

HAM

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— base station and round-
the-world satellite box

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TS-790E – Just when you thought it was impossible

Impossible to design and produce a multi band VHF/UHF transceiver which would render all others obsolete? But this is what Kenwood have done with the TS-790E, in the same way that the TS-940S set new standards which have not yet been beaten, or the TR-751E 2 metre multimode, which is still without any serious competition. Kenwood have the magic touch which gives the customer what the customer wants, in a package which is easy to use, performs like a dream, and is simply a delight to own.

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It is fashionable in some quarters to sneer at the microprocessor, but Kenwood write the software in their processors with the aim of giving the user complete control over a wide range of facilities and not confusing the issue. In this respect, the TS-790E adds a new dimension to VHF operating, with its dual (triple) band monitoring, cross band operation, full duplex facilities, and a wide range of features to make life easy for the operator.

I must mention the TS-790G which has already been advertised elsewhere. The "G" suffix denotes that the transceiver is produced for the Japanese home market. That's acceptable if you can read the Japanese handbook, but the 10 watt power outputs on 2 and 70 may not be to your liking, nor indeed the fact that there is no connection at all between the purveyor of the product and the Kenwood UK sales and service network. I know and understand the desire of certain importers to be the "First on the market" with a new product, but so often it's a bit like being the first man to offer the square wheel – not quite right for the intended purpose, but somebody will always buy it.

As always; Caveat Emptor.

John Wilson
G3PCY/5N2AAC

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HAM RADIO CONTENTS

TODAY

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REGULAR COLUMNS

READERS' LETTERS	6
Hands off the right to convert	
RADIO TODAY	12
Garex Electronics take over	
RADIO TOMORROW	48
Starting this month — regional listings	

FEATURES

METREWAVE	4
Jack Hum updates 1988	
LOOPING THE LOOP	20
Capco's little aerial calls for a new loop at looks . . .	
THE RADIO OF THE FUTURE	39
Credit card radio? You'd better believe it	
LISTENING ON	42
Featuring the Voice of America	
AIR LETTERS	46
Air band brands banned? The plane truth	

REVIEWS

KENWOOD TS-790 BASE STATION	32
Serious stuff — a new flagship	
LOG PERIODIC YAGI	36
'Create' all-round aerial in a small package	

CONSTRUCTION

SMALL IS BEAUTIFUL PART 2	16
Single-band LF antenna, Woolworths'-style	
MULTI-WAY RIG SELECTOR FOR MOBILES	26
Many machines, few hands, the easy way	

FREE READERS ADVERTISEMENTS	51
PCB SERVICE	54
CLASSIFIED ADVERTISEMENTS	56
ADVERTISERS' INDEX	55

METREWAVE

In case you hadn't heard, Christmas was invented for the discomfiture of editors, printers and pressmen. It gouges a great gap in production schedules. It has editors scurrying to

not include one ham's observations as at 31.12.88 of the relative take-up of 6 metres and 4 metres by Class A and Class B licensees. More of this below.

repeaters, remember?

There were others who took the opposite viewpoint and said: "For goodness's sake let's start using this vhf band properly".

Not to forget the third and even larger body of hams who remained undecided which was the better thing to do: opt for Six or for Four. This problem was aired here many months ago when the answer suggested was "Neither. Spend your money on 70cm. You'll get more contacts per pound expended than you will on 6 metres or 4 metres."

This problem of how much capital to tie up in equipment for a new hamband is a very real one for people with mortgages to pay and other commitments that reduce what can

"Let's update to the year-end that conspectus for 1988" suggests Jack Hum G5UM.

seek printing time from finite printing facilities. When at last they flump into their armchairs at home after it's all over they murmur: "Thank goodness that's done — until next year" (or words to that effect) (*The man's a mind reader — Ed*).

How relevant is all this to amateur radio? Very much so. It compels any conspectus of a closing year like G5UM's in HRT for February to draw the line well before that year is done in order to pre-emp the Great Christmas Lacuna. That HRT conspectus of 1988 could hardly report the interesting events on the metrewave front which occurred after press-date.

There were, for instance, the extended tropo openings caused by December's unusually mild and high-pressured weather. There was the occasional aurora. There was some notable meteor activity.

All of which had the 2 metre band in a state of high excitement in the last weeks of 1988. And the 6 metre band, too, with the added bonus of intercontinental DX showing up that could be worked on the proverbial dipole in the roofspace with 3 watts fed to its base. On Six the northern, central and southern Americas showed themselves to be readily workable from the UK. So did southern Africa, to which some classic examples of TEP (Trans Equatorial Propagation) manifested themselves in the wake of the good old Alexandra Palace TV station which did it all 50 years before, though with rather more than ham ERP (17kW peak white, to be precise).

To Think Harder . . .

So the G5UM lookback over 1988 was out of date in all these respects. In another respect because of the advanced press date it could

But in a third respect the annual round-up did what it was intended to do, and that was to provoke readers into thinking harder about the way in which they practise their amateur radio. In that self-same context of 6 metres there have been those who disagree hotly with any suggestion that Six is not primarily a DX band — and especially with that bit about

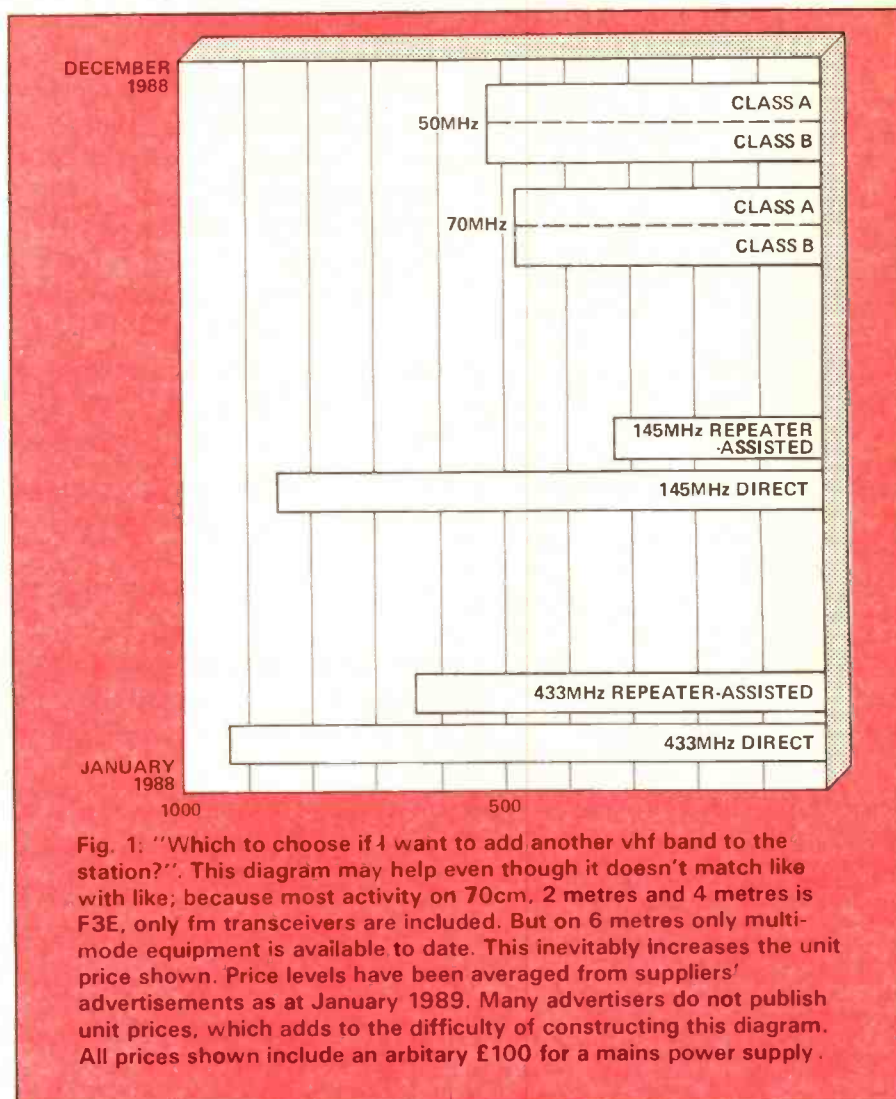


Fig. 1: "Which to choose if I want to add another vhf band to the station?". This diagram may help even though it doesn't match like with like; because most activity on 70cm, 2 metres and 4 metres is F3E, only fm transceivers are included. But on 6 metres only multi-mode equipment is available to date. This inevitably increases the unit price shown. Price levels have been averaged from suppliers' advertisements as at January 1989. Many advertisers do not publish unit prices, which adds to the difficulty of constructing this diagram. All prices shown include an arbitrary £100 for a mains power supply.

be spent on amateur radio. It is a very real problem indeed to Class B operators undecided since the Great Emancipation Day of June 1, 1987, about which metrewave band to add to their collection (ignoring 145MHz and 433MHz which have always been available to them).

An attempt to provide a modicum of guidance on this point is illustrated Fig. 1 in the accompanying chart comparing approximate transceiver prices on four bands, 145 and 433MHz added for the sake of completeness. The information was derived from traders' advertisements. In each instance another £100 has been added for the essential power supply unit.

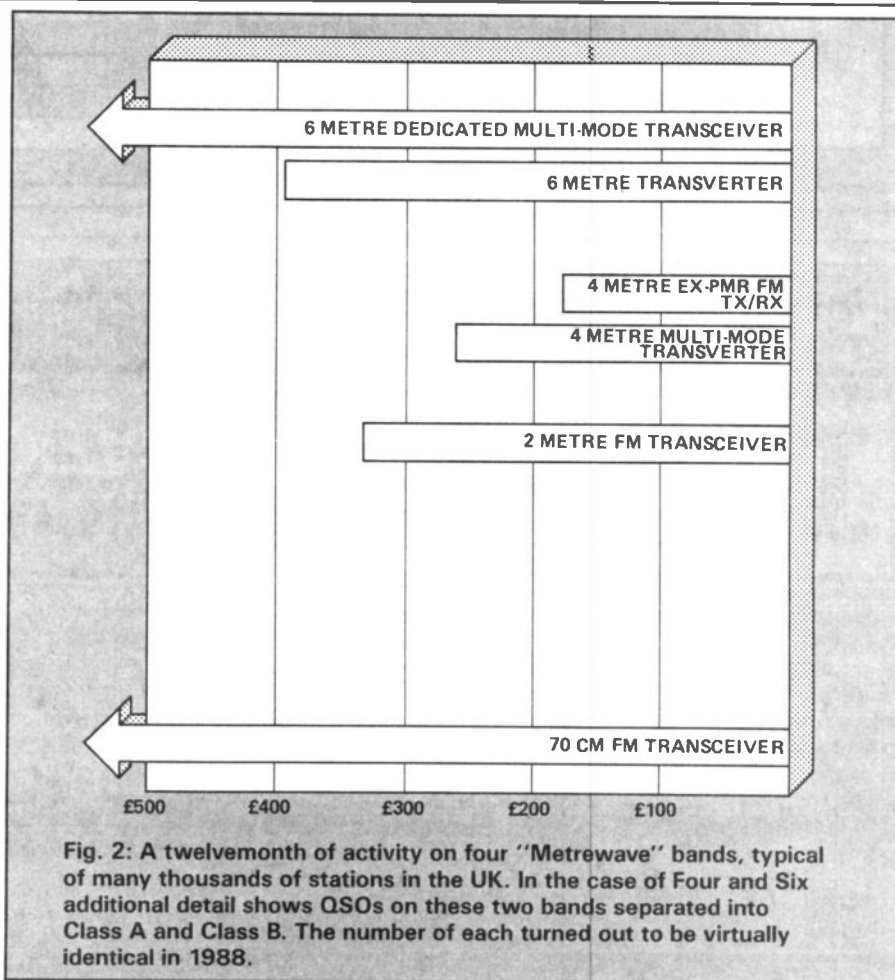
What is evident from this chart is that you will pay much the same for a 50MHz all-mode rig as you would for a 70cm fm-only rig. But to borrow the late President Roosevelt's famous phrase about "bangs per buck" you will earn many more QSOs-per-pound by opting for 70cm where there are repeaters and mobiles but little DX, while on 6 metres where (to date) there are no repeaters and no mobiles but DX for a small percentage of the time, you will enjoy fewer QSOs-per-quid but a great deal of excitement (in season).

In between these two bands of Seventy and Six the economy of opting for 4 metres becomes evident from the diagram. Discarded private mobile transceivers can be picked up for less than £20, plus crystals perhaps £40 on top of that, to give excellent fm communication. But two important desiderata are: that you will know how to tweak such rigs on to the 4 metre band, and that you will need a mains power supply unit, assuming that the transceiver is to be used primarily as a base station as well as occasionally on the road. The gross expenditure is likely to be less than £150. And the cheap-and-cheerful aerial, probably a quarter- or a half-wave vertical, will be much more wieldy than the big horizontal Yagi most people use for Six.

You almost literally "... pays your money and takes your choice" when you are faced with the decision to start on a new metrewave band.

Facts Is Sacred . . .

"Opinions is opinions but facts is sacred" said an ancient philosopher (probably out in the Mid West). How do the parameters so far deployed



relate to real life? Put more simply "How many contacts can I expect to make on the band of my choosing once I've decided to spend my money? You've told me how many 'bucks'. What about the 'bangs'? Let's have some of those 'sacred facts'."

Facts coming up, then: the next Fig. 2 diagram is an extract from one ham's log for 1988 to show a twelve-month's contacts made on 6 metres and 4 metres to give a practical comparison between the two. The 70cm and 2 metre bands do not come into this calculation because each contains repeaters capable of generating simplex QSOs; and each has much more occupancy than Four or Six.

Simplex QSOs only, then, on Four and Six. The figures given derive from a relaxed approach to all the metrewave bands in use and not a rabid attack on any one of them. They represent the kind of performance anyone, but especially the newly-emancipated Class B operator, may expect after taking the decision about which of the metrewave "dc bands" is to be adopted.

They by no means represent a steady unbroken accretion of contacts throughout the year. They are loaded by periods of frenetic activity during contests. They are "unloaded" by such events as holidays and sickness and other incidentals of almost as much moment as amateur radio (and there aren't many of those). Only a concise sum of contacts is shown in respect of 2 metres and 70cm, for as has been said, these bands are open to all. Repeater contacts, although not "real QSOs", are shown as a matter of interest. More detail is shown in the 4 metre and 6 metre presentations to indicate to Class B and Class A operators what order of activity may be expected there. Each will need to decide from the tentative suggestions given which of those two "dc bands" is to be adopted.

Best of all, adopt both if the collateral will run to it. Once the decision has been made, keep an account of how many "bangs" you have enjoyed during the ensuing twelvemonth to enable you to decide if those "bucks" have been well spent.

LETTERS

Letter of the Month

In response to the article in HRT February (*Raycom in DTI Quandary*) I would like to express my support for Raycom. They should have the right to sell single band amateur radio equipment for 10m. After all, single band rigs for different frequencies will convert to other "pirate" frequencies such as 6.6MHz. If people do convert a legal set to illegal frequencies, surely that is their responsibility and not that of the dealer.

I bought a Uniden 2830 last year because it is small, easy to use, and has been well reviewed. This set has given me a great deal of pleasure, making contacts all round the world, particularly on the 10-10 International net. I was pleased with the good quality audio received from American amateurs using the same rig (known over there as the 2510).

Lets face the facts, many other types of rig have been converted to CB and other illegal bands. I have heard of the FT747, TS440 and IC720, to name but a few, being illegally modified. All these sets are potential pirate radio transmitters, and I am sure that any

transceiver with general coverage reception can be converted to general coverage transmission fairly easily.

The objections to the Uniden rig seem to be that it is fairly easy to convert and that it is single band. I think that the argument over ease of conversion is answered by the examples of other ham equipment which have been modified. Remember also that these sets are potentially more dangerous because they could be made to transmit on the 6MHz band and interfere with MOD and aircraft. That leaves the argument about the Uniden being single band. If amateurs can get permission to convert illegal monoband CBs for legal 10m use, they then possess a legal single band 10m rig. Remember that if a rig will convert up to 10m, it will convert down to 11m, I can see no sense in the monoband argument.

Radio piracy is not the responsibility of those who sell amateur equipment, but of those who convert it after purchase, or sell it in a converted state. I could name emporiums which have offered that service not only to amateurs but also to CBers.

How many readers have heard CBers quite openly saying "The rig here is a 757" or whatever? If he Uniden is illegal because of its possible use in CB, then most other amateur equipment is also illegal.

— John McCallum G4YMC, Newcastle, Tyne & Wear.

I think that the purpose of making single band 10m transceivers illegal is that these are the cheapest easily convertible rigs. The argument runs, I expect, that far fewer CB operators want to buy expensive multiband rigs and convert them than cheap single band rigs. As far as I understand it, the reason that Raycom have had to stop selling Uniden 2830s is not directly because they could be converted to CB, but because the law prohibits their sale or import. My personal opinion is that the law is unreasonable in that it restricts law abiding folk without seriously inconveniencing the lawbreakers, but a government agency obviously has to enforce the law as it stands, not as we might like it to be. If you think, as many of us do, the legislation is unreasonable, write to your MP and put the case. — G3YZW.

Unlocal Hero

Having read about a handy little integrated circuit that provides plus and minus 8 volts at a few milliamps from a 5 volt rail and includes two TTL to RS232 and two RS232 to TTL translators, all for about £6, I went to a component shop recently to try and buy one.

Somewhat to my surprise, they were not only in stock, but the assistant who served me actually knew what they were used for.

When I asked if a data sheet was available, he went off and returned a few minutes later with four A4 size data sheets copied from their own manual on their Fax machine, as the copier was not working. On enquiring the cost of the copy, the reply was "No charge — it's a pleasure."

In case you are wondering where to find this paragon among component shops, I have, alas, to tell you that it was in Sydney, NSW!

— A Hall, Freshwater Bay, Isle of Wight.

Gift Horse with Gold Teeth

Those of us who have, over the years, developed something of a reputation for dismantling odd bits of electronic garbage "just for the bits", often find ourselves at a rubbish tip, at dead at night, disposing of the hopeless junk that well-meaning friends and neighbours have wished upon us.

My feelings can be imagined when

a friend arrived saying "I've got some junk for you in the car. It might be alright for bits." My heart sank when I saw the large, corroded, filthy boxes that he carried in and plonked on the carpet.

Rapidly repositioning the Daily Blurb under the boxes, I thanked my friend profusely for his thoughtfulness. While waiting for the kettle, I took a closer glance at the boxes. "Well", I thought, "die cast alloy! Not a total waste!" A screwdriver was obtained

£10 FOR THE LETTER OF THE MONTH

You've got a gripe about the bandplans, or you'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.

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IN AMATEUR RADIO
ABOUT 5 YEARS AGO...



WHEN I STARTED
WORKING IN A
CHEMISTS....



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and the interior of the boxes examined. Behind all the filth and corrosion lurked a couple of hermetically sealed units which proved to be a marine-band transmitter and receiver, in perfect condition. No dust, no dirt and no sign of water staining! It was, in fact, a Woodson Marine Radio Telephone unit, complete with power supply unit (totally U/S), cables, etc:

A pair of KT88s modulating a pair of 807s, (G2s and G3s eat your hearts out!). Given my desire to return to the practice of waggling a Vibroplex, are there any ops of the above vintage that have any data on or experience of, modifying this equipment for CW on 'top band', 'eighty' and 'forty'? Also, does anyone want a heavy but charming (in its own way) modulation transformer?

The real moral of this tale, if there is one, is to look around at the stuff people are throwing away and see if it can be put to good use, rather than day-dreaming about second mortgages for the latest Far Eastern 'black box'.

Another moral might be "Never look a gift horse . . ."

— Tony Tuite, Bod Afon Brynmor, Penmaenmawr, Gwynedd.

Don't Pack In Packet

I am prompted to write to you after talking to amateurs who have an interest in packet radio.

I was shocked to hear that the packet community was a very closed shop and cliquey and people were reticent about talking about their hobby, seeming to be snobbish.

I would like to put my views forward; today getting equipped for packet couldn't be much easier as all one needs is a tnc and a home computer (the rig almost every one will have). Problems arise for the newcomer, but there is little in print about packet radio and the subject is a little more complex than the chappy at the local emporium would have you

believe. The only recourse is to ask people, but it is very difficult to give one line answers to some questions, and a question answered poses three or four new ones.

A lot of prospective "packeteers" have a go for a few weeks then give it up as being too complicated. This is unfortunate as it is a great mode that deserves more than a dabble. In the final analysis, as a mode packet requires a little more commitment than do some modes, and an active interest in computing helps a lot.

Finally for those of you who are still interested in the mode, and I sincerely hope I haven't put anyone off, get alongside a friend who runs packet and ask if you can observe a few sessions and the questions you may have can be answered by demonstration which is much more powerful than talking.

— Mark Flett, Peakdale, Buxton.

Crowding Out CW

The anti-social spate of weekend cw contests continues unabated, their bandwidth allocations bearing no relationship to the percentage of non-contestors.

By what right is any initiating committee empowered to commandeer say from 14010 to 14060 for a forty-eight hour period to the detriment of others on the cw segment? This weekend has been a prime example of legalised piracy.

Another ill-conceived ruling depleted the 20m cw only portion by 5kHz, to allow RTTY users to extend into an area which they'd been unlawfully working, unimpeded by the authorities, over a period of months.

I trust furthermore that novice licenses will be endorsed Monday through Friday only? No way will they be wooed into paying their upward spiralling RSGB sub by the physical improbability of 5W contacts during a 48-hour weekend ww contest.

To 'test' organisers and contestors worldwide, I would urge some thought for others. Stipulate a singular band and band segment for each weekend carousel so that the run of the mill cw-ist may glean a few kc/s.

Upon reflection, it would take only a few hundred like-minded moderates to get together and transmit during a contest, instead of being made to feel obliged to switch off their rigs. Perhaps then contest organisers would be cajoled into a harmonious existence with fellow amateurs.

— George Lobb G4WRV, Rayleigh, Essex.

Cars And Callsigns

Why do we have to perpetuate the nonsense of changing our callsigns when we cross from one "country" to the next? When I visit friends in England I have to become a "Gee"! When I stay with relations in Scotland we have the farce of discarding the "Golf Whisky" and adopting the "Golf Mike" —.

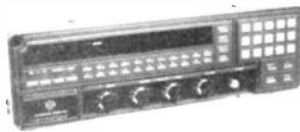
I draw attention to this subject because I read that fellow radio amateurs are already campaigning for their callsign to be their car registration number when they buy their new car in the "G" year series (if your callsign is "Gee Zero," etc. — forget it!) What bothers me is how we shall change plates (front and back) halfway across the Severn Bridge.

— Bruce Carter GW8AAG, Brecon, Powys

Gosh (I mean, jeeppers) — how naff! What happens when they sell their G cars and buy H cars? A campaign to replace the Gee callsigns with aitches? I've got a better idea — replace all national prefixes with the letters designating the caller's current square location, and change when you change squares. Simple, precise, and no more unfair advantages for people who live in big countries. — HPA.

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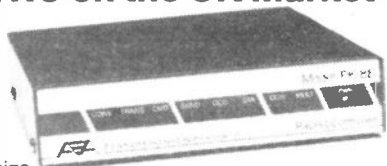
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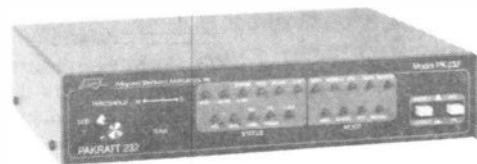


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COVERS 29 TO 956MHz (with some gaps). Covers all popular VHF/UHF PMR, Amateur, Air Band, Marine, Cellular and many other interesting frequencies. 200 Memory Channels. Complete with helical, detachable Ni-Cad pack and charger. Green keyboard/display nightlight. Super fast scan and search mode. Free where-to-listen guide and backed by Raycom scanner expertise and service.

RAYCOM NEWS BOX

Lots happening at Raycom! We are now stockists of the HRS range of Cushcraft and Butternut antennas, MFJ accessories and Packet terminals. See the TEN-TEC Paragon HF TRX and have a go. It's a beauty! - We are now stocking AEAPK-232 Packet terminals and software - **RAYCOM goes digital!** - We are now carrying NAVICO VHF mobiles. A nicely designed rig from the marine radio specialists, worth a look. - New Yaesu handhelds in stock, little beauties and best designed HT we have seen for a while. Look for a RAYCOM special mod for this one. - ICOM 725's now in stock, this will be a winner with the same type of DDS synth system as the IC781. *Don't buy an HF rig without looking at it.* - We always look around for good scanners. Watch this space! 50-950 MHz plus Pan Display! - New ICOM mobiles and HT's on the horizon. - Re-organisation in our service and shipping departments to improve service turnaround. - If you need anything to do with radio please call us, if we haven't got it we can probably get it! - We have thousands of items too numerous to list here. - We are always looking for used kit and will give you a good part exchange on new equipment. - We are SONY dealers and carry a wide range of their quality receivers and scanners. - *Don't forget we are now open again Thursdays, and late Friday until 7 pm.* - ICOM 3200 with tone button mod now available for headset use at £419 plus carriage. Raynet modded 3210 available - call.

ANTENNA FARM

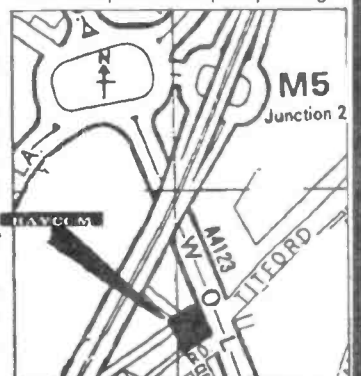
10-3CD	3-ele 10m	£115.04
R4 vert.	10/15/20	£219.00
AV4	4-band	£104.58
Ranger	VHF	£42.95
Ranger	UHF	£42.73
HF6V	5-band	£159.00
SC3000	Scanner	£63.99
70N2DX	Mobile dual	£37.00
G5RV	Full size	£16.95
G5RV	Half size	£14.95
R1300	Discone	£59.50

STOP PRESS! TCL Professional dipole kits. Complete with all fittings and 1-30 MHz coverage.

TCLDSB Single band £69.95

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This is only part of our stock of HF, VHF, UHF and mobile antennas. We also carry a wide range of accessories for antennas. Call for info or drop in for free advice! And of course, there's always our famous ROYAL 1300 discone (improved spec. over ICOM AH7000/Diamond D109) still at **£59.50 plus £5.00 post/packing.**



ORDERING INFORMATION

ALL PRODUCTS SHOWN ARE NORMAL STOCK ITEMS. PHONE BEFORE 4 P.M. FOR NEXT DAY DELIVERY. MAIL ORDER PLEASE INCLUDE CARRIAGE AND PHONE NUMBER. ITEMS OVER £750 CARRIAGE FREE. PLEASE ALLOW TIME FOR PERSONAL CHEQUES TO CLEAR. MANY OTHER ITEMS IN STOCK. PLEASE CALL FOR MORE INFORMATION AND FOR EXTRA SPECIAL DEALS.

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- 100W Output
- DDS System
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- Scanning
- CI-V Computer Control
- Semi Break-in

The new ICOM IC-725 budget H.F. has been produced due to the demand for a simple, high specification transceiver. Despite the limited features, compared to more expensive equipment this set retains a superior level of technical performance necessary to operate on the H.F. bands today.

Additional features include Noise Blanker, Pre-amp, Attenuator, AGC and RIT. The DDS System (Direct Digital Synthesizer) ensures fast Tx/Rx switching times, ideal for Data Communications. An A.T.U. controller is built

into the IC-725 for use with the AH-3 H.F. Automatic Antenna Tuner for mobile or base station operation.

Accessory options available are the PS-55 20A P.S.U., AH-3 Auto Antenna Tuner, UI-7 AM Tx. FM Tx/Rx Unit, FL-100 500Hz CW Filter, FL-101 250Hz CW Narrow Filter and SP-7 External Loudspeaker.

For more information on the IC-725 budget H.F. and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

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Dept HRT, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!



IC-575, 28/50MHz Dual band multimode.

The ICOM IC-575 base station has been developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30MHz and 50-54MHz.

Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics.

Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation.

Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SM7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.

IC-505, 50MHz Transceiver

The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF



output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.

The easy-to-read LCD readout includes frequency, memory scan and call modes. Full metering of battery condition signal strength and power output is provided. When fitted with the optional EX248 FM unit the IC-505 offers 50MHz operation at an affordable price.

Helpline: Telephone us free-of-charge on 0800 521145. Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders. Thank you.

Datapost: Despatch on same day whenever possible.

Access & Barclaycard: Telephone orders taken by our mail order dept, instant credit & interest-free H.P.



RADIO TODAY

Garex and Revco Unite

Revco Electronics Ltd. is now under new ownership and management, following the retirement of the founding Directors Dennis and Patricia Reeves. The new Directors are Peter and Mary Longhurst of Startop Communications Ltd., better known by their trading name of Garex Electronics. Revco is now a wholly-owned subsidiary of Startop Communications.

The takeover marks the culmination of many years of collaboration between Revco and Startop.

Revco was founded in 1959 by the Reeves, who worked part-time assembling and marketing antennas. By the mid '70s the business had grown and substantial orders for antennas were received from the Home Office. In 1980 the company moved into new premises in Modbury, South Devon, and a further move in 1987 took them to the present factory in the old Station Yard, South Brent, a modern 5,000 sq ft industrial unit.

Revco were pioneers of the scanning radio receiver market. With the dilution of this market, Revco have capitalised on their experience of scanners with the development of Direction Finding and Automatic Surveillance equipment. Accessories such as wide-band antennas and amplifiers have been popular and the Revco discone antenna is recognised as a definitive product.

Startop Communications Ltd was formed in 1980 to manage the operations of Garex Electronics which had been established originally in 1963 by Rex Browne G3MMJ. Garex sold radio components and became well known for its range of products based on revamped commercial radio-telephone modules such as VHF con-

verters, modulators, TX strips, and inverter power supplies.

Garex Electronics was acquired by Peter Longhurst G3ZVI in 1972 and operated as a part-time business until 1980. The business is now one of the largest processors of redundant radio telephone equipment in the UK. The salvage of obsolete spare parts and the supply of refurbished equipment to the commercial trade is the most important activity of the company, with a fast growing export market. Collaboration with Revco started in the mid 70s, with sales of antenna products and the successful joint-venture into scanner products.

Recently Garex had been marketing weather satellite receiving systems designed by Timestep Electronics with great success.

The new managing Director of Revco and Startop (Garex) is Peter Longhurst. Licensed in 1968 as G8BVI, he became G3ZVI in 1970 (G8BVI is now held by his son Philip), and holds a Maltese callsign 9H3DV. In 1969 he became acquainted with Rex Browne G3MMJ of Garex Electronics, and carried out development work for Garex, taking on operation of the retail mail order business. When Rex emigrated in 1972, Peter purchased the Garex business, and operated it in partnership with his wife Mary until 1980 when the business became full-time.

The staff at the Revco factory at South Brent are led by Timothy Reeves, younger son of the original directors, and who is Administration Manager with overall responsibility for the site. Tim has worked for Revco since 1980. His right-hand man is David Lacey G4JBE, Engineering Manager responsible for the production operations. Both Companies are long-established businesses each with its own following of customers and reputation, so they will continue to operate separately. Some rationalisation is inevitable: The space at South Brent might allow the establishment of a Sales Counter for both Companies. Garex Electronics has not previously had a shop accessible to personal callers. It is hoped that the new sales counter will be established before next summer.

Club News

The Basingstoke Amateur Radio Club has a new secretary, David J. Deane G3ZOI. All enquiries in future to David at 10 Stephens Road, Mortimer

Common, Nr Reading, Berks RG7 3TU. Tel: 0734 332777 (home), 0734 787930 (work).

BARC meets at the Forest Ring Community Centre, Sycamore Way, Winklebury,

Basingstoke, Hants on the first Monday of each month at 7.30 pm. Club net on Sunday evenings on 14MHz.

The Wimbledon and District Amateur Radio Society

has a new committee. All enquiries in future to the Secretary, Nick Lawlor G6AJY, 115 Bridgewood Road, Worcester Park, Surrey KT4 8XS. Tel: 01-330 2703.

Awards

Coventry ARS has introduced a new award: the Godiva Award. No, it doesn't require radio contact in the altogether. A brief roundup of the rules is as follows:

Contacts must include G2ASF or G7ASF or any special event callsign of Coventry ARS, or at least two club members; a cer-

tain number of Coventry stations; all contacts to be made after January 1 1988; no repeater contacts accepted; no time limit; QSL cards not needed, but a data list signed and verified by two other Amateurs is; single mode and less than 3W QRP endorsements are available. For full details, contact J. Ward G4HHT, 3 Shirley Road, Coventry,

CV2 2EL, UK. "The Award is printed in three colours on high quality paper and would make an attractive addition to any shack wall," says CARS.

East Lancs ARS's Penine Award is open to Amateurs and SWLs as heard. Contacts are by call sign only — P, M and A can be used, but only one contact per callsign will be counted.

Only stations worked in the OS Map areas SD 62,63,64, 72,73,82,83,84 are counted. The award is issued in four grades, and coloured certificates will be issued for the bronze, silver and gold awards.

For details contact East Lancs ARC., P Drew G10VP, 20 Russell St., Accrington, Lancs BB5 2NF, UK.

Ten-Tec Hits Town

HRS Electronics of Birmingham have announced their appointment as sole UK Agents for Ten-Tec Amateur Radio Equipment of Tennessee, USA. Fred Rendell G4HXX, who was previously MD of Amateur Electronics in Alum Rock, Birmingham, has been appointed to the HRS team, and is responsible for the sales, marketing and distribution of all products in the HRS Communications Division.

The £10 million plus turnover HRS group are wholesale suppliers to the electronic retail industry in the UK and carry over 29,000 products.

"The Ten-Tec range represents first-class equipment that offers a strong alternative to the traditional Japanese goods. US manufacturers are renowned for quality and workmanship, and Ten-Tec are no exception. We offer the entire range of HF transceivers such as the new Paragon, Corsair, Argosy and Century, plus the latest 1500W Titan linear. It's really a contradiction calling this equipment amateur radio, because it's so professionally made," says Fred Rendell.

"We want to position HRS as the company that imports 'all that's best' from the US, and we are also now the major importers of other brands of US amateur equipment such as Cushcraft, Telex/HY Gain, Heil, MFJ, Butternut, KLM and Mirage. The Ten-Tec range incorporates some of the latest advances in solid state circuitry, and we recommend all buyers of equipment to call their local stockist and try out one of these radios," he says.

Some Ten-Tec radios use the permeability tuned oscillator. They offer this choice for a good reason; a PTO delivers superior receiver performance. Strong adjacent signals are effectively rejected and the extremely low noise floor does not vary when strong adjacent signals are present. The ability of a PTO controlled receiver to dig out weak signals surrounded by "heavy hitters" is hard to beat. HRS also offer after sales service at their workshop in their new Birmingham premises in Garretts Green.

"... America's Best Kept Secret!" say Ten-Tec on their new colour brochure, although it's pretty clear that both HRS and Ten-Tec have had enough of the romance of secrecy and want the rest of the world to share ... after all, what's the point of a secret nobody knows about? The new Ten-Tec Paragon, for instance, offers adjustable RF output from 10W to 100W, SSB, FSK optional FM, noiseblanker/speech processor, dual VFOs and Tx/Rx offset, QSK changeover in less than 30ms, pass band tuning, reduced phase noise, circuit boards removable with no desoldering, and many other features. The latest Titan 1500W linear amp gives 65W-80W in for 1500W output, peak reading wattmeter, less than 35dB distortion at 1kW and a nearly-noiseless tape-wound Hypersil transformer, among other features. The Century 22 2W CW HF transceiver and the Argosy II 50 SSB transceiver are now both made in the UK. More details on the whole Ten-Tec range can be obtained from local dealers or direct from HRS Electronics at Garretts Green, Birmingham B33 0UE. Tel. 021 789 7171.

ARE Update

Chris Lorek has been in touch to say that ARE Electronics have advised that the 23cm sensitivity problem mentioned in our review of the IC-R7000 in the February issue of *Ham Radio Today* was a fault in the review sample which has now been rectified and should not occur elsewhere. Good news from ARE.

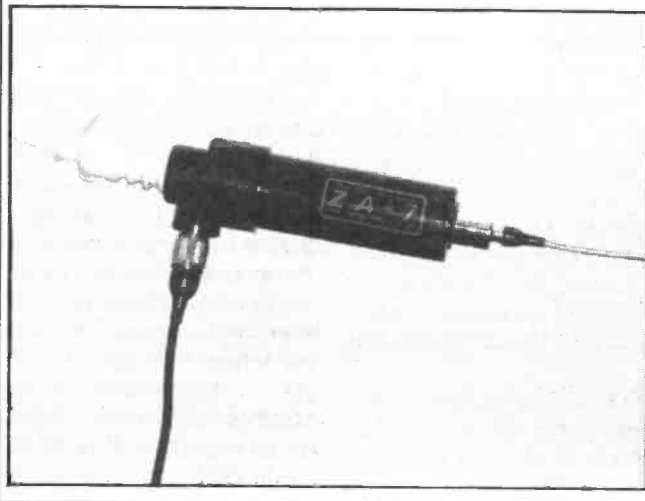
Zepp Flies In

The "end fed Zepp" was at one time a very popular aerial (its name derived from the fact that it was designed for use on the Zeppelin airships in the days when they too were popular). It is basically an end-fed half-wave dipole, which had the advantage of light weight, easy construction and an unobtrusive appearance with no untidy feeders hanging from the centre.

Waters and Stanton are now supplying a modern version of the Zepp by Sagant. Each antenna covers a single band and incorporates the "missing" bit in an encapsulated unit at the feed end. 50 ohm cable can be connected directly to the feed point at one end, with the opposite end attached to any convenient support. The matching circuit provides RF filtering as a bonus. The Zepp is therefore handy for portable operation as well as base stations.

At present two models, one for 40m and the other for 80m, are available, with dimensions similar to a full-sized dipole. The aeriels have a special PVC covered multi-strand copper wire, matching unit fitted SO239 socket, insulators, support cored, weather sealing tape and tuning instructions and aerial elements is pre-tuned and fully assembled.

For prices and availability, contact Waters and Stanton at 18-20 Main Road, Hockley, Essex SS5 4QS. Tel. 0702 206835/204965 or your local dealer.



Bands in Colour

A colour-coded chart showing all the radio frequency bands allocated to commercial and industrial uses in the UK — called the *United Kingdom Radio Frequency Allocations Chart* — has been prepared by the DTI Radio Communications Division and published by HMSO (price £2.50).

Frequencies from 1 kHz to 60 GHz are divided on the chart into primary and secondary uses. The main uses shown are broadcasting, fixed services, amateur, meteorological, radio location, navigation, astronomy, space and the maritime, aeronautical and satellite bands.

Call 01 215 4751 for more information.

Shortwave Short

Our ad. department apologises profusely to Johnsons Shortwave and the readers for the missing Mains Power Supply price which was omitted from Johnson's advertisement on page 16 of the February issue. It should have read £10. Apologies all round for any confusion caused by this omission.

Exotic Model

Johnson's Shortwave Radio are marketing a new low-cost multiband receiver lyrically called 'Sabina R610' from behind the iron curtain. "Many companies in the Eastern Bloc buy molds, parts, cabinet molds and sub assemblies from their counterparts on the Western side of the Wall", writes Peter Brownbridge, adding that this radio compares favourably with well-known brand names.

The radio's spec gives 10 bands: SW 13m, 16m, 19m, 25m, 31m, 40m, 41m, FM, LW and MW, automatic frequency control, double superhet system for SW1 to SW6, separate bass and treble controls and other features, with 20dB snr for AM and 26dB SNR for Fm. Johnson's particularly like the soft touch rotary shortwave selector and easy, comfortable analogue tuning.

"We have been selling Vega radios for many years, and this is a real upgrade on them, at a similar price. We understand from our Russian friends that they have finished the Vega 206 and there have been no Selina 251s since May, so for anyone wanting to get into shortwave on a budget, this is it," says Peter Brownbridge.

Sabina is priced £44.95 with £3.95 post and packing. The radios are on demo at the shop at 43 Friar St., Worcester WR1 2NA (Tel. 0905 25740). An information sheet is available to anyone sending an SAE.

Paper Round

The Christmas Newsletter of the 10 Metre FM Group contains a strongly argued repudiation of the requirement for DTI authority to construct or convert 10m equipment (or any other) for amateur radio. The crux of the argument is that the amateur is in the terms of the licence responsible for the performance of his or her equipment and that requiring type approval equipment or authority to construct equipment is destroying the purpose of the amateur radio licence and the responsibility vested in it. Required reading.

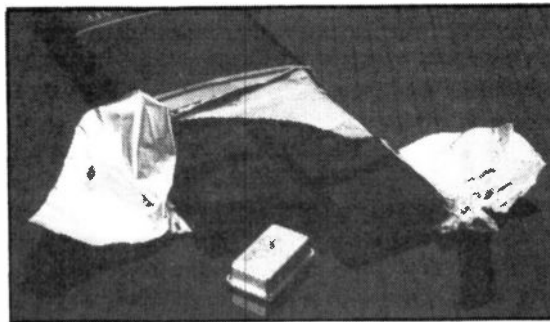
There is also a short article on VSWR on coax cable. 10 Metre Group, 9 Highlands Road, Portslade, Sussex BN4 2BN.

Hastings Electronics and Radio Club Vital Spark December 1988. Local and repeater group news, variable HT supply circuit, RF feedback, HERC awards, diary and book list, short story and local (RSGB) politics. Lively. Secretary Tim Anderson G0GTG, 2 Burry Road, St Leonards on Sea, Sussex.

Datacom. Winter 1988. Journal of the **British Amateur Radio Teledata Group**. AGM report and constitution, article on the IBM PC, screening a Dragon computer (looks familiar, this), adapting an STSMC for Amtor, punchtape pictures, more on screening Dragons, low voltage high current PSU part 2. Lubrication for the Creed 444 and others, A5 with card cover, 100pp. BARTG Pat Beedle GW6MOJ, Ffynnonias, Salem, Llandello, Wales SA19 7NP.

QZZ, the bulletin of the **Radio Society of Harrow** November/December/January issue. Club news, contest result roundup, VHF roundup, wants and sales. Philosophical treatise on badge-wearing by Editor. More entertainment than radio. 6pp, stencilled. Quarterly (as of now).

Wirral ARS Newsletter December/January. Question and Answer session with the Regional Liaison Officer Mel Chappel G0GQX, club news, technical tales; sales and wants. 6pp. A4, DTPd by the look of it, very nice. The Treasurer, Vernon Young, G3LCL, 345 Leasowe Rd., Moreton.



Components

The IQSXO-170 high performance crystal clock oscillator from IQD has a power consumption equivalent to approx. one-fifth of existing standard TTL oscillators, but is capable of handling a similar output load. It can deal with loads as high as ten TTL gates, with a rise/fall time of a half to a third compared with the former standard oscillator, IQSXO-100.

Other features include high precision symmetry (typically 50+2%) compared with 50+10% on a conventional oscillator and high reliability (even in severe environments) through perfect hermetical sealing and the grounding of Pin 7.

For further information contact IQD Ltd., Tel: (0460) 74433.

British Telecom's Research Lab have demonstrated the use of short-range millimetre-wave radio for delivering programmes into viewers' homes. If the system were licensed by the Government, it could prove a quick and economic supplement to broadband cable networks.

The demonstration, carried out at Saxmundham, Suffolk, is of a millimetre wave multichannel multipoint video distribution service (M3VDS). It uses radio with a wavelength of about 1mm (about 30 GHz) to beam four satellite TV programmes plus the four broadcast services to ten homes in the town fitted with special antennas. A commercial system operating above 30 GHz would be capable of carrying between 15 and 25 channels.

Gallium arsenide chips designed at the Martlesham laboratories would allow receiving equipment to be built at a cost many people could afford.

Martlesham has a worldwide reputation for the fabrication of gallium arsenide optoelectronic components and is now pioneering circuits operating at millimetre-wave frequencies.

A F Bulgin's 'fully touchproof' fuseholders FX0357, FX0359, FX0456 and FX0457 now have Canadian Standards Authority (CSA) approval. All four models are fully touchproof to the standard test finger of BS3042 for user safety, and conform to and beyond IEC257. The fuseholders have patented bayonet fixing caps; models FX0357 and FX0359 are panel mounting, fixing through a D-shaped cut-out and connection by 2.8 series tabs/solder tags. FX0456 and FX0457 are PCB mounting respectively vertically and horizontally. FX0357, FX0359, FX0456 and FX0457 have SEMKO approval. Their maximum rating is 10A 250V. FX0357, FX0359 are also VDE and UL approved.

For further information contact A F Bulgin, Bypass Road, Barking, Essex, IG11 0AZ. Tel: 01-594 5588.

A QRP In The Hand Can Soon Be Transferred To The Bush

"Let's put the fun back into amateur radio" is the motto that Waters and Stanton have adopted for the new HF QRP single-band transceivers by Mizuho.

Three models, covering 80m, 40m and 20m SSB/CW, are currently available, with a power output of 2W each. Each transceiver is self-contained with a microphone, speaker and Morse key built in to the 2.5in. x 1.5in. x 5.5in., 590 gm box. Frequency control is by variable crystal oscillator with a coverage of 25kHz on each segment for the 80m and 40m models, and 50kHz for the 20m model. The circuitry is based on an 11MHz crystal filter giving a single superhet receiver and a high quality transmit (SSB or CW) signal with full ALC and the rest and good stability. The units are powered by 6 HP-7 dry cells, nicads or an external 9.6V supply (not included).

The units have been extensively tested by G3OJV with indoor-only antennas and 6 internal dry cells, with results including 56/9 from LA on 80m CW, 57/9 from GM on 40m SSB and many European QSOs on CW. Results should be even better on outdoor antennas. The rig is small enough to put in your pocket with a wire dipole and carry it to any location you desire.

The 40m and 20m versions cost £179 each and the 80m model is £189. Each unit comes with one crystal segment. Optional extras include an external microphone, noise blanker, CW break-in unit, carrying case, whips and DC/DC converter.

For more information contact **Waters and Stanton, Warren House, 18/20 Main Road, Hockley, Essex SS5 4QS. Tel. 0702 206835 and 204965.**



Special Event Station

A special event station, GB4WRI, was set up at the 70th Anniversary Celebrations of the Midlothian Federation of the Scottish Women's Rural Institute over the 7th-8th October 1988. The 40,000-strong SWRI, which has existed since 1917, is part of a worldwide association of country women's organisations founded in Canada.

One of the SWRI's main intents is to promote social and educational opportunities for those living and working in the countryside, or interested in country life, as well as generally fostering the quality of life and international goodwill. Community and goodwill was certainly fostered by GB4WRI, with equipment borrowed from various YLs and OMs who were happy to help, and 17 YLs, from all around the Midlothian institutes, which now include two in Edinburgh, to operate the HF and VHF stations.

Around the Clubs

A new radio club, the **Sevenoaks and District Amateur Radio Society**, has started up in the pleasant town of Sevenoaks, Kent. The Society has been formed following an initiative by the District Council to train members of staff to become licensed after the valuable assistance offered by Raynet during the storms of October 1987, which brought home to them the possibilities inherent in amateur radio.

New members are cordially invited, and meetings at the time of writing are due to be held at the Emergency Control Centre, Sevenoaks District Council Offices, Sevenoaks at 8pm on the third Monday. The club is asking a subscription of £10 a year (£5 for students) plus 50p per meeting. Applications from the Secretary, Barry Leggett G7CIC, c/o Chief Executive's Department, Council Offices, Argyle Road, Sevenoaks TN13 1HG. Tel. 0732 741222 ext. 245.

We suggest interested visitors phone for information initially, as we only have information for the January meeting at present, whereas we are now working on the April issue of HRT. Good club secretaries, please note that, in common with many other magazines we have a lead time of approximately three months. Please send us your forward planning!

The International Short Wave League announces that its Honorary Secretary, Jim May, stepped down from the post at the beginning of January to concentrate on producing the League's magazine, Monitor. The ascending secretary is Yvonne Blain, to whom all correspondence should be addressed at the International Short Wave League, 167 Wombridge Road, Trench, Telford,

Shropshire TF2 6QA.

The **Scottish Tourist Board (Amateur Radio) Expedition Group** will hold its first event of 1989 based at the World Heritage Site at New Lanark Cotton Mill and Village, Lanarkshire. The 18th century village was the site of Robert Owens' social experiment for a self-contained industrial community in a narrow gorge of the River Clyde near to the ancient Burgh of Lanark.

Operation will take place over the Easter weekend 25/26/27 March 1989. The station GB2STB will be opened by Mr. Alan Deveraux CBE (GM8VJV), Chairman of the Scottish Tourist Board, after 11am on Friday 24 March. Mr. Deveraux will operate the HF and LF bands for a short period — calls requested. A special QSL card will be issued for the weekend's contacts. Frequencies will as far as possible be 3.7, 7.065, 14.140, 14.240, 21.250, 28.400 to 28.600. CW will be plus 10kHz on all bands, RTTY on 14.085 and 21.090.

Other events will be held this year on 29/30 April, 27/28 May, 24/25 June, 29/30 July, 26/27 August and 23/24/25 September.

Two colour award certificates will be issued by the Group: The Thistle Award for working four separate events, and the Supreme Tartan Banner Award for working six separate events. Awards will cost £1 including postage. Claims to Robbie GM4UQG at the Group's address. A full schedule of events is now available on receipt of an SAE or IRCs from Paddy GM3MTH at the same address.

The Scottish Tourist Board Amateur Radio Expedition Group, P.O. Box 59, Hamilton, Scotland ML3 6QB.

The colourful station stand at the entrance of the exhibition attracted a lot of interest in amateur radio from passing visitors. The first contact was with Dennis G5LP, followed by 127 contacts as far afield as Austria and the Orkneys. The amateurs have been invited to participate in future SWRI events, and hope to do so. A successful event was had by all.

Small is Beautiful

Part 2

In his second article on aerials for small ground-plots, Steve Ireland G3ZZD looks at LF antenna.

In the first part of this article (HRT January '88), we looked at how to build high performance antennas for the three highest HF amateur bands in very small amounts of space. Now, we will look at applying the G3ZZD 'small is beautiful' philosophy to the so-called LF bands of 160, 80 and 40m.

Just like the HF bands — where a commercial three element beam and lattice tower are often considered mandatory to have any chance at working DX consistently — there is almost religiously held belief among many radio amateurs that lots of money and space are required for long distance LF working. This is just not true.

Of the fifteen-odd years G3ZZD has been licenced, the majority of my time on the air has revolved around chasing DX on 80 and 40m, the latter being my favourite band. All the operation has been from semi-detached suburban or city environments. From my original location, where the plot the house stood in had a length of just over 20m and the back garden measured a miserable 8.5m square, all continents were worked on 80m SSB with 100W and on 40m CW with 10W.

On One Band

Anyway, enough of this boasting and let me show you how to put up antennas to do the same by making the best of *your* location.

As with the HF bands, the simplest and best antennas are those designed for just one band. However, later in the article, we will consider an antenna that does the business on all three bands but which takes a bit of effort to put together. Not that much, though, and its dead cheap.

The main trouble with LF working in general is that any kind of effective antenna appears to be much too big for the amount of room you have to

put it up in. If you are interested in DX, you have the additional problem that most practical antenna supports are apparently too low to enable you to get the low angle of radiation essential for this kind of operation.

The answer to both these problems is simple. You use some

form of 'loading' to bring a physically short antenna to resonance, to solve the first problem, and use an antenna with a substantial vertical section to it, for the second.

To put this in simple textbook terms, for workable efficiency an antenna must be at least an electrical quarter wavelength long at the required operating frequency. Also, unless the height of a horizontal antenna approaches a half wavelength above ground at the operating frequency the radiation from the antenna will be predominantly at a high angle — greater than 30 degrees.

Low Angle

This angle of radiation is fine for distances up to 10,000km, that is to say for UK and European QSOs, but pretty poor for DX. The signal from a low, horizontal antenna will have to bounce off the ionosphere and the Earth's surface many times before reaching the required DX destination and will be severely attenuated, especially over a predominantly overland path, such as the 'short' or direct path to Japan.

In contrast, a quarter wavelength vertical, fed against a reasonable earth or radial system, virtually guarantees a considerable amount of low angle radiation and DX. Although this seems a daunting idea in practice — how many amateurs interested in 80m DX could erect, let alone *dare* erect, an aerial that is over 60 feet high? — the secret is to make the electrical length, rather than physical length, a quarter wavelength.

As long as the physical length of the antenna is at least a third of an electrical quarter wave length and the antenna is top loaded to bring it to resonance, the efficiency of the antenna is still relatively high. This is because it is the bottom third of the antenna — the part nearest to the

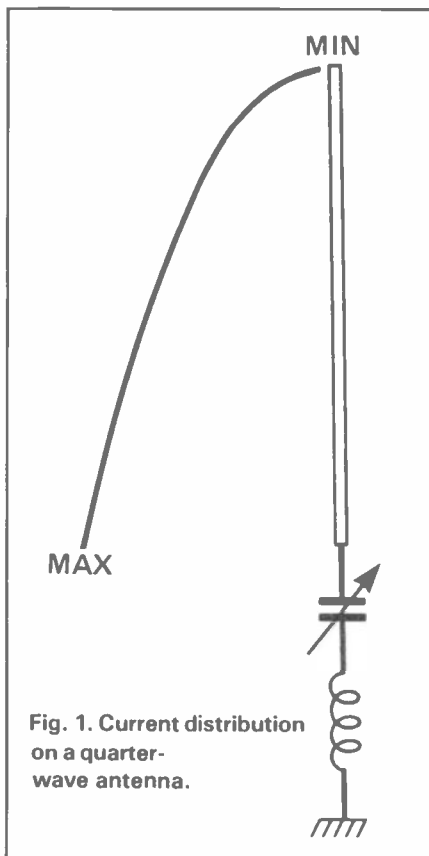


Fig. 1. Current distribution on a quarter-wave antenna.

feed point which does most of the radiating (see Fig. 1).

Once again, we shall use our 8m high wooden mast, as described in the first part of *Small is beautiful*, as our basic 'sky hook'. For those readers who missed this, this height was chosen as being the maximum easily erectible in the smallest of suburban plots. The basic design is reproduced in Fig. 2.

A single band antenna I have used with great success for DX working on 80 and 40m is an adaption of the Marconi T antenna. This has got the advantage of its more widely used relative, the so-called 'inverted L', of cutting down high angle radiation from the top horizontal section and reducing the single strength of European stations, as a result.

Perhaps my version of the T should be called the Umbrella, an object which its shape resembles. Fig. 3 shows the antenna and gives dimensions for 80 and 40m.

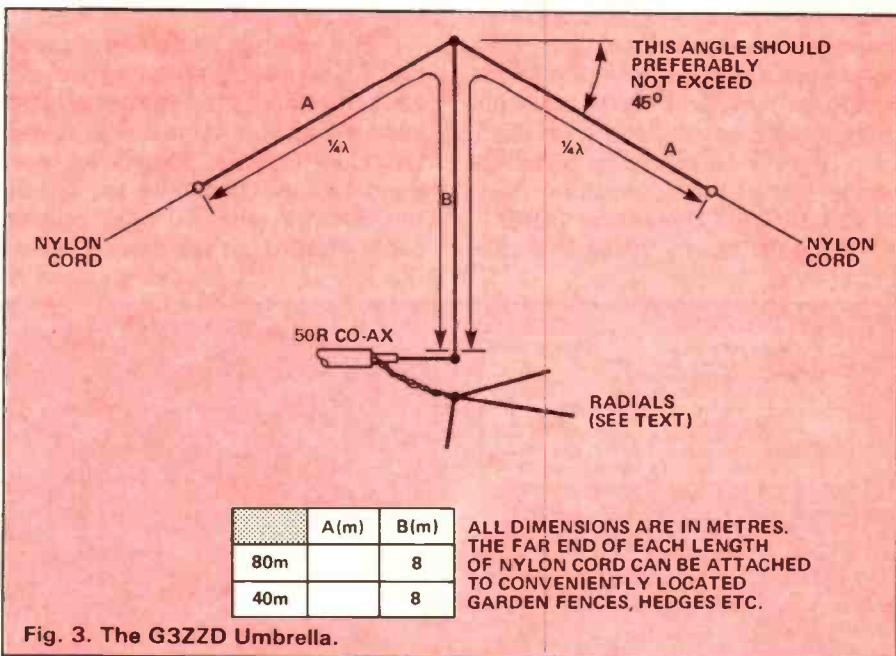
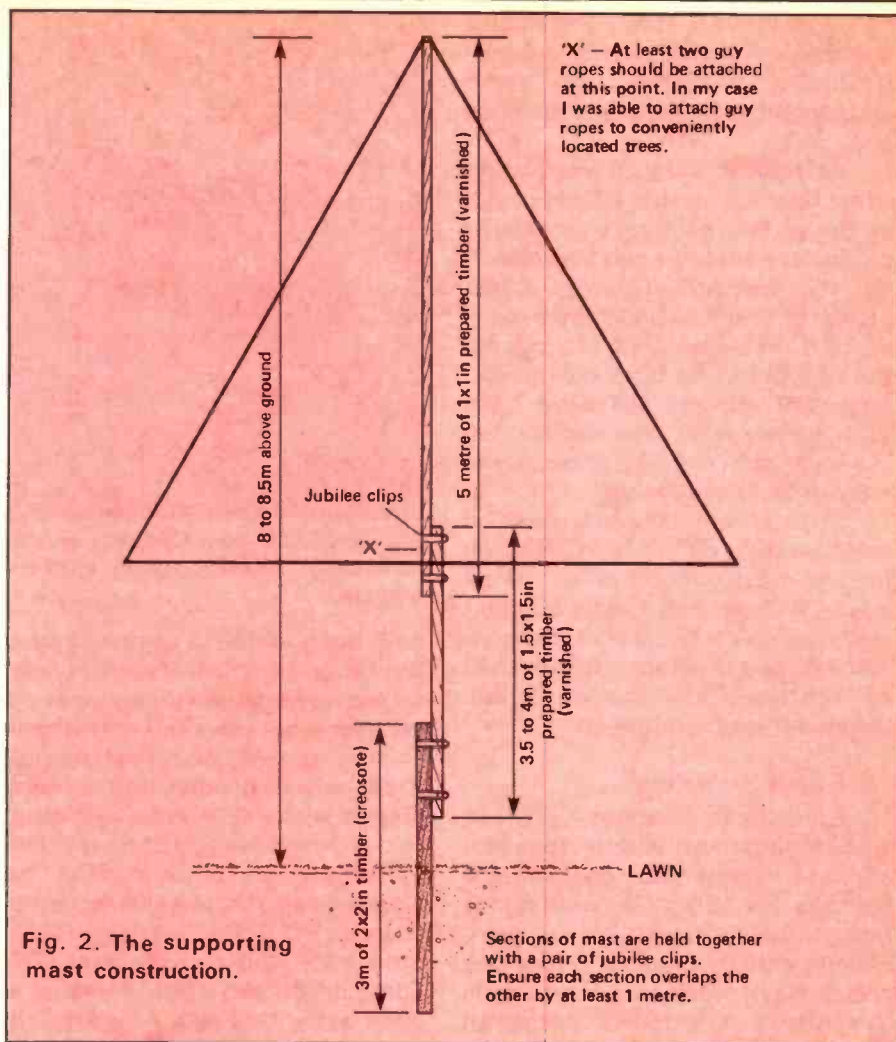
Woolworths' Umbrella

Like the antennas described in Part 1, the Umbrella is made from Woolworth's flat twin flex, after splitting this into single conductors. The antenna is supported by a halyard running from the top of the mast, attached to a T piece cut from perspex, which is placed at the central point of the top section.

The Umbrella is an electrical quarter wave on the band it is cut for, and is fed against four quarter wave radials. Although ideally these should be run horizontally at 90 degrees to each other, this is highly likely to be impossible in practice. Despite bending and zig zagging radials in a highly asymmetric fashion around conveniently situated garden fences, no deterioration in the omnidirectional qualities of the antenna has been experienced by G3ZZD.

On 40m, in sporadic operation over the last two winters, the antenna has produced easy contacts with all parts of the US, South America and Australia with 100W. Prior to this, a horizontal dipole was used, with virtually no success, at around the same height. An 80m version of the Umbrella was used several years ago and had a similar performance to the 40m one.

For those readers who have not tried vertical antennas and have



heard old timers at the local radio club talking along the lines that for one to work well it has to be 'sited in the middle of a peat bog or on top of wet clay, metres thick,' take heart. The

current location of G3ZZD is on extremely thin North London clay and the soil conductivity of the area is among the worst in the UK, according to a map I've seen. Also, a close friend

of mine in VK6 has considerable success in 40m DX working with an Umbrella, despite living some distance from the sea and on sandy soil.

At the time, the VK6 was living in a first floor flat and the antenna, with an 8m vertical section, was erected on the only space he had available — on the balcony. Despite close proximity to the building and a radial system that was bent around the 3x1m rectangular balcony, the swr on the antenna was well below 2:1. A 20m quarter wave was also erected in parallel with the 40m antenna and worked well (see Fig. 4).

So far, there has been no mention of DX working on the 160m band, by far the most difficult of all the LF bands. To build a modestly efficient vertical antenna requires a radiator of some 40 feet in height — almost half as high again as our mast of 8m. What can we therefore do?

Earth Systems

Some radio amateurs have built vertical antennas shorter than 8m and used them with considerable success for 160m DX working. In fact, probably the majority of commercial stations operating on the long and medium wave broadcast bands use antennas less than one sixteenth of a wavelength in height. On the other hand, both amateurs and commercial stations use extremely extensive earth systems, the former going for buried old water tanks and rolls of wire netting and such like.

There is an article on building a really good earth by John Heys G3BDQ in HRT December 1985.

As a result, my 160m activities



Fig. 4. G3ZZD 40m Umbrella on the balcony of VK6AIX, along with its owners.

have been limited to working around the UK and Europe, the latter being for many amateurs the most they can hope for in the way of DX in this band. That being said, I have never actually tired working anything outside Europe with the antenna I am about to describe. Maybe it can be done!

Whatever, for me 160m has always been a bit of a sideline, partly because of QHT restrictions. On the other hand, this antenna goes like a bomb on 80 and 40m — almost as good as the Umbrella — and has the virtue of covering both of them, as well as topband.

The 'inverted L' antenna shown in Fig. 5 is an electrical quarter wave on each band and is fed against an earth system that should consist of at least two quarter wave radials for each band. Like that Umbrella, the aerial is fed directly with 50 ohm co-axial cable (RG8/U) at the base. The two

tuned circuits or 'traps', shown in Fig. 5, should be adjusted for resonance at the desired frequency (trap 1: 3.7 MHz, trap 2: 7.1 MHz) before weatherproofing them with varnish.

Piped Signals

The aerial is constructed, once again, of a single conductor of Woolworths' flat twin flex, with the exception of the traps. These use 18 swg wire wound on offcuts of plastic piping. A garden 18 to 21m long is necessary to accommodate the antenna, with the mast at the far end away from the house, as per Fig. 5.

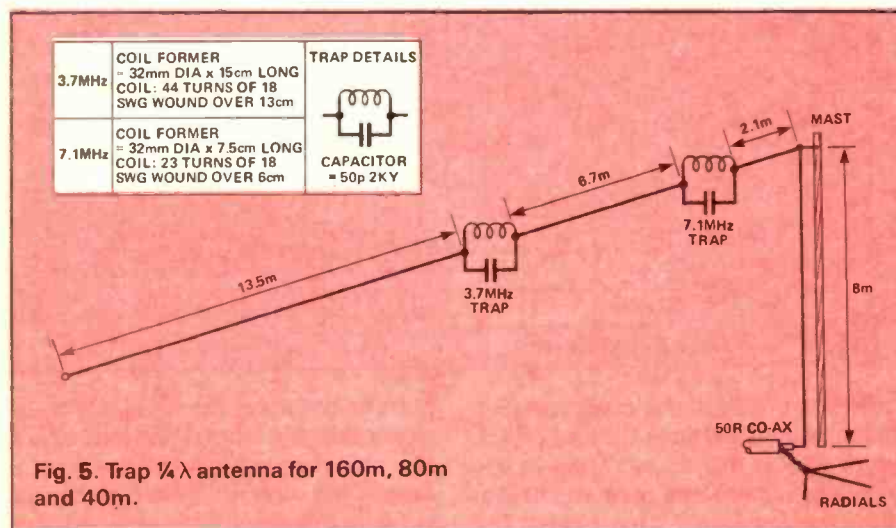
The completed aerial is first adjusted for minimum SWR in the centre of the 40m band by altering the length of wire between the 7.1 MHz trap and the antenna feed point. Next, the section between the 7.1 and 3.7 MHz traps is altered for minimum SWR in the centre of the 80m band. Finally, the 11.5m end section is altered for minimum SWR in the centre of the 160m band. Alterations of this latter may have some small effect on the SWR on 80 and 40m but should not be serious enough to warrant any further alterations to the aerial.

An SWR of under 2:1 should be obtained across the whole of the 160 and 40m bands and most of 80m.

On 160m, 5 and 8/9 signal reports have been obtained from all over the British Isles. Meanwhile, on 80m the antenna outperformed a low dipole antenna I had been using previously on DX by at least one to two 'S' points, while still receiving good reports from European stations. Finally, on 40m, the performance seemed slightly up a commercial trap vertical I had been lent, costing the best part of £100!

No great originality is claimed for either of the above aerial designs but I hope the article will serve to encourage other UK amateurs to make the most of the space available to them in working DX.

There is one final thought I would like to leave you with. If you have a small garden and put up the best aerial you can, spend the money you have saved on the commercial 3 ele beam and tower you can't put up on a more HF Linear amplifier. It doesn't take up much space and can help put you on a more equal footing with the Big Boys. Good DXing.



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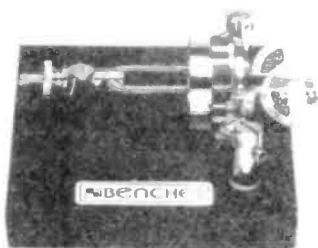
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Magnetic Loops Reality or Fiction?

It takes either a genius, or a very ignorant person to condemn a new idea before they have seen and tried it for themselves. I came up with an

strong adjacent broadcast stations and the like. On transmit, it means that harmonics and other spuri, even those in-band, are attenuated.

Chris Lorek G4HCL has come to the conclusion that magnetic loop aerials are not just a 'poor man's compromise'.

idea in the VHF aerial field a while ago which was quickly condemned by several 'experts'. The joke was on them when it was patented as well as being described in the published proceedings of an international professional radio conference.

As such, when the suggestion came that I try an HF magnetic loop for myself, I accepted with great pleasure. Much has been written about these aerials, and criticism has been banded about by self-styled experts. The military have been using them successfully for many years, and do so to this day (they also use several other types, including monster log-periodics, but I've never seen them using a tribander — maybe they know something we don't. . .).

Loop Resonance

The simplest tuned loop is a single turn, with its open ends tuned to resonance by a capacitor. When low-loss construction techniques are used, essential for the loop to have a good efficiency, a very high 'Q' results, giving a voltage magnification effect across the loop and providing a very narrow bandwidth. This narrow bandwidth means that the tuning capacitor *must* be re-set every time you QSY by more than a few kHz, but it also gives the advantage of providing a highly selective front-end stage to your system. On receive, this means that stations on other bands, and indeed on other parts of the band in use, are attenuated, giving protection from receiver overload effects due to

Loop Directivity

The loop has a defined radiation pattern as shown, which is exactly 90 degrees opposed of that achieved from a dipole or full-size wire loop. This is because the aerial employs the magnetic portion of the RF waveform rather than the electrical portion, hence the name, magnetic loop. As we all know, however, both are present in the far-field and are present at 90 degrees to each other.

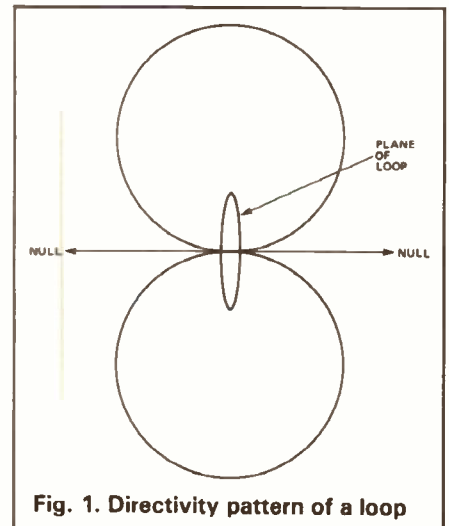
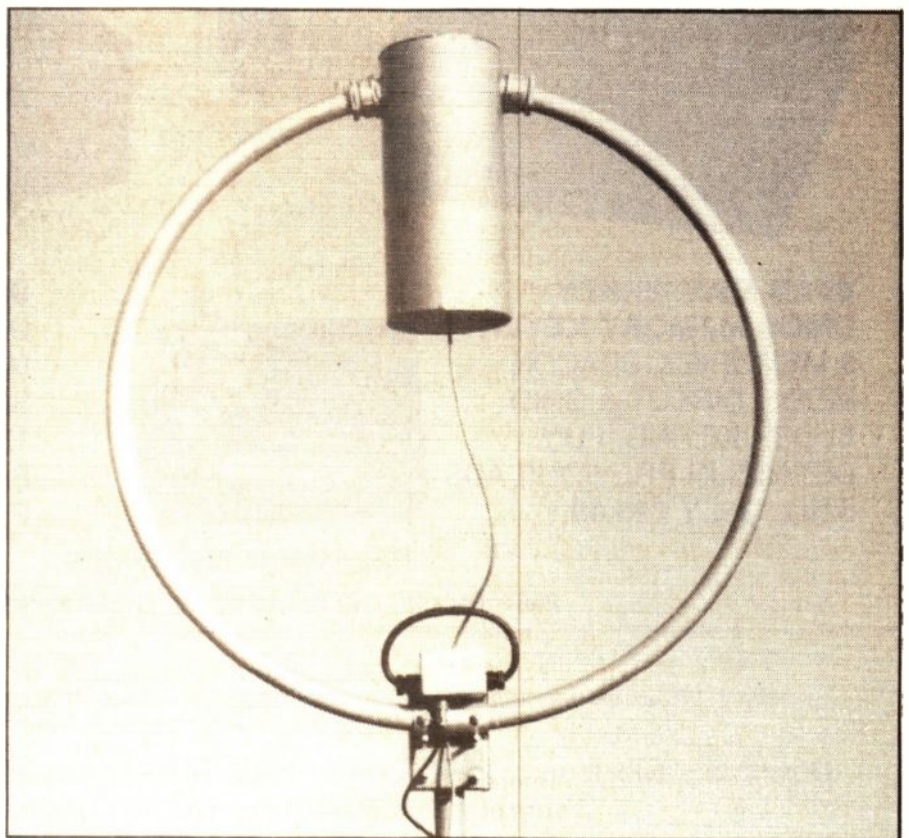


Fig. 1. Directivity pattern of a loop

Because of this sharp directivity null, and due to the small size of the loop, it may easily be rotated to null out interference such as next door's



The Capco AMA 3 loop.

computer, light dimmer, or indeed high power QRM on the same frequency from across the ocean when DX chasing trying to receive a weak station on a remote island. By careful positioning, the general band noise due to a noisy local electrical source, for instance, can be virtually nulled out.

Physical Considerations

Taking the case of a HF dipole as an example, this must be positioned at least half a wavelength above a perfect earth to operate correctly. On 14MHz, for instance, this means a 10m long aerial at least 10m above ground, rotatable if possible. In the case of a vertical quarter wave aerial, a perfect ground plane must be used. The professionals employ over a hundred buried ground plane elements to achieve correct performance, otherwise a high resistance ground path prevails, with resistance losses. The magnetic loop, when mounted in the vertical plane, is not limited by these considerations. As a free-space aerial it does not rely on a ground to operate. As it is hardly affected by non-resonant closely spaced objects, it can be mounted on a short pole a metre or two above the garden, in the loft, or even in a wooden garden shed. All this is beginning to look tempting!

Professional Technology

The average amateur who tries to build a small single-turn loop from coax or similar materials is likely to be seriously disappointed, especially if he uses techniques with lossy joints using solder for instance. A lot of professional research and development has gone into such aerials in the past, the conclusion in a nutshell is that the small magnetic loop has an extremely low radiation resistance. This means that it *must* be made from very, very, low loss materials to ensure low resistive losses.

The next point is that, when correctly constructed, the voltage potential at the loop ends across the tuning capacitor plates is in the order of several kilovolts when fed with 100W of RF, so the choice of tuning capacitor is critical. Substantial metal tube-bending facilities and the use of accurately made wide-spaced capacitors are essential. Several pub-

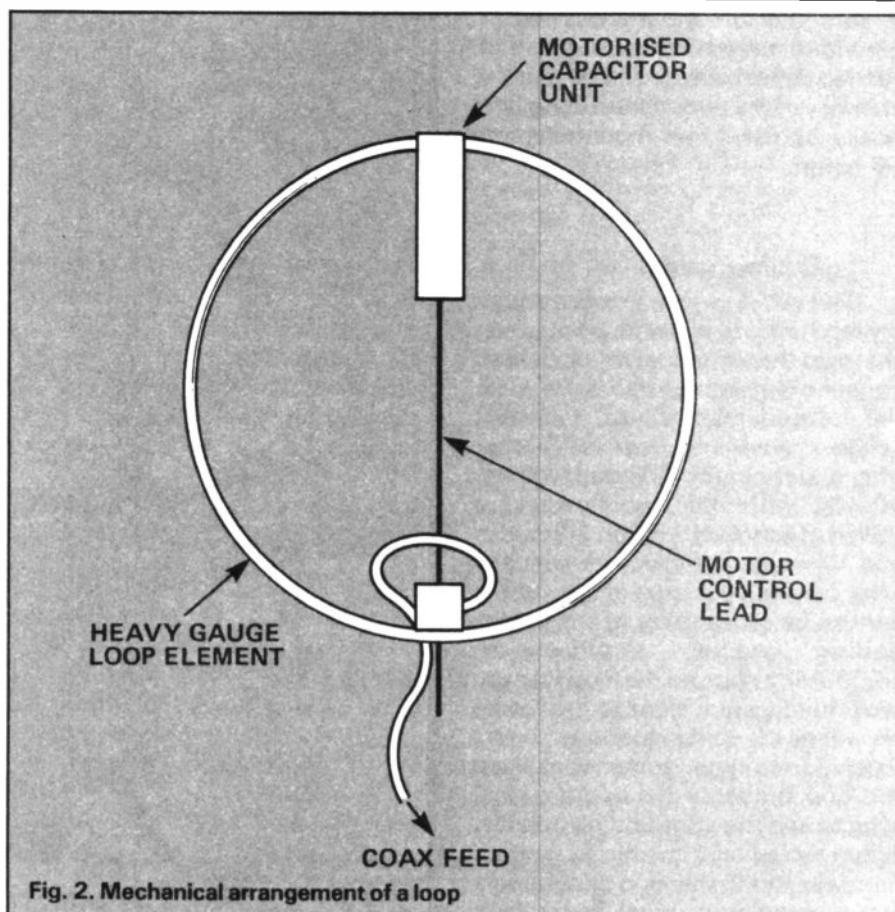


Fig. 2. Mechanical arrangement of a loop

lished text book and magazine articles, both in the UK and abroad, confirm these facts.

I visited the factory of Capco Electronics in Skelmersdale. Capco manufacture loop aerials for the professional market. I am told that Tony Johnston of that company has in the past spent many nights burning the midnight oil working on the loops, which are now in use around the world on land, sea and air. Taking a look at the thickness of alloy used for the loop element itself would even make Charles Atlas think twice about trying to bend it! However a potentially useful spinoff from their development work and machinery costs is a source of loop aerials covering amateur frequencies, using a manual remote control box rather than microprocessor-control as used by the professionals. Factors such as these together with 'stock built' types for amateur ranges and powers have now rendered these off-the-shelf loops affordable and tempting for amateur use. Their 0.8m diameter AMA 3 model for example covers the 20m, 17m, 15m, 12m and 10m amateur bands, being currently priced at £285. My car boot was quickly opened, the Managing

Director of Capco was equally persuaded to place an AMA 3 inside it!

The Loop in Use

Holding the loop, I wondered if it would really work! Maybe its just a big dummy load? Placing the loop against the shack wall and connecting a short length of coax between the loop and my HF rig tuned to 20m at first brought disappointment: all signals were at least 30dB down on even my loft mounted 20m dipole. However, plugging in the small control unit to control the motorised tuning of the loop wide-spaced capacitor brought quick results. The resonance was certainly sharp, the previous low signal levels were due to the high rejection of these off-resonance frequencies. As soon as resonance occurred, band signals on the tuned frequency came right up in level, in fact tuning to either end of the band when the aerial was tuned for the middle showed a very noticeable decrease in signal levels.

Due to the effects of concentrated RF fields, I felt it unwise to transmit with the loop placed in the shack, so I set about installing it in various remote positions, comparing

it with the loft mounted dipole, a ground-mounted vertical, my external HF trap dipole with its apex above the chimney of my two-storey house, and finally with my tower-mounted rotary HF beam.

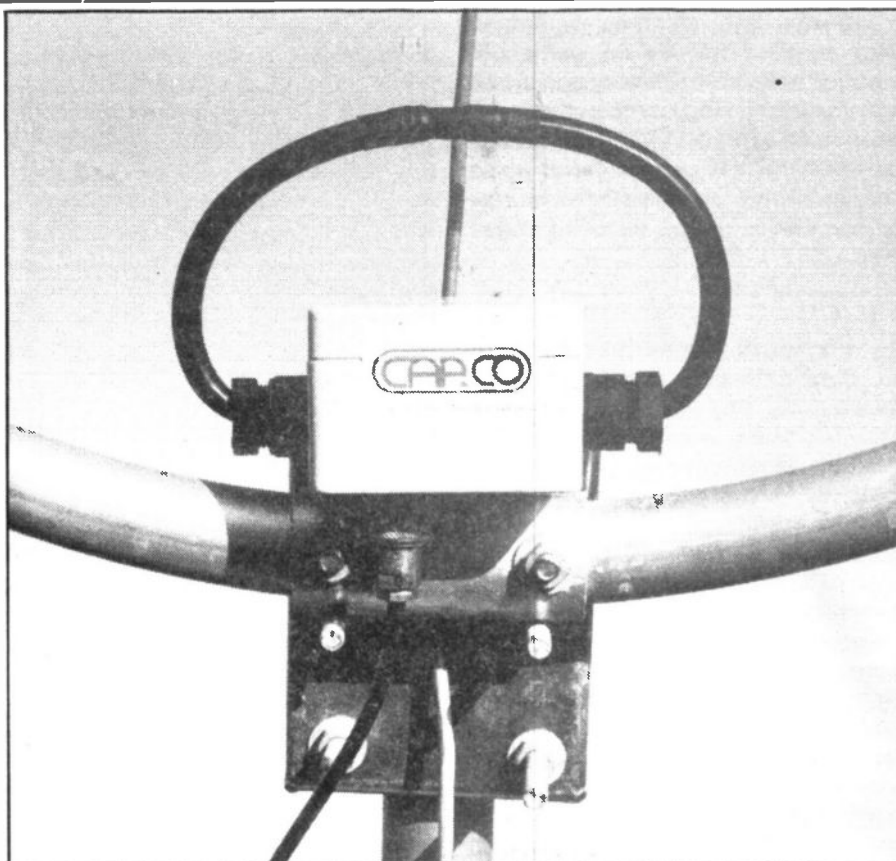
Loft Mounted

The AMA 3 just fitted through my loft hatch to allow its positioning amongst the various joists, pipes, and household effects stored there. With the loft-mounted dipole, I cannot achieve anything near a 50ohm match without my ATU due to these effects, with the loop however a VSWR of less than 1.5:1 on 20m, 15m and 10m was achieved in each case after careful operation of the tuning control box. Listening to the never-ending packet activity on 14.099MHz showed the loop was approximately equivalent to the dipole on receive, some stations being received stronger, some weaker on the loop, probably due to directional effects and the surrounding objects. When tested on transmit, however, I normally found the loop generated a stronger radiated signal, as the high VSWR present on the dipole caused a low ERP.

Outdoor

The loop was mounted on a 2m aluminium pole and, placed in my rear garden supported by a wooden fence post, it was tested on 20m, 15m, and 10m. Here, I found the performance in the direction not shielded by my house quite good, and it is of note that the loop *out-performed* my outdoor trap dipole with its apex at 10m, both on transmit and receive in this direction. This trap dipole in my location (having traps fitted for 40m and 80m) operates well on 40m, 80m and 160m, but is rather a compromise on the 20m, 15m and 10m bands again requiring the use on an ATM, yet even so this comparison in performance is notable.

When tested against a ground-mounted vertical, temporarily erected with a metal ground post used as an earth, I found it operated similarly to within a few dB on receive but slightly better on transmit due to earth losses on the vertical. A ground mounted vertical in my opinion is not a good idea unless you can put in a decent earth system, as well as keeping it in the clear away from houses. It did not



The AMA 3's coupling loop.

however match up to, nor come anywhere near to, the performance of my tower-mounted beam, which is not surprising. With the loop I found I could null out the wideband noise effects of computer timebase and so on from my house and those of neighbouring properties very well by careful hand rotation, as due to its mounting position it was being operated in close proximity to these sources. The vertical just picked all this up.

Tower Mounted

The loop was positioned at the top of my tower stub pole, to prevent resonant absorption effects. The only other aerial on the tower is a small VHF/UHF log-periodic mounted one and a half metres below it. Here, the loop proved very useful for its null effects with the automatic rotator being used rather than the previous method. I could happily get rid of S9+ signals almost into the noise if required, which could come in rather useful if a loop were used on the lower frequency bands such as 40m or 160m. Goodbye Radio Tirana and the like. Mounted in this position, all-

round coverage was achieved when the loop was positioned above my house, and raising the tower to its full height made very little difference to signal levels, unlike a normal beam where proximity to the house roof is noticeable. Again, I found the loop certainly did not have the gain nor the overall directivity of my beam, and could not be regarded as a replacement for one.

Tuning

After some time, I became used to the very sharp resonance of the loop, tuning initially for maximum received noise first generated by the motor, then the band noise which came up very quickly. Once I had tuned the loop almost to the required frequency, I switched from 'Fast' to 'Slow' tuning and operated the up/down control buttons by quickly tapping them with my finger while watching the VSWR meter. I found I invariably gained almost a 1:1 VSWR on all bands, with a 2:1 VSWR bandwidth of 17.5kHz on 20m, 32kHz on 15m and 112kHz on 10m. I felt it would have been nice to have had pre-set positions, but obviously this



would entail a higher cost control method as used on the professional types of loop. The capacitor motor housed together with the capacitor itself in the large case on the loop did make a slight 'whirring' noise when operated. If the loop were fixed to a wall bracket or chimney, or even in the loft this could be noticeable by the occupants of the house if operated late at night when all was quite.

Conclusions

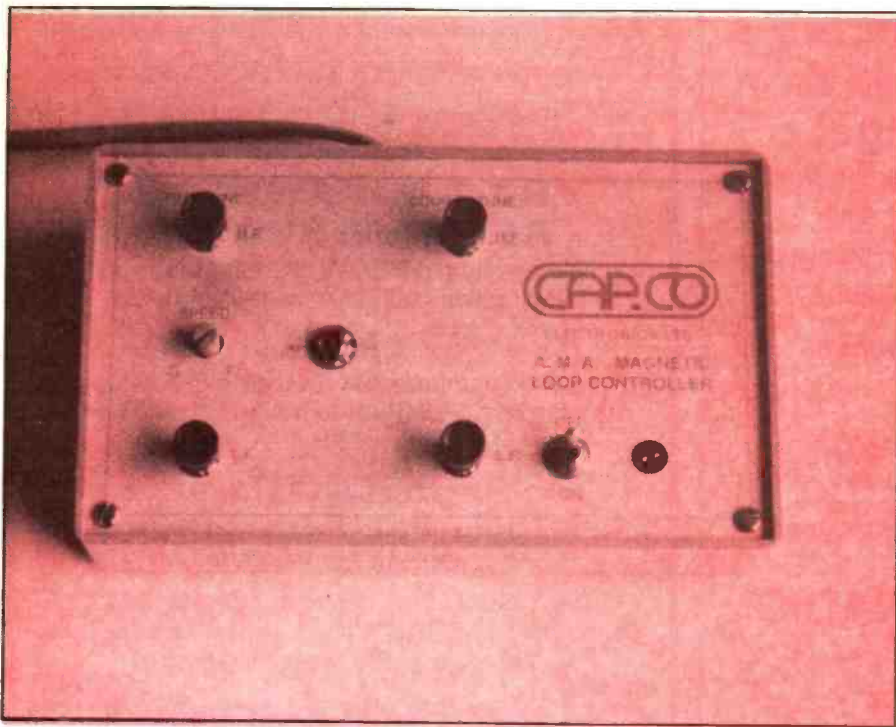
The loop is certainly *not* a 'Poor man's compromise' aerial. In my case

when mounted in the loft it slightly out-performed a dipole, and when mounted outdoors on its resonant bands it out-performed a sizeable 'compromise' wire aerial. Its directional effects could be very useful for amateurs who reside in an electrically noisy environment, as careful positioning can result in perfect communications which previously were drowned by noise. I understand a receive version is also made, which could be similarly useful with a much larger aerial used for transmission.

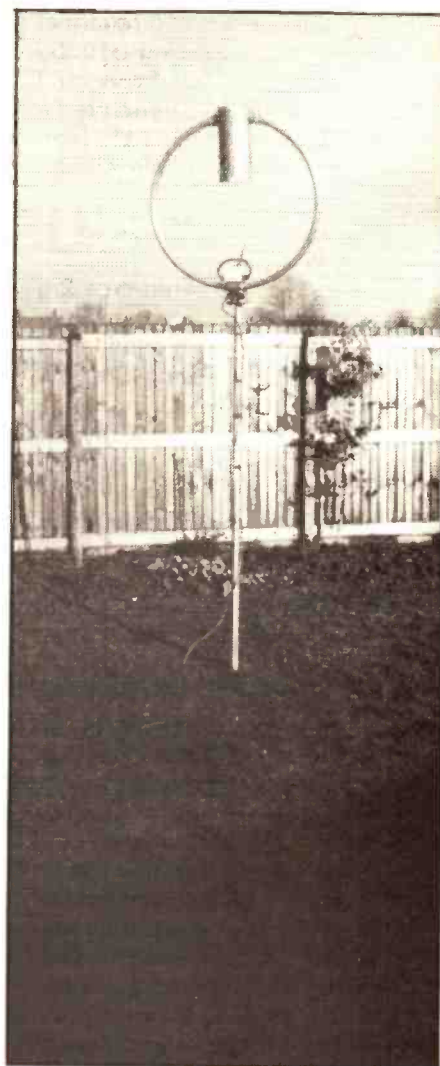
For general use in my opinion it is certainly *not* a competitor to a tower-mounted multiband beam, the loop normally being around 2-S points down on my beam, so DX chasers could be disappointed. The necessity to re-tune the loop on each QSY I sometimes found tiring, however on the positive side the loop acts as an extremely sharp pre-selector to effectively improve the dynamic range of the station receiver.

Overall, if someone comes up with a different aerial the size of this loop, having the performance of this loop, and the capability of mounting it virtually at ground level, I'd be happy to give it a try: until then the loop certainly has many things going for it given its size.

My thanks go to CapCo Electronics for the supply of the tested magnetic loop aerial.



The Capco control unit.



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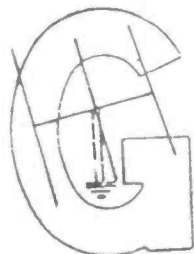
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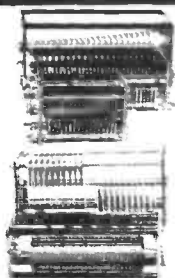


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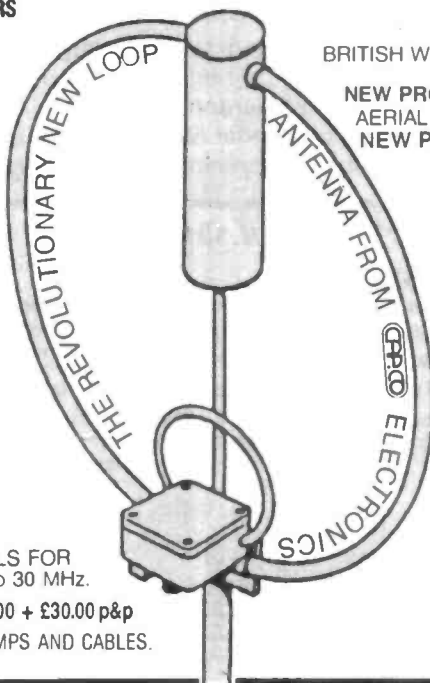
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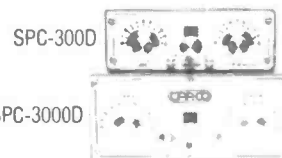
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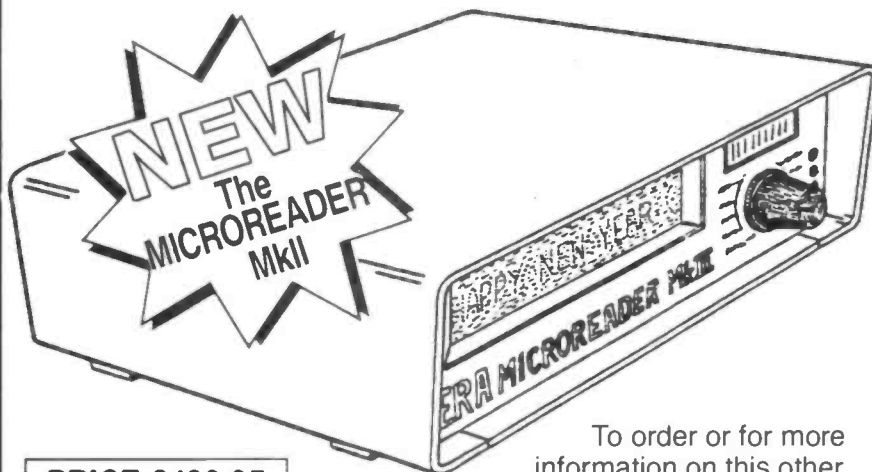
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Multi-way Mobile Rig Selector

How many rigs are there in your car? A few years ago the answer would have been an FM black box for two metres. These days the keen radio amateur could be carrying up to a

dozen bits and pieces, from an HF SSB transceiver to a cellular telephone. This may be fine in an ex-army FFR Landrover, but even with a modest selection of radios, there is great difficulty in placing the sets and their controls within easy reach in modern family cars.

Building a switch box on the lines of this project allows compliance with the highway code, and single channel sets can be tucked under the seats or in the boot.

Graham Packer works on the principle of safety first with this multi-rig switch box.

well filtered and fed to two 3.5mm jack sockets for the electret mics. S1b selects either the PTT mic, a visor/boom mic or a headset mic. R4 and R5 are to adjust for the different sensitivities and different speaking distances from the microphones and should be adjusted later when testing.

and R5 are to adjust for the different sensitivities and different speaking distances from the microphones and should be adjusted later when testing.

Construction

Use a plastic box. A metal box would short together the ground connections of the DIN sockets, negating the four pole switches. Besides this, there is not much to be said for what is really a wiring exercise. Fig. 2 gives

dozen bits and pieces, from an HF SSB transceiver to a cellular telephone. This may be fine in an ex-army FFR Landrover, but even with a modest selection of radios, there is great difficulty in placing the sets and their controls within easy reach in modern family cars.

The Circuit

A few moments staring at the circuit diagram (fig.1) will reveal that although complex, this circuit is not very complicated. 'The Box' can be built for as few or as many transceivers as you think you are ever likely to fit in your wheels. Then add at least two more positions! Just add a switch, LED and socket as required.

You will note the use of four pole, two way switches when it appears that a two way switch for the PTT and LED would suffice. An early prototype did just this with contacts 'b' and 'd' of the 'waffle switches' replaced by straight through wiring. This worked, until the car started! Then an unholy alternator whine, not previously present on any of the individual rigs, was transmitted at a high level. This took some getting rid of, resort eventually being made to a 'brute force and ignorance' power filter under the car's bonnet. Using four pole switches, although a bit harder, completely eliminates this problem, unless you try calling CQ on more than one band at once! That is the reason for the single +12V power

well filtered and fed to two 3.5mm jack sockets for the electret mics. S1b selects either the PTT mic, a visor/boom mic or a headset mic. R4

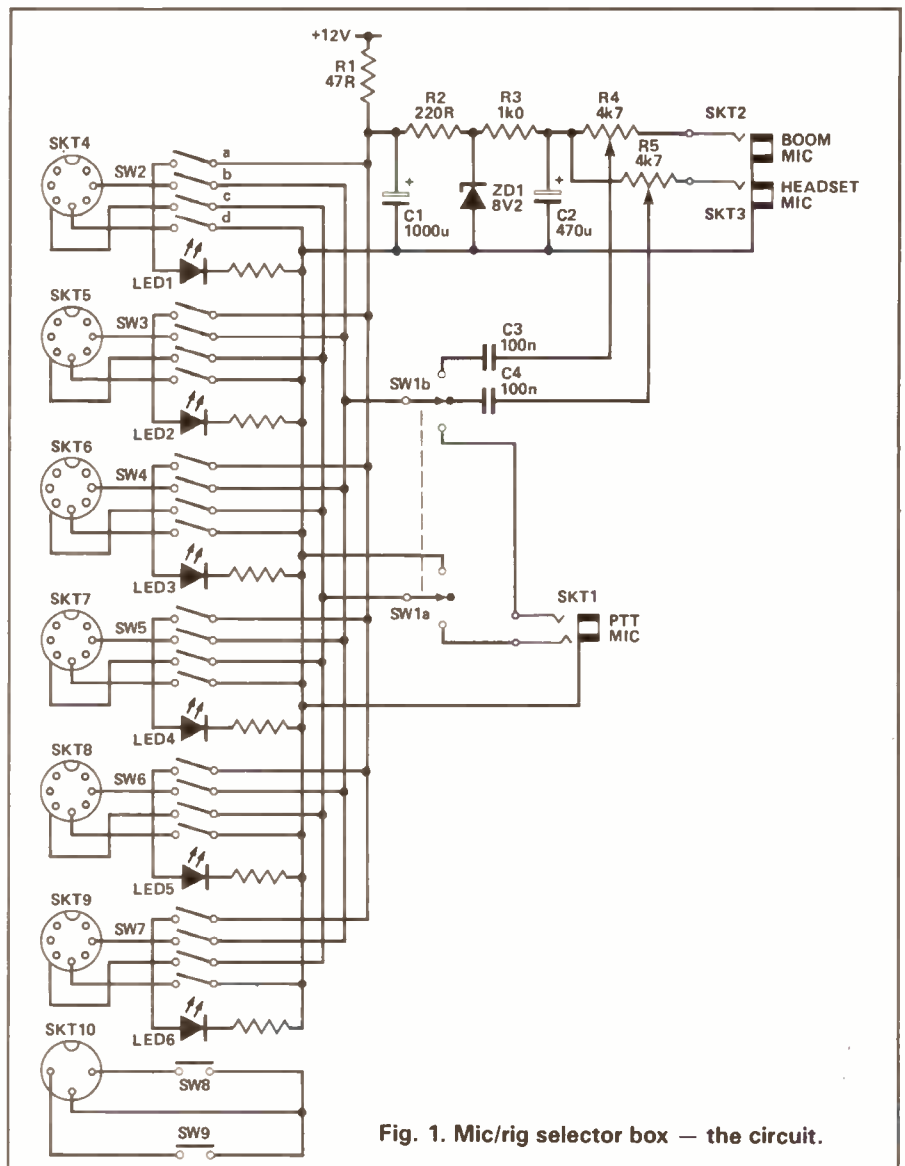


Fig. 1. Mic/rig selector box — the circuit.

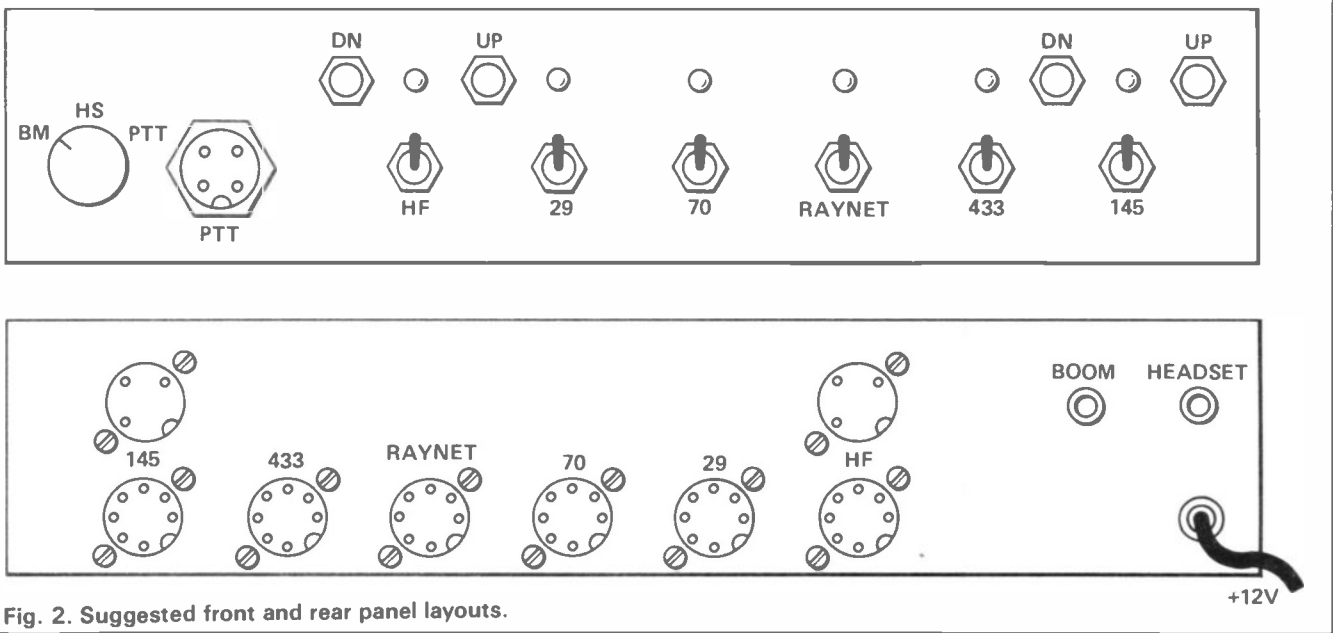


Fig. 2. Suggested front and rear panel layouts.

a suggested front and back panel layout, but much depends on available components and room in the vehicle. Have a look at Fig. 3 for sample switch wiring, being careful to 'dress' the wiring, using 'P' clips where appropriate. Coloured insulation certainly helps.

The electronics can to a certain extent be self supporting. Fig. 4 shows an 'instant surface mount PC' made by scouring a scrap of single sided board with a sharp knife and peeling off the copper.

Microphones

The PTT microphone can be the one supplied with one of the transceivers in 'the system'. These days, with so many mics having scanning buttons or other 'set specific' functions it is better to keep all the set mics safely in one place and buy a PTT mic just for this project.

The electret mics can be commercial halter/headset units from Heatherlite, Adonis, Astrolite or certain of the amateur radio manu-

facturers. For the more impecunious it is possible to make a good unit for less than one pound.

Straighten a length of coat hanger, then bend around a tin can slightly smaller in diameter than your head. Solder a length of very thin screened cable to an electret insert, obtained from a rally or salvaged from a cassette recorder, glueing it to the end of the coat hanger with five minute epoxy. Cut a 30mm length of 12mm heat shrink sleeving and quickly shrink over the electret and

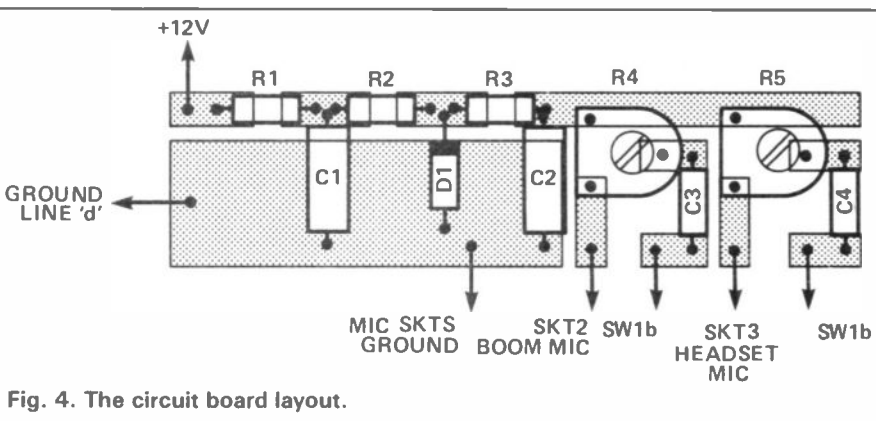
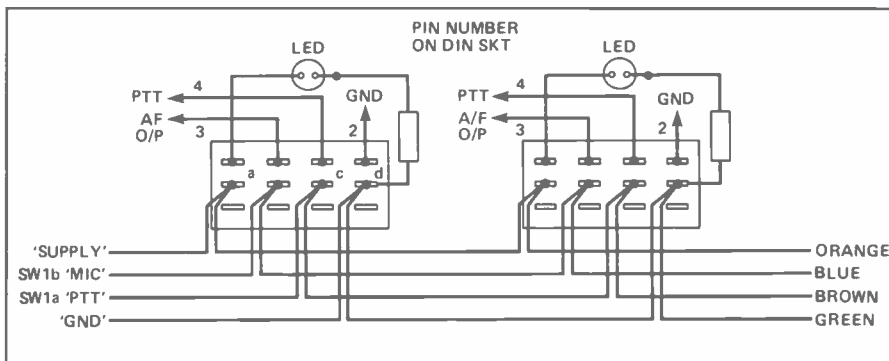


Fig. 4. The circuit board layout.

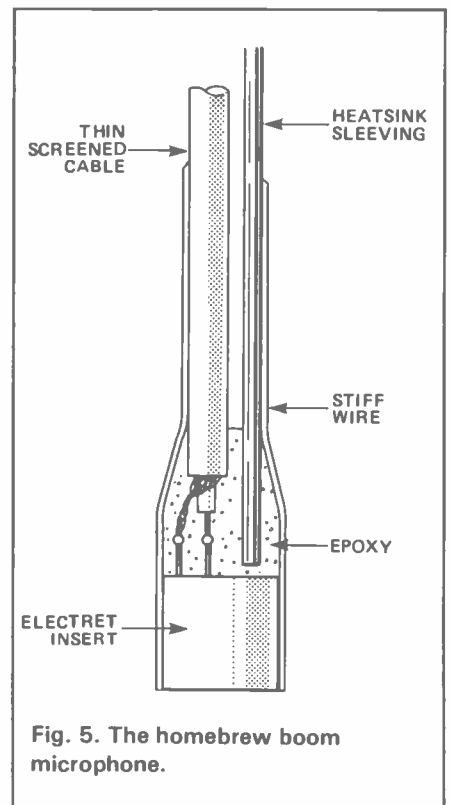


Fig. 5. The homebrew boom microphone.

epoxy while it is still curing. Cut another length of heatshrink to cover the insert and entire length of the coathanger, giving this the heat gun treatment as well. Lastly finish the job with a 3.5mm jack plug to connect to 'the Box'. Fig. 5 shows all.

Make up an identical unit, but with much shorter support wire, for sun visor/door pillar use at slow speed, low noise operation (ie when there are no children in the car!)

Patch Leads

Buy a large quantity of two-core-plus screen cable. A 50m reel is a good investment. Place each transceiver in position in the car and measure the cable length for each patch lead. Go under the carpet, behind the dashboard, over the transmission tunnel and up to the selector box. It's longer than you think!

The 'box' end uses 7 pin DIN plugs. The wiring standard adopted is one being used by Raynet groups throughout the country for remote control of rigs and to provide emergency repeater facilities. It makes sense to stick to this system, especially if you are a Raynet member. Do not use pins 6 and 7 unless you have read and understood the requirements of this standard (known as CAIRO).

The rig end you are going to have to sort out yourself. Every rig is different; even rigs from the same manufacturer, using the same connector, have different connections or 'pin-outs'. If in any doubt, read the instruction book.

If you are feeling really mean and miserable, don't bother with connectors; fit a row of grommets to bring the leads in to the 'box' directly to the 4-pole switches.

For those rigs that need up-down scanning buttons remoting to the 'box', use multiway screened cable to another DIN connector, preferably of a different type. Watch it! Some rigs use a contact to ground for scan, others a contact to +5 or +12V. Although you are unlikely to do any damage, double check before switching on. Ask the owner of a similar rig for advice.

Testing

Install all the equipment and ensure everything works on receive.

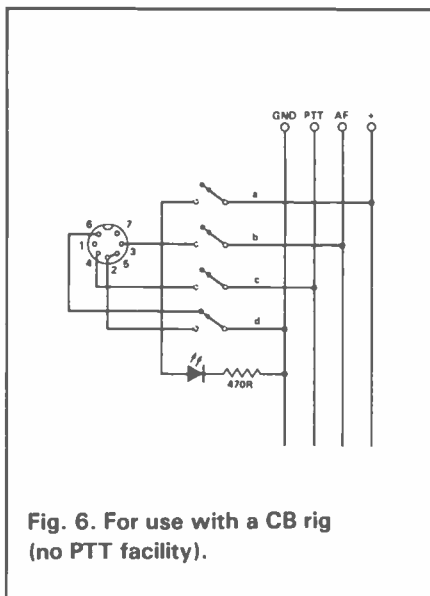


Fig. 6. For use with a CB rig (no PTT facility).

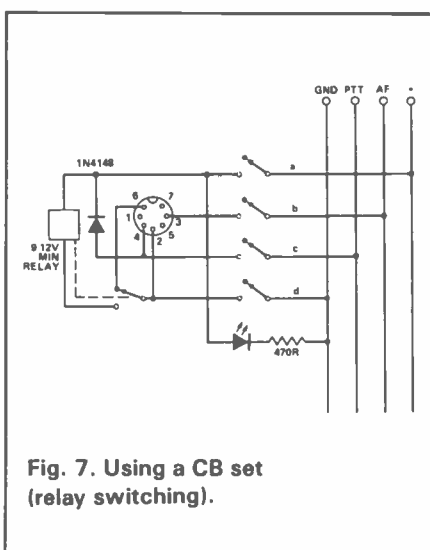


Fig. 7. Using a CB set (relay switching).

Test the up/down scan buttons (if fitted) and plug in the PTT mic. With switch SW1 in the PTT position throw the first 'waffle switch' to transmit. The appropriate LED will light, but the set should stay on receive. Press the PTT button and check the rig is modulating correctly. If there is too much modulation back off the rig's mic gain control, or if this involves

major engineering to get the lid off, then insert a 100k variable resistor in series with the wire to pin 3 of the appropriate socket. Find the optimum value and replace with a fixed resistor.

Move along the 'box', switch by switch until the speech level is satisfactory. Then deal with the boom mic. Switch SW1 to boom and select one of the radios, it should go immediately to transmit. Adjust R4 for optimum speech level, preferably with the engine running and (if possible) with the car at speed and someone else driving!). Lastly adjust R5 for the headset mic.

The time, effort and expense in building this little unit has paid for itself many times over in terms of safety and operator convenience. Work is now proceeding on an even more complex and flexible 'box', incorporating talk-through/re-broadcast/patch facilities.

Use With CB Sets

Many, but not all, CB rigs use a single-pole change-over switch as part of the PTT microphone, not just a simple closure to ground as is common amateur radio practice. In this case a little extra wiring is called for. The four-pole switches are 'two-way', although only one 'way' is normally used. Fig. 6 shows the extra wire needed, using pin 6 of the 7 way DIN such a modification means that the PTT mic cannot be used with the selector box, only the boom or headset mics. Two other options exist. Modify the CB rig to single closure operation by inserting a change over reed relay. This is a comparatively simple task if you have the rig's circuit diagram in front of you, but unfortunately, as each rig is different, is outside the scope of this article. Include a miniature relay in the CB portion of the circuitry of the 'box'. Fig. 7 shows the method.

Parts List			
Components		SW1	2 pole 3 way rotary
R1	47R	SW2-7	4 pole 2 way min toggle
R2	220R	SW8-9	Min PTM buttons
R3	1k	ZD1	6-9V zener diode 100mW
R4-5	4k7 miniature pots	LED2-7	LEDs
R6-11	470R	Sk1	To suit PTT mic
C1	100 µF 25V	Sk2-3	3.5mm jack sockets
C2	470 µF 16V	Sk4-9	7 pin DIN type 'A'
C3-4	0.1 µF 100V	Sk10	5 pin DIN type 'B'
Suitable case Knob for S1 Insulated wire.			

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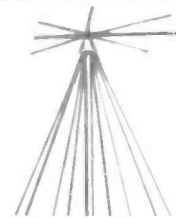
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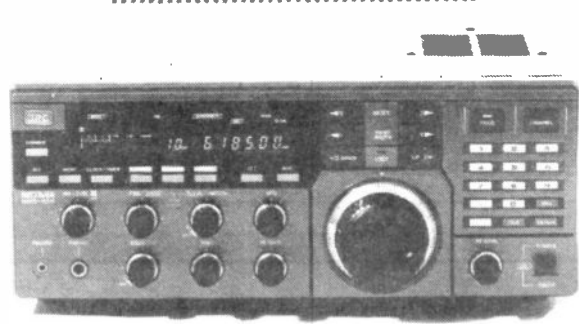
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Kenwood TS-790E

Base Station



The latest base station offering from Kenwood, unveiled for the first time at the Leicester Radio Show, is the TS-790E capable of all-mode operation on 2m and 70cm, and with an internally-fitted option, 23cm. A

band. 'Main' and 'Sub' displays on the front panel give an indication of separate band functions, and either band may be controlled at any time from the front panel.

This means for example that you

operating on all modes. Two Mute buttons are provided to quickly reduce the level of audio from either band by around 12dB to provide a quick reduction in receiver volume. An analogue S/R/F meter is fitted for the main band, a bargraph type being used for the sub band, and separate displays show the frequency, mode, tuning rate, VFO A/R, memory channel and so on. Push buttons toggle between operation modes, and an 'Auto' mode is available where the set automatically selects the correct mode depending on where you are in the band, in line with the current European bandplan.

Concentric SSB gain and all-mode RF power controls are fitted which function on the main band on transmit, and the analogue meter may be switched to indicate either relative RF power output or TX ALC level. A built-in speech processor may be switched in if required, an adjacent push-button giving a synthesised speech readout of the set's operating frequency if fitted with the optional VS-2 voice unit. Further push buttons select the required mode, a short morse code ident being emitted from the set to indicate which button you have pressed. This may be switched to a single bleep. For SSB/CW a variable IF shift control is provided for crowded band conditions, and a switchable 2mblancier receiver attenuator is fitted to provide a degree of protection from strong signals.

Tuning

As well as continuous tuning using the main knob, this may also be used as a click-step Channel control in selectable increments for FM or for quickly finding SSB activity. An Auto Lock Tuning system is provided, acting in a similar manner to an AFC loop, to correct for unwanted TX/RX frequency offset caused by frequency drift.

In normal use, the tuning knob steps in 20Hz increments on

Chris Lorek G4HCL boards a new flagship which is bound for many a VHF and UHF port — except 6 metres.

high transmit power level of 45W is provided on 2m, with 40W on 70cm, the add-on 23cm unit giving a nominal 10W. This transceiver now succeeds the earlier TS-780 as the Kenwood 'flagship' VHF/UHF base station.

Features

The set operates on the usual FM, USB, LSB and CW modes, and a 500Hz wide CW filter is fitted which may be selected in this mode. The set operates from an external 13.8V power source provided by the user, which must have at least 15A capability; alternatively a series of optional Kenwood 13.8V DC power supplies are available. Twin band full duplex operation is provided, ie two bands may operate at the same time on receive with selectable transmit

could be operating on 2m SSB while keeping a listening watch on your local 70cm FM channel, or transmitting on one sideband on 70cm while listening to the other sideband on 2m for satellite use. Received audio comes from a fitted internal speaker on the top panel, alternatively one or two extension speakers may be connected. The set has the ability to provide receiver audio from 2m to one speaker, and 70cm to the other. Likewise if stereo headphones are used, audio output from separate bands may be fed to separate headphone L/R speakers.

Controls

The usual volume and squelch controls are duplicated for main and sub band control, the squelch

SSB/CW, and 100Hz increments on FM, with an auto speed-up mode when rotated quickly to get from one part of the band to another. In channel mode, it QSYs in selectable 1kHz or 5kHz steps on SSB/CW, and selectable 5kHz or 12.5/25kHz steps on FM. Two digital VFOs are fitted on each band, which may be used independently or in split TX/RX mode as required. Push buttons change control between Main and Sub bands, the Sub band automatically switching 'off' when you select similar bands for each. The front panel mounted keypad may be used in its primary mode for direct frequency entry down to 100Hz increments if required.

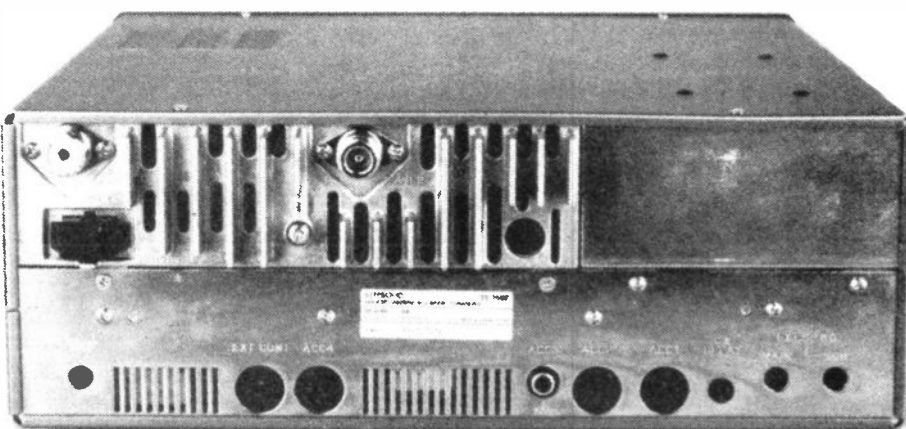
The keypad also allows you to set a call frequency, a Satellite mode where the sum of uplink and downlink frequencies on 2m/70cm are held constant when tuning, CTCSS mode for Sub-tone FM use when the set is fitted with an optional CTCSS unit, channel step size, repeater offset setting and reverse switching, and memory setting.

Memories

59 memory channels are available for storage of operating frequency, mode, tone frequency and status, and channel mode status, selected by a combination of keypad and tuning knob operations. Channels 00 to 29 are used to store standard channels, and channels 30 to 49 may be used to store split TX/RX frequencies if required. Memories may be selected by keypad entry, the VFO knob in click-step mode may be used to switch between memories; similarly by using up/down microphone mounted buttons if fitted. Three Alert channels are provided, A1 for 2m, A2 for 70cm, and A3 for 23cm (if fitted). Here the transceiver monitors the Alert channel every 5 seconds, beeping if the channel becomes occupied. Three further Call channels may be programmed, one for each band, and three Programmed scan channels may be programmed to set upper and lower scan limits.

Scanning

During memory operation, a press of the panel mounted Scan button will initiate a scan of all the memory channels that hold information, any of which may be locked out



of scan if required while still allowing manual selection. A programmed band scan is also available, where the set searches across the frequency range programmed into memory channels P1, P2 and P3. In each case, the scan halts for around five seconds whenever a busy channel indication is detected, ie when the all-mode squelch lifts; this may be switched to carrier-operated scan halt if required by pressing the TO/CO button during scanning. The scan may be resumed manually by operating the main tuning knob or microphone up/down buttons if fitted, or it may be cancelled by pressing either the Scan or Clear buttons.

Connections

As well as the usual mic and headphone connections on the front panel, the rear panel holds a large number of accessory connections together with CW key, external speaker, and 13.8V DC supply sockets. The ACC1 jack allows you to plug in an optional computer interface unit for remote control of operating frequency and the like with suitable software. The ACC2 connector allows connection of a Data Communications controller such as a packet radio TNC or all-mode unit, having RX and TX audio, RX Squelch busy, PTT, and Mic mute lines. ACC3 allows for pre-amp switching via external switching control, and ACC4 provides 1296MHz switching lines for use with an external TV unit. Finally, a 7 pin EXT CONT connector provides PTT, ALC and Band Switched lines for linear amplifier interfacing.

In Use

I connected the unit up in my

shack, powered from a professional 20A DC power supply. As well as using separate 2m and 70cm aerials, I also used the transceiver with a G4HCL diplexer (details in Jan 1985 HRT) into a wideband discone, dual-band fibreglass colinear, and a 'Create' 105-1300MHz log-periodic beam.

Testing first on FM, I was pleased to find the receiver was very selective. I could easily resolve signals separated by +/-12.5kHz, although occasionally received stations having high deviation caused a little roughness round the edges due to the narrow filter response. This rejection capability that meant I could happily reduce the effects of the primary band user signals on 70cm often interleaved between our repeater channels, likewise on 2m 12.5kHz operation was fairly satisfactory, being limited mainly by modulation sidebands from adjacent signals.

Reports of the transmitter audio were good, using a matching Kenwood fist microphone, the front panel mic gain control does not however operate in FM mode. Repeater operation at first took me a little time to get used to, using keypad mounted buttons for repeater offset, 1750Hz tone control and reverse repeater. The channel stepping facility was most useful, allowing a quick QSY between repeaters and simplex channels. The sensitivity was reasonable, although placing my external GAsFET pre-amp in line at the transceiver end did improve the overall sensitivity somewhat to match with the high transmit power a little better.

Tuning down to the bottom of the band, I had several contacts on 2m

and 70cm SSB, the receive sensitivity here nicely matching the transmit power level, due to most other stations running similar powers. I appreciated the IF shift facility, and the narrow CW filter when selected certainly cleared the wanted signal out from QRM. On transmit the reported audio quality was again quite good, switching in the speech processor improved readability when weak but in general I found my QSO partners who were receiving me at a reasonable strength preferred it switched out. Under lengthy QSO conditions, a rear-panel mounted fan automatically switched in to keep the transmitter from overheating, this was extremely quiet in operation.

The VFO in all modes certainly had a very nice feel to it when tuning, and the knob tension could be varied if required. I found it very handy to monitor a locally-used 2m FM channel while in QSO on 70cm SSB, never missing a thing. The Satellite mode allows you to enter various frequency difference settings into memory channels, ie 581.800 for Fuji Oscar 12 JA mode into memory 0, 581.004 for Amsat Oscar 10B mode into memory 1 and so on, saving 'VFO swishing' operations with any fine tuning as required being made by using the RIT facility.

Laboratory Results

The receiver sensitivity was quite good on SSB/CW, reasonable on FM but I would have preferred to see the latter a bit more sensitive in view of the transmit power level. As found in practice, the FM 12.5kHz selectivity was very good, as was the blocking performance, especially on 2m, well up to Kenwood's usual high standards. I was a little disappointed with the intermodulation rejection however, where off-frequency signals combine to cause unwanted on-frequency interference, the switchable attenuator would be useful under strong signal conditions as would be found in large conurbations or contest sites.

On transmit, the power output was certainly up specification with a useful range of variable power, the FM modulation being accurately set. The rear panel fan kept the heatsink cool, and no power slumping was evident as found on some other sets where the output power reduces with increase in heatsink temperature.

Conclusions

I feel Kenwood have again come up with what will become a popular VHF/UHF base station, especially for satellite operators with its 2m/70cm/23cm operating capabilities for these. The transceiver was very pleasant indeed to use, and I felt I was controlling it with only a small amount of effort, allowing me to concentrate on swinging Azi/Ele rotators and the like rather than swishing VFOs around.

For normal terrestrial use, I feel the lack of 6m capability is a pity, as I believe most amateurs may have preferred this as an optional band rather than 1296MHz. Also its use as a contest transceiver could be limited

in some cases due to IMD rejection. The blocking performance on 2m however was very good, but for many operators these factors may not be too important, I certainly found no problems in normal use.

All in all, I'm sure the set would take a proud place in the shack of many a keen amateur, its smart appearance would not look out of place next to the Hi-Fi in the more sociable areas of the household. Remember when contemplating purchase to allow also for a 15A DC power supply. A car battery in the lounge would not go down too well! My thanks go to Lowe Electronics Ltd. for the loan of the review transceiver.

LABORATORY RESULTS				
RECEIVER:				
Sensitivity: Input level required to give 12dB SINAD:				
	SSB/CW	FM		
144MHz	0.090uV pd	0.182uV pd		
145MHz	0.088uV pd	0.178uV pd		
146MHz	0.087uV pd	0.178uV pd		
430MHz	0.077uV pd	0.172uV pd		
435MHz	0.078uV pd	0.170uV pd		
440MHz	0.080vV pd	0.168uV pd		
FM Adjacent Channel Sensitivity Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal				
	145MHz	435MHz		
+ 12.5kHz	61.5dB	62.5dB		
- 12.5kHz	64.5dB	60.5dB		
+ 25kHz	85.0dB	78.0dB		
- 25kHz	86.0dB	78.5dB		
Image Rejection Increase in level of signal at first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals				
	145MHz	435MHz		
	95.0dB	102dB		
Blocking Increase over 12dB SINAD level of interfering signal, unmodulated carrier (SSB/CW), and modulated with 400Hz at 1.5kHz deviation (FM), causing 6dB degradation in 12dB SINAD on-channel signal				
	145MHz	435MHz		
+ 100kHz	97.0dB	86.0dB		
+ 1MHz	105dB	97.0dB		
+ 10MHz	>110dB	103dB		
Intermodulation Rejection Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product				
	145MHz	435MHz		
25/50kHz spacing	65.5dB	62.0dB		
50/100kHz spacing	66.0dB	62.0dB		
S-Meter Linearity (145MHz measurements, 435MHz similar linearity)				
	SSB/CW		FM	
Indication	Sig.Level	Rel.Level	Sig.Level	Rel.Level
S1	0.410uV pd	- 18.9dB	0.225uV pd	- 21.3dB
S2	0.531uV pd	- 16.7dB	0.632uV pd	- 12.3dB
S3	0.595uV pd	- 15.7dB	0.980uV pd	- 8.5dB
S4	0.750uV pd	- 13.7dB	1.24uV pd	- 6.5dB
S5	0.948uV pd	- 11.6dB	1.58uV pd	- 4.4dB
S6	1.15uV pd	- 10.0dB	1.83uV pd	- 3.1dB
S7	1.68uV pd	- 6.7dB	2.08uV pd	- 2.0dB
S8	2.21uV pd	- 4.3dB	2.32uV pd	- 1.0dB
S9	3.62uV pd	0dB ref	2.61uV pd	0dB ref
S9 + 20	182uV pd	+ 34.0dB	4.54uV pd	+ 5.0dB
S9 + 40	<100mV pd	<90 dB	11.2uV pd	+ 12.7dB
TRANSMITTER				
TX Power:				
Freq MHz	Power			
145MHz	Max 46.2W Min 3.4W			
435MHz	Max 41.1W Min 3.1W			
FM Peak Deviation				
145MHz	4.32kHz			
435MHz	4.98kHz			
FM Toneburst Deviation				
145MHz	4.22kHz			
435MHz	4.27kHz			

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'Create'

CLP-5130

Log Periodic Yagi

Do you live on one of the many new housing estates, where large outside aerials are frowned upon? Maybe you'd like to operate on the VHF or UHF bands using rotary yagis but

operating over a small frequency range as a result.

Offerings

The Japanese aerial company Create manufacture a large range of

types the front-to-back ratio is 15dB, with a maximum VSWR across the range of 2:1. The power handling capability is 500W PEP, with a feedpoint impedance of 50ohms. The 5130-2 has a boom length of 1.4m with a longest element length of 1.4m, the weight being 3kg. The 5130-1 has a longer boom length of 2m, with the longest element being 3m, and the weight in this case 5kg.

Mounting brackets are supplied for both horizontal and vertical polarisation, and a short 50ohm length of coax terminated in an N-type socket is provided for the coax feed.

Assembly

The aerial arrived in the post packaged in the usual long cardboard box. Altogether it took me just over half an hour to assemble the beam. The spacers used for the phasing line boom took me a couple of goes before I got it right. When assembled,

Chris Lorek G4HCL finds a multi-band log periodic that fits snugly on the roof.

can't get away with it due to neighbours or the local council not agreeing with your idea of beauty in the form of multiple arrays perched on your rooftop! Many of us would like to have a stack of monoband yagis for the ultimate performance, but this can often stay a dream.

There could be an answer. How would you like a *single* yagi to cover 6m, 4m, 2m, 70cm and 23cm, with the FM broadcast band and all the TV bands thrown in for good measure? With a log periodic yagi you can.

Log-Periodics

A log periodic aerial uses a number of elements tapering in length, all being driven by RF power. This means that it may be used over a large frequency range, dependant upon the physical size of the elements and hence the range of their resonant frequencies. Fig. 1 shows a typical arrangement. As a result, this type of aerial exhibits a virtually constant impedance across the frequency range covered, having the same radiation pattern, ie gain, beamwidth and front-to-back ratio throughout the range. Not all the elements are active at any one frequency — as the frequency is varied the active region moves back and forth. This differs from the usual form of yagi where one driven element is used, the remainder being parasitic, ie not driven, the beam

aerial. As well as various VHF and UHF yagis they also make HF beams, and can even supply an 80m HF beam if you have the space for one! For the VHF/UHF amateur bands, as well as monoband yagis two types of log-periodic beams are variable these being the CLP5130-1 covering 50-130MHz, and the smaller CLP5130-2 covering 105-1300MHz.

The 5130-2 has 20 elements, and has a claimed gain of 11-13dBi, the larger 5130-1 having 10-12dBi (dB relative to an isotropic radiator) with a beamwidth to the -3dB points of 60-70 degrees in each case. In both

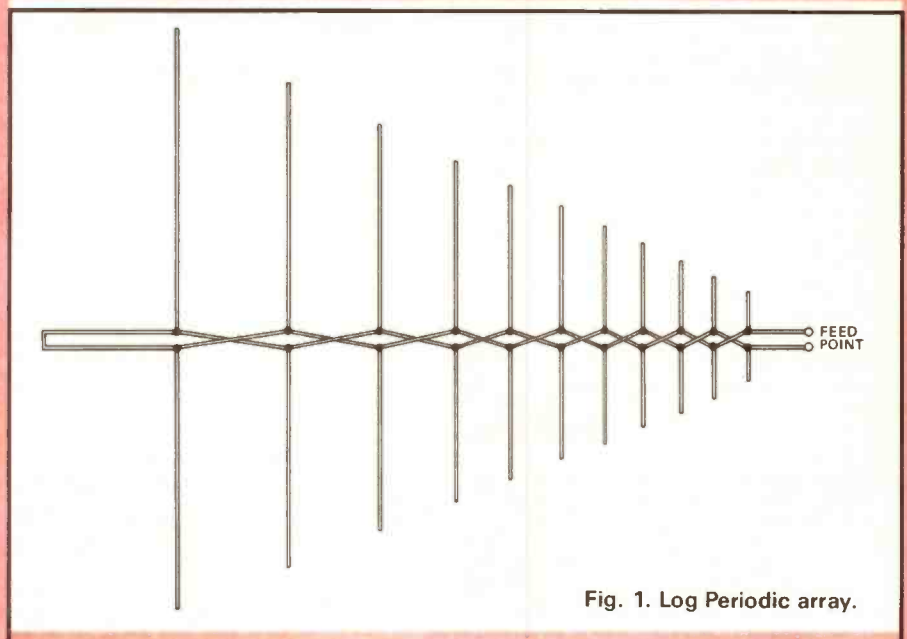
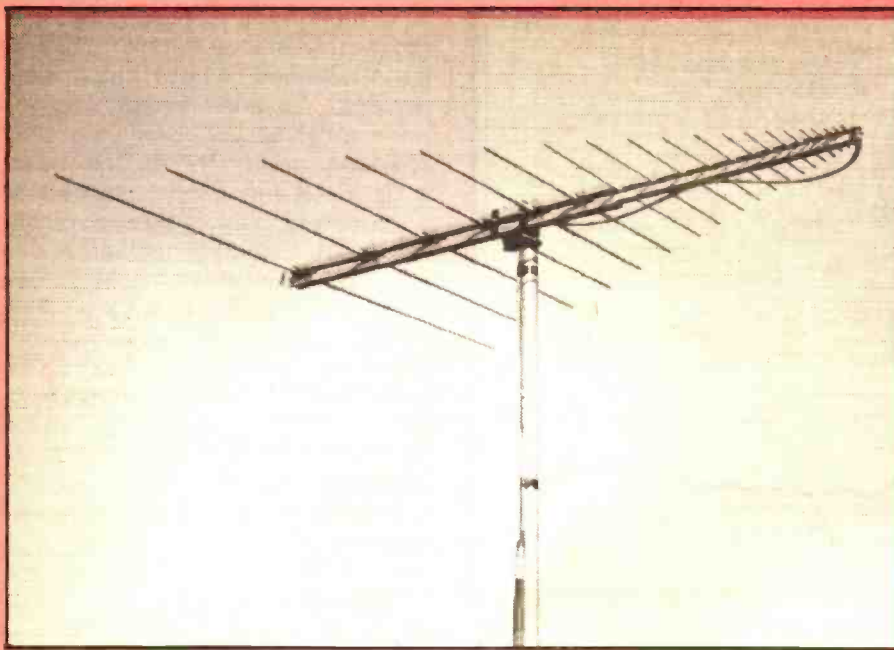


Fig. 1. Log Periodic array.



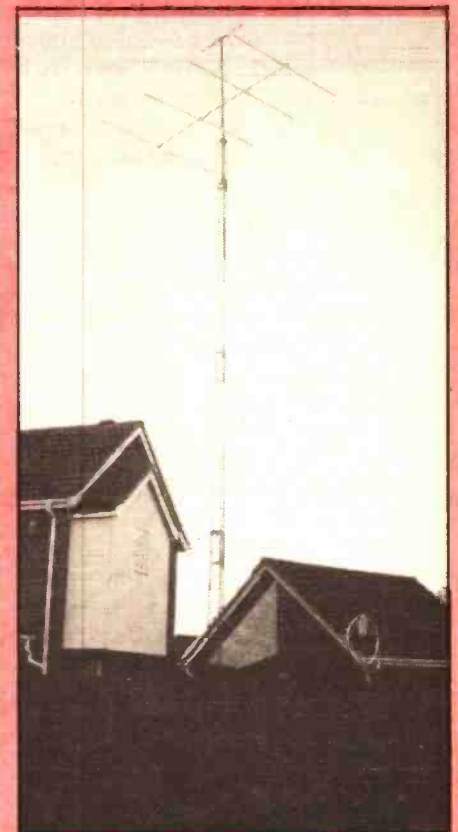
The 'Create' log-periodic 105-1300MHz beam.

I was surprised how neat the aerial looked, I was also pleasantly surprised with the size as I was expecting a somewhat larger and more conspicuous array. . . Maybe I should have put the larger 50-1300MHz beam up instead!

On the Air

The beam was first erected on my wind-up lattice mast, with its height varied over 25ft to 55ft above ground level hence giving an indication over a variety of mounting heights as would be used by our readers, also a period of indoor use was carried out, as well as loft use by an amateur friend of mine during a UHF contest to give a second opinion.

I first tried the aerial on the tower, a reply from around 40 miles away coming back to my first short CQ call on 433.2MHz SSB. The beam appeared to have a reasonable gain, with a fairly wide beamwidth compared to my usual 19ele monoband yagi. Checking the beacons showed all the usual ones I could normally hear to be audible. I also found that by rotating the beam I could certainly 'null out' signals off the side.



The log periodic Yagi in place.

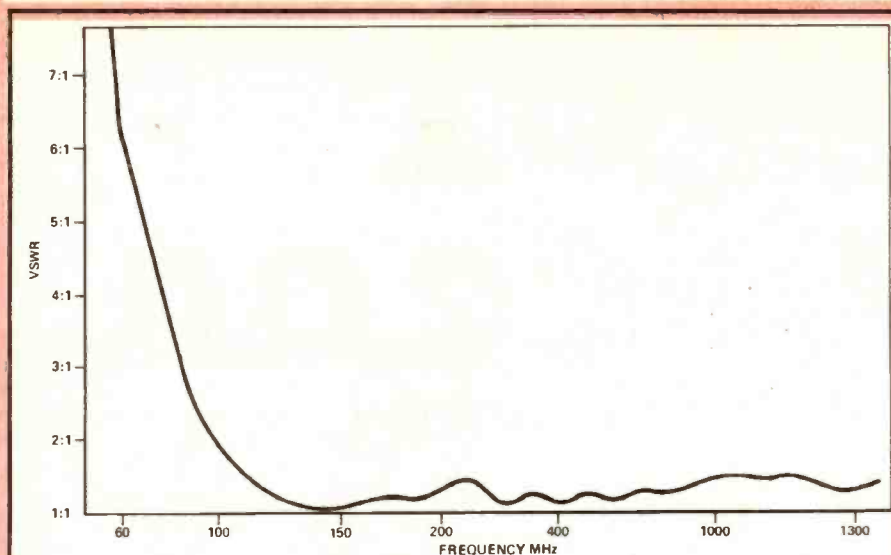


Fig. 2. 'Create' 105-1300MHz log periodic wide-band VSWR performance.

On 2m, again the aerial performed quite reasonably, with a very similar radiation pattern to that noted on 70cm during my beam-swinging operations. It didn't quite have the gain of my usual 9 ele monobander, being a few dB down, but then it certainly wasn't anywhere near the size of it. During my 2m SSB QSOs more than one amateur was surprised when I told them I was using a 20 element yagi with a boom length of just over 4ft, and that it

covered all bands up to 23cm!

A quick check on 23cm showed that the aerial had roughly similar properties, but due to absence of signals apart from my semi-local 23cm beacon/repeater I could not do many tests. However, in the loft of a friend on a modern housing estate, it was of course noticeably down in gain, compared with a 23 ele monobander beam in the same position, but wider in beamwidth.

Finally, the aerial was coupled up

to a multimode wideband scanner receiver. A listen to the FM broadcast band showed what I had been missing! Several distant stations were received very well, the side-rejection properties of the beam nulling out more local stations to allow others to come through nicely. A tune to 600MHz enabled me to receive TV sound (and indeed video signals) not only from my local Sandy Heath (Anglia TV) transmitter, but also from the Waltham (Central TV) and Belmont (Yorkshire TV) transmitters. When placed in the vertical plane I'm sure it would prove equally useful on other bands, to receive distant repeaters and airport ground stations.

Technical Performance

A wideband test setup was used to examine the aerial's VSWR across the frequency range (Fig. 2). This shows the aerial to have a good match to 50ohms across the entire range. A beamwidth plot taken on 70cm on horizontal polarisation shows a reasonable result, with good side nulls as found in practice. Due to possible test anomalies due to mounting location etc., an accurate gain measurement was not attempted, however a gain figure in the order of several dB gain over a dipole was evident on all bands.

Conclusions

The Create log-periodic yagi is very well made, and would not look out of place on rooftops. One could easily claim it as a wideband TV/FM broadcast band aerial if objections were raised, as it certainly operates on these frequencies. It does not have the gain of separate large monoband yagis for each band, but for its size it performs exceptionally well across a large frequency range. I am seriously considering erecting the 50-1300MHz version on my chimney for general use when my tower is tilted over, as it normally is when not on use. For the amateur residing in a small housing estate or flat, or for the scanner owner who wishes to extend his or her horizons, a beam such as this would be very useful.

My thanks go to Waters and Stanton Electronics for the loan of the review aerial.

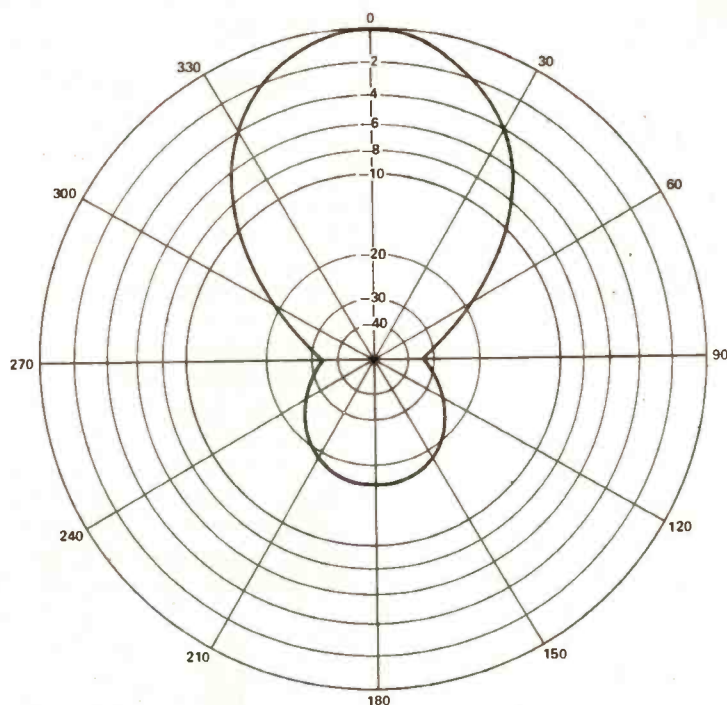
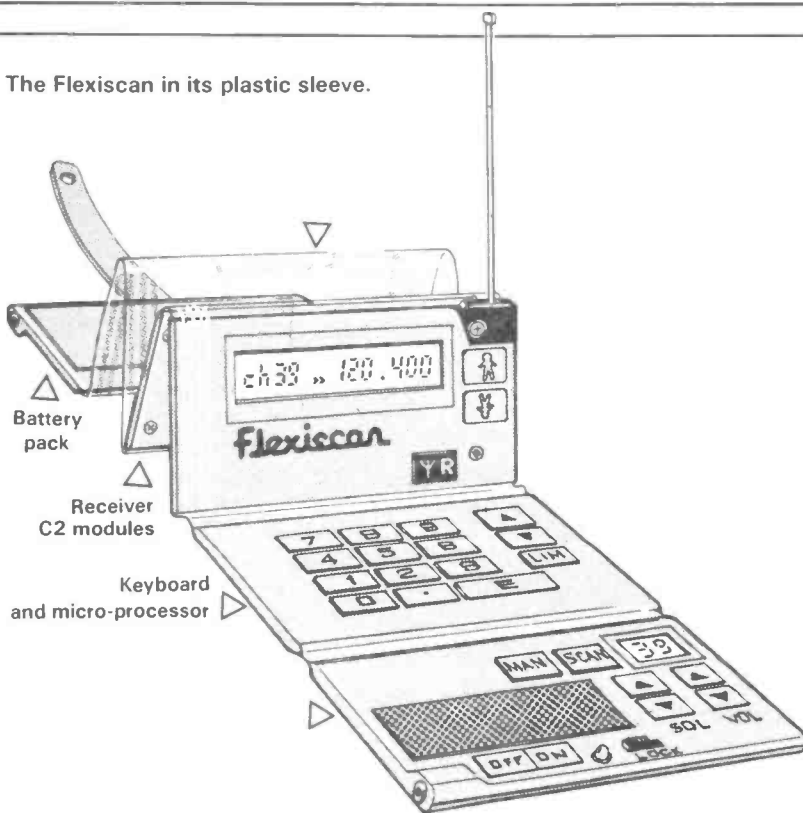


Fig. 3. 'Create' log periodic: directivity 433MHz horizontal polarisation.

Banecat[®] Flexiscan REVIEW

The Flexiscan in its plastic sleeve.



lar, just the usual 16 ch/sec. One would think that with Regency offering their 'TurboScan' 60Ch/sec, the designers might have come up with something better.

However, the innovation in this receiver lies in its unique physical construction. Like a credit-card sized calculator, the scanner is constructed in five stainless steel sleeves, each 5mm deep (plastic would have been too thick for the required rigidity) and these five modules are laminated between two soft transparent plastic sheets. This 'sleeve' enables the scanner to be folded or spread out like fan-fold paper.

Slip Rings Rejected

The first prototype was intended to be entirely modular, using a slip-ring type of interlocking joint between the modules to permit folding. The slip-ring contacts went to five busses going from top to bottom of each module and these carried all data for command switching in multiplexed format: clearly the modules could be assembled in any physical sequence, depending on how and where the scanner was to be operated. Additional modules could be added to the system at any time just by plugging them in. Among the additional modules envisaged were 400 channel memory expansion,

Bill Wilson reports from the USA on a revolutionary scanner case design.

During a recent visit to the States, I had the unique opportunity of visiting the labs of Unidem, one of the oldest established manufacturers of scanners in the world.

While on this visit, a working prototype of the newest scanner, tentatively designated HXB-450-XTL, was demonstrated and the following notes, although not comprehensive, give a fair indication of the features of

this receiver which should be available early next year.

The specification looks prosaic enough: frequency coverage is the usual 66-80, 118-174 and 408-520 MHz with dedicated AM/FM selection for the band in use.

Will designers never realise that, for the British market, AM is much more useful in the VHF Lo band?) The scan/search rate is nothing spectacu-



Shoulder/upright push button logos.

100kHz-50MHz converter, 520MHz-1350MHz converter, search-and-store between limits, solar-power supply and RS232 interface.

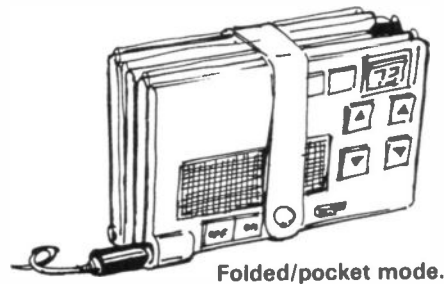
This approach was, however, considered unacceptable due to the complexity and possible eventual unreliability of the interconnections (perhaps they could have brought in Professor Rubic as a consultant?).

The present design is a simplification of the initial concept. Gone is the modular extension approach, but the compactness has been retained in the folding capability of the aptly named, but difficult to describe, 'Flexiscan'.

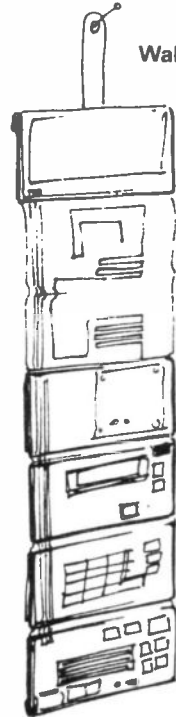
Imagine your fan-fold credit card holder; think of the cards being replaced by credit-card sized calculators — that gives the best idea of the new scanner. It can be folded up and put in the pocket, can be opened out and slung over the shoulder under ones jacket for inconspicuous eavesdropping, hung on the wall, or used in a desk-top configuration.

Clearly, an immense amount of development work has been done, even down to component level. All active devices are custom designed SMDs (for example, to save the bulk of a memory back-up battery or capacitor, the memory chip is a 2800 bit Electrically Alterable Read Only Memory (EAROM) with a 200 word \times 14 bit organisation. Two words (28 bits) are used for each of the 100 channels for frequency, bandswitching, lockout and display inversion). Even the existing 5mm high Toko wound components were redeveloped to provide 3.5mm high screened coils where this was essential. In non-critical areas, surface-mounted inductors are used. The first filter (54MHz) is based on SAW technology, while the second IF ceramic 455kHz filters area based on simple ceramic resonators with SMD matching inductors brought to resonance by 3mm diameter trimmers.

The front-end and VCO coils presented most problems, the solution being found in printing the coils and UHF striplines onto the main RF board, itself made from 0.25mm fibreglass, using both sides of the board to provide inductive coupling. Extreme precision was needed in the manufacture of this board any variation of the thickness of copper or substrate, or indeed the time and strength of the etchant would mean



Folded/pocket mode.



Wall mode.

that the inductance and coupling tolerances of $<1\%$ could not be realised.

Piezo Speakers

Audio output is a mere 50mW, perfectly adequate for earphone use, but the speaker output is perhaps just usable. The speaker itself is a new concept, being a piezo type. I know what you are thinking, piezo sounders can only operate on one frequency. However in this design the 'speaker' is made up from a mosaic of tiny sounders, each operating at a different frequency in the 400Hz-3kHz range, so even with about 50% of the audio range missing, the human ear 'fills-in' the missing frequencies and the result is totally convincing: after all, the scanner is designed for voice reception — not even for lofi music.

It was originally intended to have all the controls on one module along with the display, but this would have meant operating the scanner with a ball-point pen or matchstick, so the controls are split between three

modules with 'finger' sized pads. The main keyboard and display are inaccessible when the receiver is in the 'folded' mode, but the 'outside' section carries the main operating controls once the scanner is programmed, together with a small LCD display to provide channel number information. These 'user' controls are limited to scan, manual, squelch, volume and on-off; the volume and squelch have up and down pads.

When worn over the shoulder, the display is clearly visible, but would have been upside-down to the operator. This problem was cunningly solved by arranging two touch pads near the display to invert the information on the screen, this was simply a matter of enabling or disabling display segments according to the mode chosen. The only information on the screen consists of channel number and frequency together with a '>' to indicate scan.

In a set of this size the usual telescopic aerial was obviously out of the question. The designers have instead come up with two built-in aerials, on a printed flexible system, complete with printed loading coils. This is evidently screened on to clear plastic and laminated along with the rest of the scanner — this arrangement does not compromise the folding characteristics of the scanner. The batter pack, being at the end of the aerial remote from the main receiver, acts as a counterweight when the scanner is worn in the 'shoulder' mode.

For desk-top use, there is a pull-out aerial in the display module; this is evidently made from a very springy phosphor-bronze type of metal and is configured rather like a metal tape-measure about 3mm wide, and can be simply pulled out of its holder to the length required. To this end marks have been etched on to the tape to show how much should be pulled out for specific frequencies, so that the aerial can be made optimally resonant for particular bands. Like a tape-measure, this aerial is retracted by pressing a small button. Apart from the 'keylock' switch, this is the only physical control in the whole scanner.

Flat Batteries

OK, what about power? Even AAA cells were out. Button cells were considered but rejected because at least twelve would have been re-

quired in a series/parallel arrangement to give sufficient power. Camera firm, Polarid-Land came up with the answer by developing a special version of the battery used in their film packs. These are integrated into the film packs and disposed of automatically when the film is processed in the camera. A method of 'stacking' these paper-thin cells into a 4mm thick block has been developed specifically for this scanner. Rather expensive, but their life is surprisingly long especially when earphone use is involved.

Apparently, work is in progress in the search for a rechargeable version of this battery, but a working, cheap model is likely to be years away. Solar power was also considered, but the concept was dropped like a hot brick when the marketing people mentioned that the 'Flexiscan' might be sold in the UK.

In the illustration of the scanner one can see parallel lines following the left-hand side of each module. These are busses printed within the plastic laminate and they distribute all power and multiplexed data informa-



Shoulder mode as projected in action.

tion between all sections of the scanner. How well they will last with repeated flexing remains to be seen, but at least the designers have three samples of the receiver flexing away on very complex and expensive test jigs.

Cassette

Incidentally, the design team is considering a reconfiguration of the circuit, without the battery, audio and aerial sections, to fit into an audio cassette sized package which could be used in any of the personal stereos which have contacts to accept an FM tuner. (Countries which do not permit scanners, beware!)

No performance figures for the Flexiscan are yet available. The indications are that they will not be an improvement over existing scanners, but the makers are relying on the convenience and unobtrusiveness of the set to make it an unbelievable success on the market. First deliveries can be expected from Taiwan in April 1990.



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TRANSVERTER receive converter and 2.5W transmit converter in single boxed unit. 10m drive, 10-100mW unbuffered, types TRX4-10H and TRX6-10H, boxed kit £60, Built and tested £99.50. Buffered types for use with 10m rigs giving — 6dBm drive, TRX4-10B and TRX6-10B, Boxed kit £68 Built and tested £115. With interface unit for use with 2m drive 1/2W-5W types TRX4-10I and TRX6-10I, Boxed kit £68, built and tested £115.

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TRANSMIT AMPLIFIERS, linear two stage 1/2W in 20/30W out, unswitched, suitable for MEON. Types TA2U2, TA4U2, and TA6U2, PCB kit £41.25, PCB built £52.50, Boxed kit £45, boxed built £59.25. Switched version for use with Spectrum transverter, types TA2S2, TA4S2, and TA6S2, PCB kit £47, PCB built £60.00, boxed kit £58.25, boxed built £72.50.

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Listening On...

We take a look at the work of one of the largest broadcasters in the world, the Voice of America, or VOA

Unlike the BBC World Service, which is an independent body under a Royal Charter (and therefore not directly controlled by the government, although they hold the purse strings), the VOA is a part of the United States Information Agency (USIA) and is therefore the mouth-piece of the American government. The VOA's intention is to win the attention and respect of listeners by communicating directly with the people of the world by radio, thus serving the long-

range interests of the United States. All VOA broadcasts are therefore governed by the following three principles, called the VOA Charter, which were signed by President Gerald Ford and became law on 12th July 1976:

— "VOA will represent America, not any single segment of American society, and will therefore present a balanced and comprehensive projection of significant American thought and institutions.

— "VOA will serve as a consistently reliable and authoritative source of news. VOA news will be accurate, objective and comprehensive.

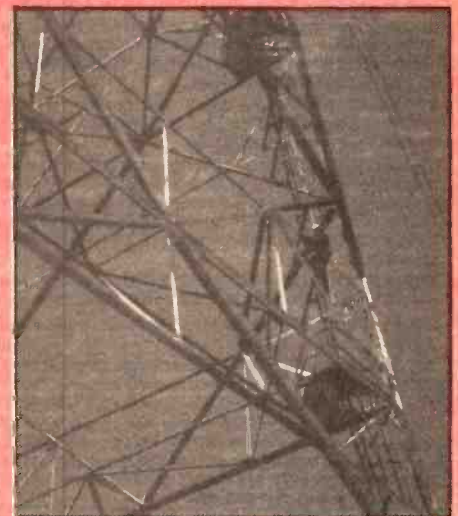
— "VOA will present the policies of the United States clearly and effectively and will also present responsible discussion and opinion on these policies."

From the above principles, it can be seen that news is regarded as being one of the most important parts of VOA's output. There are over 200 staff employed in the VOA newsroom in Washington and at 25 other bureaux around the world. On an average day, over 150 different "stories" are reported on the air. News sources include agencies such as AP, UPI, Reuters, AFP and the New York Times, as well as over 40 full-time correspondents around the world and dozens of free-lance "stringers". The VOA's policy is never to air a news story from just one source (unless it is from one of their own correspondents), but instead to wait until another source independently

corroborates the news. (The BBC World Service news has a similar policy.) Reports directly from VOA correspondents can be heard in their "Newline" programme (see Table 1.) The correspondent's reports are also fed into a computer known as Snap (System for News And Processing), which they claim is the world's largest multi-lingual computer network. It provides automated word processing for all of the VOA's 44 language sections and is used for preparing copy in the central newsroom. Snap then delivers the news over high-speed printers to the various language sections where translators and editors can prepare their own news bulletins on bi-lingual terminals. When you consider that the VOA uses languages such as Armenian, Cantonese, Greek and Ukrainian (all with different alphabets) this is no mean feat. There is also a computerised audio network called Sound On Demand (I wouldn't like to say what this one is known as) which delivers "actual material" — voice recordings and other sounds — from a central processing area to any of the 44 language services upon request.



One of VOA's most famous voices, Willis Conover, presenter of Music, USA (Jazz).



An engineer at the Bethany, Ohio site climbs a 100 metre tower to maintain a curtain antenna array.

Time GMT	Frequencies kHz	Programmes
0400-0500	5995, 6040 7170, 7200	0400 News 0410 Newslines (not Sat/Sun) 0430 VOA Morning (from 0410 Sat/Sun)
0500-0630	5995, 6040 6060, 7170 7200.	0500 News 0510 Newslines (not Sat/Sun) 0530 VOA Morning (from 0510 Sat/Sun) 0600 News 0610 Newslines (not Sat/Sun) 0610 VOA Morning (Sat/Sun)
0630-0700	1197, 3980 5995, 6040 6060, 7170 7200.	0630 VOA Morning
0700-1700	1197	VOA-Europe, including news on the hour, and 0906-1300 American Top 40 (Sun) 1210-1230 Newslines (not Sat/Sun) 1306-1700 American Country Countdown (Sun)
1700-1730	1197, 3980 6040, 9760 11760, 15205	1700 News 1710 Newslines (not Sat/Sun) Communications World (Sat)
1730-2200	6040, 9760 11760, 15205	1730 Music USA 1800 News 1810 Focus 1830 News and Features in Special English 1900 News 1910 Newslines 1930 Magazine Show (not Sat/Sun) Music USA (Sun) 2000 News 2010 Music USA (Jazz with Willis Conover (not Sun) Concert Hall (Sun) 2055 Editorial 2100 News 2110 World Report (not Sat/Sun) 2110 Communications World (Sat) followed by Weekend Magazine

Table 1: Frequency and programme schedule for VOA broadcasts audible in Europe.

Sites All Over

These 44 language services are either recorded or broadcast live from 30 studios in the Washington HQ building — some services are on the air for only 30 minutes a day, while English is broadcast around the clock. All programmes are routed via a Master Control which was commissioned in 1987, replacing an older model which had served the VOA faithfully since 1954. The Master Control links the correct studio at the

correct time with the correct transmitter chain, as well as providing a service for foreign correspondents in the USA to send their despatches home. Of the VOA's 100 plus transmitters, less than half are actually located in the USA. Transmitter sites in Greenville, North Carolina and Delano, California have, since September 1988, been linked with the studios by a new satellite set-up known as SIS (Satellite Interconnect System). Over the next few years



The Voice of America logo.

other transmitting stations will be incorporated into SIS and listeners should notice an improvement in the audio quality of the signals they receive.

At present, some of the routings used to get signals to listeners are bizarre. For example, the VOA relay station in Botswana, which broadcasts English service programmes for Southern Africa on 621 kHz medium wave gets its feed from a short wave pick-up of another VOA relay in Monrovia, Liberia. They receive the signal over a microwave link from a satellite ground receiving station elsewhere in the country. The satellite feed comes from a station in Pennsylvania and they in turn get the original signal over microwave links from Washington, so it is perhaps not surprising that the listener in, say, South Africa, on the edge of the service area of the 50 kilowatt medium wave transmitter, should get a poor quality signal. The Botswana relay will, in fact, be the next station to become part of the SIS system.

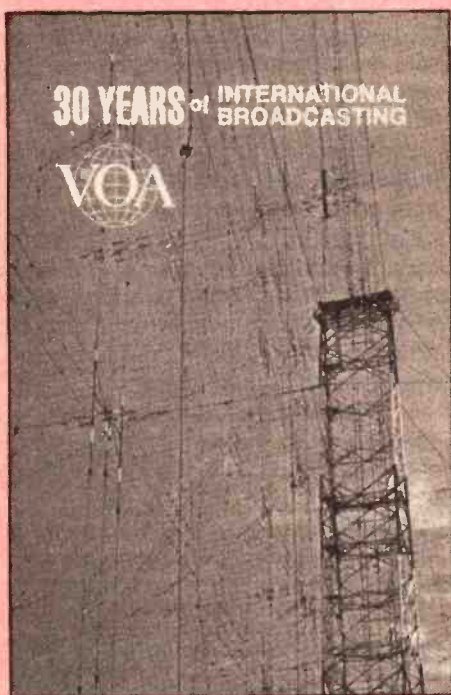
The Satellite Interconnect System (which also enables engineers at the remote transmitting sites to report back on, say, technical faults to HQ) is part of VOA's massive modernisation project which started in the mid-1980s. We reported on another aspect of this in the December *Listening On...*, when news came that Marconi had been awarded a 50 million dollar contract to supply and install ten 500 kilowatt transmitters for the VOA in Morocco, another of their overseas relay bases.

Although the VOA relies heavily on short wave, in principle they try to use medium wave wherever possible, since there is a feeling that more people have access to medium wave rather than short wave receivers and reception quality is more reliable. To this end, the VOA have used some of the most powerful medium wave transmitters in the world: 1000 kilowatt stations in the Philippines and in Thailand. The only VOA

medium wave transmitter in the USA, limited to 50 kW power by FCC regulations, is at Marathon in the Florida Keys and this is now used to broadcast Radio Marti programmes to Cuba, only a short distance away across the Caribbean Sea. Closer to home, the VOA have a medium wave station in Munich, West Germany, which is used for Central and East European languages during the evening and VOA-Europe programmes in English during the day. It is on 1197 kHz and has a power of 300 kilowatts.

VOA In Europe

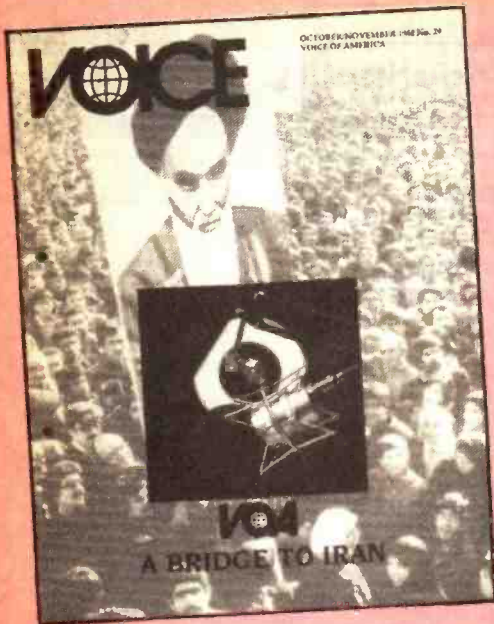
VOA-Europe consists mainly of American pop and rock music, with relays of news on the hour and occasional other VOA network programmes. It is mainly broadcast on cable networks in West Germany, Scandinavia and the Benelux countries, but there are believed to be three outlets in the UK: in Windsor on 87.5 MHz, in Coventry on 92.2 MHz and in Croydon on 104.0 MHz. These are via cable networks, so you won't be able to hear them on your normal VHF radio. VOA-Europe is broadcast by terrestrial transmitters in Italy and France, however, and there have been reports of it being heard under good lift conditions: try 90.5 MHz from Reims. VOA-Europe is on the air 24 hours a day and is carried by the 1197 kHz transmitter in Munich between 0630 and 1700 GMT (from 1300 on



This QSL was issued for VOA's 30th anniversary in 1972.

Map Ref.	Stn Location	Short Wave Transmitters	Medium Wave Transmitters	Notes
1	U.S.A. Greenville North Carolina	11 x 500 kW 6 x 250 kW 6 x 50 kW	Nil	
2	Bethany, Ohio	3 x 250 kW 3 x 175 kW	Nil	
3	Delano, California	5 x 250 kW 1 x 100 kW 1 x 50 kW	Nil	
4	Dixon, California	3 x 250 kW	Nil	
5	Marathon, Florida	Nil	1 x 50 kW Used by VOA Spanish Radio Marti to Cuba	
6	U.K. Wooferton, Shropshire	4 x 300 kW 6 x 250 kW	Nil	Run by BBC for VOA
7	West Germany Munich plus	4 x 100 kW 1 x 10 kW 1 x 500 kW	1 x 300 kW at Wertachtal, run by Deutsche Welle.	
8	Greece Kavala	10 x 250 kW	1 x 500 kW	Both MW transmitters in Greece shared with
9	Rhodes	2 x 50 kW	1 x 500 kW	Greek radio, Athens
10	Morocco Tangier	4 x 100 kW 4 x 35 kW 2 x 25 kW	Nil	To be replaced by 10 new 500 kW SW transmitters soon
11	Liberia Monrovia	6 x 250 kW 2 x 50 kW	Nil	
12	Philippines Tinang	12 x 250 kW 3 x 50 kW	Nil	
13	Poro	2 x 100 kW 4 x 50 kW	1 x 100 kW	
14	Thailand Bangkok	Nil	1 x 1000 kW	Shared with "Voice of Free Asia" radio.
15	Sri Lanka Colombo	3 x 35 kW	Nil	
16	Caribbean Area Antigua	Nil	1 x 50 kW	
17	Belize	Nil	1 x 50 kW	
18	Montserrat	Nil	1 x 100 kW	— Leased from R. Antilles.
19	Southern Africa Botswana	Nil	1 x 50 kW	

Table 2: A list of the VOA transmitters and their sites.



'Voice' magazine is sent out every other month on request to regular listeners.

Sundays) although reception is usually not too good in Britain except around dawn and dusk.

One of the most familiar voices on Voice of America belongs to Willis Conover, who has been presenting jazz programmes on VOA for very many years. He can be heard on *Music USA* at 2010-2055 GMT daily except Sunday. He can also sometimes be heard presenting features in what VOA calls "Special English". This is a simplified version of our language, which uses a vocabulary of only about 1500 words and is delivered at slow speed with particularly clear enunciation. It is intended for people whose mother tongue is not English and can be heard between 1830 and 1900 GMT. In October this



Map showing locations of VOA transmitting stations. Figures refer to Table 2.

1 February 1942	VOA starts broadcasts in Turkish
24 February 1942	The Voice of America's "official" birthday
26 February 1942	VOA broadcasts in English inaugurated (apart from Turkish, VOA had also been broadcasting in Arabic since 9 February and in Thai since 15 March 1942)
18 October 1959	Broadcasts in "Special English" started
20 July 1969	An estimated 800 million people around the world listen to VOA coverage of first manned moon landing
12 July 1976	The VOA Charter, signed by President Ford, becomes law
17 July 1983	VOA newsroom becomes fully automated
20 May 1985	An Act of Congress establishes "Radio Marti", the Cuban service of the Voice of America
15 October 1988	VOA-Europe inaugurated
September 1988	SIS, Satellite Interconnect System, set up as part of on-going VOA technical modernisation programme, in order to improve quality of broadcasts via relay stations
30 September 1988	VOA shortwave transmitters at Bethany, Ohio; Delano, California and Munich cease broadcasts of AFRTS, the American Forces Radio and TV Service

Table 3: Important events in the Voice of America's history.

year, the VOA will celebrate 30 years of broadcasting in Special English, which has proved very popular with listeners, especially those in the Third World. Programmes broadcast in Special English include *Space and Man*, *This is America* and *The Making of the Nation*.

Other popular Voice of America programmes include *Press Conference, USA*, *Concert Hall* (classical music), *Critic's Choice* (the arts), *American Viewpoints* (in which a magazine or newspaper article is debated) and *Communications World* (a telecoms magazine programme, the closest VOA has to a DX programme).

Special events also warrant special programmes, and recently VOA has carried live programmes from the Olympics in Seoul and the Winter Olympics in Calgary, as well as coverage of the US presidential elections. However, VOA claim their largest-ever audience was on the night of 20th July 1969, when some 800 million people around the world tuned in to listen to live coverage of the first manned moon landing. Generally, the average audience is around 130 million people.

The VOA has its own listener magazine, produced six times a year, and called *Voice*. Sample copies can be received from the VOA, Washington DC, 20547, USA. That is also the address to which to send reception reports, which are always welcomed by the VOA and which are confirmed upon request by QSL card. In the past, colourful commemorative QSLs have been issued to celebrate the USA Bicentennial and the VOA's own 30th anniversary.

In the past, several VOA language services have been jammed, but in December last year jamming suddenly ceased on all services, as did jamming of Radio Free Europe and Radio Liberty. Thus it is now possible to listen to VOA programmes with less interference than hitherto: Good listening.

AIR LETTERS

A reader who feels strongly about the advertising of 'air band' receivers has written to us and to a well known dealer on the subject

The Editor
Ham Radio
(Argus Specialist Publications Ltd)
1 Golden Square
London W1R 3AB

Dear Sir,

IF Bandwidths

The review by Chris Lorek (HRT January 1989) of the Sony ICF 2001 receiver was of particular interest to me as — in common with many other makes of "digital" receiver — I have found that it does not do the job expected of it for Airband VHF/AM reception.

The trouble seems to be that civil/military VHF (and UHF) ground stations transmit simultaneously from up to three sites on the same (nominal) frequency. However, for technical reasons which readers will understand, the frequencies are offset and thus "128.600" MHz comes from Ventnor (Isle of Wight) on 128.600, from Davidstowe Moor (Cornwall) on 128.075 and from Warlingham (Surrey) on 127.725. There are many other examples and in general only ground transmissions from airports (not area Air Traffic Control) are transmitted from the one point, and thus on the "000" frequency.

The international (ICAO) channel separation for civil/military VHF/AM is 25kHz and aircraft have no trouble receiving these offset transmissions in the UK, or in fact anywhere worldwide. However, I have found that the Sony ICF 2001 will not. I have also found the same problem with the Sony PRO 80 and AIR 7, the FRG 8800 VHF (either offset or "000" but not both), the AOR 2001, and others.

The usual (misleading) response from manufacturers is "you are out of range of the ground station". Buyers beware: If the ground stations you want and should be able to receive are offset many of these "Airband" receivers will not do the job.

Yours faithfully,
M. J. Taylor
New Maldon
Surrey

The Editor
Ham Radio Today
ASP Ltd.
1 Golden Square
London W1R 3AB

Dear Helen,

Mr. M. J. Taylor is saying that receivers such as the Sony ICF 2001 are not suitable for receiving VHF ground station transmissions when these transmissions are spaced in frequency, as is sometimes the case. However, Mr. Taylor has possibly reached an incorrect conclusion.

He quotes the frequency of 128.600 MHz from Ventnor, which is also transmitted on 128.075 from Davidstowe, and on 127.725 MHz from Warlingham. There seems to be something astray in the mathematics, because if Davidstowe and Warlingham were spaced 75 kHz away from the nominal 128.600, no receiver on earth would be able to resolve them — unless it had an IF bandwidth of more than 150kHz, which would be highly unlikely.

I can only assume, therefore, that Mr. Taylor is referring to the 7.5 kHz offset which is applied to some multi station ground to air transmissions, in which case Davidstowe would transmit on 128.6075, and Warlingham on 128.5925. In order to clear up the matter, I contacted the CAA, and they explained that their "Climax" system of frequency spaced transmissions is in use on some frequencies where it is necessary to provide wide area coverage on a single "nominal" frequency (such as 128.600).

There are two systems currently in use:

Where only two ground stations are required, the transmissions are spaced at ± 2.5 kHz from the "nominal", thus giving a 5 kHz spacing between them.

Where three ground stations are used, one station transmits exactly on the "nominal" frequency, with the other two transmitting + and - 7.5 kHz from the "nominal". This is the system to which Mr. Taylor refers, and he then goes on to say that some receivers commonly in use by airband enthusiasts are not suitable for receiving the frequency spaced ground stations.

Mr. Taylor quotes the following receivers in his letter: Sony ICF-2001D, Sony PRO-80, Sony AIR-7, FRG-8800, "and others" (unspecified). Apart from the AIR-7, all these receivers are intended for general listening on frequencies ranging from Long Wave to VHF FM broadcasts as well as the air band, and they are not intended to be dedicated air band receivers. In any receiver covering a variety of listening activities, some compromises have to be made, and one area of compromise has to be the IF bandwidth of the receiver. For broadcast AM stations on the short wave bands, a reasonable IF bandwidth would be 8 kHz; for listening to AM land mobile radio with its 12.5 kHz channel spacing and restricted audio bandwidth, a receiver bandwidth of 6 kHz would be better, and indeed a 6 or 8 kHz bandwidth would be perfectly in order for single channel air band listening. However, if the receiver has to accommodate signals

which may be to + or - 7.5 kHz off channel as in the case of the "Climax" system, the IF bandwidth would need to be more than 20 kHz if both sidebands of both offset channels were to be used.

So how do the aircraft receive these signals? First of all, the aircraft receivers use very good IF filtering with a pass band sufficiently wide to accommodate offsets, but with a filter characteristic having very steep sides, and a good stop band attenuation. (The CAA ask for adjacent channel rejection to receive both sidebands and the carrier, and good performance can be attained using the received carrier, on sideband at full amplitude, and the opposite sideband at reduced amplitude; as for example if one sideband were reduced in amplitude by being on the edge of a steep sided IF filter. This allows the receiver designer to specify an IF pass band width which is narrower than the theoretical pass band for offset systems, whilst at the same time ensuring good rejection of the adjacent channels spaced 25 kHz away. A frequently used bandwidth is 15 kHz.

So much for the technicalities; how do the receivers mentioned by Mr. Taylor perform in practice, and is there such a thing as the ideal receiver for the air band listening enthusiast? As the technical director of the biggest supplier of receivers to the hobby market in this country, I am in a unique position to be able to assess the abilities of a wide range of receivers. I should state from the outset that as a company, we have always recognised the specialist nature of airband listening, and have sought out suppliers who are willing and able to design and produce receivers to our specification.

The best examples of our approach are the receivers from Signal Communications, and the recently introduced WIN-108. These are all fitted with IF filters which are wide enough to accommodate the frequency spacings quoted by Mr. Taylor, and users of these receivers are probably wondering what all the fuss is about. It's a question of specialist receivers for the specialist market.

As far as the other receivers are concerned, I actually own a Sony ICF-2001D, and I was, therefore, able to check its performance at +/- 7.5 kHz spacing on the airband. Mr. Taylor is quite correct; the ICF-2001D suffers badly from distortion and poor sensitivity at these offsets but, of course, if Sony had chosen to fit a wider IF filter, the performance of the receiver on the short wave bands would have been badly compromised, and I think that Sony chose the right balance in their choice of filters. I cannot comment on the AIR-7 or the PRO-80, but I assume that Sony chose the same filters as those in the ICF-2001D.

The AR-2001 and its successor the AR-2002 are well known to me since we are the sole appointed distributor for the AOR company who manufacture them. Both these units are semi-professional wide range monitor receivers, and are designed to handle AM and FM transmissions over their entire tuning range. The quoted bandwidth in the AM mode is 10 kHz; in other words, a good compromise between all requirements, although not wide enough to handle the +/- 7.5 kHz offsets of the "Climax" system; BUT both these receivers can tune in 5 kHz increments, so all one has to do is go up or down one increment when one wishes to listen to an offset channel, and it can be received normally. After all, isn't it better to listen on frequency than listen off and increase the IF bandwidth? This does highlight one problem with the Sony receiver, in that the ICF-2001D tunes in 25 kHz steps on the air band, so you cannot "off-tune" it to receive the offset frequency.

On this point Mr. Taylor has a legitimate observation. As far as the FRG-8800 is concerned, in common with all HF receivers used with a VHF converter, it can be freely tuned across its entire range, so again the operator can tune exactly to the offset frequency and obtain good reception. The same observation applies to the Kenwood R-2000 and R-5000 receivers, both of which have VHF airband coverage available as an option. In all of these receivers you can get it "spot-on" with the tuning knob. That is why the tuning knob was provided.

So it's just a matter of applying common sense, and enjoying the hobby for what it is. As general common sense, however, the airband listening enthusiast should take what I have written as good advice, and buy a dedicated "designed for the job" airband receiver if top performance is demanded.

Your sincerely,
John Wilson
Technical Director
Lowe Electronics Ltd.
Matlock.

Editor's Note

Thanks to Mr. Taylor for raising his doubts and to Mr. Wilson for taking the time to research and produce a great deal of useful information about the airbands, as well as other trades who responded to Mr. Taylor's letter. We know that representatives of international companies, who are rarely specialists, are inclined to give blanket answers to tricky questions, and that advertising can lead prospective purchasers to expect something different from what they may get, even where there is no intention to mislead. Caveat emptor is a very old saying. But let us, as a general point, tread lightly before invoking officialdom to save us — there are enough regulations hedging the amateur bands around at the moment, and the constant threat or more and more intervention by "people" of one kind or another.

Amateur radio used to be about coping with radio, not just listening to it, and I'm old fashioned enough to think it still is. No review, article or advertisement can cover everyone's requirements, so take Lowe's advice and take time to find out about your chosen sector before investing large sums of money. It's part of the fun.

Incidentally, when Mr. Taylor spoke to me before writing, I deduced that he might at some time in his career have been an RAF man. If I am correct, I take the address "Sir" as a double honour, and gracefully accept the salute that goes with it!

Ed.



Nazgul to base
Nazgul to base

RADIO Tomorrow

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. If we get a yearly schedule, we will incorporate half-yearly slabs, to save space and admin and allow for alterations. 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.

Thanks to everyone who wished the staff of Ham Radio Today a happy new year, and the same from us to all of you. Good QSOs.

SCOTLAND

Aberdeen ARS. Contact: Don Tel. 04676 251.
Ayr ARG. Contact: GM3THI Tel. Ayr 42313.
Dunfermline RS. Contact: GM0DYD Tel. 0383 413440.
Galashiels DARS. Contact: GM3DAR Tel. 0896 56027.
Inverness ARC. Contact: Brian Tel. 0463 242463.
Lothian RS. Contact: P. J. Dick GM4DTH, 21 West Maitland St, Edinburgh EH12 5EA, Prestel mailbox (NOT phone) 314471210. Meetings: 2 and 4 Thursday 7.30pm at the Orwell Lodge Hotel, Polworth Terrace, Edinburgh. Mar 8 Junk sale; Mar 22 Outside broadcast live; Apr 12 Faultfinding including the Orwell DF Rx; Apr 26 Outside visit; May 10 Construction competition and DF tuneup; May 24 DF hunt; Jun 14 AGM; Jun 28 Barbecue.
Louth DARC. Contact: G1IZB Tel. 047286 595.
Waterside SWC. Contact: Bernie Lyford Tel. 0703 893937.
Westmorland ARS. Contact: G. Chapman Tel. 0539 28491.

NORTH EAST ENGLAND

Barnsley ARC. Contact: Ernie G4LUE, 8 Hild Av, Cudsworth.
Bourne DARS. Contact: Vince Cawthorn G4ODG. Tel. 0778 422795.
Denby Dale DARC. Contact: G3SDY Tel. 0484 602905.
Denby DARC. Contact: Kevin Jones G4FPY Tel. 0332 669157. Meetings: 119 Green Lane, Derby. 7.30pm. Most Wednesdays. Mar 1 Junk sale; Mar 8 TVI, its causes and cures by Fred Ward G2CVV; Mar 15 to be announced; March 22 AGM.
Doncaster ARC. Contact: K. McMahon Tel. Doncaster 852938.
Droitwich DARC. Contact: G4HFP Tel. 0299 33818.
Glossop DARG. Contact: G4GNQ QTHR.
Gt. Lumley ARS. Contact: G4MSF Tel. 091 4693955.
Halifax DARS. Contact: D. Moss Tel. 0422 202306.
Hornsea RC. Contact: Richard Tel. 0401 62498. Meetings: The Mill, Atwick Rd, Hornsea. 8pm. Mar 8 Committee Meeting; Mar 15 Omega entertains by G4YTV; Mar 22 Computer operating systems by Simon SWL; Apr 5 Audio Visual by G4YTV; Apr 12 Addu Attoll by Harry SWL.
Hoyland ARC. Contact: M. Wardle, 11 Sokwell Ave, Barnsley.
Keighly ARS. Contact: K. A. Conlon G1IGH. Tel. Bradford 496222. Meetings: Wednesdays, 8pm, The Clubroom, rear of Victoria Hall, Keighly, Yorkshire. Mar 7 Clandestine radio talk by G3LEQ; Mar 21 Night on the air with GOKRS; Mar 28 Visit to SMC Leeds; Apr 11 Bradford Club join us for a chat; Apr 25 Junk sale; May 2 Night on the air with GOKRS; May 9 Natter night; May 16 Annual foxhunt; May 30 Programmable devices by G3YEE; Jun 27 Wildlife on the Falklands, slides by G0FRQ.
Leeds DARS. Contact: G1EBS Tel. 0274 665355.
Lincoln SWC. Contact: Pam G4STO Tel. 0427 788356.
Loughborough ARC. Contact: Philip Tel. 0509 412043.
Macclesfield DRS. Contact: G1NUS Tel. 0625 24534.
Maltby ARS. Contact: K. Johnson Tel. Rotherham 814135.
Manfield ARS. Contact: J. M. Coates G4GYU Tel. 0623 27257. Meetings: Most Fridays. Mar 24 Foxhunt; Apr 14 Guest speaker; Apr 28 Inter-club quiz; May 12 AGM.
Mexborough ARS. Contact: D. Thomas Tel. Doncaster 859654.

Morecambe Bay ARS. Contact: G4ZJL Tel. 0524 52042.
Pontefract DARS. Contact: Colin Mills G0AAO Tel. 0977 43101. 9th Annual Component Fair at the Carlton Community Centre, Carelton, Pontefract. Sunday 12 March 11am to 4.30pm. Free admission, bring and by, QRP and bookstalls.
Rotherham ARC. Contact: F. Moody Tel. Rotherham 552925.
Scarborough ARS G4BP. Contact: I. G. Hunter G4UQP, rally secretary Tel. 0723 376847. Scarborough ARS Rally 1989, 30 July at the Spa, Scarborough, on the south shore seafront. Open 11am. Talk-in on S22. Trädestands, bring and buy, refreshments and bar. Near the town entertainments.
Sheffield ARC. Contact: Alan Pemberton. Tel. Sheffield 670866.
Sheffield Packet Group. Contact: P. Green, 8 Yews Close, Worrall.
South Tyneside ARS. Contact: G4XWR Tel. S. Shields 543955.
Stockton DARS. Contact: John Walker Tel. 0642 582578.
Tyneside ARS. Contact: G. Lindsay G4KOT, 12 Augusta Court, Harrian Park, Wallsend, Tyne & Wear NE28 9QZ. Mar 4 Blue Star Radio Rally at High Gosforth Park (Newcastle Racecourse). All the usual attractions. Contact: Terry G6VEG Tel. 091 264 8196.000.
Wakefield: North Wakefield RC. Contact: J. M. Hotchin, White Horse Inn, Fall Lane, East Ardsley, Wakefield.
Wigston ARC. Contact: G6HAJ Tel. Leicester 403105.
Workshop ARS. Contact: John Huggins G0DZX Tel. 0909 565856. Meetings: The Clubhouse, West St, Workshop.

NORTH WEST ENGLAND

Aire Valley RS. Contact: G6NPT Tel. 0532 44597.
Chester DRS. Contact: Dave Tel. 0244 336639.
Derwentside ARC. Contact: G1AAJ Tel. 0207 520477.
E. Lancs ARC. Contact: Stuart Tel. 0227 68913.
Fylde ARS. Contact: Frank G4CSA Tel. St. Annes 720867. Meetings: South Shore Lawn Tennis Club, Midgeland Road, Blackpool. 2 and 4 Thursdays. NB new venue. Mar 9 Printed circuits from DIY to mass production by Steve Williamson G3WGU; Mar 23 Informal meeting; Apr 13 RSGB regional officer visits; Apr 27 Informal; May 11 Equipment sale; May 25 Informal and preparation for field day.
Isle of Man ARS. Contact: J. Wrigley Tel. 0624 834257.
Manchester: S. Manchester RC. Contact: Dave Holland Tel. 061 973 1837.
North Staffs ARS. Contact: G6MLI Tel. 0782 332657.
Oswestry DARC. Contact: Brian Tel. 0691 831023.
Preston ARS. Contact: George Tel. 0772 718175.
South Cheshire ARC. Contact: Chris Tel. 07816 73185.
South Lakeland ARS. Contact: G4VKE Tel. 0229 65359.
St. Helens DARC. Contact: A. Riley Tel. 051 430 9227.
Stockport RS. Contact: John Verity G4ECI Tel. 061 439 3831. Meetings: Dialstone Community Centre, Lisburne lane off Dialstone Lane, Offerton, Stockport. 8pm. 2 and 4 Wednesdays.
Todmorden DARS. Contact: G1GZB Tel. 070681 7572.
Warrington ARC. Contact: Paul G0CBN Tel. 0925 814005.
Wirral ARS. Contact: A. Seed G3LCI Tel. 051 644 6094.

WALES

Abergavenny and NH ARC. Contact: GW4XQH Tel. 0873 4655.
Aberporth ARC. Contact: GWODPR Tel. 023987 274.
Bridgend DARC. Contact: D. E. George GW10UP Tel. 0656 723508.
Conwy Valley ARS. Contact: R A Hinton Tel. 01 301 1864.
Delyn RC. Contact: Stephen Studdart GW7 AAV Tel. 0244 819618.
Meetings: Daniel Owen Centre, Mold, Clwyd. Every other Tuesday. Mar 14 AGM Mar 28 RSGB film or video.
Fishguard DARS. Contact: Bernard Tel. 0348 872671.
Newport ARS. Contact: GW6ZUQ Tel. 02912 6867.
North Wales: Dragon Amateur Radio Club/Clwb Radio Amatur Y DDraig GW455A. Contact: Tony Rees Tel. 0248 600963.
Meetings: At the Four Crosses, Pentraeth Rd., Menai Bridge. 7.30pm. 1 and 3 Mondays. Mar 20 Fifty years of amateur radio by Ron Horrocks GW2FLP; Apr 3 I wonder what he has in store for us this time by Steve Price GW4BWE; May 1 Bank Holiday informal get together; May 15 Demonstration on metostat by Peter Higgs GW4IGF "Let us find out what the summer weather will be." Jun 5 Aerials for DX by Bert Hewit GW3YNNM; Jun 19 Security in the home and shack by John Parry GW3VVC.
Rhyl DARC. Contact: GW1PLI Tel. 097 888 621.

THE MIDLANDS

Atherstone ARC. Contact: Roy Tel. 0203 393518
Birmingham: Midland ARS. Contact: Paul O'Connor G1ZCY Tel. 021 443 5157. Meetings: Thursdays 7.30 at Unit 16, 60 Regent Place, Jewellery Quarter, Birmingham. Mar 14 BBC computer club; Mar 27 BBC computer club; Mar 28 Raynet; Apr 11 BBC computer club; Apr 24 BBC computer club; Apr 25 Raynet; **Drayton Mobile Rally at Drayton Manor Park and Zoo, 14 May 10am.** Parking, talk-in. Disabled parking not open till 11am. May 23 Raynet; May 29 BBC computer club. **19 Nov Mars Mini Rally at Stockland Green, Birmingham. Details to come.** Morse tuition 7pm Mar 8, 15, 22, 29; Apr 5, 12, 19, 26; May 3, 10, 17, 24, 31.
Coventry ARS. Contact: Johnathan Ward G4HHT Tel. 0203 610408.
Meetings: Baden Powell House, 121 St. Nicholas St., Radford, Coventry. 8pm. Fridays. Mar 17 Night on the air and morse tuition; Mar 24 talk from the British Amateur Television Club (provis); Mar 31 Night on the air, and morse tuition.
Droitwich DARC. Contact: G4HFP Tel. 0299 33818.
Dudley ARC. Contact: J. Barry Clarke G4XMT Tel. 09073 5720. Mar 13 HF wire antennas by Dave Reynolds, Allied Centre, Dudley.
Kidderminster DARS. Contact: Tony Tel. 0562 751584.
Midland ARS. Contact: G8BHE Tel. 021 422 9787.
Mid Warwickshire ARS. Contact: G4TIL Tel. Southam 4765.
Stourbridge, West Midlands DY9 0YH.
Stratford on Avon DRC. Contact: David GOHWZ. Tel. 0789 750584.
Meetings: 2 and 4 Mondays, 7.30pm, The Baptist Church, Payton St., Stratford on Avon. Mar 13 Visit by Howes Communications; Mar 27 AGM and junk sale; Apr 10 Visit RAF Broughton; Apr 17 80m QRP club project by Mike G3OOQ; May 8 The heyday of Wireless; May 22 Technical topics; Jun 12 Foxhunt on 2m; Jun 26 Worked all Britain by Dr. Robert Nash G4NEE; Jul 10 Amateur satellites; Jul 24 Constructors competition.
Stourbridge DARS. Contact: C. Brunn G1WAI 61 Gauden Rd., Pedmore, Stourbridge, Worc. 1 and 3 Mondays. Mar 20 AGM.
Telford DARS. Contact: Tom Crosbie Tel. 0952 597506.
Welland Valley ARS. Contact: J. Day Tel. 0858 32109.
West Bromwich Central RC. Contact: Bill Oakes G1YQY Tel. 021 556 3183.
Willenhall ARS. Contact: G4LWI Tel. 0902 782036.
Wolverhampton ARS. Contact: Keith Tel. 0902 24870.
Worcester DARC. Contact: D. Batchelor Tel. 0905 64173.
Wythall RC G4WAC, G1WAC. Contact: Chris Pettitt GOEYD. Tel. 021 430 7267. **Wythall Radio Club 4th Annual Rally at Wythall Park, Silver St., Wythall, Worcs on A435 south of Birmingham on Sunday Mar 19 at 11.30am.** Three large halls, trade stands, flea market, bring and buy, RSGB morse tests (subject to confirmation), plenty of junk, bar and snacks, talk in on S22, free parking "and more of it this time". 50p.

SOUTH WEST ENGLAND

Bath DARC. Contact: G4UMN Tel. Frome 63939.
Bristol ARC. Contact: G4YOC Tel. Britton 4116.
Bristol (Shirehampton) ARC. Contact: Ron Ford Tel. 0272 77504.
Bristol: North Bristol ARC. Contact: Alan Booth Tel. 0272 690404.
Bristol: South Bristol ARC. Contact: Len Baker G4RZY Tel. 0272 834282. Meetings: Whitchurch Folk House, East Bundry Rd.,

Whitchurch, Bristol BS14 OLN. Most Wednesdays. Mar 8 HF activity evening; Mar 15 Bring and buy/junk sale; Mar 22 Easter activity evening; Mar 29 Hand-held rig meeting; Apr 5 Lecture; Apr 12 Activity evening; Apr 19 Practice morse tests under exam conditions; Apr 26 Activity evening.

Cornwall: N. Cornwall RS. Contact: J. West Tel. 0288 4916.
Evesham: Vale of Evesham DARS. Contact: Mike G4UXC Tel. Evesham 831508. Meetings: 1 Thursdays at 7.30pm at the MEB Club, Worcester Road, Evesham. (B4084 on left entering town). Mar 2 Something in the sky by Ken G4NIJ, May 2 Visit by Howes Communications.
Exeter ARS. Contact: Roger Tipper Tel. 0392 68065.
Salop ARS. Contact: Simon Price. Tel. 0743 67799.
Plymouth ARC. Contact: G4SCA Tel. 0752 337980.
Plymouth RC Mobile Rally, Plymstock School, Church Road, Plymstock, Plymouth. May 28 from 10am. Large free car park, refreshment, raffles, usual trade stands, demonstrations and talk-in on S22. Full details from Joe G1RXR Tel. 0752 509855.
Poole ARS. Contact: GOEQV Tel. 0202 674802.
Salisbury. Contact: Neil Tel. 0980 22809.
Salop ARS. Contact: Simon Tel. 0743 67799.
Taunton DARS. Contact: Peter GOEYR Tel. 0823 275973.
Thornbury DARC. Contact: Tom Cromack G0FGI, Rose Cottage, The Naite, Oldbury on Severn, Bristol. 1 and 3 Wednesdays, 7.30 United Reform Church, Chapel St., Thornbury. Mar 15 HF activity; Apr 5 AGM; Apr 19 Project evening; May 3 Raynet; May 17 HF activity.
Tiverton SWRC. Contact: Alan Tel. 0392 881569.
Torbay ARS G3NJA, G8NJA. Contact: Bob McCreddie G0FGX Tel. 03646 233. Meetings: ECC Club, Ringslade Rd., Nr. Highweek. Natter nights most Fridays. 7.30pm. Apr 29 AGM.
Trowbridge DARC. Contact: Ian Carter G0GRA. Tel. 0380 830383. Meetings: Usually 4 Wednesdays, 8pm, TA HQ, Bythesea Road, Trowbridge. Mar 29 Sale of surplus equipment; Apr 26 Residual current devices by G0HFX; Jun 21 6.30am 2 metre fox hunt; Jul 19 6.30am Picnic.
Winchester ARC. Contact: Gordon Tel. 0703 772191.
Yeovil ARC. Contact: David Bailey G1MNM, QTHR. Meetings: The Recreation Centre, Chilton Grove, Yeovil. 7.30pm, every Thursday. Mar 9 Homebrew tobacco tin transceiver by G3PCJ. Entries is the constructors' contest; Mar 16 The effect of sunspot maximum by G3MYM; Mar 23 Constructors contest; Mar 30 Natter night; Apr 6 Geyline propagation G3MYM. **QRP Convention on Sunday May 7 at the Preston Centre, Monks Dale, Yeovil at 9am.** Two lectures, plenty of traders and refreshments. Contact: J W Howard G1MNM, 7 Thatcham Close, Yeovil, Somerset.

SOUTH EAST ENGLAND

Barking RES. Contact: R. Woodberry Tel. 01 594 4009.
Basingstoke ARC. Contact: D. Deane G3ZOI Tel. 0734 332777 (hm) 0734 787930 (wk). Meetings: The Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke, Hants. 7.30pm. 1 Mondays. Club net Sunday evenings on 144MHz.
Biggin Hill ARC. Contact: Geoff Milne G3UMI, 142 Hayes Lane, Hayes Lane, Hayes.
Binstead ARS. Contact: Douglas Tel. Ryde 67665.
Borehamwood Elstree ARS. Contact: Tony Tel. 01 207 3809.
Braintree DARS. Contact: N. Willicombe Tel. 0376 45058. Meetings: Braintree Community Association Centre, Victoria St. 7.30pm. 1 and 3 Mondays. Club net C6BRH or G4JXG, 2m 2 and 4 Mondays, 8pm.
Bredhurst RTS GOBRC, G7BRC. Contact: Kevin Fay Tel. 0634 376991.
Brighton DARS. Contact: Peter Tel. 0273 607737.
Bromley Kent. Tel. 01 462 2689. Meetings: The Victory Social Club, Kechill Gardens, Hayes, Kent. 7.30pm. 3rd Tuesdays. Club net 145.350MHz FM 11am Sundays.
Burnham Beeches RC. Contact: G6EIL Tel. 0628 25720.
Bury RS. Contact: Allan Tel. 0204 706191.
Cambridge DARC. Contact: D. Wilcox Tel. 0954 50597.
Cambridgeshire Repeater Group. Contact: Brian GODAH Tel. 09547 405.
Chesham DARS. Contact: L. Cabban Tel. 09278 3911. Meetings: The Stable Loft, Bury Farm, Pednor Rd., Chesham. 8pm. Wednesdays.
Cheshunt DARC. Contact: Roger Frisby G4OAA Tel. 0992 464795. Meetings: Thursdays 8pm Church Room, Church Lane, Wormley, Herts. Mar 8 History of communications part 3 by Derek GOBTX.

Chichester DARC. Contact: C. Bryan G4ZTD, Tel. Chichester 789587. Meetings: St. Pancras Hall, St. Pancras, Chichester. 7.30. Club net GBWSX on S11 Mondays 7.15pm. 1st and 3rd Tuesdays.

Clacton ARS. Contact: Reg Tel. 0255 430466.

Chiltern ARC. Contact: Ron G3NCL Tel. 0494 712020.

Clifton ARS. Contact: Martin Brown G0DCG Tel. 01 691 2341 (hm), 01 691 6111 (wk).

Coulsdon ATS. Contact: Alan Tel. 01 684 0610.

Crawley ARC. Contact: Jack Tel. 0294 28612.

Darenth Valley RC. Contact: the Sec Tel. 0322 63368.

Dartford Heath DFC. Contact: Pete Tel. 0322 844467.

Dorking DRS. Contact: John Tel. 0306 77236.

Dover: South East Kent YMCA ARC. Contact: Des Edwards Tel 0304 203073. Meetings: Dover YMCA, Godwynehurst, Leyburne Rd., Dover, Kent CT16 1SN. Wednesdays. Mar 16 Natter night, committee meeting, morse tests; Mar 23 Construction contest; Apr 12 AGM; Jun 24-25 Waldershare Vintage Weekend special event station GB2 WYV; Jul 19 Morse tests; Nov 15 Morse tests.

Dunstable Downs RC. Contact: Tony Kelsey-Stead Tel. 0582 508259. Meetings: Room 3, Chews House, 77 High St. South, Dunstable, Beds. Fridays. Mar 10 Battery chargers by Frank DeSouza; Mar 13 GB2WGG at Watford Girls Grammar School; Apr 1 Bowling at Stevenage; Apr 29 Wolfsburg Amateurs vist; May 1 DF/Treasure hunt; May 6.7 Germans leave; Jun 18 DF/Treasure hunt; Aug 20 DF/Treasure hunt. **Sep 10 6th National Amateur Radio Car Boot Sale at The Shuttleworth Collection, Old Warden Aerodrome, Nr. Biggleswade, Beds. 10am. Fly in is available — permission from Northhill 288.**

Eastbourne EARC. Contact: G1BRC Tel. 0323 29913.

East Kent ARS. Contact: Stuart Tel. 0227 68913.

Edgeware DRS. Contact: Ian Cope G4IUZ, Tel. Hatfield 65707. Meetings: Watling Community Centre, 145 Orange Hill Rd., Burnt Oak, Edgeware. 2 and 4 Thursdays.

Felixstowe DARS. Contact: G4YQC Tel. 0473 642595.

Grafton RS. Contact: Rod Harrigan G0JUZ Tel. 01 368 8154. Meetings: Holy Trinity Church Hall, Stapleton Hall Rd., London N4. 2 and 4 Fridays.

Great Peterborough ARC. Contact: Stan Tel. 0733 69822.

Harpندن ARC. Contact: G1BJC Tel. 05927 2455.

Harrow RS. Contact: Tony Tel. 01 861 0419.

Hastings ERC. Contact: Dave Shirley Tel. 0424 420608.

Haverhill DARS. Contact: Rob Proctor Tel. 0787 281359.

Havering DARC. Contact: G0BOI Tel. 04024 41532.

Hillingdon ARC. Contact: Howard G6SII Tel. 01 561 2917.

Horsham ARC. Contact: P. Godbold Tel. Steyning 814516. Meetings: Guide Hall, Denne Rd., Horsham, Sussex. 8pm. First Thursdays. Apr 6 Cellular telephone systems by John Pitty G4PEO.

Itchen Valley RC. Contact: G1IPQ Tel. Southampton 736784.

Kingston DARS. Contact: G30DH Tel. Epsom 26005.

Leighton Linlade RC. Contact: Pete Brazier Tel. 052523 270.

Loughton DARS. Contact: J D Ray G8DZH Tel. 01 508 3434 (ev); 015083434 Micronet 800 mailbox, TeleGold 74:MIK1824; packet G8DZH at GB7ESX. Meetings: Loughton Hall, Rectory Lane, Room 20, 7.45pm. Fridays. Mar 10 G3OPA Top band DF set construction judging night by Essex RSGB RLO Ted Whitworth G4TUO; Mar 24 No meeting; Apr 7 AGM and presentation of shield for best DF set. April 21 RSGB film night; May 5 Radio navigation by Tony Mathew; May 19 Planning night for Aylmers Farm; May 26-28 Aylmers Farm weekend GB2LRS; June 2 Birth of the multi-band receiver by Jack Atkinson G3OPA.

Maidenhead DARC. Contact: John Tel. 0628 28463.

Maidstone YMCA ARS. Contact: G0BUW Tel. 0622 30544.

Medway ARTS. Contact: Tony Tel. 0634 578647.

Mid Sussex ARS. Contact: G0GMC Tel. 07918 2937.

Milton Keynes DARS. Contact: Mike GOERE Tel. 0234 750629.

Newbury DARS. Contact: G3VOW Tel. 0635 43048.

Norfolk ARC. Contact: Craig Joly G0BGD 0303 485784 QTHR. Meetings: The Norfolk Dumpling, the Livestock Market, H all Road, Harford, Norwich. 19.30. Mar 8 Surplus equipment auction. Bring and buy from 7pm; Mar 15 computer aided printed circuits by Paul Sergeant G4ONF; Mar 29 Informal and committee meeting; Apr 5 AGM; Apr 12 Sporadic E, some new results by Jim Bacon G3YLA; Apr 26 Home construction contest.

Reading DARC. Contact: M G Anthony G4THN, 9 Paice Green, Wokingham. Berks RG11 1YN.

Peterborough RES. Contact: Peter G4PNW QTHR.

Reading DARC. Contact: Steve G4YFB Tel. Reading 867820.

St. Albans: Verulam ARC. Contact: Hilary G4JKS. Tel. St. Albans

59318. Meetings: RAF Association HQ, New Kent Rd., off Marlborough Rd., St. Albans. 7.30pm. Every other Tuesday. Mar 14 Activity evening; Mar 28 Annual G3PAO Memorial Lecture.

Sevenoaks DARS. Contact: Barry Leggett Tel. 0732 741222 ext. 245 office hours. Meetings: Emergency Control Centre, Sevenoaks District Council Offices, Sevenoaks, Kent. 8pm 3rd Mondays.

Shefford DARS. Contact Tim Stellar G6RCT Tel. 0707 372211. Meetings: Church Hall, Amphill Rd., Shefford, Beds. 8pm.

Southend DRS. Contact: S. Blinkhorn G1XGP, 102 Lord Roberts Ave., Leigh-on-Sea, Essex SS9 1NE. **May 7 Southend DARS rally and boot sale, Roachway Youth Centre, Roachway, Rochford, Essex. 10am. Contact: Ted G4TUO Tel. 0702 202129.**

Southgate ARC. Contact: Brian Shelton Tel. 01 360 2453. Meetings: Holy Trinity Church Hall, Winchmore Hill, London N21. 7.45pm. 2nd and 4th Thursdays.

South Kent (YMCA) ARC. Contact: Des Edwards Tel. 0304 203073. Meetings: Dover YMCA, Godwynehurst, Leyburne Rd., Dover. Tuesdays. Mar 8 Ten minute talks; Mar 16 Natter night, committee meeting, morse tests; Mar 23 Construction contest; Apr 12 AGM; June 24-25 Waldershare Vintage Weekend special event station GB2WVW; Jul 19 morse tests; Nov 15 Morse tests.

Stevenage DARS. Contact: G6EDA Tel. 0438 724991.

Stowmarket DARS. Contact: M. Goodrum Tel. 0449 676288.

Surbiton: 308 ARC. Contact: Bob Tel. 01 391 0788.

Surrey RCC. Contact: John Tel. 01 657 0454.

Vale of White Horse ARS. Contact: Ian White Tel. Abingdon 31559.

Welwyn Hatfield ARC. Contact: Kevin G4WLG Tel. 0707 335162.

West Kent ARS. Contact: B. Guinnessy Tel. 0892 32877.

West Sussex ARS. Contact: M. Mundy, 142 Junction Road, Burgess Hill.

Wimbledon DARS. Contact: Nick Lawlor G6AJY Tel. 01 330 2703. Meetings: St. Andrews Church Hall, Herbert Rd., Wimbledon, London SW19. 7.30pm.

IRELAND

Armagh and Dungannon DARC. Contact: J. Murphy Tel. 0861 522153.

Donegal ARC. Contact: EI3BOB Tel. 074 57155.

Mid Ulster ARC. Contact: Sam Tel. 07622 22855.

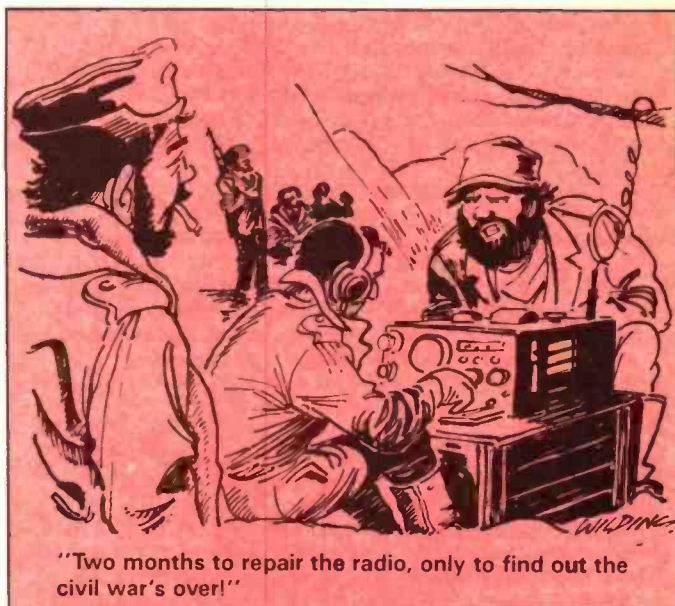
NATIONAL AND INTERNATIONAL

AMRAC. Contact: Phil G6DLJ Tel. 0703 847754.

British Amateur Radio Teledata Group. Contact: Pat Beedie GW6MOJ Tel. 0558 822286. No regular meetings as such, but GB2ATG amateur radio news service transmits on 1 and 3 Sundays, on 3.590MHz, 14.090MHz and 144.600MHz. Operated by volunteers, GB2ATG welcomes amateur radio news for possible transmission, especially concerning radio data activity (RTTY, Amtor, packet, fax, etc.).

International Short Wave League. Contact: Y. Blain, 167 Wombridge Road, Trench, Salford, Shropshire TF2 6QA. Journal: Monitor.

UK FM Group, Northern. Contact: L. Loughton, Claiement, Main St., East Ardsley.



"Two months to repair the radio, only to find out the civil war's over!"

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FOR SALE

YAESU 480R multimode 2 mtr expanded to cover 143.800 to 148.500; Daiwa 520N SWR/ power meter, Dacker wave-meter, £320 ono. Wanted, Icom R7000 scanner. Sony Air7 or 2001D ARE, micro reader, Datong 270 or 370 active aerial, accessories for NRD 515 receiver, old Radcoms, ref books, etc. — 0283 68439.

YAESU FT23R with FNB-10, FNA-10, NC-28C power packs/ charger and CSC-23 and FLC23, leather case, £180; Icom HS-10 headset/mic and HS-10SB PTT, box to match £25. — Tel. 01-749 3156.

RADIO Receivers for sale, AN-APR-4Y, brand new, in sealed box; AR-88, HRO, Hammerlund, News-Clarke, Collins, 1kHz-12GHz; Tektronix oscilloscope £45; spares available; Solartron digital voltmeter £25; signal generator, magnetic tape, 2,400ft, £5. — S.A.E. 247 Sandy Lane, Hindley, Wigan. Tel. 55948.

EXCHANGE: Tandy 200 portable computer with disk drive, leads, software, includes W/P, spreadsheet and comms internal modem (ideal for TNC), value £1160. Swap for Yaesu FT 290 and scanner or W.H.Y. — For details give Steve a call on Orpington 57433, Ansafone.

FOR SALE: Soney ICF 7600DS receiver, as new, boxed, £100. — Telephone Pickering (0751) 74266, after 6pm.

FOR SALE: MM 2001 RTTY converter plus 9" b/w monitor Hi-res, £120; plus Amstrad 464 plus printer, lots of software plus books, mags, £190 ono or Exchange all for a Kan TNC unit. — Ring Howard 01-363 3093, after 7pm.

FOR SALE: FDK 750E 2 mtr multimode rig, recently serviced by Waters & Stanton. — Phone 0343-820955.

SUPER STAR 2000, suitable for conversion 5 bands, 40 channels CW, LSB, USB, AM, FM, KC shift good cond, coverage 26.065 28.305. £150. — Contact Brian 0229 25836, Barrow-in-Furness, Cumbria.

EXCHANGE: Praktica MTL5B camera 35mm, 50mm, 135mm lenses, flash, holdall, excellent condition; want scanner, hand held preferred or 2mtr handie. — Dave "G1CCL", 192 Ambleside Road, Ridge Estate, Lancaster LA1 3ND.

EXCHANGE: Commodore 64 computer 1541 5.25" disc drive, MPS801 dot matrix printer PSU printer paper, some software, all manuals, GWO; for FRG7700 or similar quality general coverage digital

manual £100; Shure base microphone £20; Heathkit valve voltmeter £10, including manual; 20m dipole of delight £10; LCL, CB with Spectrum conversion £30. — Tel. Dick, 0303 76171.

SWAP Commodore 1541 disk drive, hardly used, for IC2E or similar 2m handheld. — Phone 0506 412374, evenings. GM7CPF.

YAESU FRG7700, vgc, matching ATU, £200; Cap.Co magnetic loop antenna, vgc, £50. — Tel. 0206 867489.

Totsuko, 1 watt and 10 watts, home or portable, offers. — Tel. 021 373 5591.

16 CHANNEL direct entry programmable Realistic scanner, Price £100. — Tel. 654 4897.

EXCHANGE a "Marco" 747, 120 channel all mode transceiver in good working order (ideal for 10 metre conversion) for short wave receiver with digital display, in good working order (cash adjustment if necessary). — Contact Tom, PO Box 4, Montrose, Angus.

FOR SALE: Kenwood R820 HF communications receiver, 160-10m amateur bands, plus 49, 31, 25, 16 metre broadcast bands, very good condition, £400. Tel. 021-427 2283.

HEATHKIT HW100 HF transceiver with PSU speaker, buyer collects or pays carriage extra, £150. — Tel. G3YTF, 0268 733914.

YAESU FT480R 2m mobile multimode used base, only £300; Yaesu mic YM48 £15; Datong PC1, HF receiving adaptor, boxed, £65; Drae 2m wavemeter £10, MMC 144/28 converter £8; 2m/70cm Yagi £12. Buyer collect or pay postage. — Siva G4IQD. Tel. 01-423 3884.

YAESU FRG7700 £230; AOR2001 scanner £300; both in excellent condition. — Ring Boston 65855, after 6pm.

FT 726R 2m 70cms Sattelite HF modules £850; Kom R20 comms rcvr with FM £500 or Swap both for FT767GX with 2m and 6m R7000 scanner, extras, £680. — Mike G1XGM, 0302 875330; 21 Marton Road, Toll Bar, Bentley, Doncaster, South Yorkshire.

1988 INTERNATIONAL and USA Call Books, £12.50 each plus postage or both £25 postage paid; high quality dual Straight and lmbic key £25 plus postage. — Tel. 0252 548561, QTHR G3IZJ.

UNIDEN Bearcat 175XL, absolutely mint condition, unused, only 3 months old! £140 ovno; or will Swap for 934MHz rig in similar condition please; prefer Delta-1, preferably with Colinear, but anything considered; also wanted,



Rx; also Ocean Star Marine transceiver, c/w, mike, works well, offers. — Trev 0792 43427.

TV CAMERA lenses, Canon V5x20 20-100mm 1:2.5 £15; second make unknown 15-150mm 1:2.5 £20; new for BBC computer prism modem 2000 £10; Commodore 64/128 multimodem cartridge plug-in switch-on £40 (cost £120). — Tel. Philip (01) 845 4008.

TRANSVERTER 70cms 28MHz ID with attenuator and

WRASSE SCI SSTV Fax receive and transmit, all in one unit, £800; Telereader CD670 LCD display, decodes RTTY, TOR, FEC, CW, original manuals and packing, £170. — Phone Medway (0634) 828952.

ICOM 71E HF receiver, FM board and crystal filter fitted by Icom, £650; Icom 7000 plus Icom Discone antenna, £800; both above receivers boxed, as new. — Phone Medway (0634) 828952.

STS TRIPPLE 4 and 2M SSB by

a "call book". — Contact me on 0443-411954 or 8 Caiaoh Terrace, Trelewis, Mid Glamorgan, S. Wales.

COLOUR Genie EG3003 computer as new, books, tapes, RTTY/CW split screen type ahead with LED tuning indicator, £60; Ferguson tape recorder, new, £20. Buyer collects. — Ipswich 0473 49139. G3ZLN. Health reason for sale.

FT101Z CW filter, fan, £400; FRG-7 £100; FL2100Z linear £400; Fortop ATV Tx £135; Microwaves modules ATV convertor £25; 2m convertor £15; RTTY convertor £100; Tono 100w 2m linear £50; LCL 29MHz FM rig £30. — G3UNT, 0622 55297.

ICOM 1200E 23cms FM mobile/base, as new, perfect, £445; Kenwood HC-10 digital world clock £50; Trio SW200 A PWR/SWR meter, plus B (70cms) head unit £95; back numbers HRT, Amateur Radio. — Phone Paul G4XHF, (0293) 515201, QTHR.

FOR SALE: Power pack, 240v-13.6 5-7 watt, £17; Power meter and matcher model 178, £17, Nato 2000 for conversion to 10 metres, £130 ovno; Beta Sanyo Video can tune in to sperodic E stations, £75. — Phone 0283 221870.

SCANNER Realistic portable PRO-32A 200 channel memory, boxed, manual, nicads, charger, covers police, aircraft, 2mtrs, 70cms etc, £130. Tel. 061 226 3639, Arif G1YMY. VHF 68-88MHz, 108-136MHz, 138-174MHz; UHF 380-512MHz.

TS930S AUTO ATU, Nar CW filters, SP930 £1175; FT726R 2m, 7cm and 6m plus satellite module and FW filter £900; TS430S Nar CW and FM board £750. All ono and incl orig bozes. — G4BWP QTHR, 0638 751830.

P6 FOR SALE: Apricot F1 computer 256K MSDOS with lots of software, wordstar, FW basic, Tu-bu Puscul DB2 etc, would be great for packet RTTY etc, £260 or PX for good Rx etc. — Phone 0993 811747, and ask for Phill.

COMPONENTS clearout: Giant parcels 10lbs weight of all sorts of new/used components, £5 plus £3 postage; loads of useful stuff; you will be delighted. Send cheque/PO. Wanted: valves, any types,

preferably new. — Mr. Bailey, 40 Seymour Close, Birmingham B29 7JD.

EXCHANGE Canon AE1 prog camera 50mm x 1.8 lens, 70-210mm lens, 28-80mm lens, dedicated flash, Cokin filters, all in aluminium case, mint condition, valued over £550, for Yaesu FRG96000 scanner or R2000HF. — Tel, after 4.30pm, 0283 218120.

FOR SALE: Plessey radio model PR1553 Rx digital read out, all band coverage, USB, LSB, BC band 0-30MHz, in very good condition; an outstanding Rx for the SW4, £400; will exchange for Eddystone around that price or W.H.Y.. — Ring: Rogers, Tadley 07356-2476 (Hants).

FOR SALE:Eddystone 940 Rx, ideal for "short wave" mag series of up-dating this model; also have for sale Plessey 1553 Rx digital read out in excellent condition, 0-30MHz, covers all BC, SSB bands. — Rogers, 07256 2476, Hants.

SONY ICF 7600DS synthesized HF receiver, memories, scanning, AM/SSB/ CW plus 76-108MHz FM; case, manuals, earpiece, antenna; will exchange for Trio/Kenwood R600 receiver in G.W.O. or sell for £120. Pref swap. — Phone Roberts (0745) 38197, eves/weekends. Stop Press! or Century 27D, G.W.O.

H.R.O.: H.R.O. wanted, also manual PSU spares, valves, etc; also good condition B40. Will collect. — Steve, I.O.M. (0983) 740 854, anytime.

YAESU FT-757GX all mode HF transceiver £600; CDE AR-40 rotator £30; 50MHz HB9CV kit £10; and AEA MD-64 micropatch RTTY, CW, ASCII, Transmit/receive cartridge for Commodore 64, £90. Reason for sale upgrading equipment. — Phone 0698 286078, after 6pm.

RECEIVER, Grundig Satellit International 650, £230 ono. — 0293 33827.

FT480R 2mtr multimode transceiver in good condition with mobile aerial and mount. Sell for £300 ono or part exchange HF transceiver; can deliver. — Telephone 0952 595380.

DRAKE TR7 all mode transceiver, all filters, 0-30MHz, P.B.T., Vox, freq counter etc, complete with P/S and manual, mint condition,

£700. — 0208 872106.

REALISTIC PRO2004 scanner, VHF/UHF 25-520, 760-1300 MHz, 300 channels, latest model, complete kit including D130N Discone antenna, frequency guides, books, car adaptor. Bought six weeks ago for over £500, will sell for £280. — Tel. 01-223 1928, anytime.

HY-GAIN V converted to 10mtr by Spectrum Communications, 240 channels; plus Zetagi all band linear B300P. £135. — Phone 0772 423741.

WELZ HF5 vertical 5 band 8-10m, traps at base, no radials required, as new, £85; Hitachi 10" monitor, amber, £35; Samsung 14" amber monitor, IBM, £65. All as new. — 0487 823779, after 5pm.

FOR SALE:Yaesu Ft290R with case, good condition, new charger unit, £230. — Tel. 01-841 6548, evenings only.

BBC MASTER 128, two double sided 80 track disc drives in case with PSU, green screen monitor, joysticks, lots of software and Roms; ideal for packet radio, £500 ono. — Dave, 021 526 6850.

C58 STANDARD Portable multimode, recent professional service, complete with matching power amplifier, 10 watts out, all immaculate, 144, 148MHz, £260. — Tel. 0375 678833, G4KIQ, Essex.

SALE: FT290R. Nicads, soft case, mobile bracket, mobile headset, with boom mike, vgc, £260. — G8GES QTHR. Tel. 0277 625649.

PHILIPS 12 wave band radio, double supe, very old, very powerful, £15; Realistic DX100L general coverage receiver, M/L wave, 1-30MHz, powerful, f30. — 01-571 5759.

PHILIPS World receiver D-2999, double super world coverage, SSB reception, bandwidth selector, quartz controlled phase loop tuning, 16 preset memories, triple speed tuning, auto search, bat/mains, 2-speaker, alarm clock, almost new, cheap but excellent performance, £225 or exchange. — Tel. 01-571 5759, Hounslow, Middx.

ASTRO Terest telescope, equatorial mount, finder scope, rack pinion focus, prism erector, angled view, three eye pieces, strong adjustable tripod, exchange for HF transceiver; —

Phone 0422 843373.

934 MegHz hand held transceiver with charger, mike, speaker, mint condition, £425. — Telephone 0242 67 4472, after 6pm.

MICROWAVE Modules, MML 144/100LS linear, 100w out for 1 or 3 watts in; vgc, £125. — Peter, G1YJL QTHR. 01-882 2351.

PHILIPS D2935 world receiver, continuous coverage, digital readout, memories, direct entry SSB facilities, £170 new 6 months ago; £120, buyer collects. — Tel. 06333 60935.

TRIO TS520 transceivers, CW filter, good condition, £280; matching home bru, 2 metre TVTR, 3 watts output, £50. — Ian, G4UWK, QTHR. Telephone 062 982 3072, evenings.

ICOM IC202 2 mtr SSB/CW transceiver, ideal for transverting (3w output), £85. — Mark, G6HSM, Canterbury 0227 750471 (after 5pm).

TELEQUIPMENT Scope D33R D/beam 10mcs £40 good; Cossor scope, 1035 Mk3 D/beam 10mcs, £40 good; Heathkit scope, mod-0M2, £30 good; AVO R/F ocs, £15 good; Solartron scope, good, no tube, £15; Racal counter SA520A, 300Kcs, £15; Scope tubes, 3PBI-5API, £5 each. — 01-883 3474.

FT7 YAESU SSB/CW transceiver & manual £200; CTE international DC9 HF linear amplifier, solid state AM/FM/ CW/SSB, 1-10w input, 150w output, £120 ono. — Tel. (Stoke Ferry) 0366 500385.

EXCHANGE IC50S portable 50MHz transceiver 10w Hi 3w + ½ w Lo for HF transceiver, FT101ZD, FT707, FT77 or similar, or sell £300. — Tel. 0384 65614, W. Midlands.

Wanted

ALPHA Mobile HF transceiver G3WPO design, HRT Sept to Dec 1984, complete or incomplete, working or not working, anything considered. — Mike, G8RCG QTHR. Tel. 0565 812262.

WANTED: Any info on communications receiver: 'Spey receiver type Sp1'. — Ring The Lizard (0326) 290711.

SAMATRON U-verter wanted. — Ring Bristol (0272) 681956. **WANTED:** NRD515 receiver

and NDH518 memory unit. Must be in very good condition. Your price paid or will exchange for Pocom AFR 2010 decoder, fully expanded all modes. — Ring (0772) 704009, after 6pm, or any time Sundays.

WANTED: Halbar 2m Colinear antenna. — Phone Ron, G6NJD, 0742 588359, after 6pm.

WANTED: Datong Morse Tutor, model D70. — Ring Fred, Halifax 53979.

WANTED: HF to 2 metre converter. Have for exchange new stereo car radio cassette player. — Tel. 0922 642509.

WANTED: Yaesu FRG8800 gen coverage receiver plus if poss VHF converter and/or active antenna; cash ready. — Tel. 0532 778689 (Leeds).

WANTED: Professional quality receivers eg Eddystone 958/7 and Racal Ra 1772. — Phone Michael O'Beirne, work 01-248 3024; or after 8pm, 0372 62268.

WANTED: Instruction Manuals, circuit schematics for AVOC378A and ADVANCE B4A5 signal generators. Good

unused can type electrolytics for HT supplies, ie 8, 16, 32µF at 350 to 450 volts working.

WANTED: Yaesu FC902 ATU and SP901, ext SP. — 051-733 1947.

WANTED Desperately, handbook/instruction manual for Honda E300 generator. — Please call Dunstable (0582) 600033.

WANTED: "Marchwood" case and bits; Tokyo Hi-power 110HL 2 metre linear. "Hilo" mast or similar. Noise bridge. — Details, Mervyn, 22 Parklands Road, Chichester, West Sussex PD19 3DT. Tel. (0243) 783605.

KW107 ATU wanted, any condition considered, cash waiting for right unit at the right price. — Tel. Peter 041-641 4700, anytime.

WANTED: VHF communication magazine 1981/1982, complete; will buy or swap for what do you want. — B. Payne, 74 Southcliff Road, Withernsea, North Humberside HU19 2HU.

FT107 HF transceiver, must be immaculate and unmarked/unmodified. — Tel. (0634)

30822, eves/weekends. G4RGB QTHR.

WANTED: General Radio Company (USA) type GR874 co-ax plugs, ideally two or more. — Phone Coventry 0203-454339 (mornings).

WANTED: Back copy H.R.T. with FT401 Yaesu transceiver article or review in full detail; possibly two years back; photocopy will do; expenses repaid. — Alan G0HKG QTHR, 07875 3356.

WANTED: Uniden 2830 Tx/Rx or would consider Concord 3 or Belcom LS102L or Nato 2000; must be in mint condition. — Telephone Glyn on 0745 823855 office; or 0745 833665 after 7pm and weekends. North Wales. Top price paid.

WANTED urgently, Yaesu FL-6010 50 MHz linear to match FT-690R Mk.1; prefer mint working, but any considered; last one needed for set so please help. — Tel. eves or w/ends, Steve (091) 2689204.

WANTED: Information on AVO transistor analyser Mk2; also wanted, system disk for Inco-term 20/20 computer or any

info on same. — Please send to Brian Dudhill, 12 Eilam Road, Rotherham, S/Yorks S61 3PQ. Tel. (0709) 554665 (reasonable costs re-imbursed).

WANTED: Ham International Jumbo, must cover 26.065 or 28.305 MHz or around that, and must have full U.K. FM. The set must be in good working order and the outside must be immaculate. — Phone (0504) 46313, after 6pm; ask for Gary.

WANTED: Eddystone model 940 communications receiver; top price paid for unit in good condition please. — Phone G. Millington, Wolverhampton 0902 333971.

WANTED: Back issues of H.R.T. and A.R. from issue 1; also Television Magazine from 75 onwards. Please write with details of price, etc, to — Mr. Upton, 35 Weston St, Swadlincote, Burton-on-Trent, Staffs.

WANTED: Copy of instructions for use for Mickey MK4000 VHF scanner, willing to pay for photostat and postage. — Redferns, Nichols Road, Southampton. Tel. 0703 226634.

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DRAKE ESR3240 RECEIVER, 950-1750MHz
Less than 7dB threshold. Rotary switch channel tuning.
@ £199.00

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60 cm RAW	£18.30	80 cm RAW	£21.55
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C Band from	£76.50	KU Band from	£23.25
		C Band from	£24.40

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12", Pot type	£90.35	Positioner	
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Carriage and VAT to be added to all prices.

World Satellite Almanac — contains over 650 pages with full details on satellites, footprints, charts, tables, etc. Price: £15.00 + carriage.

The World of Satellite TV — over 200 pages on everything you need to know about selecting, installing, operating and maintaining your satellite earth station. Price: £9.95 + carriage.

For full details send SAE to:

HARRISON ELECTRONICS

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Garex Electronics	8
GCHQ	41
Harrison Electronics	53
ICOM Electronics	10
ICS Electronics	8
Keytronics	35
KW Communications/Ten Tek	24
Lake Electronics	55
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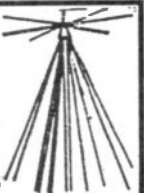
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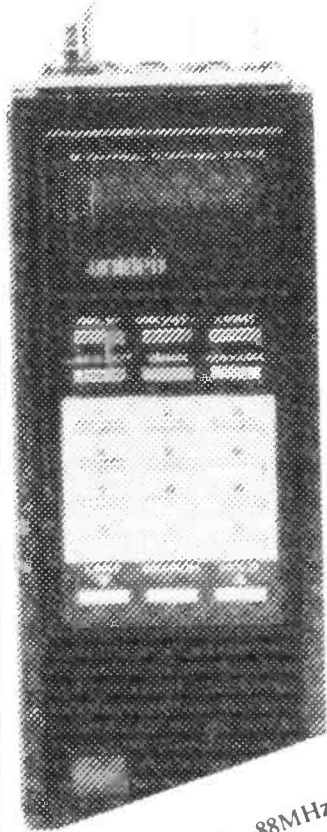
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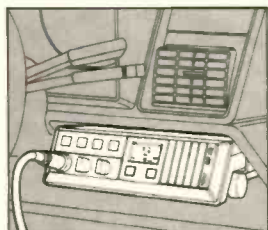
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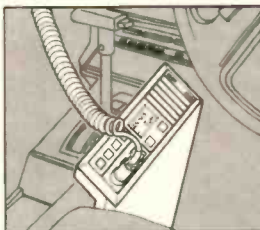
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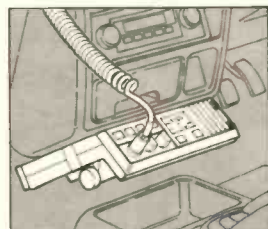
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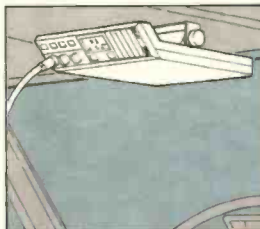
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