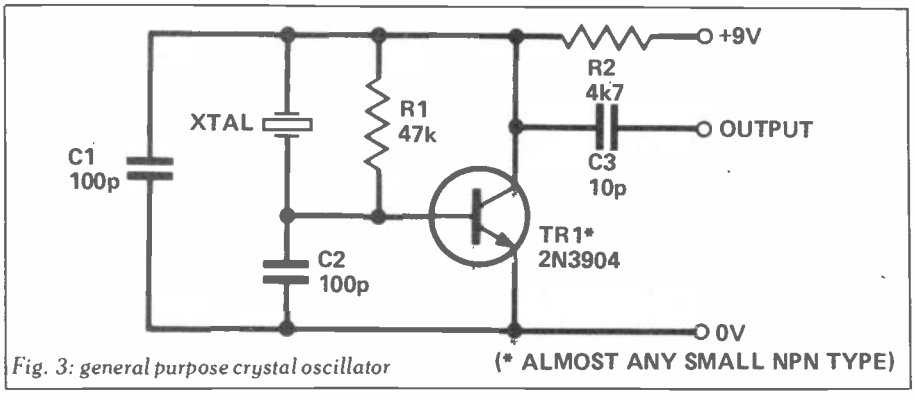
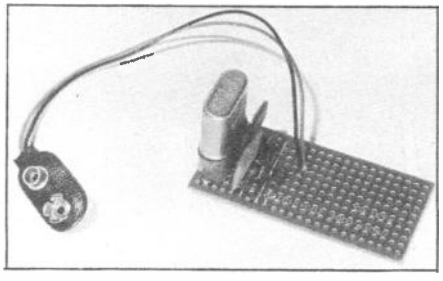


Fig. 3: general purpose crystal oscillator



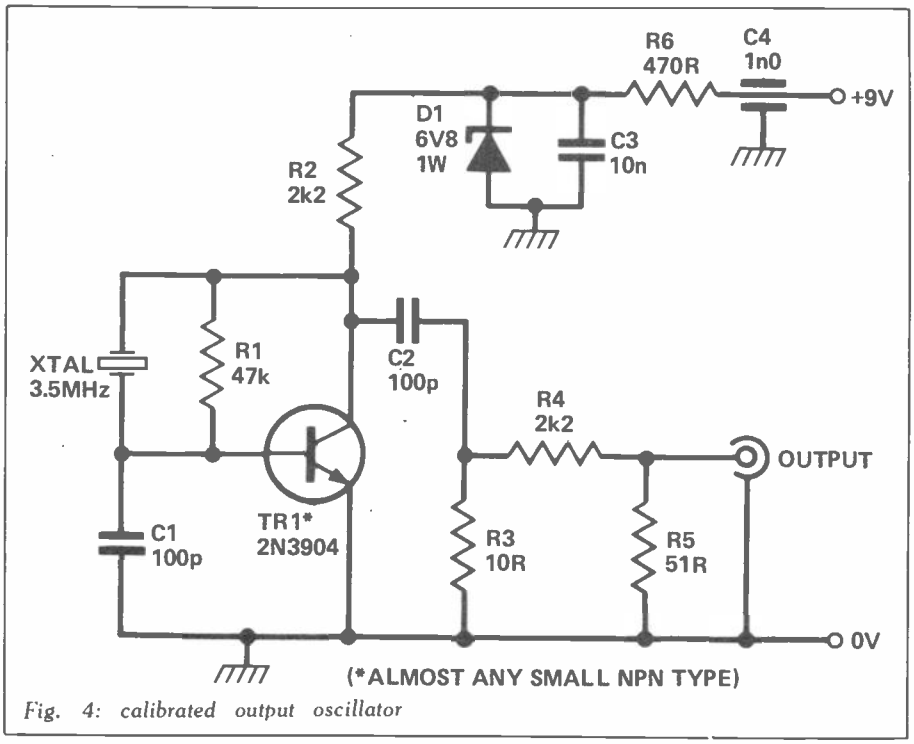
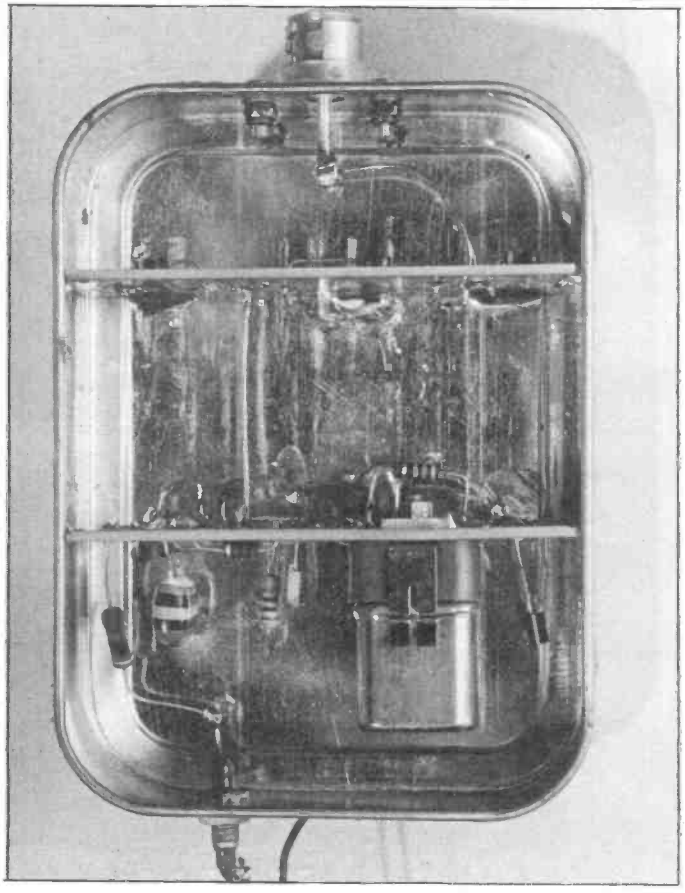


Fig. 4: calibrated output oscillator

The unit I made gave 28uV at 3.5MHz and 1uV at 7.0MHz across a 50 ohm load. It is exceedingly unlikely that a copy of this oscillator will give exactly this output but this should not cause any problems as calibration is straightforward. The easiest way is to persuade a friend who has access to a laboratory quality calibration receiver to do it for you. The normal run of amateur receivers do not have sufficiently accurate S-meters for direct use. However if you have access to a good signal generator this can be used to calibrate the S-meter. The best technique is to feed the output of the crystal oscillator into the receiver, set the gain controls to give a reading of reasonable strength without overloading the receiver, and note the S-meter reading. Now replace the crystal oscillator by the signal generator, and adjust the output of the signal generator to produce the previously noted S-meter reading. The output levels of the crystal oscillator and the signal generator are now the same.

If neither of the above methods is available then the only way left is to assume that the receiver S-meter is correct. A good assumption is S9 = 50uV and one S-point is 6dB. This will at least give you a means of comparing receivers, and that is better than nothing.

There is nothing magic about 28uV, it just happened! To produce lower and more useful output levels external attenuators as shown in Fig. 6 should be



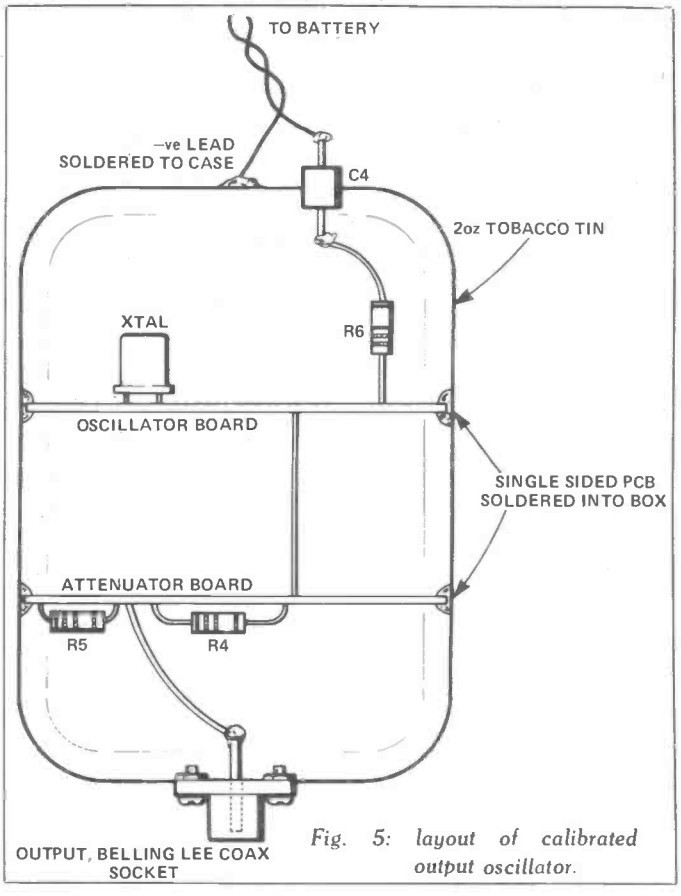


Fig. 5: layout of calibrated output oscillator.

A POOR MAN'S SIGNAL GENERATOR

used. It is however quite useful to have an oscillator that produces an output in the range 10-100uV, as this gives signals that can easily be found on most receivers.

No provision for modulating any of the above oscillators is shown. This is because with SSB/CW receivers none is needed!

The test gear in use

To show how these oscillators may be used in practice let's assume that we have a simple 80m superhet with a pre-aligned IF. Also let's assume that the set is known to be working but that the mixer and oscillator stages need aligning.

The first step is to get a signal through the set. For this we need the general purpose oscillator and any crystal in the range of say 3.43.9MHz, for example 3.65MHz. Inject the oscillator output into the receiver and twiddle the controls of the mixer and oscillator until the test signal is found. Now peak the mixer for maximum. Replace the general purpose oscillator with the crystal calibrator set to produce 100kHz harmonics and tune the oscillator LF. The first signal to be heard will be on 3.6MHz. Note the dial reading and peak the mixer. Continue tuning LF as far as possible, noting both dial readings and peaking the mixer. Then repeat the process going HF from 3.6MHz. You now have a reasonable idea of the oscillator calibration. If this is not satisfactory suitable adjustments can be made to the trimmers and padders. In this way the desired degree of band-spread may be achieved. When you are happy with the oscillator coverage the final calibration can be made using the 10kHz pips.

The final exercise is to determine the sensitivity using the calibrated power output oscillator and inserting attenuators until the signal is just audible. This is roughly the receiver's sensitivity at 3dB signal-to-noise ratio, ie. the limit of weak signal detection.

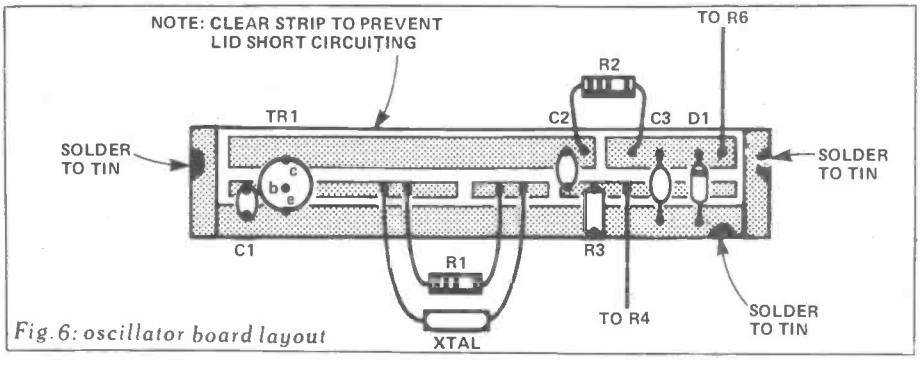


Fig. 6: oscillator board layout

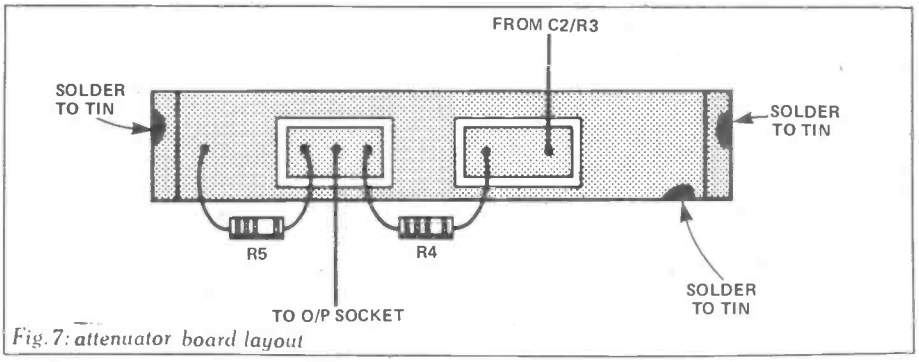


Fig. 7: attenuator board layout

Summary

The above shows how the main functions of a signal generator can easily be reproduced by means of a few simple crystal oscillators. Certain of the crystals will probably have to be purchased at new prices but a useful selection of odd frequencies can be acquired by careful shopping at junk sales and rallies. Armed with this equipment it is feasible to construct complex receivers and to make them work near to their optimum ratings.

Scopex oscilloscopes are back in full production, now that the company has been taken over by Bridage Scientific Instruments. The picture shows Production Director Elsie Roberrs handing over the first of the new instruments to Mr. A.R. Morrison, General Manager of Scopex Instruments Ltd.

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

Permitted society

If you are one of the growing band who are interested in 50MHz operation but do not have a permit allowing you to operate on that frequency you now have a chance for a second bite at the cherry. The 'powers that be' have decided to issue permits to another 60 operators. If you have already applied for a permit in the first phase then all you need to do is drop a line confirming that you are still interested. If you are starting from scratch then you need to obtain an application form from the RSGB. The completed form, or the letter confirming your interest, should be sent to G3WSN. They should not be sent to RSGB. This is an involvement that the RSGB could well do without. It must seem to some people as if the RSGB are actually choosing the applicants to be issued with permits. In fact they are only providing a short list for the authorities to select from. This may appear to be very much the same thing but in fact there is a very good reason why it should be done this way. For the purposes of the experiment it is essential that the stations should be suitably separated around the country, to enable the best possible opportunity to work over very different paths. It is unlikely that this would have been achieved if the issuing of the permits had been done on a 'first come, first served' basis

Future prospects

The issue of another sixty permits will make operating on the band a much more viable proposition by providing a lot more random paths to work. It also seems to indicate that the existing 40 operators have not provided any problems for the authorities, which in turn must surely be a good indication of an excellent possibility of at least a small allocation being made to us when the TV system closes down. The only really unknown aspect of the matter is if the band will be made available to Class B operators. It seems reasonable to assume that this will happen in the long term if remarks emanating from the RSGB are to be believed.

Orbital post box

The UOSAT-B satellite being built by the University of Surrey team is progressing well and seems certain to be launched into orbit during March. The achievement is exceptional as the team had only about three months notice to get the whole system together.

One of the more interesting features of the design is that it will contain a memory of about 50,000 words which will be used as an electronic mailbox. This facility will be generally available but we have no information at present as to how it will be accessed. The camera facility will be incorporated in the new design to send back digitally encoded pictures of the Earth's surface and various experiments on particle radiation and magnetic fields and other phenomena will be carried out. Whether the various beacons which were provided on the first UOSAT will be carried is not yet certain. The planned orbit is at a height of 435 miles above the Earth. The satellite will be available for about 14 minutes on each orbit and should be available on several orbits in the morning and again in the evening.

The team responsible are to be congratulated on a remarkable achievement and computer owners will certainly be looking forward to the Mailbox in the sky.

Beaconry

There is a proposal for a 1296MHz beacon in the Coventry area. This would provide a beacon located near the geographical centre of England. An excellent site is available and preliminary work is already going ahead.

Those of you who make use of the Sutton Coldfield 432MHz beacon may be surprised to find that it has disappeared. A new mast is being built at the BBC TV station and the beacon will have to be removed before the old mast can be taken down. Its demise will be of a temporary nature.

Repeater QSL?

From some of the remarks you hear on the band it seems that they do! Not only that but in most cases they appear to do it direct. Do some operators know something that the rest of us are missing out on? If they really do have this ability then perhaps we should organise an award for working, say, 30 repeaters. All contacts to be confirmed by QSL card of course.

All this is brought about by the frequency (no pun) with which you hear stations operating through a repeater asking for a QSL card. Now a QSL card, as most of us know, is used to confirm a contact. When operating through a repeater that contact is with the repeater, not with the remote station. The repeater receives your signal and then uses your audio to modulate its own transmitter. Your 'signal' does not go through the repeater. The whole thing is reversed when the remote station sends to you. When you 'work' a PA0 through your local repeater you have achieved no more than if you talked to your friend across town. Now, if you work him through a Dutch repeater your signal will really have done some work, but you have still only worked a repeater.

The same sort of problem rears its ugly head when stations give each other signal reports via the repeater. "I can't understand this. You are both S9 through the box but there is a lot more noise on Fred's signal" or "You were S9 running 3 watts and now you have gone up to 100 watts you are still only S9". This is usually followed by an apologetic note on the lines of "It could be something weird at my end". Yes, it could! Sadly, it would not be anything wrong with the gear,

simply a complete lack of knowledge as to how a repeater works.

What socket?

A mistake to gladden the heart of all dedicated Class B operators. The fact has been revealed in print. At last they have put the truth on the line. The Class A persons have come clean on what we Class B operators have always known. I refer you to last month's issue and the description of the front panel of the little valve rig, "the kack socket is for a Morse key". Enough said. Remember, the truth was revealed in *Amateur Radio.*

Technicians

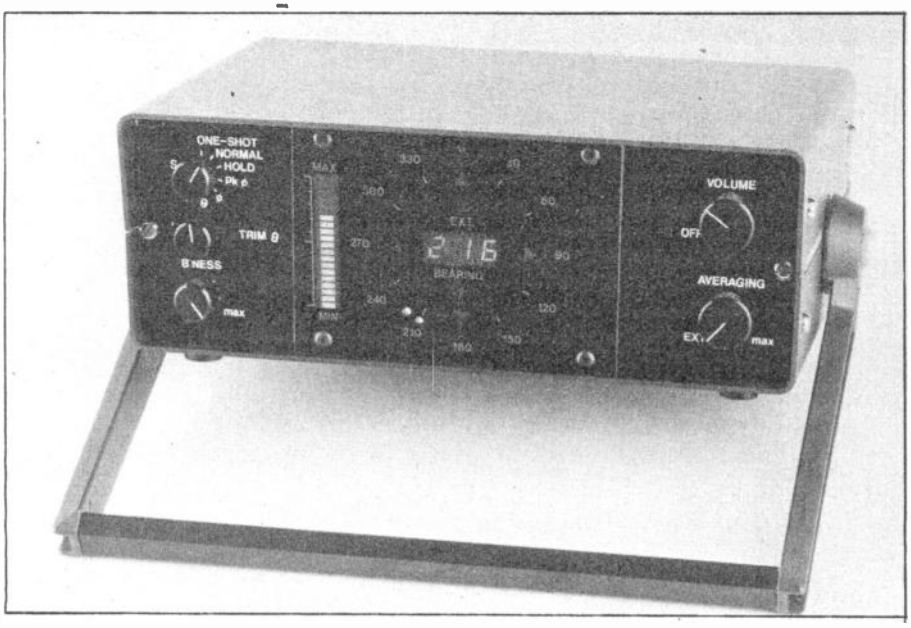
Having stirred up a hornets' nest with that last paragraph let us continue with a Good Thought. The thing about a Class A operator being superior to a Class B person is, of course, ridiculous. In technical terms the two groups are identical and the ability to use Morse, at twelve words a minute, hardly puts the Class A operator into the genius stream. The problem is that the phrase "Class B" has been used for many years, sometimes outside amateur radio, to indicate something which is sub-standard. To balance this view it has been pointed out that Class B is a more efficient class of amplification than Class A. Perhaps the whole thing could easily be resolved if the Class B licence was known as the "Technician" class. The A and B system was simply an easy way to name the two classes and was obviously done without any thought as to the popular acceptance of Class B as indicating something inferior. The change to Technician could be easily implemented within the hobby even if the RSGB had to use Class B in official correspondence. What we call ourselves will not be of any interest to the authorities and the change of name would certainly help to remove the friendly animosity that exists between the two classes. Let us know your feelings on this matter. *(Stop wingeing and take the bloody test! - Ed.)*

How conventional

The RSGB VHF Convention takes place at Sandown Park racecourse on the 24th March. This is an event that no real metre person would miss. The facilities are good with plenty of parking available. The 'rally' part of the show is well supported by the components and surplus traders and there is a ban on HF gear. An interesting lecture stream is on offer, covering a wide area of interest. Also, the chance to renew old friendships and to put a face to some callsigns is an enjoyable part of the day. How about getting a coach trip organised for your club?

Where are you?

G3SLQ writes to point out the number of people who call CQ DX without giving their own location. This is another example of lack of operating ability. If I hear a station calling CQ DX I cannot decide whether I come into the DX category unless I know where he is located. It always makes sense to give your location when you call CQ. A distant station will then know if he is far enough away from you to be an interesting contact and, more importantly, if he is using a beam he then knows which way to turn it to get the best signal. Both these points will greatly increase your chances of more interesting contacts.



This new box of tricks from Datong should sort out the local squeaky. The DF2 Radio Direction Finding System is microprocessor-based and uses an error-cancelling version of the doppler principle employed in an earlier design. It is intended for professional applications, covers HF, VHF and UHF, with most classes of modulation including AM, FM and SSB.

Microwaving

The Microwave Society mentions a few points of interest to those operating on the 10GHz band. The obvious one is to remind you to get the gear out and tweaked up ready for the start of the cumulative contests. They are looking forward to what will probably be the busiest year so far on this band, confidently expecting at least twice the number of stations that were active last year, which was itself the best year so far. Most of this extra activity has been brought about by the avilability of an excellent microwave head, making possible the construction of a complete transceiver for around £30. This in turn brings up the next point which is to do with the usual FM operating frequency. At the moment this is centred around 10.1GHz. This frequency was originally chosen when people were trying to get old klystrons moved up into the band. Obviously the less that you had to move them the greater your chance of success. Now, however, most people are trying to move intruder alarms, which normally are designed to operate at about 10.6GHz, down into the band. This means that it would be much more sense to use a frequency around 10.4GHz. A further advantage of this would be that the beacons which operate about 10.4GHz would then be much more useful. At the moment many people cannot tune this far up the band. The usual SSB frequencies around 10.386GHz should be kept clear, so a reasonable compromise would seem to be to move the FM section to between 10.3 and 10.36GHz. The society is also starting a series of awards for 10GHz and above, more details can be obtained by writing to the society at 81 Ringwood Highway, Coventry CV2 2GT.

The listener

The number of listeners on the bands above 50MHz seems to be very small. This is perhaps surprising. One may say that compared with hearing VK on the LF bands the VHFs are not very exciting. Surely this is not the case. There must be an equal, if not greater, thrill in hearing your first OZ on 23cm (or even two metres for that matter). There are also a lot more propagation modes to play with and that old standby of the SWL, building aerials, is probably more profitable on the UHF bands than on any other. There are many certificates and awards to be worked for and won and the return on the QSLs will certainly be higher than on the LF bands. Perhaps there are more listeners than we think, if that is so they certainly keep quiet about their activities.

Tailspin

Thanks for all the letters and comments that you send to me, please keep up the good work. We would still like to hear more news of club involvement in metre wave activities. Perhaps I shall see you at the VHF Convention? Be careful how you bump into me though, I stand 6ft 5 inches tall and weigh 21 stone. You should be able to find me!

AMATEUR BROADCASTING

IT'S LEGAL

If you say "broadcasting" people tend to think of the programmes transmitted by the BBC and IBA. In recent weeks, however, a number of other radio and television stations have attracted a lot of attention.

By Richard Lamont G4DYA

Radio Caroline dropped anchor 20km off the Kent coast last summer, and started pumping out rock music on 963kHz medium wave - the same frequency as the previous Caroline ship which sank a few years ago. More recently, cable-TV subscribers in Swindon got their first taste of satellite television when Rupert Murdoch's "Sky Channel" was piped through to them for the first time.

But long before either of these two new challengers to the public service 'duopoly' of the BBC and the IBA came on the air, a dedicated band of amateur broadcasters has been offering alternative radio programmes to small, specialised audiences. These broadcasters, collectively known as 'third force' radio stations, come in three different kinds. I hasten to add that these are no pirates; all are perfectly legal.

First, and probably the best known, are the 'hospital radio' stations. These provide a service of mainly middle-of-the-road (MOR) music, record requests and light entertainment to hospital in-patients. The programmes are distributed by cable to headphones at each bed; a selector switch offers (typically) a choice of either the hospital radio station or one or more national and local BBC/IBA stations. Because the service is run by volunteers in their spare time, broadcasting is usually limited to evenings and weekends.

Although the stations rely on cable rather than radio transmission, they do operate under a Home Office licence (Yes, Home Office, not Department of Trade and Industry!). About two years ago, the Home Office rules were relaxed to allow hospital broadcasters to carry commercial advertising, subject to the IBA Code of Practice and any other restrictions specified by the Department of Health and Social Security. Few stations had much success in attracting advertisers, because people confined to hospital beds aren't likely to do much shopping. So these stations, usually registered as charities, rely on donations from the public for all their money. They run on about £1,000 to £10,000 a year.

NAB cartridges contain an endless loop of tape and are used for jingles, commercials etc.

The second type of 'third force' broadcaster is the 'community' radio station. These broadcast to towns via spare channels on balanced-pair cable systems, such as those run by Rediffusion. They were set up as one of many Home Office experiments with cable services. There are five of them in operation at the moment, in Basildon, Greenwich, Milton Keynes, Telford and Thamesmead. Each of them is piped to a 'potential audience' of between 20,000 and 110,000 people - small by BBC or Independent Local Radio (ILR) standards, but big for the 'third force'.

Perhaps it's a little unfair to describe these stations as 'amateur', as they do have a small full-time staff. Money can come from several sources, including local authority grants, cable company grants and advertising.

The third kind of third-force station is the 'campus' radio station; there are 17 of these in the UK, at 16 universities and one polytechnic. These stations are possibly the most interesting - especially to radio amateurs - because they use real transmitters, and are received on an ordinary transistor radio. Yet, like the hospital stations, they are run by volunteers in their spare time.

Induction field broadcasting licence

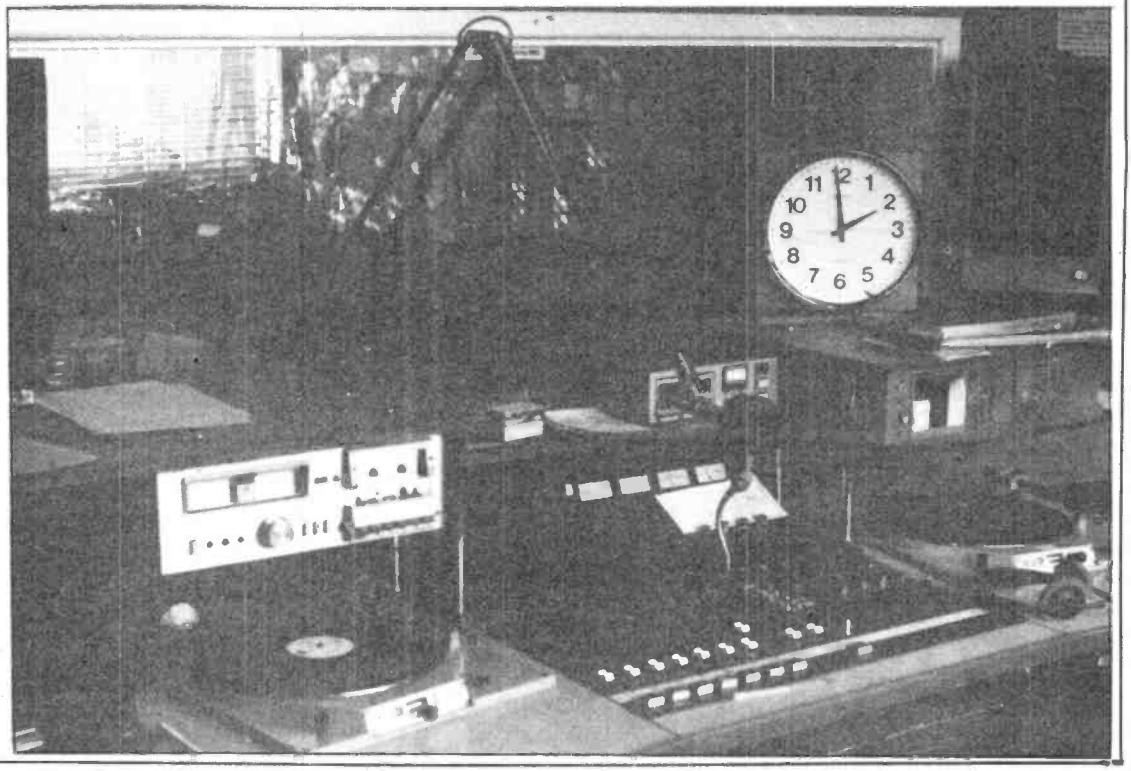
The campus stations transmit on medium wave, using AM like any other broadcaster on this band. The difference is in the aerials used. Whereas a conventional broadcaster uses a tall vertical radiator to achieve a strong electric field over a large area, the campus station transmits with the type of wire loop aerial loved by medium wave DX fiends. This produces a weak electric field but a strong induction (magnetic) field. This will loosely couple to a ferrite rod receiving aerial (which is very good at concentrating lines of magnetic flux), but only within a few tens of metres. The great advantage of the magnetic field is that it decays according to an inverse cubic law, whereas an electric field decays with an inverse square law. This makes it easier to control the 'range' of an aerial. This is why so few people know about the campus stations; few people can actually hear them! In fact it's a legal requirement that the signal strength must not exceed 48dB above 1uV/metre at (or beyond) the campus boundary, so that the general public cannot pick it up.

This condition of the 'induction field' broadcasting licence is, in practice, the most difficult one to meet. The broadcaster needs to produce a strong signal inside the campus, but a very weak one outside it. To do this he has to use not one, but several induction loop transmitting aerials, each with very low power and short range, installed inside the buildings where coverage is wanted. Some such stations use over a hundred loops.

Let's take a look at how such a station fits together. First, there will be one or more studios. There may be one or several transmitters. If a transmitter is in a different part of the site from the studio, it will need some kind of audio link to feed the programme to it. Normally this will be a balanced audio cable, which can either be installed by the station itself or rented from British Telecom. (BT offers dedicated 'private wires' for high quality audio, known as 'sound programme circuits' or 'music lines'. They are just the same as telephone lines, but with equalisation and amplification in the exchange instead of switching. They are available with a choice of either 50Hz-10kHz or 40Hz-15kHz frequency response, and in single circuits or phase-matched stereo pairs.)

Some campus stations have experimented with more exotic audio links, including microwave and free-space laser systems.

Once the audio has got to the transmitter, it has to be low-pass filtered, so that a sideband more than 9kHz away from the carrier is at least -40dB with respect to it. This requires some pretty nifty filtering. One such 'brickwall' filter design used by several stations is flat to 8kHz, -0.5dB at 8.5kHz and -40dB at 9kHz. Incidentally, the -40dB rule also applies to harmonics and other spurii.



Main control room of 'University Radio Nottingham', one of Britain's many 'induction loop' radio stations.

AMATEUR BROADCASTING

IT'S LEGAL

Popular music makes up the bulk of the 'third force' output.

After the filter, there is usually a limiter circuit to prevent accidental overmodulation should the level from the studio be too high.

The transmitter has to be within 10Hz of the nominal carrier frequency to meet CCIR regulations. In practice this can be achieved by a simple crystal oscillator without an oven.

Once the signal has been modulated, it needs to be fed to the aerial loops. In some systems, the transmitter produces several watts and feeds passive loops via coaxial cable. In others, a low level signal is generated, and linearly amplified by a simple amplifier within each loop. The 'passive loop' systems have the advantage that the transmitter is easy to get at and maintain, and the loops (which are usually installed in roof spaces and other equally difficult-to-get-at places) are not likely to go wrong. The disadvantage is that L-networks have to be set up to split the RF power at each loop.

The 'active loop' system feeds DC power as well as RF down the cable to the loops. This system does not need L-networks because the linear amplifiers have a high input impedance and can therefore be bridged across the coaxial feed without causing standing waves. The power from each loop can easily be adjusted by adjusting the gain of each amplifier. Extra loops can be added if part of a building gets a poor signal. This makes it easier to tailor a system, whereas the 'passive loop' needs to be right first time. On the other hand, the active system has many more places to go wrong!

The aerial loops are normally installed in 'halls of residence' on a university campus, but sometimes other buildings are covered as well.

Steel-framed and concrete buildings offer considerable attenuation to MF signals, which works to the induction field broadcaster's advantage. By placing his loops inside the building - where the receivers are - the structure weakens the signal outside. This makes it easier to meet the 48dBuV/m rule. Also, it attenuates co-channel interference coming in. Many university buildings, built during the sixties boom in higher education, use this type of construction.

Induction loop stations, like other medium wave stations, can only be expected to give about 30dB signal-to-noise ratio because of co-channel interference, so the transmitter needs to be modulated fairly heavily. In practice both speech and music are compressed quite a lot. Although this spoils the dynamic range of the sound from the studio, it does at least ensure that people can hear it.

Most stations operate on 963kHz (312 metres), but some have moved to 999kHz (300m) or 945kHz (317m) because of interference from Radio Caroline.

The people who install and operate the transmitters do not need any special qualifications, but the Home Office does make sure that stations meets the specification. A detailed plan of the campus showing the location of transmitters, cables and aerials has to be submitted to the Home Office engineers. If they are satisfied with it they authorise the installation and testing of the system.

When the system is built and tested to the installer's satisfaction, HO engineers visit the site and carry out a full performance test - including precise measurements of carrier frequency, audio filter response, peak modulation depth and spurii. They also plot the location of the 48dBuV/m contour to make sure it doesn't stray an inch over the boundary!

Then, and only then, the station gets a licence to broadcast.

Studios

The studios used by third-force broadcasters are as complicated as the induction loop system just described, but there are no Home Office rules about their construction or performance. Their design varies enormously from one station to another, and depends on the type of programming and the money, space and technical expertise available.

The most common type of programme is a record show, as in local radio, where a disc jockey or presenter plays records and other items, operating the equipment himself, live. This requires a bare minimum of two record turntables ('grams'), a microphone, a mixer and monitoring equipment. The mixer has volume controls ('faders') for each sound source, and many other facilities too complicated to describe here. Monitoring is particularly important, and involves loudspeakers, headphones and level metering. As well as monitoring the outgoing signal, the presenter needs to be able to check his sound sources before putting them on air. Quite a lot of audio switching is involved in doing this.

More complicated programmes may need a second pair of hands, so there will be an operator as well as a presenter. Ideally they will be in separate rooms so that the operator can listen to the mixed programme on a loudspeaker rather than headphones. There are many differences between this and the 'self-op' studio configuration.

As well as live programmes, the studio will need to be able to record programmes on tape, and play tapes back - either complete programmes, or brief inserts into a programme which may itself be recorded on another machine!

Tape is used in three main formats in radio studios. ¼-inch open reel tape is the most common, as it offers high audio quality and can easily be cut and physically edited. (Just about every tape that's played on the radio - especially if it's a news interview - has bits edited out of it, usually by literally cutting out the unwanted bit of tape and joining up the gap with splicing tape.)

Cassettes are used in broadcasting, but not very much. Their main application is in news and sports interviews, where low cost, lightweight equipment is considered more important than the ultimate in sound quality. Although cassettes can give good quality this can't be guaranteed if a recording made on one machine is played back on another. The low tape speed and the poor mechanical tolerances of the mass-produced plastic cassette housing conspire to spoil the frequency response, often quite badly, with deep 'extinction frequency' notches well inside the desired bandwidth.

The third type of audio tape used in broadcasting is the NAB cartridge. This is similar to the revolting 8-track cartridge that we all threw away a few years ago. A continuous loop of tape is wound on a spool inside a plastic box. The tape, which is lubricated with graphite particles, is pulled from the inside of the spool, past the mechanism and back onto the outside of the spool. These machines have a spare audio track used for control information. A burst of 1kHz tone ('cue tone') is used to mark the beginning of a recording. Once started, the tape will continue until it gets to the cue tone again, then it will stop ready to be played again.

Because the 'cart' can simply be pushed into a slot in the machine and played instantly at the push of a button, they are invariably used for jingles, commercials and other short items that are transmitted many times.

The more expensive cartridge machines - such as those used by ILR stations - often have additional features associated with the cue track. A 150Hz burst of tone ('secondary cue') is sometimes used at the end of a recording to start the next cartridge - very useful if there are half a dozen adverts to be transmitted back to back. An 8kHz tone ('tertiary cue') is sometimes used to fast-forward the cartridge to the beginning.

Cartridges are available with between 20 seconds and about 10 minutes of recording time.

Programmes

If you get the impression from the above that third-force stations spend most of their time playing pop records, you would be quite correct. This is partly because they attract the biggest audiences this way, and partly because a record show is the easiest kind of radio programme to make. News, features, drama, documentaries and just about any other type of speech-based programme (apart from a 'phone-in') require vastly more production. As a rule of thumb, every minute of speech transmitted needs about a man-hour of preparation.

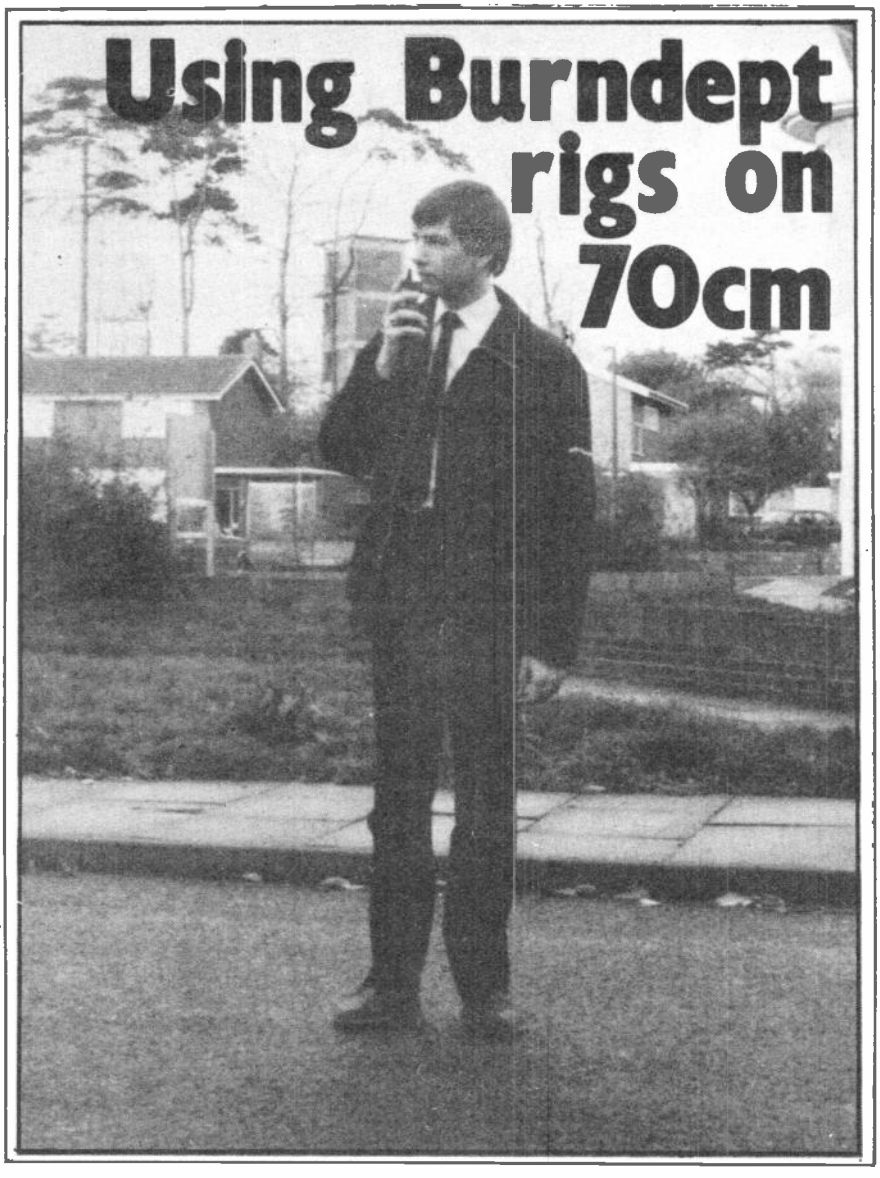
Clearly, then the smaller a station the simpler its programmes. Conversely, the smaller a station the bigger its share of the audience. Local stations tend to attract a greater percentage of listeners than each of the BBC networks, and third-force stations frequently attract a bigger audience share than the 'locals'.

The future

Cable broadcasting will bring the 'third force' to all of us. Small radio and TV stations, run by volunteers for fun, with a shoestring budget, are likely to emerge in every area. Experience shows that the audience is willing to put up with a lack of production polish in community broadcasting, because of the interest people have in a station that belongs to their neighbourhood, and is operated by people who live in it.

Because they lack money, third force stations are very dependent on their technical members to install and maintain the equipment. So, although it isn't amateur radio in the accepted sense, there's a big need for radio amateurs to get involved as the cables spread. More important, surely it's going to be damn good fun.

Using Burndept rigs on 70cm



Looking for a cheap 70cm hand-held? Paul Johnson may have the answer...

Over the past few years many amateurs have had the rather dubious honour of owning a pair of ex-Home Office Pye Pocketfones. Once the necessary modifications have taken the frequency from the 450MHz slot down to the 430MHz amateur band most people seem amazed by the performance of the beasts. The only snags seem to be the awful audio from the internal transducer and an earial which habitually stabs you in the right eye. Good fun but the two units are a bit difficult to use, as the receiver has to be silenced when the transmitter is in action otherwise feedback and other noise annoys anyone nearby. This problem of course did not happen when the units were used by the original users, as their receive and transmit frequencies were usually spaced far apart eg. RX 452MHz; TX 466MHz.

Now for the good news. The present radios as issued to most departments by the Home Office are Burndept UHF hand portables made in Birmingham. They are just starting to appear in small numbers on the second hand market. I have been using one for nearly thre years and although its spartan specification - 150mW RF and three crystal controlled channels - seems limiting, I have hardly ever wanted to use my 70cm synthesised portable (in fact it is on permanent loan to someone else at the moment). Burndept produces two models, the 470 and the 471 which are visually identical except from the type of nicad pack fitted. The 470 model uses two yellow Pocketfone batteries, and the 471 has a plug in nicad pack. Most units obtained ex-Home Office are in reasonable condition. If they are not, new cases can be obtained direct from Burndept and these make the rig look as good as new. The hand portable can also be fitted with a remote mic/aerial head and then the radio fits in your pocket.

A rather unusual feature is that the volume control is fited with a multi-position switch with stepped volume setting, instead of the usual pot. Internal construction is good and uses the mother board principle, making repairs very easy to carry out if required (try fiddling with a Pocketfone with all the components stacked end on, so that you cannot see what value any component is supposed to be).

The units as used by the police suffer from dropping, smashing and sundry electronic faults, but as these faults are user inflicted it would not really be fair to blame the units themselves. Anyway amateur equipment wouldn't last five minutes given the same treatment. I have had one fault in three years with my 471, a crack in the track on the squelch board caused by my dropping it. This took about a minute to find as the design makes fault-finding so easy.

Mobile adaptors

If you have a peep through the window of a police car fitted with a UHF aerial

Using the Burndept on its own and (bottom) with a mobile adaptor.

you will see a small rubber unit with a deep slot in it fitted under the dash with a microphone attached. These units are known as mobile adaptors and enable the standard radio to be used on external aerial and mic. They also contain a powerful audio amplifier capable of providing ample audio into an external speaker. If you think the Japs are fiendish wait until you read how the two units are coupled together. On top of the casing of the radios are two small studs which make contact with two spring steel contacts in the mobile adaptor. Now for the clever bit! One stud is earth, the other carries audio (in and out) and RF (in and out) at the same time. The small $1^1/_2$" helical aerial fitted to the top of the radio is fed through a reed relay. When the radio is inside the adaptor, a small magnet operates the relay and RF is directed to the stud contact. The TX/RX switching can also be described as quaint. When the microphone PTT is pressed, a plunger flies out of the adaptor and manually prods the radio's PTT button. This might appear a bit Heath Robinson but in action it works very well. Inside the adaptor a small R/C network separates the RF and audio and the audio goes to the amp and the RF in the original units goes straight to the aerial socket. Spring steel contacts shouldn't really work at UHF, and they certainly do not make a good match to 50 ohms, so I have fitted a small trimmer in line with the aerial socket and this matches the adaptor to the 50 ohm aerial on my car. I can only assume that the aerials fitted to police vehicles are tuned with a field strength meter as in the original state the best VSWR obtainable was worse than 4:1 on my pre-tuned whip.

The only negative point about owning a Burndept is that the majority of our uniformed gentlemen think that they are the only users of Burndept equipment. This could of course cause a few problems if you use the radio in public. I have never had trouble myself but I have spent an afternoon in the local nick explaining that the G8 in the cells was not Public Enemy Number One. If you have the 471 model with the plug in nicad packs the difference is fairly easy to show, but if you have the other model I think the best way to show that the radio is on amateur bands is to let the officer try and contact his control room on the suspect radio. The normal method of explaining about frequencies, and explaining what amateur radio is, is not very convincing. Even if you have your licence with you it does not look that official. The best way of proving its validity is not to get in touch with the RRD but to get the police to contact the local Telephone Area Manager who should have an up to date list of all amateurs in his area.

The going price for a 470 or a 471 seems to be about £75 to £100. If a mobile adaptor is offered as well, expect to pay about £25 for it. The Burndept is one of the best radios I have used and you will find it an ideal rig if you can get one. Best of all, the nicad packs on the 471 last for ages, which is certainly not the case with my Japanese rig. Good Hunting.

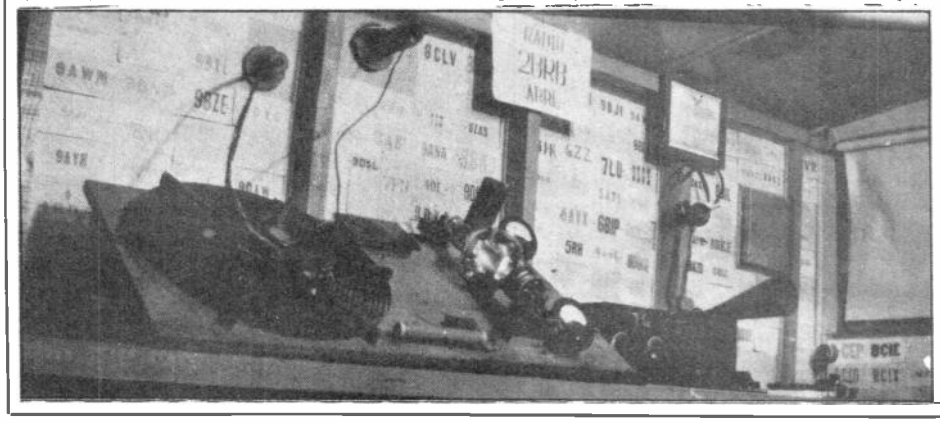
The first amateur DX

John D. Heys G3BDQ uncovers new evidence about the early history of transatlantic DX

Just over sixty years ago during the early hours of Saturday 8th December 1923 the first ever amateur radio contact between Britain and the USA took place. John A (Jack) Partridge, G2KF who then lived in London contacted U1MO, the station of Fred Schnell in West Hartford, Conn., USA. At the time U1MO was being operated by Ken Warner (U1BHW), who was then the well-known Editor of *QST*. Eleven days earlier, on November 27th, Frenchman Leo Deloy, F8AB of Nice had contacted U1MO which was operated by Schnell and John L. Reinartz (1XAM and 1QP). Reinartz became famous for his valve detector circuit which would oscillate on very short wavelengths and which was widely adopted by amateurs over the world. Deloy was the first European to bridge the Atlantic and had stolen a march on the handful of British amateurs who planned to be 'first across the pond' during the 1923/24 official tests. These tests were the fourth series organised and they were not due to start as a two-way event until 11th January 1924. Mr earlier article "QSL cards as historical documents" in another magazine told little of the amateurs who took part in them. original documents and more old-time QSL cards, this has made it possible to amplify the story and throw some new light on some of the personalities involved, their equipment, and particularly their fight against unhelpful official attitudes. This winter we celebrate the Diamond Jubilee of those events which took place in 1923/4, so perhaps now is the most appropriate time to describe them.

Slow progress

Although Marconi make the first two-way radio contact between his station at Poldhu in Cornwall and the Marconi station in South Wellfleet, Massachusetts in January 1903, enormous power and giant aerials were needed because of the low frequencies used. It was another twenty years before amateurs linked Europe and North America. Amateur power levels, using spark transmitters, were too low for the distance. Also, all amateur work ceased at the start of the first world war in 1914. After the signing of the Armistice in November 1918 the British Government was reluctant to issue anv kind of amateur radio permit. Constant pressure from the technical press, the Wireless Society of London and many provincial groups did, however, eventually persuade the War Office and the Postmaster General to relax their attitudes and allow private citizens to use receivers. On 21st October 1919, the Government granted permits for receivers, as long as certain strict rules were obeyed. Each listener holding a permit paid an annual fee of 10 shillings.



The late A.G. Davies (who was later G2PC) obtained one of the permits to receive on 13th October 1920. The communication from the General Post Office, EC1 was as follows:

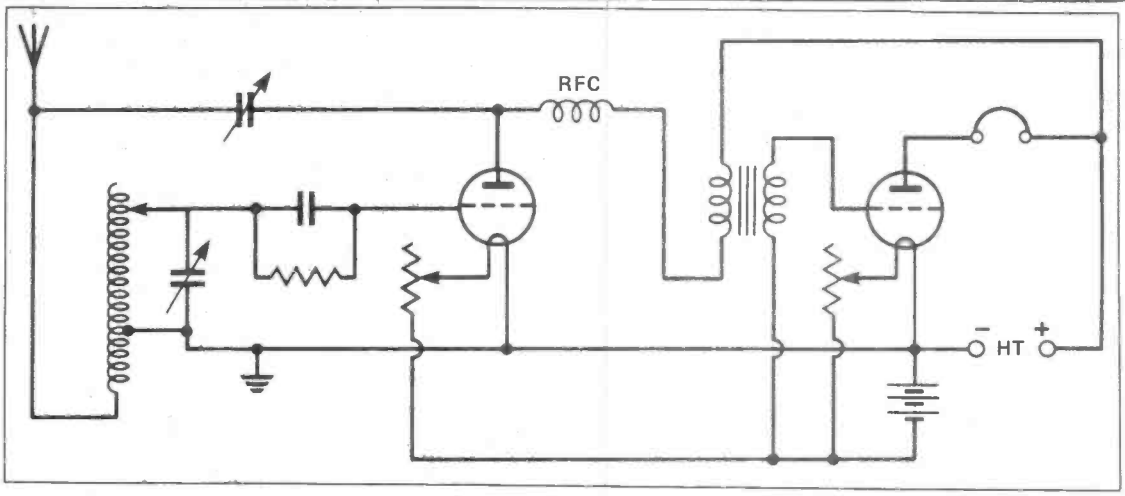
"Sir,

With reference to your letter of the 28th ultimo, I am directed by the Postmaster General to say that, pending the issue of a formal licence, he authorises you to instal and use for the reception of wireless signals for experimental purposes at Redcot, Park Road, Timperley, Altrincham, the apparatus (including a valve) and the aerial which you describe. Your son may use the apparatus as your agent.

It is necessary to stipulate that the valve shall be used in such a manner as to cause no interference with other stations, and that this permit is subject to withdrawal or modification at any time at the Postmaster General's discretion should occasion arise"

Continuing pressure from the growing wireless societies and by friends 'in high places' eventually resulted in the granting of the first few transmitting permits towards the autumn of 1920. *Wireless World* published a first list of twelve callsigns, names and addresses in their 16th October 1920 issue. 2AZ was the first call listed, which was held by William Le Queux. He was a well known novelist then living at Lavender Cottage, Guildford.

Le Queux wrote a postcard to Davies (who was then only a licensed listener) on 19th July 1921 which thanked him for the report on his transmissions. He suggested future times of operation, and also the fact that he was being heard regularly in Aberdeen at a distance of 600 miles. This was quite remarkable, for few European amateur stations could work stations more than 200 miles away at that time. A look into the 1925 call list reveals that 2AZ had moved to number 93 Marina, St. Leonards-on-Sea; just a few hundred yards from where I once lived.



An O-V-1 receiver using the Reinartz detector circuit which is typical of the receivers of the 1920s.

Far left: station 2BRB in 1922 with a single valve oscillator TX and Paragon RX. Below: three valve receiver used by Bill Corsham for his prize winning log entry.

Le Queux has the distinction of being the first British amateur to have his equipment made for him by other people. He was ahead of his time in this respect!

First organised tests

During the first week in February 1921 some twenty five amateur stations in the USA transmitted during the early hours of the 2nd, 4th and 6th. They operated within their normal licence terms, and could use input powers of up to one kilowatt on wavelengths around 200 metres (1.5MHz). At least 200 British names were entered upon the list of stations set to listen for the Americans, but only thirty logs were eventually submitted for scrutiny by the test organisers. The logs showed conclusively that no American signals had been received or identified. This was despite the offer of prizes from a number of well known wireless firms. The American amateurs blamed the British for the failure of the tests and said that their receivers were poor.

Later that year a second lot of tests were arranged. On 9th December 1921, using two specially prepared receivers (one a superhet) and an impressive 850ft aerial array in a field near Glasgow (illegal in the UK where only 100ft was allowed!), Paul Godley, 2ZE (an American) managed to receive 1BCG in Connecticut. This special station used a valve transmitter on a wavelength of 230 metres and had an output power of 600 watts. These events had actually taken place during the second transatlantic tests which had been arranged to run from midnight on 7th December and 6am on 17th December.

Prizes for hearing DX

Once again a number of British firms offered prizes for proven successful reception of American amateurs. There were to be 'free for all' periods of 15 minutes duration when USA stations transmitted from different call districts and also special $3^1/_2$ hour periods each night when selected stations, which had been allocated specific five letter code words, were to transmit. Five of these 'coded' stations were received in Britain; 1AFV, 1ZE, 2BML, 2FP and 2ZL. Five other callsigns of stations operating during the 'free' periods were also logged.

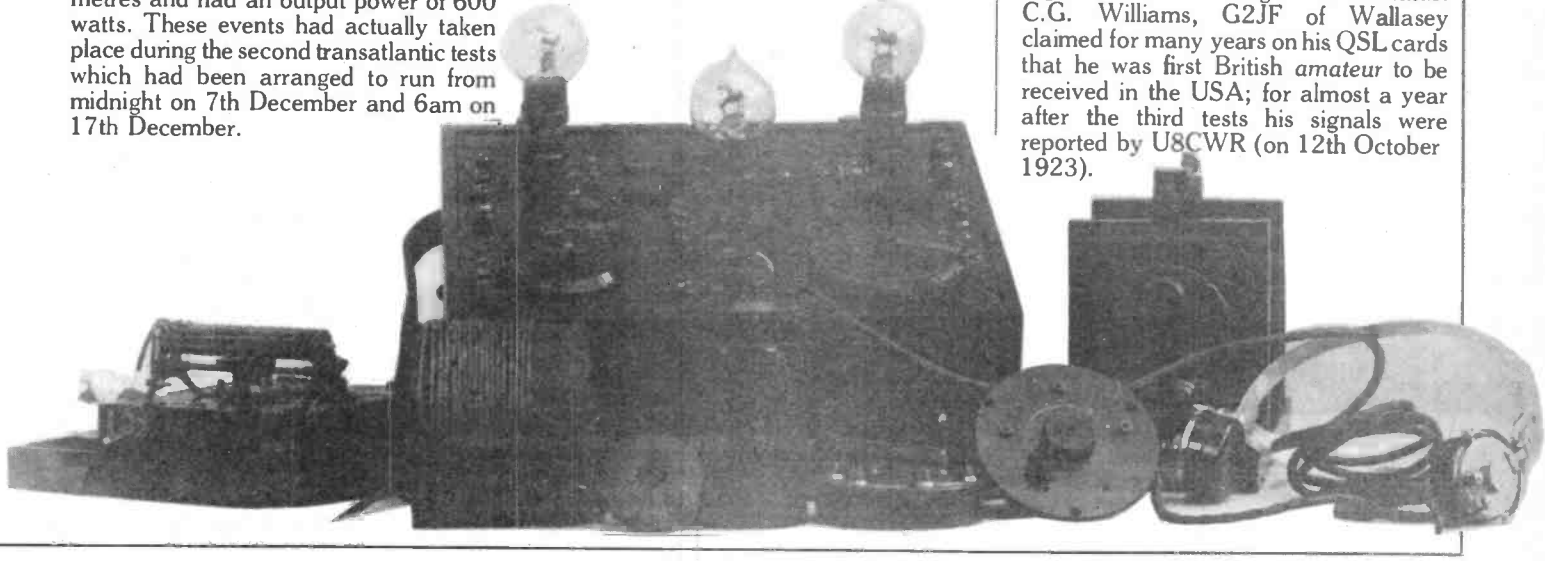
The first prize for reception of the Americans went to Billy Burne G2KW of Sale, Cheshire. He heard seven stations, three of which were sending code words which he correctly logged. Burne received goods to a total value of more than £125, a considerable sum in 1921. Mrs. A.C. Duff, a daughter of the late A.G. Davies (G2PC) says that her father always maintained that Billy Burne was asleep at the time he was supposed to have picked up the first American signals, a day ahead of Godley's reception of 1BCG, and that he, G2PC was really the first British station to hear the States! Of course Mrs Duff's story cannot be proved and in justice it must be regarded as hearsay! What's more the prize was not for being the first to receive an American station.

The second prize went to H.H. Whitfield of Birmingham who heard two stations and correctly recorded their code words. The third prize was awarded to Bill Corsham who was later licensed as G2UV. Bill Corsham, or 'Uncle Vic' as he liked to be called used a home built three valve receiver connected to a 100ft wire up at 45 feet. He heard the American 1AUV at 0249 on Monday 12th December 1921. The code word successfully received was "YLPMV", and for his efforts 2UV received a Burndept 1 receiver, worth £6.

Some of the American stations in the tests were then still using spark transmitters, but of the 27 stations logged by Godley using his long Beverage aerial in Soctland, 21 used valve transmitters.

The RSGB station

A third series of transatlantic tests took place between 12th and 21st December, 1922. This time arrangements were made for British and French amateurs to transmit in a planned time schedule. The RSGB installed a special station in Wandsworth, 5W5 with an input power of 1000 watts. This special station had a large top-loaded 'birdcage' aerial which was fixed to the chimney of the County of London Electric Supply Company's premises. 5WS was heard by eight Americans but two-way contact was never achieved. Many British amateurs resented the Society station and did not regard 5WS as having amateur status. C.G. Williams, G2JF of Wallasey claimed for many years on his QSL cards that he was first British *amateur* to be received in the USA; for almost a year after the third tests his signals were reported by U8CWR (on 12th October 1923).



The first amateur DX

Restrictions - but success

It was soon obvious that the 10 watt limit was preventing two-way contacts with the Americans, and the Postmaster General agreed that temporary high power permits could be applied for in readiness for the fourth tests in 1923/24. A few well-known and prominent 'old timers' were granted permits allowing an input of 1 kilowatt. There were also some 100 watt permits, but nothing extra for the majority of 'lesser mortals' in the amateur fraternity. This discrimination was another source of friction between British stations.

Billy Burne, 2KW, winner of the first prize in the second tests of 1921 applied for one of the high power permits because he was anxious to participate in the fourth series of tests scheduled for late December and early January 1924. The GPO's reply to his letter of application makes interesting reading!

"Sir,

With reference to your call at this Office in September last I am directed by the Postmaster General to enclose authority for transmission in connection with proposed trans-Atlantic tests.

As regards Condition 6 I am to explain that the ordinary fees payable for a permit authorising the use of power for transmissions up to 1 kw comprise an initial licensing fee of £2 plus an annual charge of £5. As the permit is for over three months but under six months, the licensing fee plus a half of the appropriate annual fee has been charged.

You will no doubt be good enough to forward a remittance of £4. 10s.

Authority to co-operate in the transmitting tests has been granted in respect of stations of Messrs Hogg, Partridge, A.E. Davies, Corsham, Mayer, Cash, Frost, Williams and Wood.

As regards the stations of Messrs Simmonds, W.H. Brown, Andrews and Higgs which are indicated in the list submitted by you as desiring to transmit, the question of granting the necessary authority will be favourably considered on receipt of individual applications from the licensees.

You will perhaps be good enough to furnish detailed particulars of the programmes arranged by you and your coadjutors in connection with these tests."

Burne was a leading light in the short-lived Amateur Radio Research Association (a rival to the RSGB) which had been inaugurated by a group of northern amateurs. The letter from the GPO mentions his September visit to the PMG's office with Jack Partidge, G2KF, when they tried to obtain high power permits for four other members of their new organisation. Later the 'ARRA' merged with the T and R Section of the RSGB, an action which had been strongly advocated by Hugh Pocock in *Wireless World*.

Another similar letter from the GPO carrying the same date was sent to G2PC (A.G. Davies). This letter, however, only allowed a power of up to 100 watts (annual charge £3 in addition to the initial £2 fee) and this power could only be used up to the end of April 1924. John Clarricoats, in his excellent *World at their Fingertips* book, mentions the granting of high power permits for the 1923/24 tests on page 89. G2PC never received a 1 kilowatt permit and had to make do with 100 watts!

More hedging restrictions were applied to the holders of high power permits in letters sent out from the GPO on 27th November 1923:

"Transmission shall take place only between the hours of 1am and 7am and shall not take place for more than 15 minutes a night."

Fred L. Hogg, 2SH, who became the second British amateur to contact U1MO on 12th December 1923 did not think much of the GPO restrictions. On a QSL card sent to 2PC (Davies) on 30th November of that year he wrote:

"Have written PMG telling him this won't suit me. I have no intention of taking a licence with any such 15 minutes per night business as it is useless. I am going to work on my ±100 watts otherwise! Very sorry OM, but its no good giving in I think. I wrote yesterday."

On the card he does not show his aerial length, but just states that it was from 45-35ft high. It had four wires, and a counterpoise of six wires 12ft high. He gave three aerial currents; 1.2, 7 and 13 amps and input powers of 10, 500 and 1,000 watts! Hogg's high power input paid dividends, for on a plain postcard written to G2PC on 18th February 1924 he said:

"Hrd you abt 1 kw strength late Sat nite - also 51K fairly QSA. Didn't call you as I had been up 20 hours and vy sleepy. Have blown my rectifier and transformer so vy low power here. Have wkd 13 Yanks in all now. Thought you

were a Yank because of your key..."

The restrictions imposed by the Postmaster General were often disregarded by the leading DX workers who were determined to contact the American stations. It was soon realised that the wavelengths below 200 metres were much better for long distance work. G2KF was one of many who used wavelengths down to about 100 metres. They were, of course, not licensed for these wavelengths and officially they were not supposed to go below 200 metres. There is no evidence to show that any two way trans-atlantic contacts were made on 200 metres or above. The QSL cards of the time either deliberately do not show the wavelength used, or simply record "various".

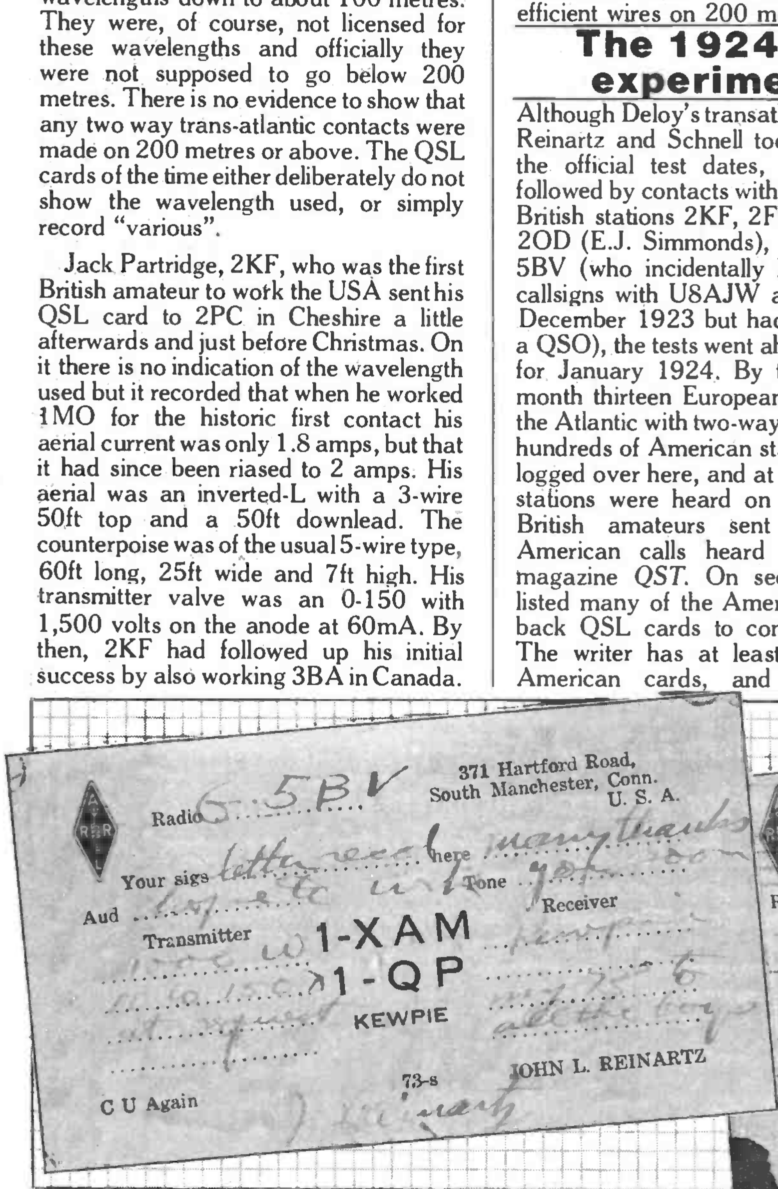
Jack Partridge, 2KF, who was the first British amateur to work the USA sent his QSL card to 2PC in Cheshire a little afterwards and just before Christmas. On it there is no indication of the wavelength used but it recorded that when he worked 1MO for the historic first contact his aerial current was only 1.8 amps, but that it had since been riased to 2 amps. His aerial was an inverted-L with a 3-wire 50ft top and a 50ft downlead. The counterpoise was of the usual 5-wire type, 60ft long, 25ft wide and 7ft high. His transmitter valve was an 0-150 with 1,500 volts on the anode at 60mA. By then, 2KF had followed up his initial success by also working 3BA in Canada. A few days later he wrote to tell Hugh Ryan, 5BV that he had just contacted 9CD in Chicago and that his aerial current was now up to 3 amps!

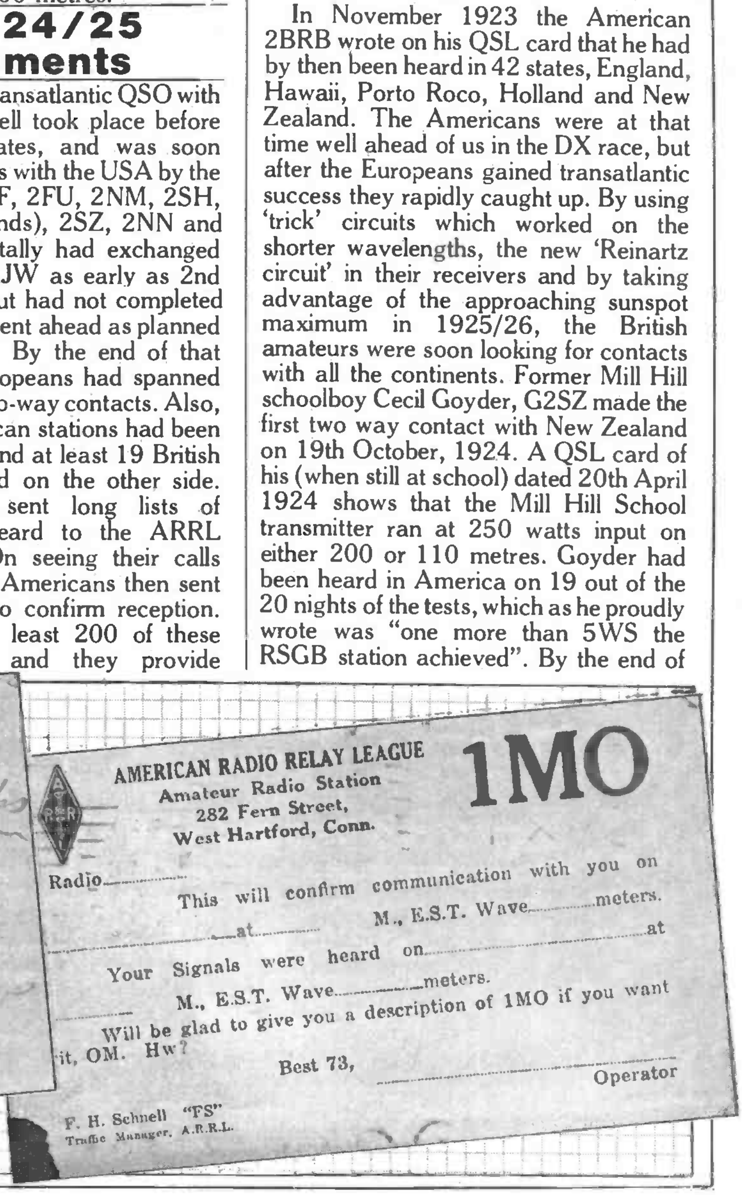
By using a shorter wavelength the 100ft loaded aerials used here became much more efficient radiators and helped to get signals across the Atlantic. The American stations did not have aerial restrictions and could put up more efficient wires on 200 metres.

The 1924/25 experiments

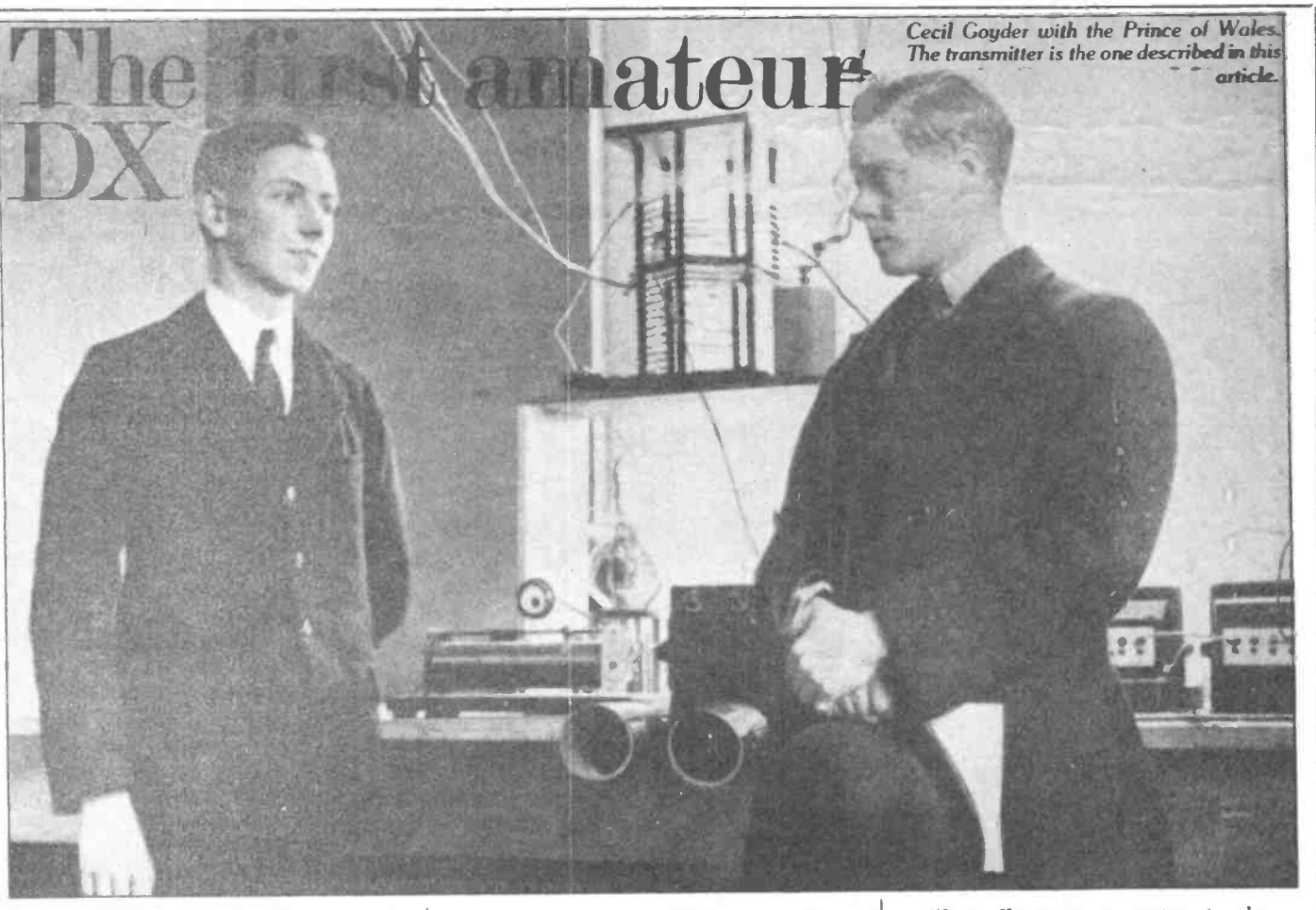
Although Deloy's transatlantic QSO with Reinartz and Schnell took place before the official test dates, and was soon followed by contacts with the USA by the British stations 2KF, 2FU, 2NM, 2SH, 2OD (E.J. Simmonds), 2SZ, 2NN and 5BV (who incidentally had exchanged callsigns with U8AJW as early as 2nd December 1923 but had not completed a QSO), the tests went ahead as planned for January 1924. By the end of that month thirteen Europeans had spanned the Atlantic with two-way contacts. Also, hundreds of American stations had been logged over here, and at least 19 British stations were heard on the other side. British amateurs sent long lists of American calls heard to the ARRL magazine *QST*. On seeing their calls listed many of the Americans then sent back QSL cards to confirm reception. The writer has at least 200 of these American cards, and they provide interesting details of the transmitters, receivers and aerials in use then. Stan Lower, G6LJ, (a former President of the RSGB and a founder member of the IARU, still living in Caterham) sent a QSL to G5BV on 1st May, 1923. He said that he had heard the 6th district (California) and had logged 509 American stations in total - 73 on one night, 60 of them very strong signals. This information was for Hugh Ryan's DX column (the first such regular column in the world) which had first appeared in *Experimental Wireless* in November 1923, and which continued until January 1927. Hugh Ryan, G5BV is now perhaps one of the last surviving successful participants of the 1923/24 tests in this country, and he still lives in Wimbledon. When recently asked about the aerials used then he replied that it was simply a case of 'hit and miss'. Amateurs just put up as much wire as was legal and then tapped in or tuned up for the maximum current at the feed point. The concept of resonant Hertzian half-waves or harmonic aerials was then unknown. The American amateur L.G. Windom 8GZ, of single wire feed fame (about 1927/8), wrote a card to thank G2PC for his report in *QST*, and said that he used 150 watts and got 9 amps into his wire!

In November 1923 the American 2BRB wrote on his QSL card that he had by then been heard in 42 states, England, Hawaii, Porto Roco, Holland and New Zealand. The Americans were at that time well ahead of us in the DX race, but after the Europeans gained transatlantic success they rapidly caught up. By using 'trick' circuits which worked on the shorter wavelengths, the new 'Reinartz circuit' in their receivers and by taking advantage of the approaching sunspot maximum in 1925/26, the British amateurs were soon looking for contacts with all the continents. Former Mill Hill schoolboy Cecil Goyder, G2SZ made the first two way contact with New Zealand on 19th October, 1924. A QSL card of his (when still at school) dated 20th April 1924 shows that the Mill Hill School transmitter ran at 250 watts input on either 200 or 110 metres. Goyder had been heard in America on 19 out of the 20 nights of the tests, which as he proudly wrote was "one more than 5WS the RSGB station achieved". By the end of




AMERICAN RADIO RELAY LEAGUE
Amateur Radio Station
282 Fern Street,
West Hartford, Conn.
1MO
Radio
This will confirm communication with you on
at
M., E.S.T. Wave
meters.
at
Your Signals were heard on
M., E.S.T. Wave
meters.
Will be glad to give you a description of 1MO if you want it, OM. Hw?
Best 73,
Operator
F. H. Schnell "FS"
Traffic Manager, A.R.R.L.

The first amateur DX



Cecil Goyder with the Prince of Wales. The transmitter is the one described in this article.

the tests G2SZ had worked 41 stations in the USA and had received 106 USA reports.

Goyder's first and historic contact with New Zealand was the more remarkable in that it was the first two-way communication with that country from Britain; something that had not even been achieved by the high powered commercial stations. He had also been extremely lucky to contact Z4AA (Frank Bell, later ZL4AA one day ahead of Ernest Simmonds, G2OD who had been heard in New Zealand a month earlier and had achieved the first UK-Australian contact on 13th November 1923.

Signals to and from New Zealand follow a Great Circle path very close to the North Pole and this makes it very difficult to establish contact on the longer wavelengths. Goyder, Simmonds and Bell were using wavelengths between 90 and 100 metres which did not suffer so much attenuation. Today G-ZL contacts on our Top Band are very rare, and the best chances of such QSOs are with ZL4 stations at the southern end of the south island. The path to ZL4 is the least affected by the polar absorbtion and it is significant that the pioneer amateur contacts with New Zealand were made with ZL4 stations. A complete account of the early amateur successes in contacting New Zealand is outside the scope of this article, but it would make a fascinating subject for future research.

Many amateurs love to tell of the 'one which got away', and Hamilton Howell, 7TQ of Medford, Oregon wrote to G2PC:

"-tnx vy much fer ur kind letter om. Am sorri to say tt 7QD es myself did not hr a signal fm England during T tests. We listened fer a month bu ND. 6AGK told me tt he hrd G2OD es 7LR has hrd F8AB so hv hopes of hrng u. Am using 50 watts trans. Hr es hv been hrd in every dist. es wrkd 1st dist. 5 times. QRK 7TQ? hi!"

There were changes in the conditions of the permits for experimental wireless sending and receiving stations (as amateur stations were then called) in June 1924. The new wavelengths included the whole band from 150 to 200 metres and the wavelength of 440 metres, subject to certain restrictions on the hours it could be used. The old 1000 metre band was lost and just used by the aircraft service. A few months later, in a letter dated 3rd October 1924 and headed "Trans-Oceanic Experiments - 1924-25" the GPO told G2PC that he could not run more than 100 watts but could use from 90 to 200 metres. Transmissions were not to take place for more than $^1/_2$ hour each night and only between the hours of 0000 and 0800 GMT.

On 6th November 1924 the GPO sent a further letter stating that the June permit did not authorise communication with wireless stations outside Great Britain and Northern Ireland! However,in order that the recipient might participate in the Trans-Oceanic tests organised by the RSGB (which went on until 15th April, 1925), and as the transmissions were to be of an international character, the call signal of his station was to be prefixed with the letter "G". The letter also added:

"In calling up a station in the United States, Canada, Mexico, Australia, South Africa, India or Egypt, the letters "N", "CJ", "CY", "VH", "VN", "VT" and "SU" respectively should be prefixed to the call signal of that station".

The authorities now recognised that world-wide communication by amateurs was a reality and they were slowly coming to terms with the new situation. At least two radio magazines had offered the RSGB £500 each with which to fight the Post Office restrictions through the courts. On 8th April 1925 the permits were extended to 15th October, and some different operating times were allowed. The half hour of sending during each consecutive 24 hour period was now allowed during the period 1400-1500 GMT on Sundays, as well as during the period midnight to 8am on any day, 6.30pm to 7pm on Wednesdays and Saturdays, and 7pm to 7.30pm on Sundays. This complex listing of times had of course been arranged to fit in with the hours when the BBC was off the air! *(Rather like 50MHz! - Ed.)*

Through 1925 many amateurs were operating on 40 metres, and with 10 watts or less, they were having many contacts with stations in all six continents. DX working was becoming rather commonplace. The big adventure and the excitement of being 'first across the pond' was over. The burning of gallons of midnight oil by the pioneers on 200 metres and just below, only two or three years previously, had slipped into history.

CLUB CALENDAR

Tell others about what's happening in your club - give us the information and we will try and print it here.

Axe Vale

Meetings of the Axe Vale Amateur Radio Club are held in the Cavalier Inn, Axminster, on the first Friday in every month at 7.30pm. Mar 2: *Static Protection for ICs* by Rex Williams G3RSJ. Further details from: Bob Newland G3VW (Secretary) on Lyme Regis 5282, or Roger Jones G3YMK (Publicity Officer) on Upottery 468.

Barry College

The Barry College of Further Education Radio Society meets on Thursday evenings at the Annex, Weycock Cross, Barry starting at 7.45pm. There are Morse classes as well as a lecture or demonstration.

Bath

The Bath and District Amateur Radio Club meet every other Wednesday at the Englishcombe Inn, Englishcombe Lane, Bath at 745pm. Details from Trevor Whitehead (PRO) on Bath 319150, or Mike Mason (Secretary) on Bath 311046.

Belfast College of Technology

Wednesday 28th March is the date for the Belfast College of Technology Amateur Radio Society's meeting for a talk on *RTTY with the ZX81* by Ray Bowring GI8RKC. This will be in the College's Millfield Complex, in lecture theatre B10, and everyone is welcome. More information from: James Barr GI1CET (Secretary) on Belfast 227244 extn. 243 (except Thursdays).

Biggin Hill

St Mark's Church Hall is the venue for the Biggin Hill Amateur Radio Club's meeting on March 20th at 8.30pm, when they are planning to bring in some test equipment to check the performance of rigs.

Bishop Auckland

The Bishop Auckland Radio Amateurs' Club meets at the Travellers Rest, Evenwood on Monday evenings at 7.30pm. They operate an RAE course, and Morse tuition is also available.

Braintree

The Braintree and District Amateur Society meets on the first and third Fridays of each month at the Braintree Community Centre in Victoria Street at 7.45pm. Mar 5: *Radio Propagation.* Mar 19: *DF Hunting* by G4PQY. More information from Pat Penny G6TAF on Braintree 26487.

Brighton

The Brighton and District Amateur Radio Society meets at the Marmion Road YMCA at 7.30pm on alternate Wednesdays. They have a Morse class on Mondays. For further information contact Wendy Firmager, 26 Brownleaf Road, Brighton.

'British Telecom'

A new club is being formed for anyone employed by, or retired from, the Post Office or British Telecom in the Midland Regional Area. Enquiries can be made to the Secretary, Mr. M. Green, on 021-643 3258/6945. As yet the club has no name, and they hope to hold a competition to find one.

Bromsgrove

The Bromsgrove Amateur Radio Society holds its meetings on the second Tuesday of each month at Rigby Lane School. Details from Alan Kelly on 021-445 2088.

Burton-upon-Trent

The Burton-upon-Trent and District Radio Society meets once a week on a Wednesday evening at the Stapenhill Club and Institute in Main Street, Stapenhill.

Bury

The Bury Radio Society meets each Tuesday evening at 8pm in the Club Room at the Mosses Youth and Community Centre, Cecil Street, Bury. Main meetings are on the second Tuesday of each month. March 13: *Integrated Circuit Fabrication* by Peter Bradley G4EXK. More details from Brian Tyldsley G4TBT, on Burnley 24254.

Cambridge

The Cambridge and District Amateur Radio Club meets each Friday at 7.30pm in the Visual Aids Room, ground floor, Coleridge Community College, Radegund Road, Cambridge. details about the club are available from David Wilcock G2FKS, on Cottenham 50597.

Cheshunt

The Cheshunt and District Amateur Radio Club meets at the Church Room, Church Lane, Wormley, every Wednesday evening at 8pm. Mar 7: Junk sale. Mar 14: natter night. Mar 21: *PI Road Show* with members of the GB3PI Repeater Group. Mar 28: natter night. Further details from Roger Frisby G4OAA on Hoddesdon 464795.

Denby Dale

The Denby Dale (Pie Hall) and District Amateur Radio Society meets at the Pie Hall every Wednesday. Details from J. Clegg G3FQH on Huddersfield 862390

Derby

The Derby and District Amateur Radio Society usually meets on Wednesdays, at 119 Green Lane, Derby, at 7.30pm. Some meetings are restricted to members only. Details: Jenny Shardlow on Derby 556875.

Droitwich

The Droitwich Amateur Radio Club meets on the first Monday of each month at the Scout HQ, North Street, Droitwich.

Echelford

The Echelford Radio Society meets on the second Monday and last Thursday in the month at The Hall, St. Martin's Court, Kingston Crescent, Ashford, Middx. at 7.30pm for an 8pm start. Club nets (non-members welcome): Sundays 10am 1.93MHz; Wednesdays 8pm 144.575MHz.

Edgware

The Edgware and District Radio Society meets at 145 Orange Hill Road, Burnt Oak, Edgware on the second and fourth Tuesdays of each month at 8pm.

Exeter

The Exeter Amateur Radio Society meets at the Exeter Community Centre, St. David's Hill for formal meetings on the second Monday of each month. Informal meetings are held on every other Monday at the Scout Hut, Emmanuel Road, St. Thomas. All meetings start at 7.30pm, and further details are available from Andy Lake G8YOA on Exeter 39597

Fareham

The Porchester Community Centre is the meeting place for the Fareham Radio Club, which meets in Room 12 on Wednesdays at 7.30pm. Details from Brian Davey G4ITG on Fareham 234904.

Farnborough

The Farnborough and District Radio Society meets at the Railway Enthusiasts

CLUB CALENDAR

Club's clubhouse off Hawley Lane, on the second and fourth Wednesdays of every month. Information: I.F. Ireland G4BJQ (Farnborough 543036)

Galashiels

The Galashiels and District Radio Society meets at the Focus Centre, Livingston Place, Scott Street, Galashiels. The Secretary is A. Walker. Tel: Galashiels 56027.

Glenrothes

The Glenrothes and District Amateur Radio Club meets monthly, on the 18th in March.

G-QRP

The G-QRP Club's Spring QRP CW Activity Weekend is on 17/18th March - details in *Sprat* no. 37.

Harrow

The Radio Society of Harrow holds its meetings at the Harrow Arts Centre, High Road, Harrow Weald at 8pm on Fridays.

Hornsea

The Hornsea Amateur Radio Club meets every Wednesday evening at 8pm, at The Mill, Atwick Road, Hornsea.

Horsham

The Horsham Amateur Radio Club meets on the first Thursday of each month at the Guide HQ, Derwne Road, Horsham at 8pm. On March 1 they have a junk sale - visitors welcome with or without junk (10% commission for club funds). Details: John Matthews G3WZT on Partridge Green 710565, or Peter Head on Horsham 64580.

Inverness

The Inverness Amateur Radio Club meets every Thursday at the Cameron Youth Club, Planefield Road, Inverness at 7.30pm. Morse classes are also held each week. For further information call Bob Irwin on Inverness 221956.

Ipswich

The Ipswich Radio Club meets on the second and last Wednesdays in each month at 8pm, in the Club Room of the Rose and Crown, 77 Norwich Road, Ipswich. Morse classes are usually held on the other Wednesdays, but check beforehand with the Secretary, Jack Toothill G4IFF, on Ipswich 44047. Mar 14: *The Talking Books for the Blind Service*. Mar 28: constructors' contest.

Jersey

The Jersey Amateur Electronics Club meets at the Communicare Centre, St. Brelade at 8.15pm. Mar 14: *World of Amateur Radio* by ARRL. *Two Pioneers of Radio* G2DX and G6CJ, on video. Details from Phil Johnson GJ8KNV (Secretary). Tel: Jersey 53333.

Kelso

The Kelso Amateur Radio Society has weekly meetings on Mondays at 7.30pm in the Kelso Community Centre. For further information contact either Bruce Cavers GM4UIB on Kelso 24654, or Andre Saunders GM3VLB on Kelso 24664.

Lincoln

The Lincoln Short Wave Club holds formal meetings every second and fourth Wednesday of the month beginning at 8pm. Mar 7: Morse/RAE. Mar 14: *Amateur Radio on a Shoestring* by Rev. George Dobbs G3RJV. Mar 21: Morse/ RAE. Mar 28: AGM-details for agenda/activity night/on air.

Magherafelt

The Magherafelt Amateur Radio Society meets at 12 Garden Street, Magherafelt on the first Tuesday in each month, and a varied programme of events is being planned for the coming season. Morse classes are held each Tuesday evening and an RAE class is held in the local Technical College on Monday evenings.

Visitors and new members are most welcome. Further details and programme are available from the Secretary, Jack Chapman (G14LVC), Tel: 0648 32096.

Maltby

The Maltby Amateur Radio Society meets every Friday evening at 7pm at the Methodist Church Hall, Maltby, Rotherham. The Club has a regular Morse Class and a computer enthusiasts' corner.

Milton Keynes

The Milton Keynes and District Amateur Radio Society holds its meetings at the Lovat Hall, Silver Street, Newport Pagnell, at 8pm on the second Tuesday of every month. Contact: David White on Milton Keynes 501310.

Nene Valley

The Nene Valley Radio Club meets on Wednesdays at 8pm at the Dolben Arms, Finedon, Nr. Wellingborough. They transmit from the First St. Mary's Scout Hall, also in Finedon. Mar 7: natter night. Mar 14: *The Truth About Amateur Radio* - video from Grafton Radio Society. Mar 21: natter night/on air (HF). Mar 28: *RSGB* by John Nelson.

Newbury

The Newbury and District Amateur Radio Society meets monthly (2nd Tuesday of the month), usually at Newbury Technical College.

North Bristol

Meetings of the North Bristol Amateur Radio Club are held at SHE 7, Braemar Crescent, Northville, every Friday at 7pm.

North Devon

The North Devon Radio Club meets on the fourth Wednesday in each month at 7.30pm, at Pelton Community College in Barnstaple ('even' months) or Bideford College ('odd' months).

Northern Heights

The Northern Heights Amateur Radio Society meets at the Bradshaw Tavern, Bradshaw, Halifax. On the second and fourth Wednesday of the month they have a lecture, and a 'noggin and natter night' every other Wednesday, all at 8pm. Further information from Brian Aspinall G6CJL on Bradford 83442.

Peterborough

The Greater Peterborough Amateur Radio Club holds its meetings at Southfields Junior School, Stanground, Peterborough, at 7.30pm, usually on the fourth Thursday of each month, when the schools are in session. Mar 22: *Submarine Radio* by Geoff G4SQB.

RAFARS

The Royal Air Force Amateur Radio Society has a 2m net in London on Mondays at 8pm on 145.325MHz, or, if conditions are poor, on 144.175MHz SSB at 8.10pm.

RATEC

The Radio Amateurs Technical Engineering Club exists to promote the constructional side of the hobby, and it meets every month at 8pm at the British Legion Club, Moor Lane, Woodford, Cheshire.

Reading

The Reading and District Amateur Radio Club meets at the Clubroom, The White Horse, Peppard Road, Emmer Green, Reading on alternate Tuesdays. Details from Chris Young G4CCC on Reading 471761.

Rhyl

The Rhyl and District Amateur Radio Club meets on the first and third Mondays of the month at the lst. Rhyl Scouts' Hut, Tynewydd Road, Rhyl at 7.30pm. Mar 5: activity night. Mar 19: Equipment demonstration by Gordon Adams G3LEQ. Information from John McCann GW4PFC on St. Asaph 583467.

Salop

The Salop Amateur Radio Society meets every Thursday at 8pm (usually) at the Albert Hotel, Smithfield Road, Shrewsbury. Every other week is a natter night. Mar 1: RSGB film. *Aerial Circus* by G6CJ. Mar 15: DF hunt - first of four. Mar 29: talk and visit by G6DYW.

Shefford

The Shefford and District Amateur Radio Society meets at 8pm every Thursday in the Church Hall, Shefford.

Skelmersdale

The Skelmersdale and District Amateur Radio Club meets every Thursday at 7.40pm at the Dunlop Sports and Social Club, White Moss Road (next to the football ground).

Smiths Industries

The Smiths Industries Radio Society meets at the Club House, Newlands, Bishops Cleeve every fortnight.

Although the Club was formed to bring together amateur radio enthusiasts working in the Smiths factory, membership is open to the public.

South Bristol

The South Bristol Amateur Radio Club meets at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol every Wednesday at 7.30pm. Mar 7: *AMTOR/ARQ* by G4KUQ/G4MCQ. Mar 14: club project/construction night. Mar 21: SWL night. Mar 28: computer night. All enquiries to Len Baker G4RZY on Bristol 834282.

South Cotswold

The South Cotswold Amateur Radio Society meets at the Scout HQ, Dr Browns Road, Minchinhampton on the second and fourth Wednesdays of each month. Details: contact R.J. Burnett G4RJB on Nailsworth 2874.

Southdown

The Southdown Amateur Radio Society meets on the first Monday of every month at the Chaseley Home for Disabled Ex-Servicemen, Southcliffe, Eastborne, at 7.30pm for an 8pm start.

South East Kent

The South East Kent (YMCA) Amateur Radio Club meets at the Dover YMCA, Godwynehurst, Leyburne Road on Mondays for RAE Classes, Tuesdays for Morse practice, and Wednesdays for main club meetings (all at 7.45pm).

Club nets are held on 3.745MHz and 144.395MHz, both at 11am on Sundays.

South Manchester

The South Manchester Radio Club meets every Friday at 8pm at the Sale Moor Community Centre, Norris Road, Sale. Mar 2: *The History of the South Manchester Radio Club* by Mr. Matt Barsnley. Mar 9: *The Mysteries of FM* by Trevor Hopkins G8TYY. Mar 16: 2m DF hunt. Mar 23: junk sale. Mar 30: lecture by Dr. David Yorke. For further details contact Dave Holland G3WFT on 061-973 1837.

Stevenage

The Stevenage and District Amateur Radio Society meets on the first and third Tuesdays of each month at 8pm at: T.S. Andromeda, Fairlands Valley Park, Shephall View, Stevenage. Mar 6: *WAB Award Scheme* by G4ISO. Mar 20: AGM.

Morse classes are held before each meeting at 7.15pm, and there is a weekly net on 145.250MHz. Further details are available from Cliff Barbar G4BPG (Secretary), on Baldock 893736.

Stockton

The Stockton and District Amateur Radio Group meet every Wednesday at 7.30 pm in the Billingham Community Centre. RAE classes, construction evenings and visits by guest speakers are among their activities. Membership is 50p and entry to meetings costs 20p.

Stourbridge

The Stourbridge and District Amateur Radio Society normally meets on the first and third Mondays of each month. Mar 5: informal, construction, Morse, on air. Mar 19: AGM. The Society meets at the Robin Woods Centre, School Street (off Enville Street), Stourbridge at 8pm.

Stratford-upon-Avon

The Stratford-upon-Avon and District Amateur Radio Club meets at the Control Tower, Bearley Radio Station, Bearley on the second and fourth Mondays of each month starting at 7.30pm. (Talk-in available on 145.55MHz).

Swale

The Swale Amateur Radio Club meets at the Ivy Leaf Club, Dover Street, Sittingbourne each Monday at 7.30pm. More Details from Brian Hancock G4NPM. Tel. Minster 873147.

Thanet

The Radio Club of Thanet meets at the Grosvenor Club, Grosvenor Place, Margate at 8pm on the second and fourth Tuesdays in the month. Mar 13: *Air Traffic Control* by G6HXR. Club nets are on 28.4MHz at 9.30am on Sundays, and on 145.575MHz at 8pm on Thursdays.

308

The 308 Amateur Radio Club, named (numbered?) after the room at the Kingston College of Further Education where it holds its meetings, meets each Monday to study for the RAE. They also meet every Tuesday evening at the Old Coach House in Church Hill Rd., Surbiton at about 8pm. (It's not a pub, but a church hall.)

Vale of White Horse

The Vale of White Horse Amateur Radio Society meets at the Lansdown Club, Milton Trading Estate at 7.30pm for 8pm. Mar 6: *VHF Contests* by Petra Suckling G4KGC, Club nets: Thursdays 28.750MHz at 7.30pm; Sundays 145.200MHz at 8pm.

Westmorland

The Westmorland Radio Society meets on the second Tuesday of each month at 8pm at the Strickland Arms, Sizergh, Nr. Kendal. Further details: Frank Burrow (G8BME) on Sedgwick 60803.

Wigston

The Wigston Amateur Radio Club meets every Friday at the United Reform Church in Long Street, Wigston, Leicester at 7.30pm. The Secretary is Alan Faint G6GWH, Tel: Market Harborough 62827

Worcester

The Worcester and District Amateur Radio Club meets at 8pm at the Oddfellows Club, New Street, Worcester on Mar 5 for *Operating Rare DX* by S. Jesson G4CNY. Mar 19: is an informal evening at the Old Pheasant Inn, New Street, Worcester.

Yeovil

The Yeovil and District Amateur Radio Club meets at 7.30pm at the Recreation Centre, Chilton Grove, Yeovil. The Secretary is Eric Godfrey G3GC. Tel. Yeovil 75533.

DODSON ON THE ROAD. The tenth of a series of profiles of distributors who serve the amateur radio fraternity.

DEALER PROFILE

This month Peter Dodson travels to Rayleigh, Esses, to report on the mail order component supplier Maplin Electronic Supplies Ltd. In existence for twelve years, Maplin has recently branched into the amateur radio field with the Heathkit range of kits. However, they say that they're still going to concentrate mainly on what they do best - selling components.

In a leisure activity largely dominated by the sale of off-the-shelf radio equipment, it is perhaps refreshing to find an organisation which caters for those who are still prepared to be adventurous with soldering irons. There was a time when construction was an essential part of being a radio amateur: in this respect Maplin Electronics has done much to bring the excitement of building back into the electronic hobbyists' world.

Back in 1972, Douglas Simmonds and one Roger Allen started selling branded electronic bits. They worked from Roger's home, but within nine months Doug, who had worked as a Post Office computer maintenance engineer, and Roger, who looked after computers at the local paper, found a need for expansion. Their shop window, right from day one, had been a catalogue. Starting with a locally printed 30-page publication, the vast extension of product range over the past twelve years has increased the size of the current catalogue to some 480 pages.

Big expansion

And so, from a room above a shop in Westcliff, near Southend, the Maplin organisation put down its roots and started to grow. By drastic re-investment of profits in what was then a wholly mail-order business, and 'sharing' his partner Roger with the local press for a few months, Doug Simmonds was able to expand his product range even further. Within two years, Maplin Electronics was able not only to make its first big expansion, but also its expansion, but also its first excursion into the retail trade by taking over the shop downstairs and installing manager Dave Snoad. Still with the firm, Dave now has overall responsibility for all Maplin retail outlets, his most recent claim to fame being his BBC TV appearance on the "60 Minutes" programme with a robot!

Right from the start Maplin won export orders - even in 1974, representing 10% of their trade. In fact, business was so brisk that overcrowding on the first floor at Westcliff necessitated a transfer of the mail-order side (but not the shop) to a warehouse at Leigh-on-Sea. The existing space was kept for storage. Under the management of Tony Patrick, the Westcliff shop thrived to the extent that in 1976, Maplin took over the shop next door and combined the two to make for a bigger sales area.

Inevitably, there had to be staff increases to handle the rapidly expanding business: in 1974, Doug Simmonds had taken on half a dozen packers. By the time the firm had taken over the warehouse, the payroll had increased to twenty, and the catalogue to 100 pages. Similarly, the range of components had

been widened from a 'popular' variety to include less fashionable items, so offering a comprehensive range to a growing number of customers. But still, Maplin's customers were the general public - it was to be some considerable time before bulk demand from the bigger organisations was to grace the order books.

Gradually, the policy of buying only British changed. With most components coming from the Far East, direct importation was deemed not only more viable, but convenient. Also, Maplin's sources were constantly increasing, with components flowing in from over 1000 manufacturers worldwide.

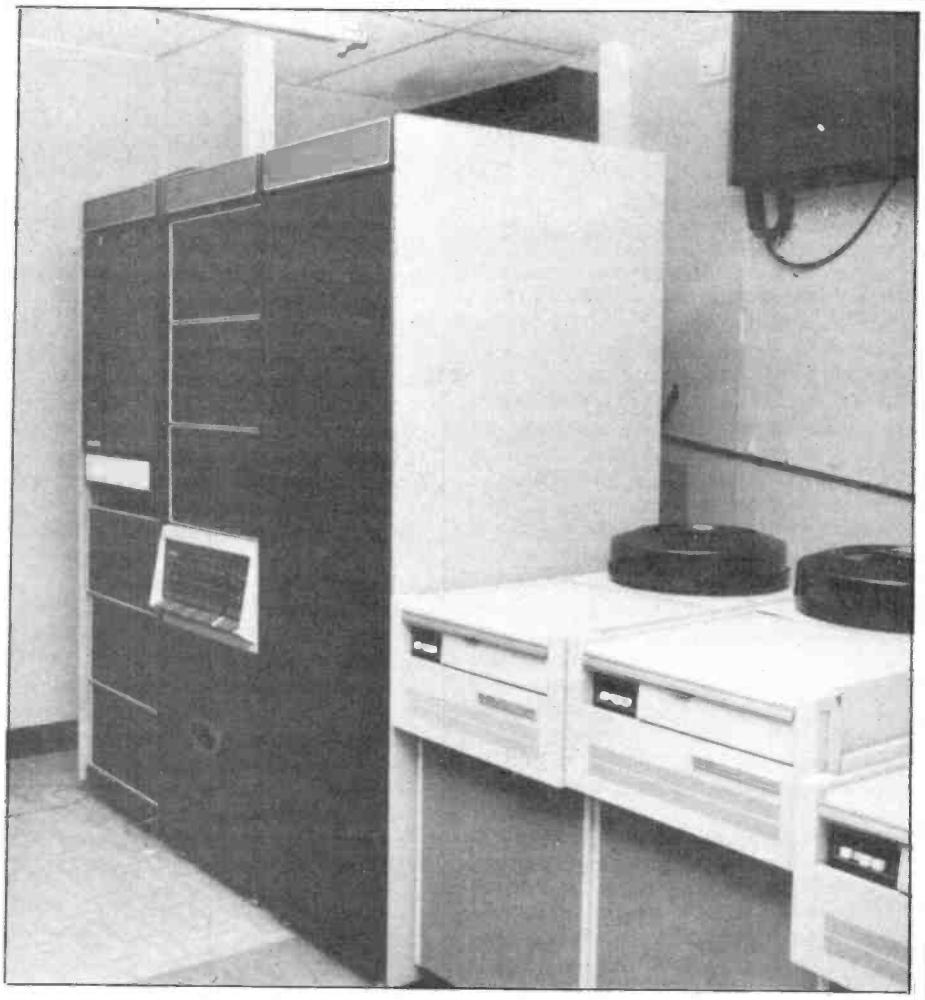
Within two years of taking over the warehouse in Leigh-on-Sea, further expansion was the order of the day. The undoubted success of the single retail outlet at Westcliff prompted the opening of a London shop at Hammersmith, currently managed by Martin Jay. Simultaneously, in 1978, the Maplin HQ and mail order operation moved to the present premises at Hadleigh. Tucked away in the corner of a small industrial estate of what is virtually a suburb of Southend, Doug Simmonds took possession of two units - soon to be augmented by another two, thus doubling their present 15,000 square feet of floor-space. And it must be said that this extension *is* necessary: even the kindest critic would describe the existing working conditions as 'concentrated', and even Doug Simmonds refers to the present accommodation as "a rabbit warren". With almost 100 staff working under the same roof, they would probably agree with him!

300 page catalogue

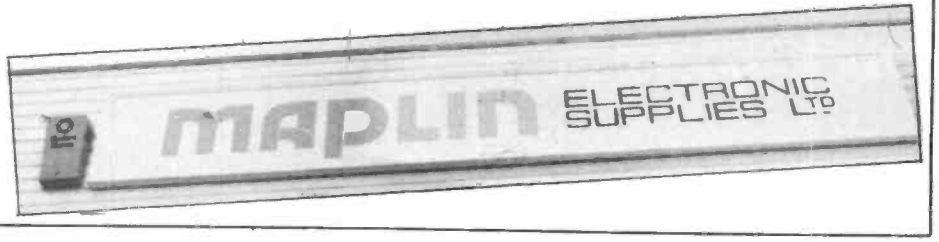
As if to commemorate the move to Hadleigh, Doug Simmonds brought out his penultimate in catalogues - a full 300 pager. The effect of this was both startling and instantaneous: turnover quadrupled and Maplin was taking on staff like there was no tomorrow. Even so, resources were stretched to the limit and despite wholesale overtime, there was still a 14 day backlog of orders. On the retail side, the Hammersmith premises had lived up to all Doug's expectations: such was their success that Maplin opened another shop in Birmingham in 1981 under the care of Keith Evans.

But if 1978 was significant in the Maplin story, 1983 was to prove equally important. In Manchester, Patrick Cooper was put in charge of their new self-service Lancashire shop, while new premises in Southampton were supervised by Ken Miles. Each shop has four to six staff, in addition to the manager, and at every branch there is an electronics specialist to cater for unusual enquiries.

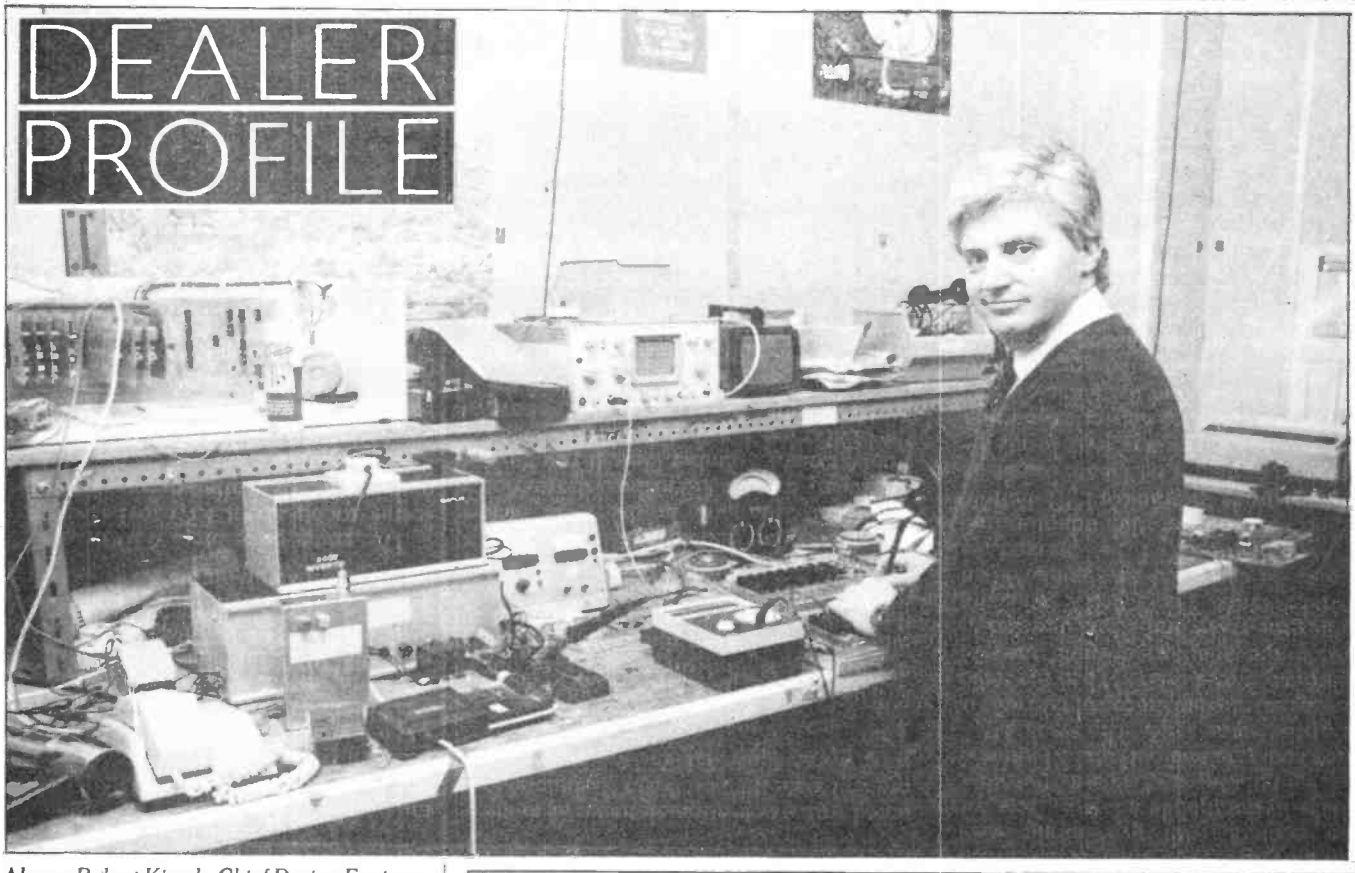
Also, 1983 was the year that Maplin emerged as UK agent for Heathkit - one of their main attractions as far as amateur radio enthusiasts are concerned. It could be argued that putting together a kit of



Top: Maplin's minicomputer: a powerful DEC PDP11/70 system. Below: over 1000 orders a day are fed in via VDUs.



DEALER PROFILE

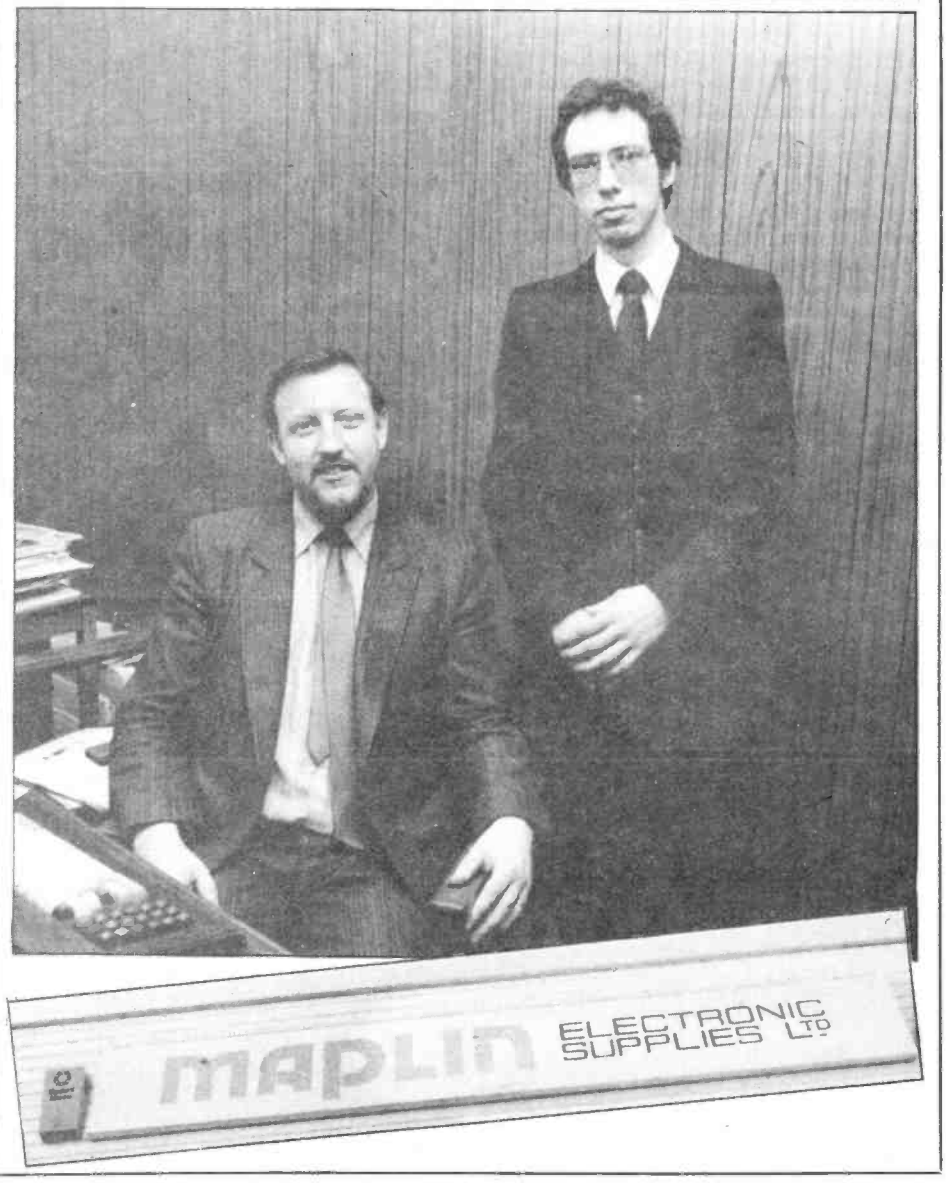


Above: Robert Kirsch, Chief Design Engineer in the laboratory. Right: Roger Allen and Doug Simmons, the two Managing Directors and founders of Maplin.

components to specific (and detailed) instructions is a far cry from building radio gear in the traditional sense, but it does go a long way towards it: coupled with some technical training, the reward of achievement by practical experience must leave many amateurs the better for buying Heathkit. Maplin *does* provide a two-man service department, which irons out the bugs from kits that don't work on completion. If the fault lies in a component, the service is free, but should the defect result from wrong assembly, the repair charge is all down to the customer: it would appear that 90% of faults in home-made equipment are caused by poor soldering. Surprisingly enough, there is no great financial advantage to be found in buying Heathkit as opposed to buying 'off the shelf'.

Large computer

Presumably on the principle of 'do what you do do well' (and certainly better than anybody else!) Doug Simmonds does not envisage any deeper penetration into the radio field. "We set out to sell components by the use of a catalogue, and we have pushed up sales until they are really high. Our market is with the electronic hobbyist". And with a list of over 200,000 customers whose requirements need a large computer and a score of small ones to handle, and which results in an annual turnover of three and a half million pounds, would *you* change horses in mid-stream?



Classified Ads

• **SWOP** Sinclair ZX81, all leads plus some programms, still 7 months warranty, for any receiver capable of SSB, VHF, UHF. Anything considered. Tel. 061 775 1569.

• **DIGITAL** frequency readout module for Yaesu FRG7 receiver, unused with fitting information. £25 or will exchange with Datong AD270 active antenna. Ring Woking (04862) 62671 after 7pm.

• **YAESU** FT480R 2m multimode as new, used as base station only, £290. Yaesu FT780R 70cm multimode used as base station only, £250. Tel. Peter, Chester 311496.

• **MERCURY** Minimeter 1930s collectors' item. Also R1182 receiver. Will go with transmitter. Any reasonable offers, or will swap for 2m home base, mobile, + beam? Top class receiver expandable to transceiver. WHY? Swindon 30535.

• **FOR SALE** Thomas electronic organ and Rollflex TIR camera £475, or exchange for HF TS530S, FT101ZD or similar. Cash adjustment. G6NUZ, Boston (0205) 65209.

• **FOR SALE** Avo universal bridge £15. Lambic keyer £11. Electronic keyer £5.50. 2 Amp PSU £6.50. 30 Amp PSU, fully protected, £40. 5 Amp Variac £6. 27-range multimeter £4. Creed 6/56 reader £4. Pye 2m RX, tunable, £20. Pye 25W 2m TX £20. Pye Vanguard boot mount £7. Speech processor £9. Transformer 240V I/P 1500V O/P 500mA £17. 2kV DC PSU suit 813 linear £20. SEM HF preamp £8. G. Martorano, Melton Mowbray (0664) 500228.

• **EXCHANGE** FT290R, nicads, charger, 3x 5/8 homebase vertical, 12-el Z L special, 6 Amp PSU, FOR BBC computer OR sell £240; D. Whincup, 29 Gorthorpe, Orchard Park, Estate, Hull HU6 9EY. 0482 850850.

• **HELP!** Wanted — circuit diagram for Zetagi model B300P or same for spares. A Green, 25 Riley Ave., Lytham, St. Annes, Lancs.

• **SHARP** MZ80K 48K green screen. Books and newsletters. RTTY, QRA, callbook programs plus games £225. 01 607 1211 evenings.

• **WANTED** Yaesu FR101SD or FR101DD receiver and KW202 receiver. Also handbooks for AR88D, Trio JR101. Please ring Bridgewater (0278) 733017.

• **FOR SALE** Murphy HF/MF receiver 60kHz to 30MHz complete with PSU in very good working condition. £50 ONO buyer collects, anytime. Mr. M. Fisher, 144 Station St., Cheslyn Hay, Nr. Walsall, Staffs.

• **BIRD** 43 Thruline wattmeter. Any elements/frequency inserts wanted. Cash or barter for ex-Army equipment. Also have many bits and pieces for sale 88/31 Set, remote antenna headgear, whips, various leads.

• **COLLINS** KWM380 HF transceiver, general coverage receive, extra CW filters £1500 ONO. Yaesu FT225RD with Mutek board, offers. Trio/Kenwood 2kW linear TL922 £450. Yaesu FT77 £375. Atlas 180/215X. Tel David Cole, 01594 3495 office hours.

• **PANASONIC** DR28 battery/mains receiver IW/MW/VHF-FM broadcast bands, plus 3 SW 3.2MHz to 30.5MHz. Double conversion, digital readout, BFO, brochure, as new, £100 for quick sale. Tel. 01 959 7715.

• **MURPHY B40D** communications receiver, £60, buyer collects. Filmosound projector, excellent order, £90, would exchange for 2m 100W linear. Wanted: Eimac or AEI loctal valve socket for 4CX250B. 0903 66329.

• **WANTED** one copy of Amateur Radio for March 1983. A.K. Henderson, 26 Combe End, Crowborough, East Sussex. Crow 62381.

Classified Ads

• **WANTED** C.R. tube type Thorn-AEI 31/SE5/2A or GEC 1300M. Tel. 0455 272014.

• **WANTED** 3AFP1 scope tube. Also VR139A scope tube. Details to G3NID QTHR, 01 889 4431.

• **IC255E** mobile 2m FM rig. 1 or 25W, 5 memories, scan facility, memories or all band. Rev. repeater etc. Complete with mobile mount, handbook etc. £150 OVNO. Tel. Hull (0482) 859445.

• **EXCHANGE** FT208 handheld mint condition plus cash adjustment for any of the following rigs: KW Argonaut 515, Trio TS700G, Standard C58.

• **REALISTIC** DX300 receiver 0.01-30MHz digital AC/DC excellent general coverage AM/USB/LSB £150. Ring 0734 581481.

• **WANTED** Trio JR310 19.955MHz xtal. Also narrow filter, xtal calibrator for same. Or whole set for spares. Cash deal. Can anyone near me help? Harmer, 9 Park Square, East, Jaywick, Essex CO15 2NL.

• **WANTED** circuit block diagram, Eddystone 770 VHF receiver. Also VCR cassettes in new condition, terminal unit for RTTY operation. G3WVP QTHR (Kent) 01 300 5891.

• **SELLING** Yaesu FRG7 communications RX. Analogue scale readout. No mode. Good condition £125. Prefer buyer collects. Phone stroud (Glos) 6171.

• **FOR SALE** Barlow-Wadley XCR-30 Mark 2 receiver. Range 0-30MHz. AM/SSB. Little used. £60 ONO. D. Carmichael, 25 Old Rectory Gardens, Morchard Bishop, Crediton. Devon. 036 37 369.

• **TRIO** TR7850 45W mobile, as new condition, with back-up nicads, boxed. Also 2m 5/8 whip and 2m 5-ele crossed Yagi £225 ONO. Stevenson GM8KCQ 0698 852349 after 6pm.

• **FOR SALE** Yaesu FT290R mint with original packing, 2.2Ah nicads and charger. Offers please. Tel. Bernard 0538 372917 Leek, Staffs.

• **WAVEMETER** No. 1 Mk. II less case £12; W1649 140-255MHz less xtals, case £25 as seen; ceramic holder 829B with V-testing adaptor, anode clips, £1+56p p&p. SAE list. 16mm optical/magnetic sound projector £25 seen running. Williams, 25 Glenmore Road, Birkenhead, Merseyside L43 2HQ.

• **EXCHANGE** Murphy FM CB base 1500 and Leson DT252A power mic. for realistic DX160 communications receiver or WHY in receivers HF? Mr. Norman Beadsworth, 2 Lapwing Way, Clooney Est., Waterside, Londonderry, N. Ireland.

• **PORTABLE** communication RX Panasonic RF3100IE FM/LW/MW/SW SSB/CW. Mains/battery; 14 months old, cond. as new. Service manual. Accept £135. Tel. Llanbedrog 740477.

• **SPECTRUM ANALYSER** panoramic surveillance receiver. Frequency range 5-1,500MHz continuoisly variable. Cost over £14,000. Excellent cond., full operating instructions. First one with £2,500 gets it. Tel Bagshot (Surrey) 74173.

• **MARCONI** mobile car radio model SV1382A. 55 channel self seeking. Convertible to battery powered portable. Extra in-car control hand set. Two aerials. Tel. 0401 42207.

FOR SALE Icom 720A power supply and ATU plus PD12 rotator and 70m H/D coax. Superscanner. 3-ele fixed beam. All perfect working order, plus much more. What offers? Tel. Dave 01 691 6284.

• **HELP** needed to interface BBC micro to Creed 7B teletype. Ends in 7-pin plug. J. Mercer, 5 Bushey Road, Sutton, Surrey SM1 1QR.

• **FOR SALE** Bencher paddle BY-2 chrome base, solid silver contact points, in mint condition. Phone Burnley (0282) 59320 anytime.

• **WANTED** circuit diagram for CR70A receiver, also circuit diagram and manual for Racal RA17T/18 receiver. Mr. M. Nixon G6YIB, 103 Patrick Street, Grimsby, South Humberside DN32 9PQ.

• **SWAP** collectors item 1935 battery signal generator by General, USA, good. Transformer mains in, 2200V out, about 2kW. Wt. 75lbs. 19-set and PP. Wanted: Avo 160 valve tester. Scope valved-type single or double beam any age... or any test gear or CB bits. A. Keys, Mill Lane Farm, South Somercotes, Louth, Lincs.

• **TRIO** 2300, nicads, charger, soft case, telescopic aerial, rubber duck, car plug, price £110. Postage extra. SRX30 HF communications receiver price £100. Pastage extra. D.J. Thompson, 112 Lexton Drive, Southport PR9 8QW. 0704 20003.

• **YAESU** FT707S 8-band HF solid state TX/RX. Work DXCC without TVI with this super rig in mint cond. Plus, H/B ext. VFO for split freq. operation. £340. pair. Phone evenings 01 578 4484.

• **COMMUNICATIONS** receiver Admiralty B40 640kHz-30MHz USB/LSB/CW/AM 5 bands. 3 bandwidths 8/3.5/1kHz Xtal calibrator, 13 minature valves. £60 buyer collects. Steven Rutherford, 91 The Rundels, Thundersley, Essex. Tel: Rayleigh 778661 after 6pm.

• **FOR SALE** audio generator 20Hz-20kHz £8. Top Band TX £12. Filmosound 16mm 634 projector £75. Plenty of valves, cheap, lists, G8BSK, 190 Priory Road, Southampton SO2 1LS.

• **TEKTRONIX** scopes for sale. Model 581 with dual-trace CA plug-in, model 555 on trolley with CA and B-type plug-ins. Both with service manuals, excellent condition, £225 ONO the two. May separate. M.A. Patterson, 70 Tattersall Gardens, Leigh-on-Sea, Essex. SS9 2QT.

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• **ICOM** 260E mint condition £220. ONO. Also R1000 receiver excellent condition £190. Philip. 031 664 9731.

• **REALISTIC** DX200 communication receiver mint condition, crystal calibrator, 150kHz to 30MHz AM/SSB/CW with owners manual. Boxed. B. Shepperd, 86 Sandcroft, Sutton Hill, Telford, Shropshire TF7 4AD. Phone 588363 between 9 and 10pm.

• **WANTED** telescopic mast at least 40ft. Must be easy up and down, to experiment with 934MHz aerials. N. Childs, Brookwood 2011.

• **WANTED** Drake microphone type heavy duty ceramic desk top model no. 7075. Price details please G3VDU Nuneaton 349461.

• **EXCHANGE** Wavemeter type W1191, needs crystals, plus 1940 to 1980 collection of Wireless World, for a good receiver (beginner). Stuart Wilson, 26 Watson Ave., St. Andrews, Fife.

• **FT101ZD** Mk.III, YM34 microphone, fan, FM board fitted, also spare desk microphone and AM board, eight spare crystals, £500. Also Realstic DX200 communications receiver 0-30MHz many extras, £100. Dave, Lincoln 43642.

• **DATONG** automatic notch filter model ANF with mains power unit model MPU1, cost £74.75, brand new, boxed, instructions, guarantee, £60. Want Drake SCC-4 calibrator, 5NB noise blanker. Trowell, G2HKU, Tel. (0795) 873100.

• **FOR SALE** Trio TS430S 6 months old, genuine reason for sale, £600 no offers. Please phone 0303 873010 anytime.

• **FDK** Multi 11 2m autoscan, toneburst, 10W O/P VHF FM transceiver £100. Earth leakage circuit breaker £10. Brand new 4CX250B valve £25. Paraffin 1kW heater for shack £5. Tel Mick, Milton Keynes 316052.

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• **PANASONIC** DR49 general coverage receiver 1.6-30MHz plus MW/FM/USB/LSB, digital display, mains/battery 12V DC, £150 ONO. J. Simpson, 2 Springfield Close, Eaglescliffe, Cleveland. 0642 783873.

• **R107** receiver, working, complete with original handbook, mains lead. Repainted front panel. £25. Will risk hernia and deliver London postal area. Phone 01 576 1929 (work), 01 340 5398 (home).

• **£20** plus postage offered for Yaesu FRT7700 ATU in mint condition and in original packing. Phone Crewkerne (0460) 75470 evenings.

• **WANTED** 2 handheld transceivers. Must be in good condition. G. Whittle, 13 Balcarres Ave., Mossley Hill, Liverpool 18. 051 734 4848.

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• **FOR SALE** Trio R2000 general coverage receiver, mint condition, purchased May 1985 £300 OVNO. Contact C. Rogers on 031 553 5027 anytime.

• **EXCHANGE** 6 berth trailer tent, fully equipped, beds, cooker, lights etc. for WHY? 70cm or HF equipment or ATV equipment. Tel 061 456 9088 G6XIG.

• **WANTED** Icom IC2E in good or fair condition. Tel. Newcastle (0632) 863044.

• **URGENTLY** wanted: handbook and any other paperwork for Drake SSR-1 communications receiver. Will hire or buy. (0222) 790463 Cardiff. Anytime.

• **WANTED** Grundig Satellit 3400 or other good receiver. Strutt, 26 Fleetwood Avenue, Herne Bay, Kent. Phone 02273 5338.

• **WANTED** AR88D (unmodified) or EC10 good working condition. Can collect. Required for disabled SWL. Phone evenings 0278 73UJ17.

• **REALISTIC** DX200 communications receiver 0.10-30MHz AM/SSB mint condition, boxed, instruction book £75, Buyer collects. Wegg, 23 Kerdane, Dane Park Road, Hull. Tel. 855052.

• **HER INDOORS** orders clearance. Pye Europa LBHP £40, HB £35, UHF £40. W15AM + cbox £20, L470 on 70cm £40. Converters at £15 432-144, 144-28, 116-16. 1296-144. Triplers 144-432, 432-1296 each £15. Preamp MMA144X2 £15. Lowe RXASV1515 £20. Trio 2200GX £60. VFO-30 £30. All ONO, G8HVV QTHR. Cambridge (0203) 812188.

• **FOR SALE** MML144/40 linear amp/preamp 10W in 50W out £48. W2AU 1:1 balun plus 30ft copper wire, new, £10. Ring Terry G4OXD. 0462 35248.

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• **COMPLETE** receiving station Yaesu 7700 with antenna tuner FRT7700 and FRV7700 140 to 170, also Datong Active Antenna as new, £400. Or offers. Woolley, 9 Fenton Close, Osgodby, Scarborough YO11 3QS. Tel. 0723 583381.

• **PYE** pocket phone receivers UHF, less batteries, £3 each. Marconi signal generator model TF1064A, perfect working order, price £65. Discone VHF/UHF antenna suitable for SX200 scanner £10. Phone Burnley (0282) 59320.

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• **WANTED** Trio JR599 circuit diagram. I will refund expenses and return original after copying. Anderson, 44 The Spring, Market Lavington, Devizes, Wiltshire SN10 4EB.

• **WANTED** Trio TS130V with PSU and handbook. Please contact: Mr. C. Booker, 54 Lodge Hill Lane, Chattenden, Nr. Rochester, Kent. ME3 8NR.

• **WANTED** IC AT500 1.8-30MHz auto tuner. Must be in good working order. Please state price. Phone Burnley (0282) 59320 Bart anytime.

• **RESTARTED** SWL wants good homebrew RX, crystal filters etc. Needn't be pretty but must work in all modes 100kHz-30MHz. Ring Tamworth 66974 with price. Will collect.

• **KENWOOD** R1000 communication receiver 0.15-30MHz LSB/USB/AM/AM narrow, digital frequency display, noise blanker, RF att., timer/clock. Excellent cond. Phone Aylesbury 88178. £195.

• **YAESU** FT290, carrying case and strap, 8 Amp power supply, nicads and charger, 5-ele beam, ½-wave vertical omni. 1kW power/SWR meter. £230. Aylesbury (0296) 21612.

• **RTTY** G4BMK transceive program £8. PNP Communications PF1, FP1 TU boards RTTY transmit £18. All for Dragon 32 computer. Tel. Weymouth 786930.

• **WANTED** loop aerial as used with R1155. Phone Doncaster 27915.

• **FOR SALE** radio noise measuring equipment ideal for radio astronomy 30-220MHz £60. Receivers: Eddystone 730/4 £95; Eddystone EC10 £75; Marconi CR150/6 £60. J.A. Bird, 27 Manor Road, Bolehall, Tamworth, Staffs.

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• **WANTED** Lloydtron Pathfinder 12 bands receiver OR Koyo 11 bands receiver or anything similar. Mr. D. Rowe, 178 Ferrar's Road., Trosley, Sheffield S9 18A.

• **LINER 2** with preamp, instruction book, large circuit diagram £55. MML144/50 linear as new £55. G4UXM Stroud, Glos. Brimscombe 882570.

• **SELLING** TR2300, VB2300, MB2 mounting, MEX55 boom mic, Valor magmount, Azden speaker, Packer ATU, carry case, RAI antenna VGC 9212, Use mobile or portable. Patrick, Soith Wootton, King's Lynn, Norfolk. PE30 3TD.

• **WANTED** Icom ICR70 receiver, Bearcat 220 FB scanner, both must be mint, reasonable. Collicott, 10 Tor Road, Hartley, Plymouth, Devon. Plymouth (0752) 777777.

• **WANTED** RA17L adaptor RA63. Also ex-WD RX non-workers, HRC, 348, CR100, 1155, AR77, Redifon etc., reasonable prices paid. Sell model beam engine, all brass, circa 1870. £350. 0908 314095 after 3pm.

• **ICOM** R70 receiver with FM board fitted, excellent cond., trial invited. Buyer collects. £400, no offers. 0632 673507 Newcastle-on-Tyne.

• **FOR SALE** or swap Heathkit HW12 80m SSB transceiver +HW32A 20m SSB transceiver and power supply. Wanted: 28 to 144MHz transverter SSB, or 144MHz SSB transceiver. Tel: 0770 2515 or Write: J. Park. 17 Brathwic Place, Brodick, Isle of Arran. KA27 8BN.

• **YAESU** FT101ZD with cooling fan and mike and FT707 ATU. £550. Tel. Sittingbourne (0795) 74701.

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• **YAESU** FRG7700, FRT7700, ATUm FRV7700 converter model E, £275. Chichester 788075.

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• **FT290R** all mods, working but needs attention. Offers? Mr. C. Hawkes, Lindham, College Rise, Maidenhead, Berkshire.

• **FOR SALE** Trio TS130S, as new condition, 200W PEP version of this excellent transceiver. Telephone Ken G4RPV after 6 o'clock on 021 459 7041.

• **SALE** Eddystone 830/7 with spare set new valves, little used, as new £250. Eddystone EC10 Mk.II new condition, battery or mains, and telescopic aerial £100. 01 394 1971.

• **WANTED** manual for Avo electronic testmeter No. 866-448 (ACWEECO). Wanted manual for Geloso 209G. Wanted manual for Mullard valve tester type E7600/4 (card index type). D. Bean, 0405 60754.

• **EXCHANGE** FT290R, nicads, charger, case, plus new TR2400, nicads, charger, case, belt clip, boxed, FOR good IC251E. OR exchange for TS430S. Have cash adjustment or swop TR2400 and accessories for Belcom LS102L. T. Waters, 42 Tregundy Road, Perranporth, Cornwall.

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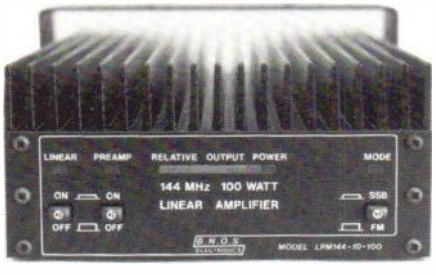

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