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ICOM IC-751A
ICOM IC-735
ICOM IC-775
ICOM IC-9700

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2Gigahertz coverage, Magnificent is the word for it

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ICOM IC-270 25W
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ICOM IC-290 25W
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MESFETs are fast becoming important in microwave technology. They are finding their way into new pieces of equipment because of the advantages which they offer. They are still expensive, but in common with other newly exploited technologies their price should fall.

What Are They?
MESFETs are like conventional fets in many respects: they have a drain, source, gate channel and so forth. However, they have distinguishing features as shown in Fig. 1.

The channel is very thin, normally between 0.1 and 0.35 microns. This is set on a semi-insulating buffer layer, on top of the substrate. The gate is made by depositing metal, usually vapourised aluminium, directly onto the channel, giving a Schottky diode which is reversed biased for operation. It is the metal deposited directly onto the channel which gives the mesfet its name: MEtal Semiconductor Field Effect Transistor.

Many of the outstanding characteristics of the mesfet are a result of the gate junction structure, which enables the gate length to be made very small, often less than 1 micron. This gives excellent characteristics at very high frequencies.

Apart from the gate the channel is also very important. Normally the channel will be made of N-type material because the operation of the device is dependent on the mobility of the majority carriers — free electrons are much more mobile than holes. This means that P type material which has holes as the majority carriers cannot be used. Silicon or gallium arsenide is used because of its high electron mobility. Unfortunately it is difficult to use and expensive.

In order to manufacture mesfets the latest technology has to be used. The very small dimensions and the high levels of accuracy which are required means that electron beam lithography is used to manufacture mesfets. This inevitably increases the cost considerably.

What Can They Do?
As a result of the very short gate lengths it is possible for mesfets to outperform more conventional technologies easily. Their high frequencies and low noise figures have been a revolution in the microwave semiconductor field. They are now used in many low noise amplifiers for microwave links and for satellite broadcast and communication systems.

Their impressive noise performance in particular has created interest. Figures of 2.5 dB have been obtained in the lab at 25 GHz and 1.5 dB at 15 GHz. Commercially available devices are now available to give better than 0.5 dB at around 4 GHz, but these cost £10 or more.

Frequency response is also impressive. Devices operating up to 40 GHz are available, which is in itself a great achievement. On top of this it is rumoured that some devices can operate at up to 76 GHz, and much higher frequencies are on the horizon.
Not only are people content with single gate mesfets, but there are also dual gate versions available. These offer several advantages: one is that circuits using them can be stabilised more easily because the extra gate reduces the feedback between the drain and the signal gate. As a result designing and manufacturing equipment using these devices becomes much easier.

Mesfets also lend themselves to power applications. Currently there are devices which can develop 5 watts of RF at 10 GHz, performance figures which cannot be met by any other form of semiconductor device.

**Using Mesfets**

If you can afford to use these devices it pays to be careful with them. Gate currents must be avoided at all costs; even very small amounts of gate current will produce enormous current densities in the gate. Almost any forward current will mean instant death to the device.

Gate currents can be avoided in a number of ways. The first is to ensure that under no circumstances does the bias network allow the gate to become forward biased. Another is to ensure that static precautions are observed when installing the devices onto boards, because static discharges will destroy the gate.

These devices offer such a good performance for microwave applications that they bound to be used in much greater numbers.

**Hemts**

HEMTs (high electron mobility transistors) are an exciting development. They are a breakthrough in transistor technology giving an unparalleled performance in low noise amplifiers at microwave frequencies. It is only now that this technology is being introduced even though they were first produced in 1978, because they were originally thought to be of little use and they were treated with scepticism.

**What are Hemts?**

A hemt is very similar to a mesfet. However, owing to small difference in the way they are fabricated their mode of operation is different. This allows a vast improvement in noise performance.

A typical hemt device has a fairly complicated structure, but its operation is similar to that of a normal mosfet. Essentially what happens is that the control voltage on the gate modulates the number of carriers in the channel, while the channel thickness remains constant. The secret of the performance of the hemt is in the thickness of the channel. It is only about 150 Å (1.5 x 10⁻⁸ metres). As a result of this incredibly narrow channel the electrons find that they can only move in two dimensions. In normal fets where the channel is much thicker the electrons move in all three dimensions.

The exact reason for the exceptional performance of the hemt is not yet known. There are links between the properties which determine noise figure and electron flow in a two dimensional flow rather than a three dimensional one.

**Performance**

The noise performance of hemt devices operating at frequencies of 10 GHz and beyond is impressive. As far back as 1981 a noise figure of 2.3 dB was being reported at 10 GHz and this was with a gain of 10 dB! As time has passed rapid improvements have been made. Noise figures have been reduced also top frequencies have been raised pushing the top limits up to 50 GHz. It is also known that work is progressing into producing very low noise amplifiers using hemts working at frequencies up to 100 GHz and beyond. However, much work remains to be done before they become viable.

Other work to further improve hemt noise performance has been done by cooling them. By reducing the temperature to around -200°C the noise figures of complete amplifiers have dropped to well below 2 dB at frequencies up to 40 GHz. Figures like these mean that it is almost impossible for any other semiconductor technology to come near the hemt, let alone surpass it for noise performance.

Not only are the possibilities of microwave amplifiers being explored, but also low frequencies ones. Accordingly the ultra low noise characteristics of hemts are being put to good use here as well.

The potential for hemts is phenomenal. Unfortunately their cost currently matches the performance. Nevertheless as development proceeds and the devices are used more often the prices are bound to fall. This may bring them into the reach of the average radio amateur. How about a hemt preamp for your state of the art 2 metre or 70 cm preamp.
Navico & Co.

British tranceiver manufacturers Navico have awarded a dealership to ADITI Communications of Horstpierrpoint, Sussex. Navico builds its equipment in Kent and currently has southern dealers in London, Portsmouth and Margate.

ADITI stocks the popular AMR1000 and AMR1000S 2m mobiles for £247 and £299 respectively, with optional telephone handsets.

ADITI, ceremonially opened earlier in the year by Euro MP for West Sussex Madron Seligman, also sells rigs, scanners, aerials, mast and associated fixings, power supplies, cable and connectors and publications. The company offers savings plan options and easy payment terms, a regular newsletter, free local deliveries and parking, and opens regular office hours plus Wednesday evenings till 8, Saturdays 9-5 and Sunday mornings. The village is on the A23 near Brighton, and is said to have "a fine range of specialist shops and hostleries".

No definite news on mail order yet, so contact the shop on 0273 833311 with any queries. They have a musical telephone, but it's not too bad. Good luck to ADITI, who can be found at 46 High St., Horstpierrpoint, Sussex.

10m - Here Is The News

The publication of a DTI Authority in London, Edinburgh and Belfast Gazettes (in line with legal requirements) on 17 February 1989 has cleared up — to an extent — the doubt and uncertainty about radio amateurs’ right to build, convert and own single-band 10m transceivers within the law as it relates to amateur and CB equipment.

Legislation in August 1988 which made it suddenly, it seemed to many amateurs and dealers — illegal to construct or convert any equipment for single-band 28MHz operation without specific written permission from the DTI to the amateur concerned, threw up all manner of fear and consternation, from the confiscation of rigs imported (possibly erroneously) as legal amateur rigs to fears that this was the first step towards restricting the right of amateurs to build or convert legal equipment within the terms of the licence.

The DTI has apparently been working on a means of removing the 10m ban from amateurs after protests from amateur bodies, particularly the RSGB, resulting in the Authority published in February.

The published authority reads:

Authority given under Section 7 of the Wireless Telegraphy Act 1967:

Whereas: A) the manufacture (including construction by any method and the assembly of component parts) of certain wireless telegraphy apparatus is restricted by the Wireless Telegraphy (Citizens Band and Amateur Apparatus) (Various Provisions) Order 1988 (a) (the “Order”); and B) the Secretary of State is satisfied that this Authority and the terms and conditions attached to it are compatible with the international obligations of the United Kingdom;

Now therefore

1. The Secretary of State, in exercise of the powers conferred on him by Section 7 of the Wireless Telegraphy Act 1967 (c. 72), gives his authority to any person holding a valid Amateur Radio Licence (A) or (B) issued to him ("a licensed amateur") to:

(a) manufacture wireless telegraphy apparatus designed to operate in the frequency band 28 to 29.7 MHz and no other frequency band; or,

(b) convert or adapt CB apparatus which complies with the requirements of article 3 of the Order in order to enable it to transmit messages in the frequency band 28 to 29.7 MHz and in no other frequency band, subject to the terms and conditions specified in paragraphs 2, 3 and 4.

2. The apparatus shall not be manufactured, converted or adapted for any commercial purpose or in the course of any business.

3. The manufactured, converted or adapted apparatus shall be intended for use by the licensed
amateur who manufactured, converted or adapted it (as the case may be) under and in accordance with his Amateur Radio Licence (A) or (B).

4. This Authority shall remain in force until it is revoked by the Secretary of State with or without notice.

5. Words and expressions used in this Authority shall have the same meaning as they have in the Order.

6. The Interpretation Act 1978 shall apply for the purposes of interpreting this Authority as if it were an Act of Parliament.

Signed: M.V. Coolican on behalf of the Secretary of State for Trade and Industry.

Date of issue: 9 February 1989 (a) S/I/1988/1215.

Explanatory Note (This Note is not part of the Authority).


This Authority allows the manufacture of such apparatus and conversion and adaptation of CB apparatus which falls within the purview of MPT 1320 or MPT 1333 to operate on the frequency band 28 to 19.7MHz by licensed radio amateurs on a non-commercial basis. The Authority only covers manufacture, conversion and adaptation of apparatus by a licensed amateur for the purpose of use by him under and in accordance with the terms of his Amateur Radio Licence.

Those persons wishing to carry out manufacture or conversions as part of their business must first apply for (and be granted) an individual authority to manufacture or convert under Section 7 of the Wireless Telegraphy Act 1967 by Writing to the Department of Trade and Industry, Radiocommunications Division, Room 102, Waterloo Bridge House, Waterloo Road, London SE1 8UA. Such authority may be granted by the Secretary of State at his discretion.

The single main import of this Authority is that licensed radio amateurs are no longer breaking the law by constructing, owning or using single-band 10m (that is, 28 to 29.7MHz) transmitting equipment, PROVIDED that the equipment is for that amateur’s own use, provided that it is not bought or sold, provided that conversion does not involve an illegal CB set, and, so far as we understand the above text and previous information received, provided that, if a legal CB set is used for conversion to 10m, it no longer functions even on legal CB bands after conversion, as the combined functions would mean that it no longer conformed either to legal CB specifications.

This certainly means that many types of set which would be ideal for conversion to legitimate amateur use on 10m are not available — without special permission, which is not likely to be forthcoming for illegal types of CB radio — for such conversion, even for licensed, private use.

Equipment like the popular Uniden 2830 is not legitimised by this Authority. Indeed, we understand from Uniden that, now that their position in relation to the legislation of last August is clear, that they have withdrawn the 2830 from sale in the UK. As Uniden act as their own sole importers, and Raycom are their sole UK dealership, any new 2830s now purchased in the UK are (apart from being illegal) effectively unbacked by any warranty. Uniden have previously sold the 2830 as an amateur radio, keeping a log of all serial numbers sold. They say that they are unable even to accept for repair sets which they have not previously logged.

Present owners of 2830s and similar sets are required to seek individual permission to own and operate the sets from the DTI at the address given.

Both Uniden and Raycom have complained that last August’s legislation came as a complete surprise to them — Uniden apparently did not even know of changes at the time, a position which has been acknowledged by the DTI.

Readers who were taken by surprise both by the August legislation and by the new Authority given above will be surprised and doubtless amused to hear that Ham Radio Today received no press information about the latter changes.

Imagining that something might have got lost in the post, we made enquiry, to find that none of the radio press had been informed. “We may have made a mistake here,” said a spokesman apologetically. Radcom — the RSGB initiated and were closely involved in formulating the new Authority — was the first to print details of the Authority.

The Gazettes, of course, can be obtained at main libraries — but how many amateurs have time to spend time leafing through every day’s Gazettes looking for legislation which might affect them?

Howsoever, one of the avowed aims of the DTI is to discourage the supply of non-compliant CB sets at source — and this seems to be amply embodied in the terms of the Authority.

HRT — and, judging by our correspondence, its readers — feel that there are areas which need clarifying. To this end, we are going to assemble a list of questions to submit to the DTI in the hope of getting such clarification. If you have any questions, please send them to us, and we will collate them into our document. We can’t advise on the status of any specific model, although we will get information where we can. Please mark your envelopes ‘10m questions’ and keep them separate from other correspondence.

Low Power Unlicensed

Certain low-power radio devices no longer require licensing after a move by the DTI to abolish certain licenses from the first of May 1989.

These include garage door openers, children’s handhelds, some burglar alarms, industrial remote control gear, radio microphones and low power microwave devices.

The intention is clearly to allow trade and industry more scope for using radio control without costly and time-consuming licensing arrangements. Receive-only equipment, including — surprise — tv satellite receivers, were exempted in February 1989. Exempted items will still need to be type-approved. We’ll have some more details next month.
Travel To The Calf

The Isle of Man ARS is again setting up a station on the Calf of Man, a small island half a kilometre southwest of Man. The club will be going to the Calf, a bird sanctuary, on Friday July 7 and returning on Sunday July 9. Operation will be on 20m 14.250, 15m 21.250 and 10m 28.525 SSB, 2m and 70cm, and possibly 4m, 6m and 23cm. Contacts made count towards the Golf Delta award.

RSGB Quit NEC

The RSGB will not be holding show at the National Exhibition Centre in Birmingham this year. Instead, it will centre its operations on the annual Mobile Rally at Woburn House on August 6th.

The reason for abandoning the NEC appears to be cost. An RSGB representative told Ham Radio that the NEC show was successful but ‘astronomically expensive’ for everybody concerned.

Traders have also expressed unhappiness at the cost of stands and facilities at the NEC in the past.

The NEC’s central location with good road and rail links is an advantage, but the only accommodation for overnight stay nearby is a five-star hotel, which is not felt to be an appropriate outlay by many amateurs. ‘It’s nice if you can set if off against corporation tax,’ said the gentleman from the exhibitions department, ‘but we are a club.’ Not much help to most of the visitors, either. Not everybody’s mother-in-law living nearby.

‘We are going to concentrate on Woburn and the main conventions,’ said the gentleman at the exhibition department. ‘We will probably have our regional liaison officers to represent us at the local shows. Liaising with the regions is their function, after all.’ HRT was at the NEC show last year, but subsequent concern about mounting cost kept out stand away from the Leicester radio show. This is felt to have been a grave mistake by the current editorial and ad. departments, who visited Leicester ‘on the hoof’, and we hope that HRT will be at both Woburn and Leicester this year.

Components

SCS Components has issued its first UK mail order catalogue. Costing 50p, the catalogue is not a specialist radio catalogue, but contains a good range of general components, including boxes and hardware, batteries and accessories, switches, pcb making equipment, connectors, cables and discrete components. For more details contact SCS Components at 218 Portland Road., Hove, E. Sussex BN3 5QT, tel. 0273 770191, fax 0273 23077.

Cirkit have introduced two more Toko filters to their range: the THB277A 300 Hz to 3kHz bandpass filter and op amp, and the THB227 300 Hz - 3kHz bandpass, 3kHz lowpass and op amp. Both are hybrids. Information from Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ. 0992 444111.

PRO Scanner Arrives

Selectronic kindly informs us that they are now stocking the new Realistic 400-channel programmable PRO-2005 scanner. Operating on 25-520 MHz and 760-1300 MHz, the receiver can access CB and amateur bands, airbands, FM broadcast and others. Receive frequency intervals give a choice of 5, 12.5 or 50kHz, with wide and narrow FM and AM receive modes, 40 channel by 100 monitor channel operation, and fast and slow scanning. HRT will be reviewing this one very shortly — indeed, the reviews department is looking excited already.

Selectronic are at 203 High St., Canvey Island, Essex SS8 7RN, Tel. 0268 691481.
Awards

The Civil Service ARS has launched a new award. The award is open to all amateurs and SWLs and revolves around contacts with CSARS members and call signs over different path lengths. There are Gold, Silver and Standard awards. For full details, send an SAE to the Awards Manager, Civil Service Amateur Radio Society, Civil Service Recreation Centre, Monck St., London SW1P 2BL.

The Northampton RC has established the 800 Award as part of the 800th anniversary of the granting of Northampton's Charter by Richard 1st (The Lion Heart). Special event station GB8 OO will be in operation throughout the year, and NRC will be calling other Northamptons throughout the world on the anniversary date in November.

For details of the 800 Award, contact Northampton Radio Club, c/o D J Linell G7CMA, 19 Beech Av., Northampton NN3 2HE with an SAE. The Award is open for contacts from 1 March 1989 to 1 January 1990.

Willenhall DARC is establishing the Key Award with gold, silver and bronze levels. To qualify you QSL with other UK radio stations and check the telephone STD code, such as 01 for London, 0442 for Hemel Hempstead and so on. 300 different codes plus three Willenhall ARS members get the gold award, 150 plus two Willenhall members get the silver and 75 codes plus one Willenhall member gets the bronze.

SWLs can apply by submitting logs indicating that they have heard UK amateurs participating in this award scheme, including the Willenhall club call sign G4ETW. Same numbers apply. Transmission modes AM, FM, SSB, CW, RTTY, real time packet. Send certified logs with a fee of £1 to the QSL manager, Willenhall DARC, PO Box 252, Willenhall, W. Midlands, from July 15 1989.

New Irish Beacon

The South Eastern Amateur Radio Group have announced that the first 70cm beacon in EI is operational. It is located, with the Group's 2m beacon, at Port-tional. It is located, with the announced that the first Amateur Radio Group have SW1P 2BL.

Centre, Monck St., London Civil Amateur Radio Society, send an SAE to the Awards awards. For Gold, Silver and Standard path lengths. There are with CSARS members and revolve around contacts with amateurs participating in this award scheme, including the Willenhall club call sign G4ETW. Same numbers apply. Transmission modes AM, FM, SSB, CW, RTTY, real time packet. Send certified logs with a fee of £1 to the QSL manager, Willenhall DARC, PO Box 252, Willenhall, W. Midlands, from July 15 1989.

Corrigenda

John Worthington, author of the Pye West-sterling, four International Reply Coupons, or three xUS$ bills, postage inclusive. The 24-page, stapled A5 publication is arranged in frequency order, and lists all the national, local and regional long, medium and VHF/FM transmitters in the UK for both BBC and IBA. Entries give station details including transmitter power and locations, and are cross-referenced to help identification and show channels operating in parallel.

The booklet lists the postal addresses and phone numbers of each station, with background information, reception reports and details of any major changes planned in the UK broadcasting structures from 1990.

A useful publication for DXers and SWLs, as well as tourists travelling around the UK. Radio Stations in the United Kingdom is available from the British DX Club, 54 Birkhall Rd., Catford, London SE6 1TE.

Harrow

The May/June/July issue of QZZ, the magazine of the Harrow RS, contains club and competition news, VHF reports and a letter from a gremlin. 8pp A4 corner-stapled. Radio Society of Harrow meets 8pm at Harrow Arts Centre, Uxbridge Rd., Hatch End on Fridays.

Television

The British Amateur Television Club's latest publication, The ATV Compendium, is now out, priced £3.50. Mainly technical articles, the 104-page, beautifully-produced A5 booklet with glossy cover is of interest to all amateur TV operators and enthusiasts. This should keep you occupied for the rest of the year, with some over for next year. Order from BATC Publications, 14 Lilac Av., Leicester LE5 1FN. Membership is £6 a year, on application to The Membership Secretary, Greenehurst, Pinewood Rd., High Wycombe, Bucks HP12 4DD.

Paper Round

The 18th edition of the British DX Club's publication Radio Stations in the United Kingdom is now out, priced £1.20
These new models from ICOM add a new dimension to the mobile scene. Enjoy the freedom of the open road and experience the advantages of simultaneous dual-band operation.

They are capable of receiving on both MAIN and SUB bands at the same time. While operating on one band, you can monitor a second band for activity. It is very easy to switch between the MAIN and SUB bands allowing you to reply immediately to calls received on either bands.

Full duplex operation lets you transmit on one band while receiving on the other for telephone style contacts. Each band can be independently regulated using separate volume and squelch controls.

Both models incorporate 20 memory channels and a call channel for each band, these memory channels store all the information needed for repeater operation.

For 23cms operation the IC-2500 features an AFC function which automatically tunes the receive frequency to the transmit station frequency. The AFC function eliminates the need to retune if a station's transmit frequency is off centre.
The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attenuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 desk microphone and SP3 external loudspeaker.
Letter of the Month

I recently came across a reference to EMC (electromagnetic compatibility) requirements due to be introduced by the EEC. Apparently any electronic or electrical equipment must have a specified immunity to external electrical interference, and not radiate interference above a certain level. I also read that one piece of equipment cost one million pounds to test. Will this prevent amateur radio construction? Or, will the regulations mean an end to any details that were available.

Some problems could be caused, however. The regulations are due to come into force on Jan 1st 1991, but they have not yet been issued. When they are issued there will be limited time to test equipment, and there may be delays before new (or currently available) equipment can be released for sale. The other problem could be that, faced with telephone number testing fees, smaller amateur radio suppliers will either close down, or take the risk of assuming that equipment meets the specification, and be fined into bankruptcy. Hopefully there will be some specific provision to avoid this — we must wait and see.

— A J McNab, Milton Keynes

Radio Silence In Paradise

Early last year I decided to have an exotic holiday in the Maldives, a group of islands which, on a map, look like a spray of ink, just south west of India.

First I rang the reciprocal licensing department at RSGB. "Maldives? Where's that, then?", said a lady at the department at RSGB. "Maldives? I read that one piece of equipment cost one million pounds to test. Will this prevent amateur radio construction? Or, will the regulations mean an end to exotic holiday in the Maldives, a group of islands which, on a map, look like a

My initial response was rather disappointing. I was told that there was no formal reciprocal agreement, although she would send any details that were available. A week later a letter arrived saying that I should write to the Department of Posts and Telecommunications on Mate — the capital island — which I did. I received a letter from the Deputy Director at the DOPAT saying that I should report to his office on arrival in the Maldives, and a licence would be issued. "Simple", I thought. So there I was, one Thursday in September, voyaging from Bardos (approximately 800 yds long and the same wide; less than a mile across). When we got there, I walked into a bazaar area that reminded me of a James Bond scene in dusty Cairo. I had no idea where the DOPAT was, as the letter had no address on it. I headed towards a tall lattice mast, and within a few minutes I saw that it belonged to the Cable and Wireless station.

I headed back to the quayside and found the Post Office. I asked a man at the counter. He looked at my letter and said I should ask a policeman. At last I had found someone who knew where I wanted to go.

I eventually found the building. An employee was gazing across the town from a balcony about 30 feet above me. I climbed a couple of steps only to find the doors locked. I went back outside and shouted up, saying "Amateur radio... a licence". He appeared a few moments later at a side door. I showed him my letter. "Can you issue me with a licence?" I asked. He nodded. "Can it be done quickly, as I have to go back to Bardos at 5 o'clock?" "Hold on", he said, and dashed away. Moments later he returned with another man, who said "I am afraid this department is closed at the moment. Can you come back tomorrow?". I said that I would, knowing I wouldn't be able to.

Maybe I will return another day and activate 8Q7GB (the authorities seem to issue the last two letters of your callsign prefixed by 8Q7) but at least I will know which mast to look for next time.

— Mark Rogers G4RGB, Wigmore, Gillingham.

In lands where everything is manana, you have to arrive yesterday so that you can arrange tomorrow for today. Or try bribery. Or go sit in the sun and have a long, cold drink.

£10 FOR THE LETTER OF THE MONTH

You’ve got a gripe about the bandplans, or your’re sick of being wiped out by next door’s microwave. Or maybe you’ve been bowled over by the excellent service from your local radio shop.

Whatever you’ve got to say about amateur radio say it here in the letters column and you could win yourself £10 for writing the letter of the month.

Sent your epistles to: Letters Column, Ham Radio Today, ASP Ltd, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST.
Use Your Guide

Please could you send me a list of amateur radio clubs for my area, which is west and north London. I would like a club with some equipment and one that gives help with morse.

— H E Dadack, Southall, Middx.

All the ARCs we know about at present are listed monthly in Radio Tomorrow with a precis of their activities. I gather Loughton DARC is well-organised and active. If Loughton is too far for you to travel, try ringing round some of the others and asking for details. We can't fit everything they tell us into our pages, but we try to give a fair taster and a contact number.

— HPA.

Europa to Packet

Further to C4HCL's article on the Pye Europa conversion, there is an important point omitted which concerns its conversion for packet radio. Neither of the Europa's speaker leads is connected to chassis, and they must not be grounded, otherwise damage to IC 3 in the power amp and other components will result.

Therefore instead of the usual connection from radio to tnc in respect of the RX audio, I suggest that a 1:1 coupling transformer be inserted in thespeaker leads as in the attached sketch. These connections are shown using a MFJ 1278 data controller as tnc.

— D T Steer G8LER, Mannamead, Plymouth.

All That Work...

G4XPP's letter in your May edition stimulated me to write to you. It took me two years and several examinations to pass my 8wpm to 12. True, I do not use it very much now. I concentrate on getting new members to concentrate on their voice procedure. I enclose part of a letter I sent to a new packet operator in South America. It may interest you.

I only started Ham Radio Today eight months ago, but have had my Wireless World since 1923.

(Herein follows the extract from the letter.)

"May I pass on some excellent advice given me many years ago by a mercantile marine 'sparks' (ship's radio operator) when I was 'bones' (ship's doctor): 'Try to emulate professional quality by having clean, clear signals, good voice procedure and courteous technique. Keep the apparatus in tip top condition, especially the joints. Keep signals short, giving callsigns, keeping within allotted frequencies and avoiding adjacent interference (splatter). Give honest reports. Avoid working amateurs who violate good principles. SWLs and pirates often progress and become good amateurs — encourage them by your example.'

(And many another wise saw of advice both from the ancient sparks, and Jack, promoting clarity and lambasting band-cloggers and time-wastrels.)

"Best regards from a Greybeard who started with a coherer in 1918."

— Jack Swanston GM3ZVF, Kirkaldy, Fife.

Couldn't agree more about the courtesy and the joints. Not so sure about the subsequent advice to avoid gossips and groups. There must be something to occupy us between DX reports and emergencies. Rag-chewers, um, well, maybe. Gas-bags, granted. Greybeard though he be, Jack shows that he is still working on bringing the old traditions band up to date — he calls me Ms Armstrong instead of Sir.

Incidentally, wave if you noticed that the new editor of Electronics and Wireless World is Frank Ogden G4JST, who launched Ham Radio Today back in 1982. Today, Ham Radio — tomorrow, the World.
Several amateurs have had FM phone QSOs with astronauts aboard the Russian MIR space station, now busily trying to keep up again now the Americans are planning to place an Amateur Radio station aboard their facility that exists on Worli bulletin board stations.

This is an intelligent 'server' that collects data related to callsigns and answers queries using that data. The data is collected from WP messages and transiting the MailBox, message headers, and logged in users, so be careful, your messages are being noted! Callsigns are kept in three different classes:

1) users that have logged in to your local BBS
2) other BBSs that have been noticed in message headers
3) users of other BBSs seen in WP Update messages

The data collected on each call is: callsign, home BBS, zip code (normally entered as the QTH locator), name and QTH. A WP query is simply a message addressed to WP entered on your local Worli type BBS. Each line of the message is the callsign, a space, and a question mark. WP returns a line containing all information about that callsign. So, if you’re not too sure which of the Worli network BBSs in your areas is the ‘home’ BBS used by your friend G9XYZ, all you need to do is log into your local ‘box’ and find out. A shortened form with the use of the ‘P’ command may be used for local requests, by entering ‘P G9XYZ’ or whatever. The BBS will reply with a single line giving the information as entered by him when he first logged into his local BBS. Remember those requests for you to enter your name, QYH, QTH locator, and home BBS? Well they do serve a purpose. A further method is to send a message to ‘WP’ entered in on your local BBS, which where appropriate will be forwarded to a distant server to provide information on stations not known at your local BBS. Let’s give an example.

I log into my local BBS, GB7XJZ, and send a message to WP by entering ‘S WP’ followed by a carriage return. The ‘Subject’ prompt need not have anything entered apart from a carriage return, then in the message field I enter the following, ending in a ‘/EX’ as usual to terminate the message:

```
G4AEU?
G1JAF?
G3PLX?
G6OLK?
G8HWF?
/EX
```

The BBS will return a message to me:

```
Reading this gives:
Date: 14 May 89 20:12
Message-ID: <3410@GB7XJZ>
From: WP@GB7XJZ
To: G4HCL@GB7XJZ
Subject: WP Reply

On 890514 G4AEU @ GB7AEU zip 1090HV Malcolm Southampton
On 890509 G1JAF @ GB7KCM zip 1090GT Tony BEAULIEU
On 890507 G3PLX @ G3PLX zip 1090 Peter AM/PK GWAY ON 14076 kHz
On 890514 G6OLK @ GB7XJZ zip 1090IV Frank Hedge end
On 890513 H8HWF @ GB7KCM zip 1090Dave Southampton
```

From this one can tell where to send any messages to, as well as please mention HRT when replying to advertisements
Of course — a lot of the younger amateurs don't even remember steam radio.

other gems of information, clever eh?
I wonder if amateur communication is covered by the data protection act?.....

6m Packet
As we approach another sunspot maximum, an ideal opportunity presents itself in worldwide communication on 6m. As well as having DX contacts, the very nature of packet radio with its automatic beacon and ID packets together with in-built logging operations lends itself nicely to providing useful propagation experiments without the need for constant supervised operation. You may for instance like to leave your rig and TNC monitoring 50.400MHz FM, where ZS6SE (South Africa) may be found, the path to ZS from the UK being open most days around lunch time. Thanks to Etienne ZS6SE for the info, you can send him a message for skeds of reports etc. addressed to ZS6SE @ ZR6ADO.

End of Message — CTRL-Z
That’s all for this month. Next month I’ll provide a bit of information regarding forwarding and reverse forwarding between your local BBS and the personal message store residing in many TNCs. Please keep the information coming, remember it’s a two-way system, I’m always happy to give a mention to the activities of various groups. I can be reached via packet with a message routed to G4HCL @ GB7XJZ, or via Prestel Mailbox 011138096. If you prefer pen and ink, then letters addressed to Chris Lorek, c/o HRT Magazine at the editorial address will also get to me, but please note that my callbook address is not correct. Till next month, 73 de G4HCL.

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Up The Tower

Chris Lorek G4HCL to the dark tower came, and upped his odds!

It's the piece of radio equipment that many amateurs dream about, a nice wind-up tilt-over tower adorned with aerials to beautify their back garden and make them the envy of local amateurs! Well, that's the theory, and it is often said that beauty is in the eye of the beholder! But several years ago, after getting fed up with climbing ladders and getting active with the masonry drill into the side of the house to put yet another aerial pole up, I eventually decided to splash out on one of these 'amateur dreams'.

The advantages are many, of course, as I told the XYL. Rather than having the aerials permanently erected out of the reach of easy maintenance, and up there all the time even when they're not being used, a tilt-over tower lets you lower them down with ease. All maintenance, aerial changes, mast-head pre-amp additions and the like can be performed at ground level. Whenever the aerials are not in everyday use you may (works well with the local council, as it did in my case) even bring them all down below the ridge height of your roof to keep the neighbourhood beautiful.

Choose Carefully

My first tower was a 30ft three-section lattice job made by a firm in the north-east of England. The first strong wind snapped the head unit completely off the retracted tower, causing around £500 worth of damage to the aerials and rotator. More seriously, my wife was in the garden at the time, around 10m away from the system when it came tumbling down. When examined, rust within the snapped weld revealed all — oh dear. The supplier certainly knew my feelings about his manufacturing! As I was due to move house shortly, I decided the next tower I purchased would be from a reputable and carefully chosen manufacturer.

Offerings

I had previously had lengthy discussions with the engineering firm of Allweld, and I was very pleased with their AQ-620 compact HF yagi which I had in use with very good results (having previously used a loaned 'MH' minibeam). With this in mind, it was almost a natural choice when they sent me one of their tower catalogues — into my pocket I dug! I settled on the D444 three section 13.4m (44ft) high model, and eagerly awaited its arrival. Being slightly nomadic, moving house five times in eight years and having to leave the concrete-encased ground post at the last QTH (described as a 'Rotary Clothes Line Support' — I pity the new owner if they try to get it out!), I decided this time to plan ahead. Happily the manufacturer could supply a post 'sleeve', which fits around the post allowing it to be removed, leaving just the sleeve embedded in the concrete. This proved ideal, so the potential tower order was quickly augmented.

Site Planning

As my house was newly built, I consulted the plans to check for present and future service runs, and
double checked with the builders who were still working down the road on the next phase of houses. No problem was the answer, the next action was to check where the tower would fit. Several matters must be taken into account here, such as the length of the tower plus the extra dimensions of the tower behind the ground post as it tilts over, the length of coax feeder runs to the shack, and of course the screening effect of the house to allow it to become as inconspicuous as possible to the neighbours.

After settling on the site, the required formalities concerning neighbours and the council could then be undertaken as appropriate, luckily in my case this was not a problem. The matter of planning permission has been covered in last month's HRT so I will not dwell on it further here.

Hole Digger

Following all this, the next question was 'what size of hole?'. Depending upon the soil type and drainage characteristics, the geography of the area as well as the site itself will dictate the size of the foundations. This has been well documented in the past in several publications so again I will not dwell on technicalities here. The adage of "If in doubt, ask!" certainly holds true, and you should normally find any reputable tower manufacturer or distributor quite helpful. I found I needed a 1.25m cubic hole, so out came the shovel. After digging down to 1m, a 'clunk' was heard — oh dear (or words to that effect). Yes, I'd discovered a land drain pipe leading off to nowhere in particular, which no-one seemed to know about! There was only one thing to do to stay on the safe side — dig another hole!

The Ground Post

After a while, I got quite used to all this physical effort; the second hole only took around half the time of the first, and the XYL became expert at wheel-barrow manoeuvring between the two. Eventually, it was ready, and a wooden framework was constructed to support the heavy ground post with its fitted sleeve, and to keep it in place during the addition of concrete.

Levelling the post was very simple with the aid of a large spirit level. Next came the little matter of the concrete. Two immediate choices were ready-mixed or do-it-yourself. The cost of hiring a small mixer for a weekend together with the cost of the cement, sand and ballast, were in my case within a few pounds of the cost of having ready-mix delivered. After the hole digging efforts, there are no prizes for guessing the method chosen.

Of course there had to be one problem. In common with most amateur towers, mine was at the rear of the property, too far and at the wrong angle for concrete to be 'chuted' down to the hole from a mixer vehicle positioned on the road or driveway. Access to the rear was limited in my case by a 2m high fence — very simple, take the fence away! The posts of this were concreted in — no problem as I would soon have plenty more to spare for re-concreting. The local builders were very helpful, allowing me to economise even further by purchasing a 'part load' from the concrete supplier, the builders (nice chaps) even helped with the fence removal and re-erection, as well as the concrete transportation and hole-filling.

Waiting . . .

After checking the ground post was still perfectly level, all that was needed was to wait for the concrete to set completely, covering it as required to save any problems with the surface cracking due to day/night temperature variations. While a small, separate amount of concrete was half-set, I took the advantage of building up a small 'pyramid' around the ground post to save water built-up, preventing any possibility of a weak spot in the future due to
rusting. This was also necessary as I had decided to have the concrete level around 10cm below the average ground level, with soil and grass seed added above the concrete. When moving house the ground post could be extracted leaving a reasonable piece of grass rather than a large unsightly patch of concrete. After two weeks, the concrete was ready to take the load.

Tower Erection
Following all that, the entire tower assembly took less than half a day. The very clear instructions provided by the manufacturers helped a great deal. Two types of winches were available, the standard ratchet type and the auto-brake variety. The ratchet type has the advantage of reliable performance at an economic price, but to prevent any mishaps when lowering the tower, in case I were to slip and let go of the crank handle, I settled on the auto-brake variety. Although costing a little more, this type certainly gives me a slightly greater peace of mind as well as reducing the effort required when lowering and tilting the tower. Following assembly, a trial 'crank up' was made; a walk around the neighbourhood quickly followed to provide a degree of user satisfaction following all the hard work!

Aerial Fitting
All that remained was to fit the rotator to the tower head unit, test this out, and fit the stub mast and aerials. The four element Altron AQ-620 20m/15m/10m/6m yagi was the first to be fitted, with additions of 4m, 2m, 70cm and 23cm beams as and when required on the stub.

Another walk around the neighbourhood, then the fun started! No—not the neighbours complaining, but the on-air results. As to be expected, DX stations on HF started coming back to the first rather than the nineteenth call, links on HF packet also became much more reliable, 2m and 70cm stations were easily workable.

Over The Months
The tower has now been in use for nearly a year, with many types of aerials fitted for general nattering as well as review performance tests; it certainly makes a difference from climbing ladders. Some amateurs are stupid enough to go along with the idiotic idea 'If it didn't blow down last winter, it wasn't big enough'; fine if they don't mind killing themselves or other people. The installed system has survived many strong winds without any problems, as it is designed to do, and peace of mind at night is a great feeling.

As for the neighbours, the only comment I ever had was 'don't you need a red light on top of that mate?'. I think they were glad I didn't.

My thanks go to Mr. Alan Barraclough of Allweld Engineering for his helpful advice when planning the tower project.
mufek limited
R.F. Technology

mufek in 1989

mufek limited returned to Amateur radio in mid 1988 with new headquarters in Long Eaton, Nottingham. Since the relaunch of the company, many of the old products have now become available again, and a range of new products are beginning to appear. mufek’s emphasis on high quality and high performance equipment means true value for money. Much effort too has been put into the appearance and physical design of the equipment so that it will perform in the field, and not just on paper. Much effort too has been put into the appearance and physical design of the equipment so that it will perform in the field, and not just on paper.

mufek limited Product and Price guide

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Complete packaged version and special options: details and prices on request. Crystals can be supplied if requested. Most current range of products are available from stock; for those items that are not listed as stock items, delivery is normally within 6 to 8 weeks, though this is usually dependent on certain rare components.

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**HIGH PERFORMANCE 2 METRE PRE-AMPLIFIER**

- A Band-pass stages for improved selectivity.
- 16dB gain with 1dB NF.
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- RF switched (fail-safe action) gas-filled relays.

Assembled, tested pcb

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Prices include UK P&P and 15% VAT.

Ask for details of our Interest Free Credit Scheme. Prices include UK P&P and 15% VAT.
The Mark 123 was introduced in late 1958. It followed on from the earlier B2, being intended for special forces. The 123 is obsolete, and many are now available as surplus.

The 123 is a portable transmitter/receiver not a transceiver able to operate in the range 2.5 to 20MHz in three bands (2.5 to 5MHz, 5 to 10MHz and 10 to 20MHz). It will therefore cover the 3.5, 7, 10, 14 and 18MHz amateur bands. The transmitter is CW only, with a maximum output power of 25W. The receiver will receive AM, CW and SSB, though the latter requires careful tuning.

The Power Supply Unit
The case of the 123 has the transmitter at one side, the receiver at the other, with the power supply in between them. It will run on supplies in the range 100 to 150V and 200 to 250V, and there is a thumb wheel switch to set the voltage in ten volt steps over these ranges.

Two optional extras are available: an inverter to be used with a 12V battery, and a hand cranked generator. In addition, a re-former is provided, to re-form the electrolytics if the set is left unused for several months.

The circuit of the power unit, with the switch in the transmit position, is shown in Fig. 1. The configuration of the HT section on transmit is shown in Fig. 2, and that on receive in Fig. 3. The basic voltage doubler configuration is the same in both cases, but on receive a lower transformer tapping is used. Several other differences are also apparent. In the transmit configuration, the key-up current of the transmitter flows through R3 and R4, providing approximately -125V to the grid of the PA valve and slightly less to the grid of the oscillator. This keeps the valves cut off until the key is pressed. The key shown in Fig. 5 (the transmitter circuit) effectively shorts R4, removing the negative voltage on the oscillator grid and reducing that on the PA grid to about -35V. This allows the unit to transmit.

On receive the main output is further decoupled by R1 and C1, while a separate output is provided for the receive oscillator, via R2. This voltage is regulated by V8, shown in the receiver circuit diagram Fig. 4. The extra voltage drop in the main receiver ht supply, caused by the current flowing in R1, drops the 180V on the main smoothing capacitors to approximately 155V.

The Receiver
The receiver is a single superheterodyne. Once the Rx/Tx change over switch is put to receive, not only is the HT taken off the transmitter and onto the receiver as described in the PSU section, but the aerial is also switched over. Signals are fed via the aerial into one of three tuned circuits, depending on which band is being used. The output of the relevant tuned circuit is fed into the RF amplifier V1, which is an EF72. The amplified signal is passed from the anode of V1 to one of three tuned anode circuits, again depending on the band. The output of V1 that is fed into one of the primaries enters that circuit along with the local oscillator signal from V5, which is also an EF72.

The local oscillator is of the tuned grid type. Its screen voltage is stabilised by a neon valve, V8, a QS1202. Both the output of V1 and the signal from V5 pass via the tuned anode circuit of V1 into the mixer valve V2 and EF73. After mixing, the IF of

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**CONVERSION: MARK 123**

Ross Bradshaw G4DTD converted his Mark 1-2-3 for fun, but gets some work out of it too.
The Mk.123 with its case removed, showing the separate transmitter, PSU and receiver.

465kHz is applied to an IF transformer, the output of which is then fed to the IF amplifier valve V3, an EF72. The output of the IF amplifier is fed via a second IF transformer to the detector valve V7, an EA76.

At the anode of the detector valve, the signal from the BFO EF73 valve V6, an electron-coupled Colpitts oscillator, mixes with the detected signal from V7 to make the CW signal readable. If the BFO is not switched on, AM signals may be received. The required output, be it CW or AM is now passed to the audio amplifier V4, an EF73. The output of V4 is fed to high impedance earphones. The earphone socket has two diodes back to back across, to act as limiters. It is to this point that the output from the sidetone oscillator is fed when the Mark 123 is in transmit mode.

The scale used to read off the received frequency can be used on 3.5MHz, but on other amateur bands it is too cramped to be of much use unless you are listening to a very strong signal. It would therefore be worth considering either broadbanding the receiver and accepting a loss in sensitivity or only using the PSU and transmit parts as the basis of a good crystal controlled 25 watt CW transmitter, in which case you could choose a modern broadcast Rx in place of the 123's receiver. The 123 can still be used for broadcast listening. However, bear in mind that the original users of the 123 would have been listening for a kilowatt signal, unlike the amateur who is listening for signals of 100 watts or less.

**The Transmitter**

The transmitter consists of two valves, V1 (5A/163K), a Colpitts oscillator/doubler and V2 (5B/254M) the power amp valve.

In its key-up state, 470 volts is fed to the top cap of V2 via RFC 3. This 470 volts is then dropped by the chain R10 and R16 to apply voltage to the screen of V2, and also by R7 to be sent to the anode of V1 via RFC 3. The voltage applied to the anode of V1 is also dropped by R4 and applied to the screen of V1. Negative bias is applied to the control grids of both V1 and V2, keeping them in a cut-off condition.

When the key is pressed, the negative bias fed to the grid of V1 is...
shorted, allowing it to oscillate. The key also reduces the negative bias to the control grid of V2. The signal from V1 is applied to the control grid of V2 via C5.

There are three switched tuned circuits connected to the anode of V1. L1 and C9 are for the 2.5 to 5MHz range, L2 and C9 for the 5 to 10MHz range and L3 and C9 are for the 10 to 20MHz range. By tuning the required circuit, one can select the fundamental crystal frequency or the second harmonic. In some cases one might be lucky and get a third harmonic, but it is not recommended in the manual.

This means that a crystal for 3505kHz can be used for 7010kHz as well as for 3505kHz.

The output of the pa valve is tuned by one of three circuits. This final tuning is in fact a built-in ATU, consisting of C13 and L5 for 2.5 to 5MHz, C13 and L6 for 5 to 10MHz and C13 and L7 for 10 to 20MHz band. To assist in tuning the output of the oscillator valve, a small neon bulb, LP1, is provided. Tune for the brightest glow, using the drive control C9.

To assist in tuning the aerial tuning unit a small amount of RF is tapped off and rectified by the circuit C14, C15, rect 1, rect 2, R11, R12, C16, R13/R15 and fed to the small built-in meter, where one tunes for the highest reading. In the control grid circuit of V1, the components C1, R2, C18 are the key click filter.

Transmitting
To transmit, connect an earth lead to the 123 and take it to earth. Connect an aerial, which can be a long wire as supplied, or you can do as I often do, and use coax with the braid to the earth socket of the 123, the inner to the aerial socket and the other end to a PL259 plug.

Using coax, I would plug the 123 into my KW107 Supermatch and switch to dummy load, tune into the dummy load and then switch to my aerial (in my case an indoor trap dipole). I would then use the KW107 as my ATU and tune into the dipole, using the ATU controls and built-in SWR meter. If you are not sure what to do, stick to a long wire.

Let's assume you are using a long wire. Connect up the proper voltage supply and switch on, allowing five minutes to warm up. Take a crystal, an A, C or FT, or any crystal that will stand up to 60 milliamps. Assume in our case it is a 3.5MHz crystal: plug it in and set the changeover switch to transmit. Set the band switch to the 2.5 to 5MHz position. Press the key - either an external one or the built-in one. Tune the crystal tuning control for maximum neon brightness. If you get two tuning points, take the lowest dial reading of the adjusting control as the correct one. Release the key. Set the aerial matching control to position one. Press the key and adjust the aerial tune control for the highest reading in the meter. Release the key.

Try tuning the aerial tune control again with the aerial selector switch in position number two (if necessary three or four) for the best reading. You are now tuned to 3.5MHz.

To transmit on 7MHz, tune as before, but change the band switch to the 5 to 10MHz range. If you get two tuning points on the neon, take the highest reading as correct in this instance.
Receiving

Assume that you are still connected up for transmit, but switch the changeover switch to receive. Select the band you wish to listen to. If you select AM switch off the BFO. If you select for CW, switch the BFO on and rotate the control to the centre position. Ensure the phones are plugged in and adjust the gain for a suitable level. Use the tuning control to tune to a desired station. Adjust the BFO as (or if) necessary.

Conclusion

Although it is a ‘fun’ rig, the 123 cannot be used seriously in its original state. However, the transmit side will make a good 25 watt transmitter. I bought mine three years ago. It’s still in use.
The Yaesu FT-470 is the world's smallest dual band hand portable rig. It has a transmit power of up to 5W on 2m and 70cm. Its special features are that it can listen on both bands simultaneously, or transmit on one and damp by plastic covers. To the right of the aerial is the squelch control, which affects the primary frequency in use. To the right of that is a dual gang control, the volume/on-off switch and balance control. The purpose of the balance is to mix the audio from 2m and 70cm reception, to allow monitoring of both bands at the same time. There is also a tuning knob. This is not strictly necessary, because frequency may either be entered directly on the keypad, or selected by the up and down buttons on the keypad. It is however a welcome addition and to my mind makes the rig significantly more user-friendly.

In common with many modern professional software packages, the rig is supplied with a 'crib card' for the most common program functions. I found that this avoided the need to read the instructions more than once, and was well worthwhile. It isn't even necessary to remember how to use all the functions to make use of them, because memories can be programmed with repeater offsets, tone guarded squelch etc and accessed at need.

Controls

On top of the set is the BNC socket for the aerial and sockets for an external microphone and speaker. These latter are protected from dust while receiving on the other using the same flexible antenna. This means that it is possible to monitor continuously a frequency on one band while having a OSO on the other band — ideal for Raynet. The microprocessor control is comprehensive, and the rig probably contains more processing power than one could easily lift ten years ago.

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Androm Armstrong G3YZW tries out a 2m/70cm handheld which can listen continuously on both bands.
pretty lit up in green.

Despite all these fancy controls, the rig is very easy to operate in a basic mode. One simply selects the band required with the band key, selects a VFO with the VFO key, and adjusts the tuning with the dial switch on the top of the rig. Repeater shift is engaged with the immediately obvious RPT key. The only slight bit of deduction required may be to set the step length, which is the secondary function of the 7 key. In practice, this function is obvious. Simply select step and use the dial switch on top of the rig to choose 5, 10, 12.5, or 25kHz steps. The rig, of course, remembers which step length you are using on which band.

**Functions**

The most important function of the rig is to monitor two bands simultaneously. This is facilitated by having two frequency displays, one for the primary band and one for the secondary band. The primary display, which is larger, is on the left, and is the one which is adjusted by the tuning controls. If only one band is of interest the secondary display and reception can be switched off.

The dual band aspect is considerably enhanced by the ability to scan memories on alternate bands. There are eighteen ordinary memories and three special ones (lower, upper and call), and all except the calling frequency memory may be scanned. The sequence runs: M1 2m, M1 70cm, M2 2m, M2 70cm etc. Not all memories need be used, and any memory can be removed from the sequence by setting it to skip mode.

The calling frequency memory enables you to jump to a calling channel immediately regardless of scanning frequencies in other memories. A second press of the button returns to the frequency previously in use. This memory, along with the other eighteen channel memories, may be programmed by storing the frequency of either of the two VFOs, or by tuning the memory without affecting either of the VFO frequencies. Each channel memory can have repeater shift stored, or independent transmit and receive frequencies for those countries where occasional non standard repeater shifts are used. It may also have the CTCSS mode stored.

The continuous tone controlled squelch system is becoming more common, and at least one 70cm repeater (BG3BX) uses CTCSS to assist in selecting wanted signals under lift conditions. Under lift conditions the squelch threshold is raised by 20dB for signals not possessing a 71.9Hz tone. The FT-470's memories can store tone frequency, and whether CTCSS is to be used on transmit, or both transmit and receive. This function is likely to be of increasing use as repeaters have enhanced LF response or tone regeneration circuitry fitted. (We hope to run an article on the subject next month. Ed).

The lower and upper memories are used for programmable memory scanning — to scan over a limited range rather than over the whole band or only channel memory frequencies.

**Tone Dialling**

You don't need packet radio to leave messages for absent operators. Some base station transceivers such as the FT212 now include voice storage chips and DTMF (dual tone multi frequency) decoders, so that they can store a brief spoken message preceded by the required tone sequence. While the FT-470 hasn't got such a message storage system, it can transmit DTMF tones to activate such a system. The tone sequence can be stored in one of the DTMF memories, or it may be transmitted manually using the keypad.

Tones are also available from the keys in normal operation. Single tones in this instance, to help identify key pressed without the need to look at the set. The notes available cover two octaves, so if there is nobody on the bands you can always play a tune. The beep function may be switched off or on, and when it is on the rig tells you when the scanning jumps from end to end of the band, when it is about to switch off to save power etc.

Repeater operation is selected by pressing the RPT button. The repeater shift can be programmed if necessary, but in the UK the default values
will be correct. In addition, automatic repeater shift is available on 2m (and on 70cm for American versions). Unfortunately the automatic repeater shift extends from 145.600MHz to 145.850MHz, but this probably doesn't matter too much. The range is not programmable, and the facility is not available on 70cm. Considering the versatility of the transceiver in other respects, I am surprised that repeater sub-bands are not programmable on both 2m and 70cm.

**Power**

A range of rechargeable battery packs is available, covering 7.2V and 12V. The 7.2V pack allow only 2.3W transmit power, while the 12V ones allow 5W on both bands. Two packs for primary cells are also available. The packs used are the same ones as other Yaesu rigs (FT23/73/411/711) so that owners of these rigs will not have to stock up on new battery packs.

The longest battery life quoted is for AA size primary cells at 17 hours. The second longest is 11 hours for the 1Ah 7.2V nickel cadmium pack. These figures assume that the battery saver system, which can be set to switch the receiver on and off with adjustable duty cycles, is on at 10:1 off to on ratio, with 6 seconds per minute of transmission (presumably on low power). In my normal operation of the rig I obtained about 4 hours from the pack quoted at 5 hours, using a proportion of high power transmission.

**Inside**

The innards of the FT-470 are as miniature as one would imagine. The front panel pcb contains the microprocessor, sundry control items, and the loudspeaker and microphone. It also contains (at least the review copy did) a small piece of printed circuit with one surface mount IC on it. The scrap of board is connected to the main pcb by four wires, and is held upside down between what appear to be a lithium battery and a surface mount clock generator chip.

The front panel pcb is connected to the boards in the rear of the case by a ribbon cable. In the rear are two boards, presumably the synthesiser closest to the processor and the rf board mounted on the back of the case.

The back itself is diecast to serve
as the heatsink for the rf power transistors. This is no doubt necessary to provide 5W from such a small rig. The appearance, however, is deceptive, and the finishes on the diecast metal and on the plastic front are identical.

The construction looks good, to the extent to which one can inspect it with the naked eye. The appearance suggests it should be reliable, which is just as well, because repair of anything more complicated than the wire from the battery spring to the board is not plausible for the amateur (save of course, for the few who have surface mount rework stations to hand). The rubber moisture seals under the top panel fitted well and should do the job.

On The Air
The rig was easy to use after minimal reading of the manual, but I was still learning about new functions several days later. I was able to access the local 2m and 70cm repeaters from a deckchair in the garden, and even managed some simplex QSOs.

The receiver sensitivity was very marginally worse than my FT290 with Mutek preamp, but few signals would be copyable on the '290 and not on the FT-470. The audio output was limited, and would be unusable in a noisy car. Given the size of the rig, and the size of the loudspeaker in particular, this is not surprising. For mobile use an external amplifier would be desirable.

Transmitted audio reports were good in general. The phrase well rounded came up several times, with good clarity at low signal levels. One report classed the modulation as slightly too toppy. The audio gain would seem a little on the low side for normal operation, with several stations commenting on low audio if I did not speak close to the microphone. On the other hand, this would be useful to reject external noise, for example in a moving vehicle. The modulation level was audibly adequate when driven to the compression level, so no real problem here.

The IF passband is narrow enough to reject S9 signals 12.5kHz off channel. This is likely to become more important as 2m becomes more crowded, and is valuable to avoid interference from the primary band users on 70cm (whose channel spac-
The image rejection, while good enough for a handheld, should have been better.

The transmitter performance was good, with a low level of harmonics coupled with good power efficiency, giving good battery life. The peak deviation was accurately set at just below 5 kHz. Altogether an impressive piece of kit.

Our thanks go to South Midland Communications for the loan of the Yaesu FT470.

... AT THE MOMENT OLD MAN, WE'RE BEAMING AT YOU ...

The interior of the FT-470 is truly micro-miniature.

The receiver sensitivity is good, as is the adjacent channel rejection. The intermodulation and blocking performance were also good for a handheld, though of course below the performance of a base station rig.

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We obviously stock the complete JayBeam range, as well as the Revco aerials (not antennas, nor indeed the correct "antennae", cos we are old fashioned enough to prefer the English terms).

Many, many more products in our range. Why not send off the coupon for details. "Why no photographs?" I hear you cry. We have prepared an information pack on these two remarkable JRC products and it is available on request.

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THIS AND THAT

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Please mention HRT when replying to advertisements.
In the last Listening On..., we gave an idea of some of the programmes that you can expect to hear on shortwave from some of the world's major international broadcasting stations. This time, we will look at the major news stories from these and other broadcast stations, and also give some transmission schedules for programmes in English for Europe from some of the most popular Western broadcasters.

The Roving Ear receives some news from stations across all the nations.

The End Of Jamming

One of the biggest news stories on the broadcast bands recently, if not the biggest, has been the decision taken by the Soviet Union and almost all other countries to stop the jamming of foreign broadcasts. This means that broadcasts from, for example, Radio Free Europe, Radio Liberty, the Voice of America, Deutsche Welle and the BBC are now being heard clearly once again in the USSR and Eastern Europe. This includes broadcasts in the languages of those countries.

For the short wave listener, this is also good news, as the old jamming transmitters did not just jam out the broadcast directed to these countries, but also destroyed reception on at least two, and sometimes four or more additional channels either side of the frequency being jammed. There is, however, some jamming still evident on the bands — the more noticeable form now being the wobbly carrier type of jamming employed, it is believed, by both Iran and Iraq to counter each other's broadcasts. The anti-Libyan government clandestine station, The Voice of the Libyan People seems still to be attracting Libyan jammers too, but the vast majority of transmissions are now in the clear.

Reports on Radio Moscow World Service indicated that the Soviets did not really know what to do with all the transmitters thus liberated, as they apparently already had enough to broadcast their normal programmes. The reports stated that instead they would start broadcasting programmes from the other fourteen republics in the USSR, on shortwave. The programmes are intended primarily for residents from those republics now living in the Moscow area, and would be in both Russian and the republic's own languages (presumably, although many transmitters became available, they were connected only to high-angle antennas, as — although the jamming was often very strong outside the USSR — the former jammers were of course intended to wipe out reception in very localised areas).

Unfortunately, the reports on Radio Moscow World Service did not give details of the times and frequencies of these broadcasts and so far I have only heard two of them. Radio Ashkhabad is heard on 17635kHz with excellent reception from about 1500 until 1700 GMT with programmes in Turkoman and Russian and a lot of very ethnic-sounding Central Asian music. This station is not difficult to hear in the early hours of the morning, or late in the evening, on 4825kHz, though this is the first time I have heard it during the afternoons. Much rarer is Radio Frunze, from Kirghizia, which is heard at around the same times, but on 17785kHz, with a similar fare of music and programmes in Russian and what is presumably the Kirghiz language. Presumably there must be a dozen other stations lurking around somewhere, carrying relays of programmes from Radio Dushanbe, Radio Vilnius, Radio Tallinn and so on.

Radio Tallinn

Staying in the USSR, but only just, the three Baltic Republics of Latvia, Lithuania and Estonia have been in the news quite a lot recently for attempting to show their independence. The English language programmes from Radio Vilnius in Lithuania have been fascinating, and quite difficult to believe that they came from the USSR sometimes, as they think nothing of criticising the central government in Moscow. They frequently broadcast interviews with Lithuanian religious (Catholic) leaders, too, which must be frowned on by the powers that be.

Not wishing to be outdone, apparently, Radio Tallinn from Estonia has recently started an English-language broadcast too. So far, it is broadcast only on one day a week, on Mondays, at 2030-2100 GMT on 5925kHz. According to the station announcements, it is also broadcast on 1035kHz medium wave, though I have not been able to hear it on this frequency (in fact, reception has not been very good on shortwave either). Like Radio Vilnius, Radio Tallinn's programmes have been quite pro-independence. I wonder when Radio Riga will start English-language broadcasts too? Incidentally, if you are trying to tune in Radio Tallinn's English programme, note that for half an hour before it is a programme in Swedish, while on Tuesday-Sunday the programme is in Estonian rather than English. Radio Tallinn also has programmes in Finnish and even Esperanto.
Radio Norway

Remaining in Northern Europe, one of the smaller international broadcast stations, Radio Norway International, appears to be having some difficulties. According to their latest programme schedule the broadcasts every Monday in Spanish will be suspended, and their Norwegian programmes will be reduced from three-quarters of an hour to just thirty minutes. The English-language programmes, which are only broadcast on Sundays, would continue to be broadcast, but on fewer frequencies than hitherto. Radio Norway International continues to make frequency alterations almost every month, which makes it almost impossible to give out their schedule, as it will probably have changed by the time this is in print.

New Stations

Way over on the other side of the world, it was good to hear that the Tonga Broadcasting Commission had started using shortwave to cover some of the outlying islands in the Kingdom of Tonga. DXers in New Zealand report hearing the station on 5030kHz around sign-off at 1000 GMT. The power is believed to be just 1kW. So far, I have not heard any reports of this station being audible in Europe (or anywhere outside the Pacific region), but it is possible that it could become audible in the middle of winter around 0700-0900 GMT, given a fairly clear frequency. It would be an excellent DX catch indeed.

One that there will be no problems at all to hear is Atlantic 252, which is apparently to be the name of a new commercial radio station due on the air very soon (it may even be on by the time this is in print). It is a joint Irish-Luxembourg government project, and will broadcast a commercial pop-music format in English from Ireland during the day on 254kHz longwave. The transmitter power is no less than 500kW, and it is located just north of Dublin. The antenna, consisting of a pair of 600 foot high towers, will be directional, beaming towards Britain and the idea is to appeal to the 16 to 34 year olds and, they hope, capture some of the audience away from the ILR commercial local radio stations. Atlantic 252 is meant to complement Radio Luxembourg, and therefore it will close down in the early evening, when Radio Luxembourg's English-language programmes start on 1440kHz. If you are wondering why there is a discrepancy between the name of the station and the frequency on which it is operating, it will in fact move to 252kHz in February 1990, in accordance with the Long Wave frequency plan (if you remember, Radio 4 moved from 200kHz to 198kHz some time ago as part of the same plan). One potential problem that may have been overlooked, though, is that the station in Algiers, Radiodiffusion-Television Algerienne, broadcasts its French-language programme on the same frequency, and with a power of not less that 1500kW (!). This is very strong in parts of southern England and could cause some severe co-channel interference to Atlantic 252.

A joint CLT-Irish project, called "Atlantic 252" should be on the air very soon . . .

Lithuanian Radio (Lietuvos Radijas) has been broadcasting some quite controversial programmes in its English service — called Radio Vilnius — recently.

Radio Australia's Darwin transmitter site, pictured here, was completely destroyed in the 1970s: now their new Brandon site has also been damaged by another cyclone.
Human Rights
Les droits de l’homme

New Site Damaged
You may remember us reporting in Listening On . . . that Radio Australia had decided to build a new transmitter site at a place called Brandon, near Townsville in Queensland. The transmitter finally went on the air on 2nd April, broadcasting a test transmission for listeners in Papua New Guinea and the Solomon Islands on 6020kHz at 0800-1400 and 2000-2100 GMT, but, less than a week later, disaster struck when Cyclone Aivu passed directly over Brandon. The antennas were destroyed and the test transmissions came to an end, for a time anyway. Radio Australia reports, however, that new curtain antennas should be erected soon, possibly during July, and Brandon will soon be on the air again. It is not the first time that Radio Australia engineers have had to deal with elements other than the type they are more familiar with: in the 1970s their Darwin transmitter site in the Northern Territories was completely destroyed by Cyclone Tracy. It has now been completely re-built.

More Relay Agreements
We have often reported in the past on Broadcasters signing agreements with each other to relay programmes from more advantageous locations. Now, Radio Austria International, which until recently had only broadcast from its own transmitter site at Moosbrunn in Austria, has joined the club. They have swapped two hours a day with Radio Canada International: Radio Austria International’s programmes go out at 0500-0700 GMT from Sackville, New Brunswick (for listeners on the West Coast of North America), while Radio Austria International is the latest broadcaster to sign a transmitter-swap agreement with Radio Canada International . . .
Radio Canada International’s programmes are broadcast at 0300-0500 GMT from Moosbrunn (for listeners in the Middle East). At around the same time, Radio Canada International also started a similar arrangement with Radio Beijing, with English and Spanish broadcasts for North and South America being broadcast from Canada on behalf of Radio Beijing, and RCI’s programmes in English and Japanese (for India and Japan) being broadcast over Radio Beijing’s transmitters at Xian.

On Radio Netherland’s Media Network programme, the director of RCI recently spoke about these relay agreements and also said that their future plans included the introduction of broadcasts in Chinese. Radio Canada International already had a relay agreement with Radio Japan, and so they intend broadcasting Chinese language programmes from Japan and Japanese-language programmes from China. It is all getting extremely confusing these days, with BBC programmes coming from Hong Kong, Voice of America programmes coming from England and Radio Netherlands programmes coming from Madagascar — you never really know what you are listening to.

Happy Birthday, Happy Station

The 1st January 1990 marks the 20th anniversary of Radio Netherland’s Happy Station programme being presented by Tom Meijer. Tom is only the second presenter of this programme, the first being Eddie Startz, who broadcast from the 1930s until 1969, originally with Radio Station PCJ as it was then, and later with Radio Netherlands. The Happy Station programme is broadcast in all the English and Spanish language programmes of Radio Netherlands every Sunday (see transmission listings) and is usually presented live. The format and musical style of the programme has not changed markedly since the early days, and while it is true to say that this Family Show of Smiles Across the Miles may not be to everyone’s liking, it does have a very loyal following. While this may be a little premature, I would like Listening On... to be the first to wish the Happy Station and especially Tom Meijer himself a very happy birthday.
New amateurs who start on the 2 metre band are usually faced with purchasing a transceiver and the added expense of buying an antenna of some sort or other. The following simple project will help those who want to get on 2 metres quickly with minimum outlay.

The Dipole
First, obtain a car or portable radio-type telescopic antenna. Modify the bottom section to fit in the insulated piece as in Fig. 1. This may not be necessary if the lower half of the telescopic section is of the required diameter to fit in the pre-drilled hole. Drill and tap a 4BA or metric equivalent into the insulated piece to retain the antenna as in Fig. 1. Proceed to drill a hole the diameter of the coax connector pin, making sure the pin eventually makes a good electrical connection to the lower half of the telescopic antenna piece.

Fit the tin plate section (Fig. 2) under the coax connector screws as in the drawing. Assemble all the appropriate screws etc. and the telescopic section of the antenna is now completed.

Ground Plane
Find an old umbrella. XYL types are best (How d’you tell a lady umbrella from a gentleman umbrella? Answers on a postcard please. No correspondence will be entered into. Ed.) but any type will do if you are prepared to work on them. Remove the plastic cap screwed on the top of the umbrella. This should expose the ¼ in Whitworth threaded nylon piece about ½ in long. Cut this off and replace with the 4BA/metric screw and nut with the tin-plate washer clamped underneath. Take off all the fabric, which will expose the metal spokes. Remove the required number of spokes until only four remain. Proceed to bind the 22 SWG wire to each spoke as in Fig. 3, making a good electrical connection of each spoke.

Edgar Powell GW1 TDW opens aegis against expense with the help of an old brolly.
Fig. 2. Details of the tin-plate connections.

Make sure that these two surfaces are making good electrical contact to each other.

Nut soldered to tin-plate piece as in Fig. 1

Antennas

"I've been experimenting here drooping the ends...."

Fig. 3. Top view of the umbrella antenna, ground plane sections

Remove all spokes except four. All remaining spokes must be electrically connected to tin-plate washer.

22 swg tinned copper wire wound around each spoke and electrically joining all spokes.

Solder wire to washer here.

4BA nut and bolt clamping the washer. Height of this bolt is set to coincide with locking screw in Tufnol piece as in Fig. 1.

Switch the transceiver to an empty channel away from the local net and repeater channels. Press the PTT switch. Note the SWR reading. If this is high slide the telescopic section up or down until the lowest SWR is obtained. Having found the lowest SWR, you could now drill a small hole in each of the sliding sections and lock them with small pins or nuts and bolts or, if you want real portability, arrange that these can be removed easily for collapsing the telescopic section, retaining the pins/bolts safely when reassembling. By this method the lowest SWR can be re-obtained in the shortest possible time.

Caution!! Do not touch antenna while pressing the PTT switch.

The design of the antenna is such that it is so portable that within a few minutes it can be dismantled, making it very easy to carry around as well as being a fixed antenna if required — for instance installed in a roof space.
Fig. 4. Details of the umbrella modifications.

Remove this nylon screw. Replace with 4BA nut and bolt or metric equivalent.

Remove all spokes except four. All remaining spokes must be electrically connected to tinplate washer.

Telescopic antenna as in Fig. 1

Washer made from tinplate fitted under 4BA nut. 22SWG wire connecting the spokes together are soldered to this washer.

Small G-clamp screwed to handle of umbrella.

Top Section
If difficulty arises in getting the materials for the project as in Fig. 1, refer to Fig. 6 which could solve the problem. If you are confined for space, the design in Fig. 7 is not so cumbersome yet works quite well.

On the Road
The umbrella was taken on a short caravan holiday during the summer and clamped to the opened caravan door. Twenty contacts were made via repeaters and simplex.

The other was taken to a holiday flat in the centre of York which also gave excellent results. These antenna was designed for indoor use, therefore as they are they cannot withstand outdoor weather conditions, such as rain and wind (oddly enough).

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73 from Dave G4KQH, Technical Manager.

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Cirkit News
July 1989

New Cat Out Now!

Over 3,000 product lines feature in the Summer 1989 edition of the Cirkit Constructors' Catalogue, available from most larger newsagents or direct from the company priced at £1.50. The latest books, an RF frequency meter, two new PSU designs and a 3.5MHz converter are among the innovative new kits this issue, while our construction project - a 2 Watt stereo amplifier - is bound to prove an absorbing activity for dedicated constructors. In the test equipment section there's a whole new range of multimeters, a bench DVM and a triple output PSU.
For eagle-eyed readers who enjoy a challenge of a different sort, there is the opportunity of winning an audio signal generator worth more than £180.00 in the latest fiendish competition. All prices now include VAT for quicker, easier ordering; and Cirkit's same-day despatch of all orders, combined with value-for-money discount vouchers, makes the line-up even more attractive.

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commenting on methods to abate the increasing congestion in the 2-metre band urged, inter alia, the use of beam aerials which would "... permit a doubling band occupancy 'at a stroke'."

He also advocated a "... reduction of power to the minimum necessary". There was much more he had to say about the need to reduce channel spacing, and he observed how prodigal of frequency spectrum the fm mode is.

What immediately concerns us is that vital need to employ beam aerials on Two to put your rf where you want it, and not all around you which happens with an omni — and please forgive if you may have read this here before: there are thousands of newer licensees who haven't and who may wish to ponder how to make the best of their hard-won rf energy.

Talking Around Corners

Unfortunately, on 2 metres the belief has grown that a simple omni-directional aerial is all that the operator needs at the home station. It is indeed, if he wishes to do no more than talk around corners or through the nearest repeater. This belief is slowly spreading even to the 70cm band: the misconception has arisen that an adaptation of some of the notorious designs of omni used for Two will function perfectly well on Seventy, quite ignoring the tiny capture area available. It seems to be a long time since that old adage was uttered: "... the more metal you put up into the sky the better you'll get out". G5UM makes no apology for reiterating it here.

To be effective, any projectile must be aimed at its target and not sprayed around. Exactly the same analogy applies to metrewave beam aerials. Fire your rf where you want it to go and not in all directions to the discomfort of the hundreds of other people trying to find a clear channel. If you were directing your rf in one direction there would be many more clear channels, as G3GDU suggested.

Let us for the time being sidestep that other palliative for the overcrowding of Two, namely, to halve every rig's band width and thereby in theory to double the possible occupancy: this point has been dealt with here and the difficulties of its practical application discussed.

No practical difficulties, exist, though in improving the station on the aerial front — but yes, there is one and it is spelt "indolence". And yes, there is another and it is spelt "parsimony" ("meany" — Ed.), meaning people's reluctance to spend money on improvements when they get what they want out of amateur radio by spending the minimum. Yet it seems illogical to lay out, say, £400 on a latter-day state of the art fm sender for Two, and then to feed it into a far from state of the art aerial which can do it no justice — except for talking around those corners. To spend £400 just to do that seems extravagance of an unwarranted order. It would be cheaper to use the landline telephone. So let's address the question of how that expensively generated rf may best be put where you want it.

The all-too-obvious answer is "use a directive aerial". There are plenty of basic Yagi designs on the market at modest prices. If you prefer to construct one yourself, take a few lengths of copper or aluminium rod, which your local TV aerial installer will be only too glad to give you from that pile of discarded Band 1 aerials cluttering his backyard, bolt them at the appropriate positions along a boom of metal — but old broomsticks have been known to work — and hey presto, you have a beam antenna (Fig.1).

Here are the dimensions:
- First director: 35½ inches
- Second director: 36 inches
- Folded dipole: 38 inches
- Reflector: 40 inches

Spacing between all of them: 19 inches (a quarter wavelength at 145MHz).

For your folded dipole you will need a rod double the length shown, for it is to be folded back on itself as shown in Fig.2 and the feeder attached to the open ends.

Setting Up

Your transceiver probably employs 50 ohm impedance output. You cannot be sure that the 50 ohm feeder which you extend from it to your newly fashioned aerial will be an exact match to the latter. But don't worry if the SWR appears to be unduly high: so long as the front-end protection of your rig doesn't shut it down, you can get away with SWR ratios and you can ignore the almost paranoid belief that if one's SWR is worse than 1 to 1.2 then one is in dire trouble. Not true: a modest order of mismatch is acceptable and will be...
barely discernible at a distant station—say, S8 instead of S8½ (gauged entirely by ear, of course: you don’t put your trust in those Japanese S-meters, do you?). How, then, to achieve the best available SWR with that newly built Yagi? First, bolt the aerial to a length of plastic pipe or metal rod and support it on a wooden pair of steps out in the garden. The steps will give you access to the antenna and allow you to compress or extend the folded dipole element until you achieve best SWR. You will have your transceiver in the near vicinity along with its SWR meter to permit you to take continuous readings from the latter as you compress or stretch. While performing this operation do not point the Yagi directly at a nearby object such as your house wall. Mount is as many quarter-wavelengths as you can (and a ¾-wave at 145MHz is 19 inches) from nearby reflective objects. You now have an aerial testing range which will do approximately the same job as those vast ranges which the professionals employ—often on disused airfields—to test their skyhooks.

Important: perform this operation on 144.9MHz or 145.2MHz where your continuous carrier will not clobber either the beacon signal or the repeater area of 2 metres. Equally important: break carrier regularly to give callsign.

Having satisfied yourself by compressing or extending the folded dipole that you have achieved best SWR, dismantle the aerial and its stub mast from your garden steps and erect it in its permanent location, preferably on a chimney stack but, if that means living dangerously, put it in the roof space. The roof members may affect the SWR and the aerial being inside will not radiate as well as it would outside, but you still end up with an antenna system with much more potential (in both senses) than a vertical omni.

“Lowest Power Conducive” Having completed and erected your no-cost Yagi, the next thing to remember is that although it will radiate in the wanted direction and not all around, your transmission will be heard well up country by operators within its beamwidth.

The answer? To use the minimum power conductive to maintaining solid contact. To pile on the power, as all too many stations do is expensive, adds probably no more than one S-point to your signal at a distance, is antisocial because of the noise it produces in nearby operators’ rigs, and can be described as an admission of failure through the resort to brute force.

Which is not to deny the case for the use of high power by stations and expeditions in rare districts or squares where the maximising of signal level some hundreds of metrewave miles away is important. This article is not directed to them. It is directed to operators in urban areas who all too often pile on the power and, because the receiver then seems deaf, add a masthead amplifier to the antisocial omni. The question “How can I organise my station so that it will perform better?” is not answered by the addition of expensive PAs and preamps. It is answered by the adoption of a simple directive aerial such as the one described.

But remember that instead of clobbering all your locals to a radius of 360 degrees you will clobbering others perhaps 80 miles away who cannot find a clear channel because your beamed signal is so strong. “Lowest power conductive . . . then. It’s in The Amateur Code.

No Searchlights Halving transceiver bandwidths, installing of directive aerial: these are two of the palliatives to the congestion problem on Two. There is another: don’t use Two at all. Move up to Seventy. Construct yourself a Yagi one-third of the size of the 2 metre one described. Add a few more directors 12in long and spaced 6in to increase the gain by a modest amount.

Do not fall into the trap which gapes wide and catches some of the less experienced operators, that is to buy one of those enormous 48-element or 88-element aerials. These are fine for DX chasing at the low end of Seventy. They have serious disadvantages in the middle of the band where the repeaters and all the fm activity reside. They concentrate the frontal lobe into a narrow “searchlight” pattern. Of course, you can always cut one down and then, hey presto, if you erect it vertically you are in business in the fm/repeater segment of Seventy. Maybe it would be simpler and cheaper to adopt the simple h/b Yagi described above.

Getting Rotational “Fire your r.f. where you want it to go . . .” again. You can’t do so unless you recognise that it is rational to be rotatable — call it rotational if you like.

Commercial antenna rotators are offered in profusion by advertisers in HRT. Or you may prefer to construct something yourself by adapting one of the ingenious methods which have been presented in the amateur radio press ever since aerials were required to rotate — popularly, “handralic”.

One exponent of the home-build ethic uses a length of cord twisted around the mast outside, ends terminated in the shack. He pulls on the appropriate cord-end to maximise the incoming signal.

Others use the system which requires the base of the supporting mast to be stepped into a builder’s scaffolding peg down at ground level and rotated at shack level by a horizontally polarised bicycle wheel, and chain.

Still others arrange for a horizontal bar to be fixed across the mast at head level, and then to trot out of the shack to turn the device on to the required bearing, heedless of face-titious comments from observers who are amused at your “up periscope” procedure.

Plan position indicators to show in which direction the beam is pointing present a few practical difficulties. At least one enthusiastic metrewave operator does it the simple way: he keeps a large electric lantern in his shack and shines it on the mast outside in the dark to ascertain the aerial’s heading.

There are many other ingenious mechanical methods. If you have adopted or adapted one, then write it up for HRT. It could well be the answer to the question which harms will increasingly ask as omnis lose favour, and that is “How do I get rotational the easy way?”

Back to square one, then. Fire your r.f. in the wanted direction, and put a quietus to those snide comments from your locals that “. . . old so-and-so goes rabbitting on through that omni of his, and we can never find a clear channel when we want one.”
G4HCL gets an exclusive on a handy new scanner that will please air band buffs as well as others.

Last year the HRT review team marvelled at the AR800 scanner, the first handheld model available to feature coverage of the 900MHz range. Indeed following our exclusive review of this we even received a letter from the DTI staying that we must be careful not to encourage people to listen in on cellular telephones which operate in this frequency range! Hence, don't think we at HRT are encouraging UK readers to do this with the AR900, as it also covers the 830-950MHz range. Interestingly enough, it also covers the 220-280MHz and 300-380MHz ranges as well, which the VHF/UHF Airband Frequency Guide (Spa Publications, reviewed HRT June 89) tells me is used by military aircraft. I believe one could get locked up for telling everybody what is heard on that sort of band when residing in the UK. As well as these, other frequency ranges covered are 108-136MHz, used around the world by civil aircraft, 137-174MHz, and 406-470MHz. Again a copy of one of the VHF/UHF frequency guides shows who uses all these frequencies, such as amateurs on the 2m and 70cm bands, Marine VHF communications around 156MHz and so on.

Features

The latest offering from AOR in the shape of the AR900 is a lightweight handheld unit, which for your £235 comes fitted with an internal rechargeable nicad battery pack. Two set-top aerials terminated in BNC connectors are provided, a helical for VHF and a flexible quarter wave for UHF, together with an AC mains charger which may also be used as a mains power supply for the set.

We've already discussed the frequency coverage, any frequency in these ranges may be programmed for reception to the nearest 5kHz increment on the 147-174MHz range, and to the nearest 12.5kHz increment on the remainder of the ranges. Either FM or AM modes of reception can be selected on any frequency. This is in contrast to the common limitation with many other scanners where AM may only be received when you are within an airband frequency range, with listeners resorting to such tactics as internal modifications or image reception to allow AM reception on other VHF ranges.

Memories

100 memory channels are provided, arranged into 5 banks of 20 channels each. Any number of banks of channels may be scanned for activity, and within each bank any channel may be 'locked out' of scan mode as required. The memory scan halts as soon as the receiver squelch lifts, and resumes either as soon as this closes or alternatively following a short delay of a few seconds after the squelch closes, depending upon the scan mode pre-programming.

A 'search' mode is provided where once the set has been programmed with lower and upper frequency limits, it may be set to search between these limits for activity. Again five banks of lower/upper frequency pairs may be programmed for instant access. The set may search in selected 12.5kHz, 10kHz, or 25kHz increments within the remainder to either halt on an active frequency until the search is manually resumed, or to pause for a few seconds after this before resuming the search. A useful feature in this mode is that when halted, the displayed frequency and mode may be programmed into any desired memory channel by simply entering the desired memory bank letter followed by the channel number.
Controls

Frequencies and other scanner functions may be entered directly using the front panel keypad, which may be locked using a top panel button to prevent accidental operation when out and about. An LCD panel shows the reception frequency and other programmed parameters, together with a 'battery low' indication when required to warn you of the status of the nicads. If you attempt to enter an incorrect frequency, the display even gives a 'Fr Err' display in large letters in place of the frequency. This display may be backlit for night use by pressing a top panel latching push button, although the accompanying instructions warn this will drain the batteries fairly quickly.

The top panel also contains the usual rotary on/off/volume and squelch controls, a BNC aerial connector, and a 2.5mm jack socket for an earphone. An small coaxial DC socket is fitted to the side of the case to accept the matching plug from the AC charger/power supply.

In Use

I had previously used the AR800, so at first I believed the AR900 would be fairly similar to operate. I was quickly proved wrong. However after studying the supplied instruction sheet followed by a quick practice, I soon got the hand of operating the unit. Fitting the helical aerial and programming in the frequency of my semi-local 2m repeater give me rather a surprise, unlike other handheld scanners the AR900 picked it up with ease. I normally have to be careful in positioning with other sets. The received audio quality of local FM signals was excellent, listening to the local 2m news service as well as other nearby UHF signals gave the impression they were being received on a large table top set rather than through a tiny speaker.

Using the set when outdoors showed there was only just enough audio level present from the internal speaker for reasonable reception, but not quite enough for when driving at speed in my family hatchback without a degree of distortion. I did use the earphone connection quite a bit, and found the audio quality was excellent when using a good quality earphone rather than one of the tiny plastic affairs (I used a Kenwood HS-8 earphone which gave excellent results). As a built-in audio attenuator is used in the AR900 earphone output, none of the usual squelch clicks and charger hum noises were present. I approached when listening at home although this didn't allow its use as an external speaker socket which I feel could have been useful in some cases.

Searching

When powered up, the set comes up in scan mode with all five memory banks enabled, a quick press of any of the buttons A-E toggled the appropriate bank in and out of scan mode which I found most useful. What I really appreciated though was the facility of five separate search ranges without the need to re-program each time, this enabled me to quickly change between looking at different frequency ranges for general activity, such as the entire 70cm amateur or the airband range. During keypad entry, I found I had to pause about half a second between each button push to allow the set to register this entry, which took a little getting used to at first. A faster entry time would have been nice, but this is only a minor grumble considering the set's wide capabilities.

The lack of 12.5kHz steps on VHF was a little annoying, as in the UK 5kHz and 10kHz steps are of little use, but I found no problems in reception due to the adequate IF bandwidth of the receiver. Potential users may find this slight limitation is easily forgotten due to the advantage of being able to receive AM transmissions on VHF, many other scanners not having this mode allowed for any frequency range other than airband. The other useful facility for manual direct memory entry when an active channel has been found also simplified my initial programming effort quite a bit!

Performance

When out and about, I found the set a very handy companion, lunch times at the office suddenly became that bit more interesting with the set scanning away next to me. I'm sure a set such as this would also have a priority place in many briefcases during business trips as well, to while away any evenings not spent in the bar. The squelch was very sensitive, and would raise on very weak signals indeed to make sure nothing was missed. The maximum squelch setting was also a bit on the sensitive side, especially on AM, as was apparent when receiving local noise sources such as computers and the like which tended to stop the scan. There was also little hysteresis in its action, ie the difference in level needed between opening and shutting, the lack of which can cause squelch chatter.
The performance of UHF when using the UHF whip was extremely good, but replacing this with the helical VHF whip reduced the performance quite a bit, as it did with the UHF whip used on VHF. However the two supplied aerials did allow a choice, to give the best performance on the main bands of interest rather than just a compromise on all bands as I have found with one or two other scanners. Connecting an external VHF/UHF aerial mounted on the roof of my house provided good results as long as there were no very strong local signals present, as these tended to give rise to blocking effects in the set. Again I can't really grumble as it is intended for use as a portable; if you need a good base station scanner you'll need to pay rather more than the price of this set! I was very happy to find few problems due to image reception, as this is a common limitation with many scanners.

### Laboratory Tests

A brief set of measurements were taken, which confirmed the set to be quite sensitive on the VHF ranges, and quite reasonable on UHF. I noticed the FM sensitivity on all bands was around 6dB better than that found on AM. An exception to this was the 350MHz range where the set was fairly noisy on reception, causing weak signals of around one or two microvolts pd to be received OK but needing fairly strong signals to completely get rid of the background noise. The image rejection on VHF was quite good for a handheld scanner of this type, but again an exception was 220MHz where the image was actually stronger than the tuned frequency.

The current consumption measured would allow the set to run from the internal 600mAh nicad pack for around eight or nine hours before a recharge was necessary. This should easily allow a complete day's worth of use when attending an air show for example, which is quite good.

### Conclusions

Overall I was quite taken with the set, it offers more features than any other handheld scanner I know of at the time of writing, particularly in its airband coverage. Although occasionally suffering from blocking effects when used with a large external aerial, the performance when used as a handheld was quite good. When it is returned following review I'll certainly feel I will have lost a useful and handy piece of equipment, even though I already own a somewhat more limited handheld scanner.

My thanks go to Lowe Electronics Ltd. for the loan of the review scanner.

### Laboratory Tests

<table>
<thead>
<tr>
<th>Frequency</th>
<th>AM Sensitivity</th>
<th>FM Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>120MHz</td>
<td>1.21μV pd</td>
<td>1.98μV pd</td>
</tr>
<tr>
<td>145MHz</td>
<td>0.47μV pd</td>
<td>0.45μV pd</td>
</tr>
<tr>
<td>156MHz</td>
<td>0.45μV pd</td>
<td>0.90μV pd</td>
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<tr>
<td>220MHz</td>
<td>1.98μV pd</td>
<td>0.90μV pd</td>
</tr>
<tr>
<td>350MHz</td>
<td>6.90μV pd</td>
<td>0.79μV pd</td>
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### Squelch Sensitivity:

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<td>&lt;2dB SINAD</td>
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<tr>
<td>Maximum</td>
<td>&lt;2dB SINAD</td>
<td>5dB SINAD</td>
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### Current Consumption:

- Scanning: 68mA average
- Receive, Mid Volume: 73mA
- Receive, Max Volume: 102mA

Please mention HRT when replying to advertisements.
TX-3 RTTY / CW / ASCII TRANSCEIVE
The high performance, low cost system
Split-screen, type-ahead operation. Unbeatable features. Needs TIFI interface or TU. BBC, CBM64 tape £20, disc £22. SPECTRUM tape £35, + 3 disc £37 inc adapter board (needs TIFI or TU also).

RX-8 for the BBC computer
Receives screen and printer FAX charts & photos, HF and VHF PACKET, Colour SSTV, RTTY, AMTOR, CW, ASCII, UoSAT 1 & 2.
Receive them all with every possible feature, superb performance and ease of use. Full printer and disc support. The best receive system ever £259. FREE Klingensfuss Utility Guide for 1st 50 purchasers. DISCOUNT for RX-4 users. More details in June issue or send for full information.

RX-4 RTTY / CW / SSTV / AMTOR RECEIVE
Performance, features and ease of use make this still a best-seller. Text and picture store, disc and printer support. Needs TIFI interface. BBC, CBM64 tape £25, disc £27. VIC20 tape £25, SPECTRUM tape £40, + 3 disc £42 inc adapter board (needs TIFI also) or software only version £25.
TIFI INTERFACE Optimum HF and VHF performance with our software. 4-pole filtering and computer noise isolation for excellent reception. MIC, PTT & KEY TX outputs. Kit £20, ready-made, boxed with all connections £40. Available only with TX-3 or RX-4 software. Also MORSE TUTOR £6. LOGBOOK £8. RAE MATHS £9 for BBC, CBM64, VIC20, SPECTRUM. BBC LOCATOR with UK, Europe, World maps £10. All available on disc £2 extra.

technical software (HRT)
Fron, Upper Llandwrog, Caernarfon LL54 7RF
Tel: 0286 861886

THE NEW TEN TEC PARAGON
Synthesized Transceiver
An addition to the TEN-TEC range of top quality equipment from the U.S.A. This general coverage all mode receiver tunes from 100kHz to 29.9999MHz. Modes USB, LSB, CW, FSK, AM, (FM optional). Sensitivity SSB/CW/RTTY 0.15uV. Dynamic range: 100dB on SSB. Blocking and 3rd order Intercept, very impressive figures. Transmitter 200 watts D.C. Input. CW Sidetone, Speech compression.

TX-3 RTTY / CW / ASCII TRANSCEIVE

HRT PCB SERVICE
Ham Radio Today can supply ready-made, pre-drilled printed circuit boards for some of our published constructional projects. The first board to become available is the Morse Keyer, published in the January 1989 issue of HRT. The board reference number contains the essential information for identifying and ordering a board from our PCB Service. The first two digits give the year of publication, and second two the month. The extension number gives the number of projects available from that month's issue.

Please send orders to: HRT PCB Service. ASP Readers Services, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST. Please make cheques out to ASP Ltd. Payment can also be made through Access and Visa cards by telephone on (0422) 66551 during office hours.

HRT 8901-1 Electronic Morse Memory £5.50

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On these club contacts and forward diary pages, dates are shown approximately from the week of publication to the end of the cover month, and further into the year where dates have been supplied. We need dates at least three calendar months in advance to get them into the nearest issue. For example: the last possible issue for dates from mid-August to mid-September is the September issue. The September issue normally appears on the first Friday in August, and we need club dates by the second Friday in June. Club dates received well in advance will normally be run in more than one issue. Also, please write and let us know if your club has ceased, or changed its name or contact.

SCOTLAND
Aberdeen ARS. Contact: Don Tel. 041676 251. 
Ayr ARG. Contact: Robert Paterson GM4CUB Tel. 0292 262496.
Meetings: 2 Fris. Community Centre, Wellington Sq., Ayr.
Dunfermline RS. Contact: GM0DYD Tel. 0383 413440.
Galashields DARS. Contact: GM3DAR Tel. 0896 56027.
Glenrothes DARC. Contact: Sep 16 Scottish National AR Convention at Fife Institute of Physical Recreation.
Glenrothes. Contact: John Hardwick GM4ALA Tel. 0592 742763 (h) (0506 410677 (wk).
Inverness ARC. Contact: Brian Tel. 0463 242463.
Lothians RS. Contact: P J Dick GM4DTH 21, West Maitland St., Edinburgh EH12 5EA. Prestel (NOT phone) 314471210. Meetings: 2, 4 Thursdays 7.30pm Orwell Lodge Hotel, Polworth Terrace, Edinburgh.
Louth DARC. Contact: G1ZB, Tel. 047286 595.
Mid Lanark ARS. Contact: David Williams GM1SSA, Holytown Rd., Hamilton.
NORTH EAST ENGLAND
Barnsley ARC. Contact: Ernie G4LUE, 8 Hild Av, Cudworth.
Denby Dale DARC. Contact: G3SDY 0484 602905.
Derby DARC. Contact: Kevin Jones G4FFP Tel. 0332 669157 Meetings: 119 Green Lane, Derby. 7.30pm. Most Weds. Aug 13 Derby Radio Rally, Lower Bemrose School, St Albans Rd., Derby. All the usual, and monster junk sale. Contact: Martin Shardlow 0332 556875.
Hornsea RC. Contact: Richard Tel. 0401 62498. Meetings: The Mill, Atwick Rd., Hornsea. 8pm.
Hoyland ARC. Contact: M. Wardle, 11 Sokwell Ave, Barnsley.
Leeds DARS. Contact: GIBBS Tel. 0274 665355.
Loughborough ARC. Contact: Philip Tel. 0509 412043.
Mansfield ARS. Contact: J M Coates G4GYU Tel. 0623 27257. Meetings: Fridays.
Morpeth ARC. Contact: G4JR Tel. 0509 585858. Meetings: The Clubhouse, West St., Workop.

NORTH WEST ENGLAND
Aire Valley RS. Contact: G6NPT Tel. 0532 445957. 
Chester DRS. Contact: Dave Tel. 0244 536639.
E. Lancs ARC. Contact: Stuart 0227 66813.
Isle of Man ARS. Contact: J. Wrigley Tel. 0524 3382457. 
quizz Jul 25 Surplus sale Aug 1 VHF NfD inquest Aug 9
Construction, on-air Aug 15 SSB FD Aug 22 Surplus sale Aug 29 Police radio
Morecambe Bay ARS. Contact: D H Wood G4ZJL Tel. 0524 52024. Tuesdays 7.30 Trimpell Sports and Social Club, Out Moss Lane, Morecambe, Lancs.

Preston ARS. Contact: George Tel. 0772 718175.
St. Helens DARc. Contact: Carol Wainwright G0CXT Tel. 0744 813589. Meetings: Thurs 7.45 Community resource centre, Old Central Secondary School, St. Helens. Regular morse tuition.

Staffs ARS. Contact: Bill G4WTP Tel. 0782 514741.
Stockport RS. Contact: John Verity G4ECI Tel. 061 439 3831. Meetings: Robin Woods Centre, Beauty Bank, Stourbridge, Construction competition.

Todmorden DARc. Contact: Ede Tyler GOAEC Tel. Halifax 882038. Meetings: 1, Thursdays.
Warrington ARCC. Contact: Paul G0CBN Tel. 0925 814005.

Wirral ARS. Contact: A Seed G0FOO Tel. 051 644 6094. Meetings: 1, Mondays at 7.45 Ivy Farm, Arrows Park Rd., Birkenhead. Jun 19 Equipment sale for funds.

WALES
Abergavenny and NH ARS. Contact: GW4X0H Tel. 0873 715411. Morecambe Bay ARS. Contact: D H Wood G4ZJL Tel. 0524 52024. Tuesdays 7.30 Trimpell Sports and Social Club, Out Moss Lane, Morecambe, Lancs.

Brighton DARS. Contact: Peter Tel. 0273 607737. Meetings: 1,3 Thursdays.
Bredhurst RTS. G0BRC, G7BRC. Contact: Kelvin Fay 0634 376991.


Basingstoke ARC. Contact: D. Deane G3Z01 Tel. 0734 332105. Basingstoke ARS. Contact: G0JXG, 2m 2,4 Mons, 8pm.


Cornish RAC. Jul 15 Cornish RAC Rally, Richard Lander School, Truro.


Evesham: Vale of Evesham DARc. Contact: John G3DEF Tel. Evesham 6407. Meetings: 1 Thurs at 7.30pm at MEB Club, Worcester Road, Evesham Aug 14 Informal.

Exeter ARS. Contact: R. J. Donno G3YBK Tel. 0392 78710. Meetings: 1,3 Thurs at 7.30pm at Club House, St. David’s Hill, Exeter 7.30pm. Jul 10 Construction competition Aug 14 Free and easy evening.

Plymouth ARc. Contact: G4SCA Tel. 0752 337980

Poole ARS. Contact: G0EQV Tel. 0202 674802.

Salisbury RES. Contact: Neil Tel. 0980 22800.

Basingstoke ARC. Contact: D. Deane G3Z01 Tel. 0734 332105. Basingstoke ARS. Contact: G0JXG, 2m 2,4 Mons, 8pm.

Braintree ARS. Contact: G0BRC, G7BRC. Contact: Kelvin Fay 0634 376991.

Braintree DARc. Contact: Ian Carter G0GRA Tel. 0282 830383. Meetings: Most 4 Weds, 8pm, TA HQ, Bythesea Road, Towbridge. Jul 19 6.30am Picnic White Horse Hill, Westbury 14 Aug 2,3 Social Aug 16 TB.


SOUTH EAST ENGLAND
Basingstoke ARc. Contact: D. Deane G3Z01 Tel. 0734 332777 (hm) 0734 787930 (wk). Meetings: Forest Ring Community Centre, Sycamore Way, Winklbury, Basingstoke. 7.30pm. 1 Mondays.


Biggin Hill ARC. Contact: Geoff Milne G3UMI, 142 Hayes Lane, Hayes, Meetings 3 Tuesdays, Victory Social Club, Keirhill Gardens, Hayes, Jul 18 PBCS Aug 15 Operating evening.

BraineMade ARS. Contact: M. Andrews 0376 72431. Meetings: BraineMade Community Association Centre, Victoria St. 7.30pm. 1 Mons. Jul 17 Live broadcasting Henry G1GMM Aug 7 TBA. Aug 21 Something by Rob G0ZSH. Club net C6BRH or G4JXG, 2m 2,4 Mons. 8pm.

Bredhurst RTS. G0BRC, G7BRC. Contact: Kelvin Fay 0634 376991.

Brighton ARS. Contact: Peter Tel. 0273 607737. Meetings: 1,3 Weds. Roast Beef Bar, Brighton Racecourse, Elm Grove, 8pm.

Burnham Beeches RC. Contact: G6EIL Tel. 0628 25270. July 23 6th McMichael Rally with Maidenhead DARc at Haymill Centre, Burnham (Slough). CAMRA bar, food, parking, radio controlled cars, ATV group, packet and HF stations, £1, car boot area £5, from 10.30 (10.15 disabled). Contact Bob Hearn G0BTH Tel. 0494 29868.

Cambridge DARc. Contact: D. Wilcox Tel. 0954 50597.
Chesham DARS. Contact: L. Cabban Tel. 09278 3911. Meetings: Stable Loft, Bury Farm, Pednor Rd., Chesham. 8pm Weds.

Cheshunt DARC. Contact: Roger Frisby G40AA Tel. 0992 464795. Meetings: Thursdays, 8pm, Church Room, Church Lane. Worrall. Herts.


Clwydian RS. Contact: Brown. 0232 499080.

Crawley ARC. Contact: Jack Tel. 0293 28612.

Coulson ATS. Contact: Alan Tel. 01 684 0610

Crawley ARC. Contact: Jack Tel. 0293 28612.

Croydon ATS. Contact: Alan Tel. 01 684 0610

Cumbernauld ARC. Contact: J. Paterson G3OJC Tel. 081 558 2324.

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**FOR SALE**

**YAESU FT101Z transceiver with fan.** Excellent condition. £425, ono. FTV901R transceiver with 2m's and 70cms modules. £250, ono. Both for £600. J. Chimney, 31 Kingsway, Kington, Northampton NN2 8HD.

**FOR SALE**

Racal Dana 9837 frequency counter/timer: £80. Ian Poole G3YXW, OTHR Tel: 07844 450847.

**FOR SALE**

or swap 1 Daiwa 2m receiver 144.146MHz, plus 2 Pye Westminster AM Rigs can be converted to 10m-70m. £120 ono. The three or will swap for scanner, or any GCR. Contact Mr. David Brookes, 219 Wood Lane, Partington, Manchester M31 4HY. No Phone.

**FOR SALE**


**FOR SALE**

Collins 51J4 general coverage Rx all previous model to 680 40, 50, 10, 60A, offers. Phone Mark 0296 618499. 10W on 6m. Brand new, boxed, warranty remaining. Bargain at £250. J. Chimney, 31 Harlow Lane, Romford, Greater London.

**FOR SALE**


**FOR SALE**

Racal Dana 9837 frequency counter/timer: £80. Ian Poole G3YXW, OTHR Tel: 07844 450847.

**FOR SALE**

or swap 1 Daiwa 2m receiver 144.146MHz, plus 2 Pye Westminster AM Rigs can be converted to 10m-70m. £120 ono. The three or will swap for scanner, or any GCR. Contact Mr. David Brookes, 219 Wood Lane, Partington, Manchester M31 4HY. No Phone.

**FOR SALE**

UHF bands 1.5 AM, FM, 6 presnets in receve mode. £25. All prices include delivery. 0245 324565.

HAND HELD Kenwood TH205e in original packing. £225. Spectrum communications transceiver 2mtr with 6mtr with 5Wt line and 4 ele Jaybeam. £100. Phone New London 154600. MAJOR M5885 fully moddified CB suitable for 10MTR conversion £150. Mark (0296) 88064. HI-MOUND MK-704 twin paddle key new unused £12. GZAZ, QTHR or phone (06858) 2535.

JAYBEAM TB3 six months use. Excellet condition. Elements pre-assembled for easy building. Will fit estate or go on roof rack. Buyer will have to collect or arrange transport. Bargain at £200 ovno. 0296 6pm.

FOR SALE FT414A RTTY decoder for Ham + Press + 19"VTR. All in perfect working order. Buyer collects. Cash, please. 0296 270143.

TRISTAR 747 CB convertible to 10m 160 channels. £70 ono. Mark (0296) 88064. 18 Kingsland Rd. Aylesbury. HP21 9SY.

GOM1YN Tel: 041 9548 0365.


HAM RADIO TODAY AUGUST 1989

TRIO TS530SP HF transceiver 160-10M as new. £955. Can deliver within 100 miles of Newcastle. Tel: 091 4770392 or 4782965 Day, Ian GOCCL.

JON3911 VV09452.2 AS 100W SSB. £60. Telephone 0506 709456.

FOR SALE Yaesu FT757GX, with discone. £370. Yaesu FRG-7700. 60-950MHz boxed, with Discone + £375. Yaesu FT781B, V.C.G. with ATU and boxed as new. £525. Yaesu FT250 + FTDK ATC 720 sky voice professional air band monitor. 118-136MHz AM, 720 channels, complete with charger, slightly scratched for £80 ono. Phone 01 692 0944.

PYE F8AM base station with PC1 remote control, £85; Westminster W15 mobiles, £28; PFZAM, handheld with charger, £65; all converted for hi-band, also some Westminster, Cambridge spares, including PCBs, valves, etc. £250 for video camera. £25. Yeovil 25225.

934 FL micro 1 mobile rig and rig £250.00 ono. £95.

FOR SALE Yaesu FRG-9600. 60-950MHz boxed, with Discone + £375. Yaesu FT781B, V.C.G. with ATU and boxed, £375. Yaesu FT250 £250.00 ono. Also Yaesu FRG-7700. £375.
ALL unmarked, mint. Hardly used after 6pm on 0695 624211. £165. Tel: Bude (0228) 2951 after 6pm.

RT-ONE Yamaha, perfect condition. £160. Tel: Bude (0228) 2951 after 6pm.

Literature for Yaesu FR - 9000. £2 each. Call Dave G1NYN. 1950 - 07310658487.

FT902D CW filter FSK. AM FM, 2m & 70cm, £160. Tel: 0228 22712.

WANTED for Yaesu FT10/120 with FM. Condition in mint condition. Please ring (0689) 890277.

WANTED Pye M212 VHF FM Olympic. 01 856 4123 evenings.

WANTED for cash. Sony CRC 330 or ICF 21000D, ICF 7600D. Non-working or not also considered. Tel: 0462 421247. After 7pm.

WANTED crystals for 16cm WARC. Brands for Drake RYC receiver. Please contact Egbert Hertsen. PO Box 85, Mechelen 2 8000, Mechelen. Belgium. Also like to swap software for CSV on Disk.

WANTED construction details and information on the WISL 15L 4C 2500 linear amplifier. Anything welcomed. Postage refunded if required. Dave GASR, no QTHR. QTHR - 16 Windermere Road, Edith Weston, Oakham, LE15 8JF.

WANTED morse RTTY ASCII reader made by AEA, marketed by ICS under MBA-RO code reader blue, display 32 character or similar reader. Reader please contact GJ RHN - tel: 01 660 1326 evenings w/e, or 01 629 1201. (ext 236) Hugh Weekdays.

WANTED for Eagle RX-60N waveband switch. Phone 0769-731516.

WANTED Kenwood MC-6A0A microphone and AT-230 ATU. Tel: 0258 55232.

WANTED YC221 digital readout for FT221. Also weather sat converter, £535 ono. Also FT23OR TCVR £150. Tel: 0602 379229.

WANTED Dial and drive unit for Yaesu 500 ohm. £12. Ring 90FJL 57416.

WANTED Yaesu 500 ohm. £12. Ring 90FJL 57416.

WANTED morse ASCII in good condition. £30 Tel: Bude (0228) 2951 after 6pm.

WANTED for FT220 also the mike (600 home) and power cable with plugs. Call Dave G1NYN Heckmondwike 405274 after 2pm.

HELP wanted, info for converting Storno Bootmount mid-band to 70cm, also wiring diagram for control unit. My one is wrong! Any info very much appreciated. Robert, No.5 George Walk, Tranent, EH33 2EN.

WANTED Dial and drive unit for HRO IC 375C 414060 c/w valve type. Tel: 0228 264360.

WANTED wanted on audio chip SN76013. Please contact Graham 0493 76-5600 or send info to No. 5 Greencrooks, Winterton on Sea, Gt. Yarmouth, Norfolk NR29 4AQ.

WANTED webbing canvass and key for WS18, also PSO No.5 for same and control box/accessories for 46 set. Phone Tony, 051-931 1716.

WANTED hand-book for INOUE RX-700R or any help. Phone 051-227 4123.

WANTED Beg, borrow or buy original AP2548 or copy for school project. To revitalise TT115/1155 G141KQH.

WANTED Pye Olympic M202. Also M212. And SSB 130. Phone: 01 856 4123.

WANTED manual for Faris band-limited electronic Wave Giver. Will borrow. A photostat copy will be acceptable. All expenses paid. Ring Richard, 0244 816435.

WANTED Trio TS-180S and Trio TR-7500. Particulars to John J. Houghton. 4 Cambridge Road, Salisbury Road, Shobust, near Romney, Hampshire PO61 6GA. Tel: (0794) 512283.

WANTED Kenwood R6000 or JRC 986SG in multimode condition. Cash or PX icom R71E with FM. Boxed, perfect. 01 566 6131.

WANTED Pye Europa type MF25R with 25MHz channel spanning. Must be in good, clean and complete working condition. Conversion to 2M FM: Details please to Paul - G7ACU - by phone only on Redditch (0527) 68863 after 18.30. Please no time wasters.

WANTED would follow amateurs please contact me to confer on suspect faulty solenoids and dry joints involvement. In the meantime, whilst I am still taking legal advice. This information is essential. 14 Penrith Street, Port Talbot, SA13 1UL.


TOWER and beams for sale. Westover 25/FSP 2 section 45 feet. Wind-up, tilt-over. Full instructions. DX 22 2ef tirbender + Delta. Quad for £50 or £600 the lot, ro will split QTHR or ring 061 973 1611.

FT602DM CW filter FSK/P, AM FM, SSB, memory and split frequency TCVR. Canadian made, 12V DC converter, £535 ono. Also FT23OR 2mtr FM TCVR 10/25w, £160 ono. Both exc cond, Phone Coventry (02063) 450476. John GOUL.

WANTED smartly made coupling receiver, good condition, fitted with switchable mechanical SSB and standard filters. £120 ono. DNT supermated by Radiotechnic. 1640 FM transceiver converted to cover FM portion of ten metres. Complete as new, with box microphone mobile bracket and power supply. £55. Madestone 55232.

EXCHANGE Tx/Rx microwave modules. For Bearcat BC200 XLT, or any H/IC scanner coverage up to 950MHz. Telephone: 021-743 7519. Between 6pm & 9.30pm.

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