JUNE 1984 90p

Amateur RADIO

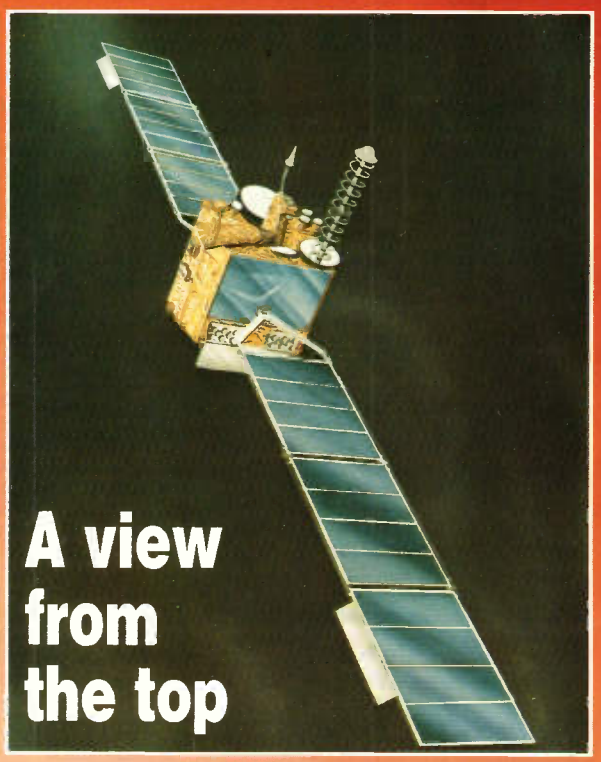
For all two-way radio enthusiasts

24cm ATV – PA construction project

HF roofspace aerials

Marconi story on QSL cards

Learning Morse without tears



A view from the top

Angus McKenzie tests the Icom IC-R71E Rx

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750XX	£349.00	Converter	£26.95	1-100 Linear..	£172.50	Safety Mic	£28.95
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		24cm TX	£199.00	25 amp PSU	£125.45	303 Mic	£36.50

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YAMATO ROTATOR takes up to 8 element 2 metre beam. Uses 3 core cable, in line and neat controller **£40.00**

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Including the new 1 ELI TRIBAND 16-15-10 metre Rotory Diopol/and I-2 2-3 CONVERTION KITS.

MET. Full Range including the Non Metalic Masting in 1.5/3 metre sizes.

NEW Fortor 70cm TV Transmiter Kit. **£33.55p.**

ALSO: Poles, Masts, Rotors, Brackets Clamps, Plugs, Sockets, Cable, Tape etc in stock.

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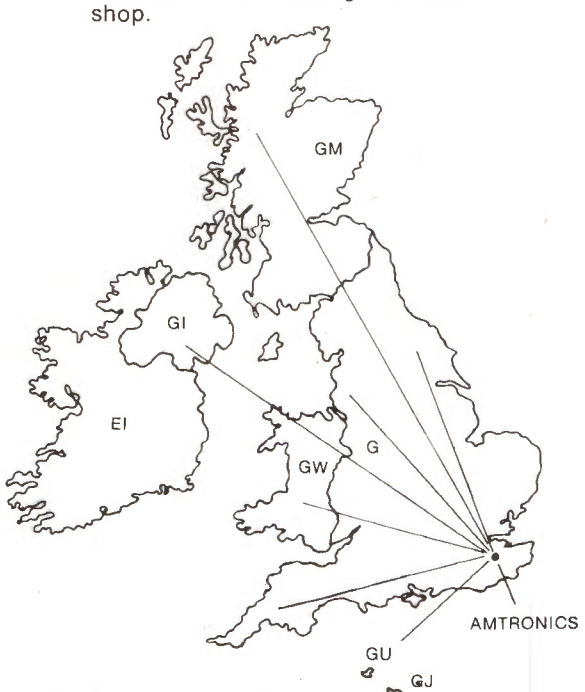
SEND LARGE SAE for details on any of the above equipment.



Instant credit. Ask for details when you call or write for a quote. See us at most of the major Rallies: ie Brighton, Longleat, Woburn, Harlow, Vange & Tunbridge Wells.

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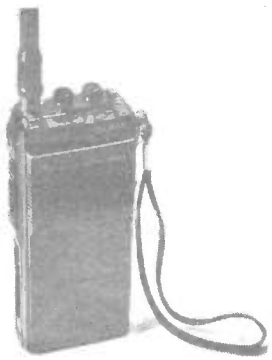
Amateur RADIO



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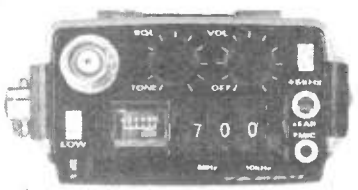
Front cover: The Icom IC — R71E receiver on test this month. See page 23. Picture by Jay Moss Powell



We are pleased to announce that the company has recently been appointed U.K. distributors for the TELEREADER range of equipment. Those of you who have seen TELEREADER products will know that outstanding performance allied with ease of operation are the hallmarks of this particular company. The three models in our range are the **TELEREADER CWR6** combined transmitter and receiver and the **CODE MA** **CWR610E** which not only receives CW and RTTY (Ba ASCII) but doubles as a morse tutor.

The **TELEREADER CWR685E** has many outst CW. Baudot and ASCII receive and transm RTTY at 45-300 bauds (transmission/reception of both upp Built-in 5" green phosphor sc brightness that I have not seen

An external QWERTY ke case and supplied with key or plastic faced 6 Memory chann total memory addition the character memo for m

morse dal morse

*CW: 3-40 wpm, peeds) *CW morse ers: 6.12 characters x 2 allel interface for printer ut *12 volt DC operation

TELERE 94 inc VAT. carr. £6.00
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special announcement
a new LOWE shop
in Cambridge
ring Matlock for details

THE POCKE TRA, A NEW DIMENSION IN PORTABLE AMATEUR RADIO

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

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

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

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

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

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

LS 20XE

£139.00 inc VAT carriage £2.50

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

what to buy,

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

here to buy it,

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

help,

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

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

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Matlock, Lowe Electronics Ltd.,
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Tel: 041 945 2626

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

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

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

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

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

TR9130 TWO METRE ALL MODE TRANSCEIVER

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

TR9130 ..... £442.52 inc. VAT

TS780 DUAL BAND BASE STATION TRANSCEIVER

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

TS780 ..... £795.00 inc. VAT

TR7930 TWO METRE FM MOBILE TRANSCEIVER

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

TR7930 ..... £312.11 inc VAT

R2000 GENERAL COVERAGE RECEIVER

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

R2000 ..... £421.36 inc VAT

TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE FACILITIES

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

TS930S ..... £1,150.00 inc. VAT

NEW PRICE

TR2500/TR3500 HANDHELD TRANSCEIVERS

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

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

TS530SP HF AMATEUR BAND TRANSCEIVER

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

TS530SP ..... £638.00 inc VAT

TW4000A DUAL BAND FM TRANSCEIVER

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

TW4000A ..... £469.00 inc. VAT

just a part of the range

Send 90p for full catalogue

CURRENT COMMENT

NICE NEC DOES IT!

This month's ***Amateur Radio*** includes an extensive review of the RSGB Convention at Birmingham, but for those of you who did not attend it represents little compensation.

I cannot express just how much fun it was, and I certainly echo the reviewer's sentiments in congratulating Norman Miller and his committee for the work they put in.

An example of the behind-the-scenes organisation involved was the negotiating of special low-rate block-booking of accommodation for those staffing many of the exhibitions – this incentive for attendance and consequent saving must surely have helped all of *us*.

Chatting with Norman towards the end of the exhibition, it became clear that the RSGB Convention and radio amateurs in general are a peculiar phenomenon at the NEC. Whereas the majority of exhibitions held in Birmingham are backed by big business with big money, surviving on the cheque books and expense accounts of those attending, the RSGB Convention is quite uniquely different.

The RSGB are not looking to make a profit – only to break even. Those who come through the turnstiles, though 'amateur' by definition, do so with a diligence and enthusiasm, and in numbers that make a mockery of that label.

The fact that this was the largest hobby exhibition ever held in the UK says something for amateur radio.

Indeed, the only criticism we can offer is done so in the gentlest terms, directed at those who missed the convention: see you next year.

A NEW APPROACH?

The RAE, its teaching, its content, those who pass it and those who fail it provide a constant source of discussion in the hobby. Those of you who've got your ticket and therefore think it has nothing to do with you should stop and consider that if students with an insufficient grasp of the subject do learn enough to pass the RAE, you too will suffer when they begin operating on the bands.

In such cases it may be too late, though not if, as G3OSS suggests in *For Goodness Sake Fix It!* this month, you are prepared to lend your experience to assist the relative newcomer.

More important is to sort out such problems before people get on the air, and events such as the RAE forum at the NEC go a long way to doing just that.

Another approach to the problem has been brought to our attention by Paddington College, who this autumn are offering a rather special RAE course. Not only do they cover the syllabus for the City & Guilds exam, but also make use of the facilities provided by the Electrical Engineering Department, allowing students to carry out practical experiments in the electronic theory covered by the course. The course is nonetheless pitched at the student with no previous experience of radio or electronics. Paddington College also has an active club station (G4UWU) operated by the course tutors and past students.

Because of the extended-scope of the course, attendance is required twice a week during term time between the end of September and the examination in May (30 weeks). Inevitably this means the course fees are slightly higher than those charged by some colleges (special rates are available for pensioners, those at school fulltime, and the unemployed, residing within the ILEA area).

Enrolments are at Paddington College on 10-12 September between 7-4pm and 6-8pm, and further information can be obtained from David Peace G4KKM on 01-402 6221 (ext 54).

We would be pleased to receive and pass on details of any special courses such as these.

SPREAD THE WORD

On Sunday, June 24th, London's Capital Radio will be holding its 1984 Venture Day. Last year, the Day was a tremendous success. Three quarters of a million people gathered to try out the challenging activities on offer. There were 140 organisations demonstrating activities that ranged from hang-gliding to computers, from dancing to American football. But there was no amateur radio.

This year will be different, as the Radio Society of Harrow will be demonstrating as many of the aspects of amateur radio as can be squeezed into a Summer's day. What is requested from you is a constant stream of contacts, to give the maximum number of opportunities to show the scope of the hobby.

The station, GB4CVD will operate from Battersea Park, London from 1000-1700 GMT on all bands and in all modes (including RTTY and TV). A special QSL-card will be available via the RSGB Bureau.

So let's give them our support and put amateur radio on the map as well as on the air.

IT'S YOUR MAGAZINE

Now that we are settling in as new producers of ***Amateur Radio***, we are always on the look out for new authors and new ideas.

If you would like to send us a completed article on any topic related to the hobby, we will certainly give it careful and prompt consideration.

Alternatively, we are happy to consider any ideas or synopses you might have for articles, or suggestions for features that you want to see in ***Amateur Radio***.

If you *are* thinking of writing an article, you don't need to be an expert writer. If you can get your ideas down on paper, preferably typed, with drawings that we can follow and illustrations where relevant, we'll be happy to sort out the rest. Of course, all material used will be paid for.

On the other hand, if you want to grumble about the magazine rather than write for it, your comments and critisms are always welcome, and we do take note of your opinions since such feedback is our major link to you, the reader. So when something in ***Amateur Radio*** makes you want to scream, let us know and where appropriate you'll see it on the letters page, which is after all *your* open forum.

Additionally, if there are any events which you think need bringing to the notice of a wider public, we'll try our best in *Rally Calendar, Straight and Level*, or even *Current Comment!*

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INSTANT FINANCE AVAILABLE TO ALL LICENCED AMATEURS SUBJECT TO STATUS. VIA LOMBARD TRICITY.

TRANSCEIVERS & RECEIVERS – BEST BUYS

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		P & P
Kenpro handheld 140-150 MHz 2 watts H/Power out includes Nicad pack & charger 3	**£159.95**	£2.00
ALL AVAILABLE KENPRO ACCESSORIES IN STOCK		
AM/FM Revco/Gemscan 60 MHz to 515 with airband (extended coverage out soon) only	**£249.00**	£3.50
Hamaster FM 2085–25w 2mtr mobile	**£179.00**	£4.00
FDK Palm II–Ex Demo 6CH 2mtr H/H	**£119.00**	£2.50
FDK Palm II–Ex Demo 6CH 70cm H/H	**£119.00**	£2.50
Blazetone FM200–15w 2mtr PRT Shift	**£129.00**	£3.00
Century 210–AM–FM–SSB Digital PLL SW Receiver 0–30mhz	**£199.00**	£5.00
Kenwood/Trio TR3500 UHF/H/N	**£199.00**	£2.50
Kenwood/Trio TR 7950 45W Mobile	**£319.00**	£5.00

ARM Antenna Research Manufacture

R. WITHERS COMMUNICATIONS appointed sole distributors for this exciting range of new antennas, portable, fixed, mobile. SAE for details. Trade enquiries welcome.

ACCESSORIES

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PART OF OUR EXTENSIVE RANGE ON OFFER

		P & P
500mhz 7 Digit Mini Frequency Counter	**£59.98**	£2.00
40mhz 7 Digit version of above	**£39.98**	£2.00
Spring Silly Price Rotator Offer 50KG – Kopek Straight Through Rotator	**£38.95**	£2.00
Oskerblock SWR 200 maximum power 2kw. Normal price £59.95 –3.5–144MHz– 100 to clear at only	**£39.95**	£2.50
Yaesu Mics. MH1B8, YM35, YM49, YM36. **All 10% off Regular Prices**		
Yaesu FT102 Filters	**Special**	
XF82GA 6khz AM Filter	**£14.50**	£1.00
XF82HSN 1.8khz Narrow SSB Filter	**£15.00**	£1.00
XF82HC 600hz CW Filter	**£15.00**	£1.00
XF455C 500hz CW Filter	**£39.50**	£1.00
XF455CN 270hz CW Filter	**£39.50**	£1.00
Yaesu SP980. Ext LS with Audio Filters (£54.00)	**Special £45.50**	£2.50
Yaesu FL110 HF Linear 10w – 100w HF	**Special £89.00**	£2.50
Kenwood/Trio type Mobile Mini Speaker	**£4.99**	£1.00
Diawa Auto ATU CNA 1001 Special Price	**£139.00**	£2.50
Diawa 1.2 k/watt CNW 518 Special Price	**£189.00**	£2.50
Yaesu World Clock QTR 24D only	**£29.95**	£1.50
Diawa CN 510 Cross Needle – HF	**£39.95**	£1.50
Diawa CN 560 Cross Needle – VHF/UHF	**£49.95**	£1.50
Diawa 2030 30 watt FM Booster – 2mtr	**£55.00**	£2.00

PLUS HUNDREDS OF MAIN LINE ITEMS FROM ICOM, YAESU, FDK, KDK, KENWOOD, TRIO, WELZ, DRAE, DATONG, REVCO, MICROWAVE MODULES.

ANTENNAS — REMEMBER IT'S THE ANTENNA THAT MAKES THE STATION!

NEW

		P & P
A.R.M. TRAVELLING JIM — The exciting new portable Slim Jim	**£8.99**	£1.00
Sun KB-144 Triple 518 Base	**£29.95**	£3.00
Hoxin 8/8 Mobile 88	**SPECIAL £16.50**	£2.00
Sun Double 5/8 KG5 Mobile	**SPECIAL £11.50**	£2.00
Hoxin DC Grounded ½ wave mobile complete with cable and mount	**SPECIAL £10.50**	£2.00

TET Beams VHF Special – Enquire – All Tonna & Jaybeam in stock

2mtr HB9CV	Over 5000 made to date –	**£6.99**	£2.00
70cm HB9CV	Manufactured by RWC – Price held for 4 years!	**£5.99**	£2.00
10mtr HB9CV	Complete Assembled or Kit. Full Instructions	**£29.50**	£3.50

ALL TYPES HF AERIALS IN STOCK + 3 types of Discone/Scanner aerials in stock – please enquire.

10 METRE FM MOBILE BASE '2740' from the company who have converted over '600' units.
We have obtained the last 200 units we believe available in the UK. Take this opportunity to obtain any of the following options:-
2740 modified to 6 watt output 29.310 to 29.700 (All units guaranteed brand new) ..... **£47.50 inc**
2740 as above but inc repeater shift ..... **£10.50 extra inc**
2740 unmodified less crystals ..... **£33.00 inc**
Crystals for above **£4.75** each plus 50p p&p = 2 req'd plus one for repeater shift.
Suitable 25 watt linear 'Relay Switched' only **£16.50 inc** plus £1.50 p&p
IF Crystal filter **£2.00** inc + 50p p&p
MOD Sheet for above including improved audio also applies to DNT rigs **£1.00** plus SAE
Delux mic ready wired 5 pin din **£3.50** inc plus 50p p&p. (Also suitable for all VHF rigs)
Delux 10 metre dipole inc wall/loft bracket **£8.50** & £2.50 p&p.

SPECIAL

Complete mod kit for LCL 2780/DNT M40 inc 2 x XTALS, 2 x c's XTAL filter full instructions @ £12.95 inc post.

TRIED 10-FM?

Ray Withers G4KZH says now is the opportunity for all progressive radio amateurs to work real DX for less than £50.00.
Don't Forget We stock almost all Power Transistors/Modules for amateur radios which we import ourselves proving we mean business when it comes to service back-up! – Phone us for your requirements.
'Visit our Shop' – Junction 3 M5 2 mins up the A456 – Full demonstration facilities – All major Brands stocked – something of interest for everyone! – including full Yaesu/Somerkamp range.

Please note all special offers will be dealt with strictly on a first come first served basis. This offer is available only while stocks last. All lines we will be pleased to send mail order.

Please send a SAE for any information you require and our latest s/h list.

T.V. SOUND TUNER SERIES II

BUILT AND TESTED

£26·50 + £2.00 p&p.

In the cut-throat world of consumer electronics, one of the questions designers apparently ponder over is "Will anyone notice if we save money by chopping this out?" In the domestic TV set, one of the first casualties seems to be the sound quality. Small speakers and no tone controls are common and all this is really quite sad, as the TV companies do their best to transmit the highest quality sound.

Given this background a compact and independent TV tuner that connects direct to your Hi-Fi is a must for quality reproduction. The unit is mains operated.

This TV SOUND TUNER offers full UHF coverage with 5 pre-selected tuning controls. It can also be used in conjunction with your video recorder. Dimensions: 10½"x 7½"x 2½".

Also available with built-in headphone amp. £32.50 + £2.00 p&p.

E.T.I. kit version of above without chassis, case and hardware. **£16.20** plus £1.50 p&p.

PRACTICAL ELECTRONICS STEREO CASSETTE RECORDER KIT

• NOISE REDUCTION SYSTEM • AUTO STOP • TAPE COUNTER • SWITCHABLE E.Q. • INDEPENDENT LEVEL CONTROLS • TWIN V.U. METER • WOW & FLUTTER 0.1% • RECORD/PLAYBACK I.C. WITH ELECTRONIC SWITCHING • FULLY VARIABLE RECORDING BIAS FOR ACCURATE MATCHING OF ALL TAPES. – METAL, CHOME DIOXIDE, ETC.

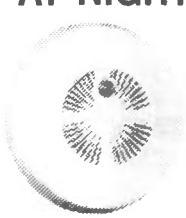
Kit includes tape transport mechanism, ready punched and back printed quality circuit board and all electronic parts. i.e. semiconductors, resistors capacitors, hardware top cover, printed scale and mains transformer. You only supply solder and hook-up wire.

Featured in April issue P.E. Reprint 50p. Free with kit.

£34.50. + £2.75p+p. Complete with case.

SLEEP SAFELY AT NIGHT

SMOKE DETECTOR ALARM!



Gamma ionization type smoke detector with built-in audible alarm. Model No. F227. IDEAL FOR HOMES, HOTELS & GUEST HOUSES, CARAVANS, BOATS, ETC. • MICROCHIP technology, no mechanical parts. • Maintenance free. • No wiring needed. • Runs off transistor battery, lasts for a year. • Money back guarantee.

£4.95 plus 75p p&p. or 2 for **£8.50** plus £1.50 p&p.

QUALITY SPEAKER SYSTEMS

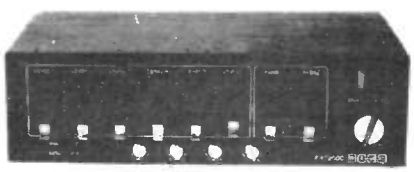
Made to sell for over £300! Must be heard to be believed. Made in England by World famous British manufacturer. SPECIFICATIONS: Bi-Directional 5 speaker system. Drive units: 2x25mm soft dome tweeters, 2x13cm polymer cone mid range speakers, one 24cm bass unit. Impedance: 8ohms. Rated power 200W peak max. Sensitivity: 87 dB @ 1W. Freq. range: 45 to 20,000 Hz. Finish: Satin walnut veneer, with brown trim. Size: 35½"x8½"x15¾". Weight: 27kgs.

£125.00 a stereo pair. Buyer collect only!

MONO MIXER AMP

Ideal for Church halls & Club houses. **£45.00** + £2.00 p&p.

50 WATT Six individually mixed inputs for two pick ups (Cer. or mag.), two moving coil microphones and two auxiliary for tape tuner, organs, etc. Eight slider controls - six for level and two for master bass and treble, four extra treble controls for mic. and aux. inputs. Size: 13¾"x6½"x3¾" app. Power output 50 watts R.M.S. (cont.) for use with 4 to 8 ohm speakers. Attractive black vinyl case with matching fascia and knobs. Ready to use.



VHF STEREO TUNER KIT

* SPECIAL OFFER! *

£13.95 Plus £2.50 p&p.

This easy to build 3 band stereo AM/FM tuner kit is designed in conjunction with Practical Electronics (July '81 issue). For ease of construction and alignment it incorporates three Mullard modules and an I.C. IF. System.

FEATURES: VHF, MW, LW Bands, interstation muting and AFC on VHF. Tuning meter. Two back printed PCB's. Ready made chassis and scale. Aerial: AM - ferrite rod, FM - 75 or 300 ohms. Stabalised power supply with 'C' core mains transformer. All components supplied are to strict P.E. specification, Front scale size: 10½" x 2½" approx. Complete with diagram and instructions.

HI-FI SPEAKER BARGAINS

AUDAX 8" SPEAKER

High quality 40 watts RMS Bass/Mid. Ideal for either HiFi or Disco use this speaker features an aluminium voice coil and a heavy 70mm diameter magnet. Frequency res 20Hz to 7KHz. Impedance: 8 ohms.

£5.95 +£2.20 p&p.

AUDAX 40W FERRO-FLUID HI-FI TWEETER

Frequency response: 5kHz - 22kHz. Size: 60mm square. Impedance: 8 ohms.

£5.50 +60p P&P.

GOODMANS TWEETERS

8 ohm soft dome radiator tweeter (3¾"sq.) for use in up to 40W systems.

£3.95 each plus £1.00 p&p, or **£6.95** a pair plus £1.50 p&p.

125W HIGH POWER AMP MODULES

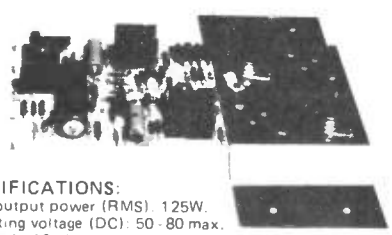
KIT **£12.00** + £1.15 p&p

BUILT **£17.50** + £1.15 p&p

The power amp kit is a module for high power applications - disco units, guitar amplifiers, public address systems and even high power domestic systems. The unit is protected against short circuiting of the load and is safe in an open circuit condition. A large safety margin exists by use of generously rated components, result, a high powered rugged unit. The PC board is back printed, etched and ready to drill for ease of construction and the aluminium chassis is preformed and ready to use.

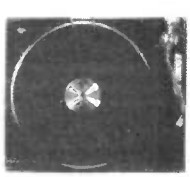
Supplied with all parts, circuit diagrams and instructions.

ACCESSORIES: Stereo mains power supply w/transformer **£10.50** +£2.00 p&p. Mono version, **£7.50** + £2.00 p&p.



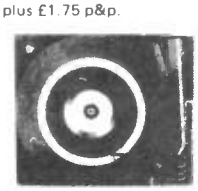
SPECIFICATIONS:
Max. output power (RMS): 125W.
Operating voltage (DC): 50 - 80 max.
Loads: 4 - 16 ohms.
Frequency response measured @ 100 watts: 25Hz - 20KHz.
Sensitivity for 100 watts: 400mV @ 47K.
Typical T.H.D. @ 50 watts, 4 ohms: 0.1%.
Dimensions: 205 x 90 and 190 x 36 mm.

BSR RECORD DECKS



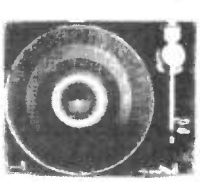
3 speed, auto, set-down, with auto return. Fitted with viscous damped cue, tubular aluminium counter-weighted arm, fitted with ADC magnetic head. Ideally suited for home or disco use.

£25.95 plus £1.75 p&p.



Auto-Changer model - takes up to 6 records with manual override. Supplied with stereo ceramic cartridge.

£12.95 plus £1.75 p&p.



Manual single play record deck with auto return and cueing lever. Fitted with stereo ceramic cartridge 2 speeds with 45 rpm spindle adaptor ideally suited for home or disco. 13"x11" approx.

£14.95 + £1.75 p&p.

SPECIAL OFFER! Replacement stereo cassette tape heads - **£1.80** ea, add 50p p&p to order. Philips stereo magnetic cartridge. £3.95 + 60p p&p.

PLINTH TO SUIT BSR RECORD PLAYER DECK (with cover) Size: 16½"x 14¾"x 2¾". Cover size: 14½" x 13½"x 3½". Due to fragile nature of this item, buyer to collect only. **ONLY £8.95.**

All mail to: **21A HIGH ST, ACTON W3 6NG.** Callers Mon - Sat, 9.30 - 5.30. Half day Wednesday. Note: Goods despatched to U.K. postal addresses only. All items subject to availability. Prices correct at 30/11/83 and subject to change without notice. Please allow 14 working days from receipt of order for despatch. RTVC Limited reserve the right to update their products without notice. All enquiries send S.A.E. All cheques & P.O.'s payable to RTVC Ltd.

CALLERS TO: **323 EDGWARE ROAD, LONDON W2. Telephone: 01-723 8432.** (5 minutes walk from Edgware Road Tube Station) Now open 6 days a week 9 – 5.30. Prices include VAT.

Mail or 'phone orders by ACCESS. Tel: 01-992 8430.

RTVC

L·E·T·T·E·R·S

FT-757GX

I was very impressed with Angus McKenzie's report on the three receivers in the April ***Amateur Radio*** and also pleased to read a report which told the truth 'warts and all' compared with some of the equipment reviews one sees which are little more than re-written sales literature.

The reason I write however, is because the article mentioned more than once the FT-757GX, perhaps implying that it was the target to be aimed at in this price range. Indeed the receiver is very good and does all it is required to do – once it is on frequency.

As an avid CW operator I was looking for a companion/replacement for my Swan Astro 102BX which would give me all that it does but with the new bands and an all band receiver. Along came the adverts of the FT-757 – inbuilt keyer, QSK, 100W Out, narrow CW filter, general coverage Rx, two VFOs. The extras such as memories, AM, FM etc were frills which just turned me more on to the equipment.

Well – the keyer is a 'rubbery' affair which has poor bias and no means of adjusting it. The QSK is fair but cannot be called good. But the shock was the manual tuning. The spec is that the tuning is in 10Hz steps. It does indeed start off as 10Hz steps but when the tuning is getting near the point where the display will move to the next 100Hz point, the rig gives off a short chirp of audio instability and flips about 30 or 40Hz just as the display changes. On SSB this effect is hardly noticed at all but on CW it is most disconcerting. All in all a bit of a disappointment. It appears that this rig was rushed out in a great hurry for some reason.

I have made up a G3KHZ keyer on a piece of vero to fit into the space taken up by the original board and fitted that. The mods necessary to make the rig operate on AMTOR have improved the QSK but the tuning is a disaster area. I have written to Yaesu and received a note about adjusting VR14, and suggesting that a more expensive rig might better suit my needs – cheek!

However the trouble is that *I like* the set and if they would only put the tuning right I will not have to return it and ask for my money back. I have written again asking them to think it through and produce a mod that we can do either at home or in the dealers' workshops. All I ask is if you hear of anyone else (he will be a CW man) mentioning this problem and you have a chance to check it out another input to the Japanese might bring them to their senses.

Sidney Will GM4SID, Aberdeen.

GIVE US A BREAKER

I purchased a copy of your magazine ***Amateur Radio*** yesterday and was very annoyed to read another of the senseless attacks on the CB radio operators. I refer to the comments made by G3URA.

Why must the amateur fraternity continually denigrate the radio operators who use 27Mc/s? I fully admit that there are many people who use the privelige of radio transmissions to the annoyance of other users but please do not class us all as illiterate morons.

Since the outset of legal CB I have devoted a considerable amount of my time to using the medium with the object of helping the many people who need a cheap and efficient means of communication without having to pass the RAE. I regret that my success rate has been very small and this in my opinion is due to a number of factors.

First the lack of interest taken by the authorities to adequately supervise the frequencies, secondly the very small number of channels allocated, and last but by no means least the open hostility shown to the system by the amateur radio operators and by inference in my opinion the RSGB.

Before Mr. Whittering tells me to stop complaining and take the RAE let me make the point absolutely clear that for a number of reasons I do not wish to sit the exam. I have no great interest in transmitting over great distances and in any case have not the finances to enable me to buy the equipment. I also live in a district that will not take kindly to the erection of large antennas.

To sum up...instead of this continual enmity between the radio amateur and the CB operators why can we not both get together and enjoy the hobby and – dare I say it – learn from each other!

May I suggest the first step...incorporate the CB operators within the RSGB. Accept us for what we want to be...not what you would like us to be.

Ivan Chidwick, Wakefield.

SUPERB

I have been reading all and every radio monthly for about 4 years, and having read the ***Amateur Radio***, I must say that it is a superb paper for both the expert and novice alike.

It is the only one I know that helps the newcomer to radio and does not shun the CBer who has started in the only way he knows, at the bottom of the ladder, and wishes to get further in the vast field of radio.

Most items are put in plain language and explained in an easy way for the 'ordinary' man to understand.

I will recommend this mag to any and all radio users.

C Light, Godalming.

LOSSLESS?

I am sorry to have to say it, but without attempting a pun, I feel that Mr. Gillam of Colchester (March issue) is more off the beam than my good friend Angus, G3OSS. Whilst Angus may have over-simplified his argument to get his points across, some of Mr. Gillam's statements are quite erroneous.

It is a pity that the latter so glibly stated '*without going into the mathematics*' for a few calculations would have provided a rigid and irrefutable proof that his conception of the lossless transmission line, whether short or open circuited, is wrong.

Energy will flow into such a line and will be completely returned at the discontinuity. If it were not so, the input impedance would be a real quantity equal to the line's characteristic impedance.

It is the combination of the incident and reflected waves at the input terminals which provide the appropriate reactance, depending on whether the termination is open or closed.

How one considers the undesirable effects of the reflected wave is a matter of personal choice; one can either consider the input condition as the algebraic sums of the two voltages and currents at the input terminals, or one may just consider the ratio of the two sums, namely the input impedance. Which concept one uses may also depend on the particular result one is trying to deduce.

Whilst it is often difficult to understand what is happening on a transmission line when energy is being delivered to it continuously, what is happening will be made quite clear if the energy is pulsed into it. The repeated reflections at the end termination, and from the sending end termination can be seen on a 'scope connected across the latter.

SF Brown G4LU, Oswestry.

WORKS IN PRACTICE

I purchased your yearbook at Christmas while I was still G8LKF and when I passed the CW test in January I set out to try one of the aerials referred to in the article 'Getting out from the inside'.

You asked for feedback so here it is:

I received my new call G4WJX and went onto 20m with the wide band foil dipole. My first contact was VK2QT followed a few days later by a ZL1.

A 15m version of the same aerial was tried which resulted in JA and UA (Sakhalin Island) and East Coast USA.

A 10m inverted version of the same foil aerial has given ZS6, PY5 and UB5.

All contacts on all bands were SSB.

Thanks for an excellent and very cheap design.

M Kessel, Stoke-on-Trent.

STRAIGHT & LEVEL

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

THE G4VQS CHECKLOG

We've received information on the G4VQS first contact checklog. The story of its origins certainly makes for bizarre reading, starting as it does when VQS was spending 3 years on the British Antartic Survey as a meteorologist. We begin somewhere in the wintry wastes:

The first time I saw a radio transmitter, it was encased in a near solid block of ice, forty foot beneath the snow in Antarctica (76°S 26°W). Just in case you ever have a similar problem take heart; it only takes a fortnight to thaw out a block of ice 10ft square (the transmitter was British).

In the dry Antarctic air not one component had failed since abandonment five years previously, so UP8MA first went on the air with very little fuss.

My problems really started with my name 'HWFA' (yes Hotel, Whiskey, Foxtrot, Alpha!). Most of my contacts were with South America. I changed it to 'HOOF' which was easier to explain than Welsh pronounciation.

Now back in the UK I have persisted with Hwfa which sounds to most people more like a callsign than a name, but at least most amateurs have heard of Wales!

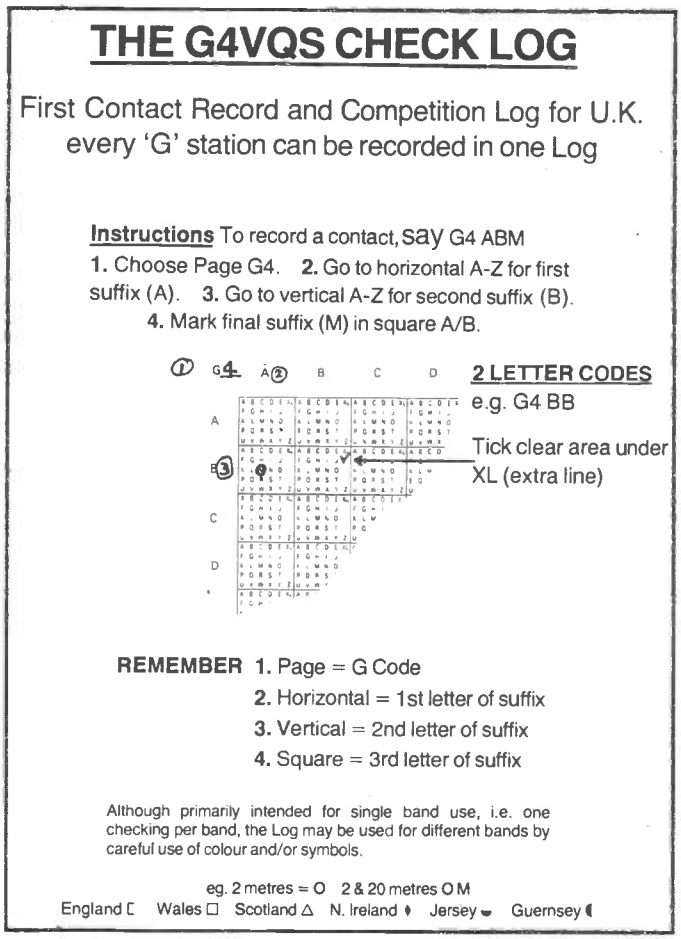
My name is, however, memorable if unpronouncable, and I am sometimes at a disadvantage in remembering whether I have previously worked a UK station. The problem was solved by making a checklog based on a trigraph; within seconds I can use the checklog to see if I have had a QSO before.

There are a possible 85,000 UK call signs in the system with over 18,000 per double page, so I expect the checklog to last a lifetime. This year I intend to use a red pen to circle each new station worked. The system could be expanded by using symbols for GM/P etc, and in 'G' competitions the operator or 'logger' can save time and points. There is also a page for Special Events.

If you invent a better system I would like to hear from you. I will certainly know if we have worked before without log searching file searching/ computerizing.

Incidently there are about one million square miles of flat and featureless ice in the immediate vicinity of the Antarctic base which allowed for some experimentation with antennae – our nearest neighbours were 500 miles to the North and the nearest TV was on the other side of the Weddel Sea. There were no 'TVI' complaints!

The result is certainly something to behold. The G4VQS Checklog costs £2.50 plus 27p p & p from *T P Forms, 357 Upton Road, Noctorum, Birkenhead, Merseyside.*

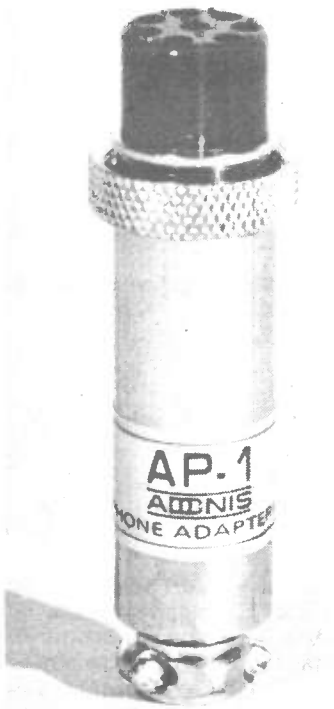


PERFECT MATCH

One of the problems customers have experienced with the latest ICOM series of transceivers is the difficulty of using microphones other than those supplied by ICOM. The reason for this is that all ICOM microphones have amplifiers built into the microphone housing and the input sensitivity of the transceiver is thus too low for normal microphone outputs.

Adonis have just announced their accessory AP-1 to overcome this problem. This is an 8-pin microphone plug fitted with an amplifier and drawing power from the existing dc point on the ICOM 8-pin microphone transceiver socket. All that is necessary is to wire this plug onto any current microphone thus enabling it to be used with all modern ICOM transceivers. The price of this unit is £10.95 and they may be ordered direct from: *Waters & Stanton Electronics, Warren House, 18-20 Main Rd, Hockley, Essex, SS5 4QS.*

STRAIGHT & LEVEL



SPECIAL STATIONS

Here are a couple of special event stations to be looking out for in the coming months:

During D-Day anniversary week, June 2nd to June 9th, the Southampton Private Amateur Radio Club (SPARK) will be operating a special event station from the premises of the Royal British Legion at Netley, Southampton.

The exercise, which will be called 'Operation Overlord', will commence with a mammoth 36 hour session spanning from 10am on Saturday June 2nd to 10pm on the Sunday. This will be followed on the anniversary of D-Day, June 6th, by a session lasting from 9.30am until 10pm. The following Saturday, June 9th, will see another all-day operating session from 10am to 10pm.

On Monday, Tuesday, Thursday and Friday (June 4th, 5th, 7th and 8th) there will be short operating sessions from 7pm to 10pm.

The station call sign will be GB4BLC and commemorative QSL cards will be sent to all stations contacted.

The operators will be Bill (G4REB), Chris (G4UDB), Les (G4VNK) and Brian (G4VYW).

Meanwhile, we have news of another special station the following month.

Plans are well advanced from an expedition to XQ square during the Persied Shower in August of this year.

We will be QRV on 2m, 70cms and 23cms from the 6th to the 15th, though the 11th to the 14th will be devoted almost entirely to 2m MS, but as with previous years (GB2XM and GB2XN) we will put out calls for normal QSO's when our skeds allow.

Operators will be GW3NYY Walt, GW4LXO Johnathen, G8TFI Chris and GW8TVX Richard. Our callsign will be GB2XQ, or a slight variation if this call has already been issued.

Hopefully this will be as successful an expedition as the previous two years, and we look forward to meeting up with many old and new friends on the air during our operations.

Final details will be passed onto GB2RS News prior to our leaving so as to give the maximum warning to the DXers and square hunters.

Straight & Level is always keen to receive advance news of any special stations or events.

THE SUSSEX MOBILE RALLY

The Sussex Mobile Rally on the 15th July at the Racecourse Brighton has over 20,000 sq ft of exhibition area, undercover, and free car parking for 4000 cars. This is one of the few rallies which caters for the whole family, with free minibus rides to and from the sea front plus many attractions for the family and excellent catering facilities.

One of the most popular features of this rally is the huge bring and buy stall, plus all the usual trade stands.

The rally is open from 10.30am until 5.00pm. Admission is £1, children and disabled free. There will be talk-in facilities on 2metres (S22) and on 80metres.

Advance tickets for Clubs can be obtained at a rate of 12 for £10 (plus SAE) from: *Mr S Sims G8NFZ, 71 Green Street, Eastbourne, East Sussex, BN21 1QZ.*

RALLY CALENDAR

June 10: **Elvaston Castle Mobile Rally** at the Elvaston Castle Country Park from 10am. Free admission. Talk in on 2m and 70cm by GB2ECR. Details from John Robinson G4PZY (Derby 767994) or Les Jackson G302 (Derby 71694)

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

June 24: **Longleat Rally** in Longleat Park, Warminster. Open 10am-5pm. The many attractions include a parachute descent to open the event (weather permitting). Admission to the rally and parking are free but there is a 50p charge to enter the park. Camping and caravanning facilities are available.

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

July 22: **Home Counties Mobile Rally** at the McMichael Sports and Social Club, Bells Hill, Stoke Poges, Bucks. There will be trade stands, flea market and special event station GB2MRS amongst other things. Doors open 11am. Refreshments available.

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

DX DIARY

News for HF operators compiled by Don Field G3XTT

I am writing this column immediately after the HF Convention at Birmingham. The HF Forum, an opportunity to air views and grievances, proved to be both interesting and controversial. As usual the question of lists and nets was raised, and I have devoted part of this month's column to airing some of the issues involved. Contesting was also subject to heated debate. Both these matters, and many of the others raised at the Convention, point to the same conclusion: that radio amateurs are a highly competitive lot. Lists and nets wouldn't be a matter of concern if the resulting contacts were not used to claim some kind of award. Contest issues become important because everyone wants to be a winner. Even the QRP crowd are a competitive lot, chasing QRP DXCC awards and what have you.

All this competition is admirable in its way, and encourages us to improve our stations, learn about propagation, and generally do everything we can to outdo the opposition. However, let us not forget that amateur radio can also be about communication in the widest sense. The hobby gives us the opportunity to speak with people from other countries and cultures and learn about their way of life and in this way,hopefully, to contribute to mutual understanding and peace between nations. Let's not neglect this aspect of our hobby in the race to that contest trophy.

Taiwan

For many years the only amateur licensed in Taiwan has been Tim Chen who uses the call BV2A on CW and BV2B on SSB. Last year, however, the authorities issued temporary licences to a group of Italian amateurs who did a good job of putting Taiwan well and truly on the amateur radio map, at least on 20 and 15 metres. Unfortunately, the Italians were hampered by some poor propagation during their visit. The picture changed entirely in April when OH2BH and PA0GAM visited Taiwan to operate under the call sign BV0AA.

Propagation was kind to them and British stations were able to work them on 10, 15, 20 and 40 metres. Unfortunately no 80 metre permit was forthcoming. If you contacted BV0AA, send the QSL card to OH2BH, Martti Laine, Nuottaniementie 10 D 20, SF-02230 Espoo 23, Finland.

Other DX news

WB4BSJ/KL7 is now active from the Pribilof Islands and is expected to be there until June 1985. He has been worked in the UK in the morning on 20 metre SSB. There was recently a tied vote by the ARRL DX Advisory Committee as to whether the Pribilof Islands should count as a separate country. The question will be subject to retrial at a future date.

UW3HY/1; is very active from Franz Josef Land on 80-10 metres, mainly CW. QSL via the bureau. UK1PGO has been reported on several bands, also from Franz Josef Land. QSLs go to UA1OSM.

K2KTT was expected to be operational as VP2EAJ, FG0I IK/FS and K2KTT/PJ7 from 17-29 May. Operation was to be SSB only on 40-10 metres. QSL to his home call.

At the time of writing, the future of the XU1SS and XU1KC stations seems to be in doubt because the Kampuchean village in which they were located has been subject to heavy shelling by the Vietnemese in their latest offensive.

There now seem to be no less than four amateur stations active from Nepal. 9N1MM, Father Moran, has been the backbone of amateur radio operation from Nepal for many years, and most of the visitors to operate from Nepal have used his station. There now appears to be an active group of amateurs working for Radio Nepal and callsigns which have been reported include 9N1RNK, 9N1RNP and 9N1KBK.

Derick, 9K2BE, now has his TS930 with him in Kuwait, so is able to operate on the new 18 and 24MHz. He was also quite active on 160 metres earlier this year and worked a number of UK stations. He will be on leave in the UK for much of June, but then returned to Kuwait for a further spell of activity. His QSL manager is G4GIR.

Prefixes

A change of prefixes for French amateurs is expected to take place on 1st January 1985. Corsican stations will use the prefix TK, and the FB8 prefix used by the French Antarctic territories will be replaced by FT8. These changes release the FB and FC prefixes for French amateurs who will use FA, FB, FC etc instead of just F, the second letter indicating the class of call. I have mentioned all this now rather than later in the year because some of these new prefixes seem to have already appeared on the bands.

TE5DX was the call of a station operating from Poas Volcano in Costa Rica towards the end of April. QSL to T12CF (whose address apeared in last month's column).

If you are stuck in identifying an unusual prefix, remember that all prefixes accord with the ITU assigned prefix allocations even if they haven't previously been used for amateur purposes. So, if you have a list of the ITU allocations (eg pages 83-88 of the *Amateur Radio Yearbook),* you can track down even the strangest prefix.

USSR Callsigns

The exact location of club stations in the USSR has been quite difficult to determine ever since the introduction of the UK1-0 prefix block for club callsigns. From May 1st there will be some rationalisation of USSR callsigns which, hopefully, will make life easier for us all. All prefixes will start with U or R, regardless of band. The

second letter will denote the Republic, essentially as at present. Personal callsigns will have three letter suffixes in which the second and third letters are in the AA to VZ series. Club callsigns will be similar except that the final two letters will be in the WA to ZZ series. Existing two letter calls (eg UT5AB, UA1NA) will be unchanged.

Lists and nets

One of the great controversies to hit HF amateur radio in recent years has been that of lists and nets. Just in case there is somebody out there who has succeeded in remaining unaware of all this let me fill in the background.

Nets have been an integral aspect of amateur radio since its earliest days. I well remember the Sunday lunchtime net on 160 metres when anything up to 20 of the local amateurs used to gather for a natter. So, you say, what can be controversial about that? To which the answer is, of course, nothing. On such a net, if I, for instance, was having trouble hearing G2XYZ and he was trying to get a message across to me, then doubtless one of the other stations who was hearing both of us and was being heard by both of us would act as an intermediary and pass on the message. Fine, you say, that's what communication is all about and shows the best spirit of amateur radio at work. There may be some query about whether the passing of such 'third party messages' contravenes the licence regulations, but nobody is likely to get too upset.

The controversy arises, however, when the station you are trying to hear is rare DX, when the message he is trying to pass you is your signal report, and when you may well want to later claim this 'contact' as credit towards an operating award of some kind. What, under such circumstances, constitutes a contact? For many, nowadays, a satisfactory exchange of signal reports is regarded as a two-way contact for awards purposes.

Curiously, though, the ARRL doesn't make any stipulation at all about signal reports in connection with the DXCC awards. My own view is that it is necessary to truly demonstrate that two-way communication has been established, and that this should include, as a minimum, satisfactory reception of each other's callsigns. It is much easier to receive a signal report than a callsign and it always saddens me to hear callsigns being passed by a third-party in some of these DX nets. Unfortunately it is unlikely that such a definition of a contact would be enforceable. Perhaps, as an alternative, we should insist that the report include a random number between 1 and 100 to prevent the kind of guessing which goes on at the moment.

List operations are similar to nets except that the idea of a net is that everybody should have the opportunity to make a two-way exchange with anyone else on the net. A list operation specifically excludes this, and gives those on the list the opportunity to call one (or occasionally perhaps two or three) previously specified DX stations.

The motivation behind DX lists and nets is often of the best intent. There are times when a newly licensed DX operator feels unable to handle a pile-up by himself, and there are times when a distant station cannot be heard under the stations calling and an element of order must be retored. It is also argued that lists and nets give the weaker stations a chance at the DX, competing only with propagation rather than with old 'ten-kilowatts and blow the licence limitations' down the road.

Unfortunately, lists and nets often run into problems which then bring them into disrepute. The master of ceremonies (MC) often feels obliged to ensure that all on the list make a 'contact', even if it means passing the callsigns and signal reports himself. The vagaries of propagation can also introduce problems. Examples of this are often heard on 80m where a European station MCs for a DX station. The people who get on to the list are the Europeans whose antenna put out high angle radiation. They are heard well by the MC but then fail to be heard by the DX. The real enthusiasts who have tailored their antenna to produce low angle radiation (ideal for DX working) find that they are not heard by the MC and fail to get into the list.

The controversy has reached such proportions that representations have been made to the ARRL not to accept list and net contacts for awards purposes. The mechanics of how such a policy might be policed are always conveniently overlooked.

It really does seem a pity that there should be any controversy at all. After all, the only person who really cares about your achievements at the end of the day is you, and you know full well whether you were really hearing that DX station or not. However, the controversy certainly will rage on. Such is human nature. Don't let it put you off. Just steer clear of it and operate in the way which you enjoy best.

The June Calendar

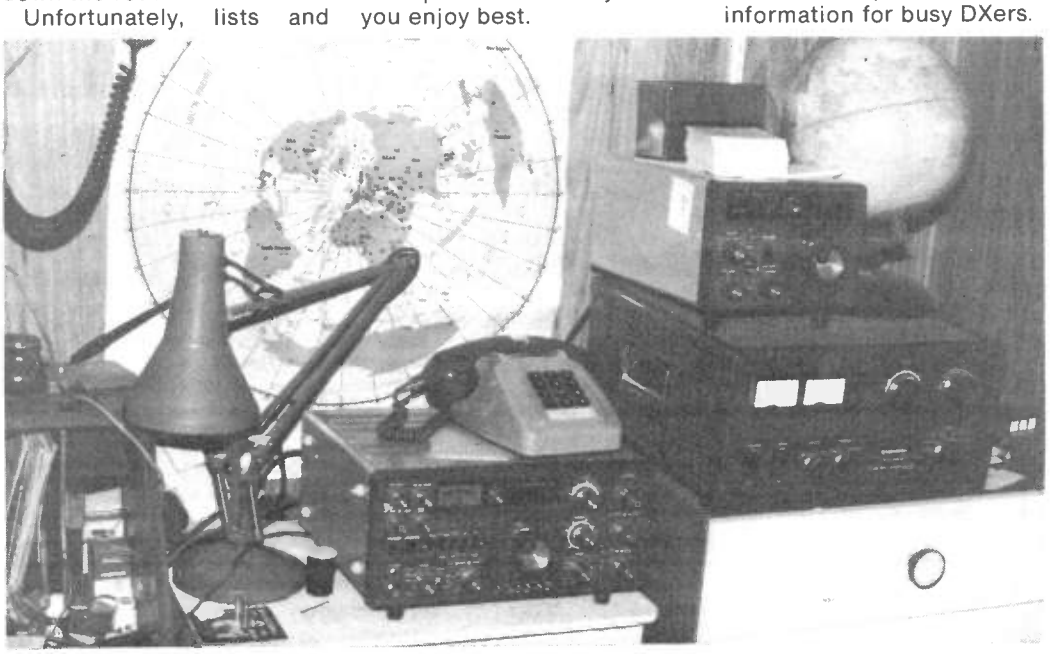
The RSGB's National Field Day takes place on the weekend of 2/3 June and is an opportunity to get some fresh air and to practice your CW at the same time. This is a club event and many clubs turn it into an enjoyable outdoor occasion for all the family. The weekend of June 16/17 brings the All Asia SSB Contest, an opportunity to fill your log with Japanese calls as well as other Far Eastern exotica.

The RSGB's Summer 1.8MHz contest takes place on the evening of 23 June. In recent years this contest has produced some interesting DX in the way of PY, LU and ZD8. Summer is always a fascinating time on 160-metres, with plenty of South American activity after midnight GMT, if only you can stand the high static levels which are the norm at this time of the year.

At the time of writing there are no DXpeditions notified for June, but expect to hear some interesting callsigns as people make a last minute decision to take their rig with them when they go on holiday to the Mediterranean, the Caribbean or wherever.

That wraps it up for this month.

Please let me know just how you would like to see this column develop and I will do my best to accommodate your particular interests. Next month I shall be looking at news-sheets and other sources of up-to-the minute information for busy DXers.



The G3XTT shack. Why not send a photo of your own shack for possible inclusion in a future column?

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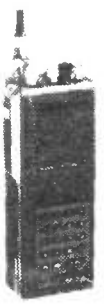
'SMC' YOUR ULTIMATE CHOICE FOR SERVICE

FT203R YAESU'S NEW COMPACT 2M HANDIE

The ultra compactness of the FT203R is due mainly to Yaesu's chip component circuit board assembly, the chip components being installed automatically by robots. The 203's features include thumbwheel frequency selection, built in S/PO meter, 2.5W RF O/P at 10.8V, (3.5W O/P with FNB4). Vox activated switching is possible when used in conjunction with YH-2, Accessories supplies include FNB3, FTE-2 tone unit, CSC6 case and YHA-14A antenna.

FT203R	2.5W transceiver	£169.99 inc
FBA5	Case for 6AA cells	£6.50 inc
FNB4	12V Nicad pack	£36.40 inc
CSC7	Soft case (when FNB4 is used)	£6.50 inc
YH-2	Headset/Mic	£13.80 inc
MH-12A2b	Speaker Mic	£16.85 inc
SMC8-9AA	Charger (13A style)	£8.05 inc
MMB21	Mobile mounting bracket	£7.65 inc

HANDHELDS FOR 2m or 70cm
FT208R & FT708R



FT208R	2m Handheld 2.5W	£199.00 inc
FT708R	70cm Handheld 1W	£209.00 inc
SMC8-9AA	(13A style) Hand charger	£8.05 inc
NC7	Base charger	£32.95 inc
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FNB2	Nicad Battery Pack	£21.45
FBA2	Battery pack sleeve	£3.45
FLC5	Heavy duty case	£25.30
MMB10	Mobile bracket	£8.05

FT 726R MULTIMODE UHF, VHF, HF

FT726R (2)	Transceiver c/w 2m	£739.00 inc
21/24/28	HF module	£200.00 inc
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FT690R	Multimode Transceiver 6m		£249.00 inc
FT290R	Multimode Transceiver 2m		£269.00 inc
FT790R	Multimode Transceiver 70cm		£249.00 inc
SMC2, 2C	2.2Ah Nicads 'C' size	per set	£21.60 inc
SMC8C	220mA Charger (13A Style)		£8.80 inc
MMB11	Mobile Mount		£26.85 inc
CSC1A	Carrying case		£4.20 inc
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FM TRANSCEIVERS FOR MOBILE

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FT730R	70cm Transceiver 10w	£229.00 inc
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FRG7700	Receiver 0.15-30 MHz AM/CW/SSB/FM	£369.00 inc
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FF5	Low Pass filter 500 KHz	£10.75 inc

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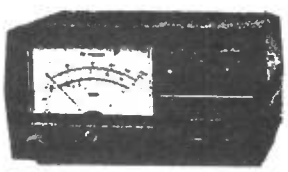
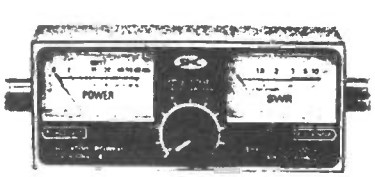
The Hansen range covers 30 quality models with top-of-the-line the FS710. This is a flat frequency response, peak envelope power and average in-line wattmeter with many novel features. Notable being the 'power independent' SWR scale – no forward power calibration knob, just direct reading SWR.

FS-500H



				£
		HANSEN		
FS710H	1.8-60 MHz	15/150/1500W	Pep	**97.75**
FS710V	50-150 MHz	15/150W	Pep	**97.75**
FS50HP	1.8-60 MHz	20/200/2000W	Pep	**96.60**
FS50VP	50-150 MHz	20/200W	Pep	**96.60**
FS500H	1.8-60 MHz	20/200/2000V	Pep	**77.80**
FS500V	50-150 MHz	20/200W	Pep	**77.80**
FS300H	1.8-60 MHz	20/200/1000		**50.60**
FS300V	50-150 MHz	20/200		**50.60**
FS200	1.8-150 MHz	20/200	Pep	**55.95**
FS601M	1.8-30 MHz	20/200W	Pep	**57.50**
FS601MH	1.8-30 MHz	200/2000W	Pep	**57.50**
FS602M	50-150 MHz	20/200W	Pep	**57.50**
FS603M	430-440 MHz	5/20W	Pep	**56.75**
FS210	1.8-150 MHz	20/200W	Auto SWR	**59.80**
FS301M	2-30 MHz	20/200W		**39.50**
FS301MH	2-30 MHz	200/2000W		**39.50**
FS302M	50-150 MHz	20/200W		**39.50**
FS711H	2-30 MHz	20/200W	Head	**41.00**
FS711V	50-150 MHz	20/200W	Head	**41.00**
FS711U	430-440 MHz	5/20W	Head	**41.00**
HB1	FS711H Coupler			**23.00**
VB1	FS711V Coupler			**23.00**
UB1	FS711U Coupler			**23.00**
FS5E	3.5-150 MHz	20/200/1000W	HF	**41.00**
FS5S	1.8-150 MHz	20/200/1000W	HF	**41.00**
FS7	145 & (432 MHz)	5/20/200	144	**44.85**
SWR3E	3.5-150 MHz	20/200/1000W	HF	**26.85**
SWR3S	3.5-150 MHz	F/S Meter ant.		**28.35**
SWR50B	3.5-150 MHz	Twin Meter		**26.85**
FS20D	3-150 MHz	5/20W		**39.85**
FS-800	1.8-150 MHz	6/30/150W		**115.00**
		JD		
JD110	1.5-150 MHz	10/100W		**13.80**
		S.M.C.		
S3-30L	Mini			**8.80**
T3-170L	3.5-170 MHz	Relative		**16.50**

T3-170L



NB: PRICES INCLUDE VAT AT 15%
Carriage free by post

SMC-HS

HF, VHF, UHF ANTENNAS MOBILE VERTICALS

SMC-HS Mobile Elements, tabulated below, feature an inbuilt PL259M connector, which mates with the SO239M on any of the four standard mounts. This arrangement is ideal for easy removal -band changes, comparative test, car wash, and anti-vandal, system checks from the feed point, portable operation and for ease of garaging etc. All models have fold over bases (either lift and lay or locking collar) except the 78B which has an inbuilt ball in case the mount must be fitted askew.

SMC 78F

GCD

SMC258

GCD

			P&P
	SMC-HS MOBILE ANTENNAS		
SMC6P2T/PL	Telescopic 2M PL259 fitting 0dB	**£5.75**	£0.85
SMCT144h	Telescopic 2M 1/2 wave BNC	**£9.20**	£0.85
SMC6PT/BNC	Telescopic 2M BNC fitting 0dB 1/4	**£5.75**	£0.85
SMC2H/PL	Helical 2M PL259 fitting	**£5.75**	£0.85
SMC2H/BNC	Helical 2M BNC fitting	**£5.75**	£0.85
SMCHS430	70cm 1/2 wave BNC fitting 2.5dB 1/4	**£7.30**	£0.65
SMC2QW	2M wave 0dB 1/4 1.6'	**£2.53**	£1.85
SMC2NE	2M wave fold 3.0dB 1/4 4.3'	**£7.30**	£2.00
SMC2VF	2M wave fold 3.0dB 1/4 3.5'	**£12.65**	£2.00
SMC78F	2M 7/8 wave fold 4.5dB 1/4 5.7'	**£14.95**	£2.50
SMC78B	2M 7/8 wave ball 4.5dB 1/4 5.6'	**£14.95**	£2.59
SMC78SF	2M 7/8 wave short 4.7'	**£14.95**	£2.50
SMC88F	2M/8 wave 5.2dB 1/4 6.5'	**£20.70**	£2.50
SMC118M	Colinear 2M 11/8 wave fold 7db 1/4 9.7'	**£33.35**	£2.65
SMC25B	70cm 2 x 5/8 fold 5.5dB 1/4 3.1'	**£13.80**	£2.00
SMC358	70cm 3 x 5/8 6.3dB 1/4 4.7'	**£18.40**	£2.00
SMC70N2M	Dual band 2M 2.7dB 1/4 70cm 5.1dB 1/4	**£18.40**	£2.00
SMCHS770	144/432 Duplexer 50W	**£16.50**	£1.85
SMC20SE	20M 1.72M 'fold over' 100W PEP	**£19.15**	£2.50
SMC15SE	15M 1.72M 'fold over' 130W PEP	**£15.70**	£2.50
SMC10SE	10M 1.72M 'fold over' 200W PEP	**£14.95**	£2.50
SMC17SE	17M 1.915M 'fold over' 200W PEP	**£17.25**	£2.50
SMC12SE	12M 1.915M 'fold over' 200W PEP	**£15.35**	£2.50
RSL-28b	Yaesu 10M mobile whip	**£10.65**	£2.00
SMCGCCA	Gutter clip 4 mtrs cable	**£10.35**	£2.00
SMCSOCA	Cable assembly 4M	**£5.35**	£1.50
SMCSOCAL	Cable assembly 6M	**£5.75**	£1.50
SMCTMCAS	Trunk mount c/w 6M cable	**£9.20**	£2.00
SMCSOMM	Magnetic base c/w 4M cable	**£10.75**	£2.00
SMCSOWM	Adjustable wing mount base	**£4.60**	£0.90
SMCGCD	Gutter clip deluxe	**£5.00**	£1.50
SMCBSD	Bumper strap deluxe	**£9.60**	£1.50
HS88BK	Bumper mounted extension for 144 MHz ant.	**£20.30**	£2.00

SOMM

HS770

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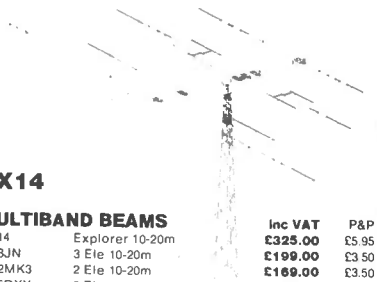
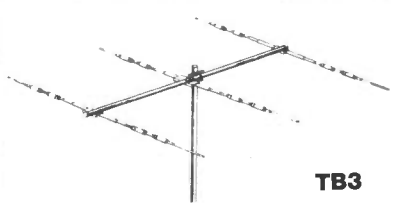
HF ANTENNAS

SMC have the greatest range of HF antennas eg. Multi Beams/Quads, over 20 models. Shown below is the sensational new Explorer 14 – contact us for full details.



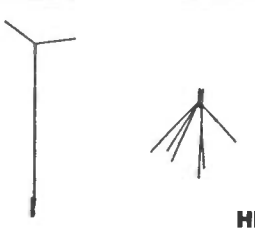
EX14

			Inc VAT	P&P
	MULTIBAND BEAMS			
EX14	Explorer 10-20m		**£325.00**	£5.95
TH3JN	3 Ele 10-20m		**£199.00**	£3.50
TH2MK3	2 Ele 10-20m		**£169.00**	£3.50
TH5DXX	5 Ele 10-20m		**£419.00**	£6.70
TH7DXX	7 Ele 10-20m		**£520.00**	£8.75
TB3	3 Ele 10-20 Jaybeam		**£189.75**	£5.90
HQ1	Mini Quad 10-20		**£169.00**	£4.00
G4MH	Mini beam 1-20		**£88.50**	£4.50
RA33JNR	3 Ele 10-20 Moseley		**£177.10**	£6.00
Mustang 2	2 Ele 10-20 Moseley		**£177.10**	£6.90
Mustang 3	3 Ele 10-20 Moseley		**£220.80**	£6.90
GQ2E	2 Ele 10-20 Quad		**£270.25**	£5.40
GQ3E	3 Ele 10-20 Quad		**£435.00**	£9.20
GQ4E	4 Ele 10-20 Quad		**£599.00**	£10.00
Hyquad	2 Ele 10-15M dipole 20M		**£325.00**	£6.00
LP1007	Log Periodic 13-20 MHz		**£1707.75**	DIST
3Y1015D20	3 Ele 10-20m		**£158.70**	£5.95
DB10/15A	3 Ele 10-15m		**£199.00**	£4.80



TB3

	MONO BAND BEAMS		
103BA	3 Ele Yagi 10m	**£69.00**	£3.50
105BA	5 Ele Yagi 10m	**£155.00**	£3.95
153BA	3 Ele Yagi 15m	**£95.00**	£3.50
155BA	5 Ele Yagi 15m	**£239.00**	£5.90
203BA	3 Ele Yagi 20m	**£179.00**	£4.90
204BA	4 Ele Yagi 20m	**£289.00**	£7.30
205BA	5 Ele Yagi 20m	**£399.00**	£9.40
402BA	2 Ele Yagi 40m	**£249.00**	£6.50
18TD	Dipole Tape 10-80m		



HF5V **HF5R**

	VERTICALS		
12AVQ	Vertical 10-20m	**£52.90**	£2.75
14AVQ	Vertical 10-40m	**£66.70**	£2.75
18AVT/WB	Vertical 10-80m	**£113.85**	£2.75
18V	Vertical 10-80m taped	**£36.22**	£2.75
C4	Vertical 10-20m	**£59.00**	£2.65
SMCHF5V	Vertical 10-80m	**£59.00**	£2.65
SMCHF5R	Radial Kit for above	**£38.35**	£2.65
	TRAP DIPOLE		
SMCTD/HP	High Power 10-80m	**£45.00**	£2.65
SMCTD/P	Portable inc coax	**£65.55**	£2.65
	MOBILE		
Tribander	10-20m Slide sw.	**£27.37**	£1.65
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Flexiwhip	10m only	**£19.21**	£1.85
Extra coils	For above to 160m	**£6.90**	£1.00
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SCANNING RECEIVER

MS-8400

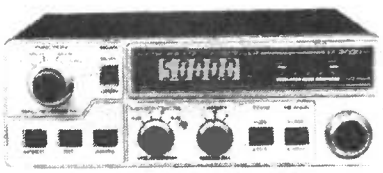
New from S.M.C. the MS8400 VHF/UHF microprocessor controlled scanning receiver with 40 programmable memory channels, keyboard entry of frequency or command; automatic band search, AM and FM selectable; 4 selectable scanning steps, priority channel, connections for external antenna, DC supply and loudspeaker. Supplied c/w telescopic antenna mounting bracket, etc.

SPECIFICATIONS

Frequency Range:	Low VHF 68,000 MHz – 88,000 MHz Mid VHF 108,000 MHz – 136,000 MHz High VHF 136,005 MHz – 174,000 MHz UHF 360,000 MHz – 512,000 MHz
Scanning steps:	5, 10, 12.5 and 25 KHz VHF (10, 12.5 and 25 KHz UHF)
Channels:	40 programmable memories
Modes:	AM or FM selectable
Scan rate:	Approximately 18 channels per second
Scan delay:	2 seconds – **Priority sampling:** 4 seconds
Audio output:	1.2 Watts
Selectivity:	Better than – 60 dB @ ± 25KHz
Power supply:	DC 12V – 16V 0.6A max
Memory backup:	9 volt, battery (PP3)
Antenna:	Telescopic antenna or External
Loudspeaker:	2.5" x 4" oval speaker
Size:	190(W) x 250(D) x 85(H) mm
Weight:	1.7kg

£249.00 inc.
Price includes free carriage

KDK KYOKUTO DENSHI CO. LTD.



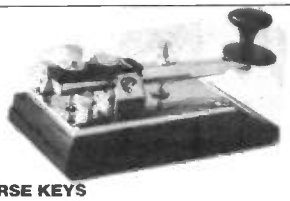
FM2033

144 MHz, 12VDC Transceiver. 25W/5W Hi/Lo (both adjustable). Compact 2 9/16" x 6 3/8 x 7 3/16". 12½ KHz steps (100 KHz fast QSY). Amber LCD 'Sunlight View', Side Lit. Display; 100's of Hz or channel number. Sensitivity **<0.2μV for 12dB** SINAD. Single knob frequency control "Dial". Endless or non-endless dial options. RIT: 1 KHz steps, V.F.O. + memory. Two 5 slot memories A, B, A + B, A x B. 11th memory instant "call" channel. Memories simplex or duplex channels. Band scanning, programmable limits. Scan halts, squelch + centre zero. Pause on scan halt for 3 seconds. Scan/tune/RIT from microphone ± 600 KHz split, plus cross memory. Repeater input listen by pressing "dial". Setable; steps, tone, splits, limits. Simple controls for safe mobile operation. C/W mobile mount, mic and handbook.

£239.00 inc
Price includes free carriage

NEW NEW

MORSE EQUIPMENT



MORSE KEYS

HK703	Straight Key	**£28.00**	£1.20
HK704	Straight Key	**£19.25**	£1.20
HK706	Straight Key	**£15.90**	£1.00
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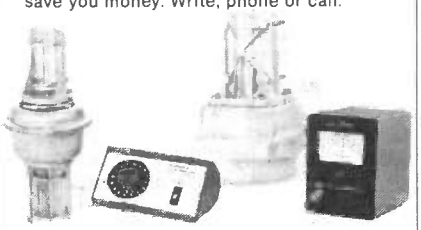

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RSGB NATIONAL

This year's RSGB National Convention at the NEC appears to have been a success for all concerned, and one can honestly say, with due deference to the cliché, that it was 'better than ever'.

Over the two days more than 10,000 people attended the convention and its lectures, displays, stalls and flea-market.

Most of the problems encountered last year, when the convention was held at Birmingham for the first time, seemed to have been ironed out by the RSGB committee. The hard work and careful organisation by the committee and their close liaison with the people who run the NEC, was particularly evident.

For instance, last year's major problem seemed to be actually getting in to the exhibition, with massive, slow-moving queues creating incredible delays. This year, although once again over 2000 people were waiting outside the hall before the doors opened on Saturday, they had all passed through the turnstiles and into the exhibition to snap up the first bargains in less than fifteen minutes.

The 'Majors'

Inside Hall 3 itself, all the major names amongst the equipment manufacturers and suppliers were represented as usual. Of course, the 'black box' stalls were crowded throughout the two days with a mixture of the curious, the envious, and even the potential buyers.

Certainly, judging by all those people with big cardboard boxes and broad grins to match making their way out of the exhibition, the big names seem to have had every reason to be pleased.

The larger firms certainly made it tempting with attractive displays from the likes of SMC, Thamet, Dewsbury and Lowe Electronics – all of whose staff were kept more than busy throughout. Firms such as these offered many special products and prices for the exhibition. Amateur Radio Exchange were also there with the ARE Club.

R Withers Communications provided one of the most active stalls, since they were quite prepared to fit the muTek front end modification and do 10m conversions on the spot. They also introduced the new 'Slim Jim' portable antenna which we have since tested and found to be very impressive.

In many cases the most important question seemed to be 'how will we get it home?'

Wood and Douglas had their full range of kits available, including two which were new to the market. These were a varactor multiplier kit for 24cms and a new updated 70cm linear amplifier.

Scarab Systems had a popular stall which featured software for the Commodore 64 and prototype RTTY for the ZX 81.

The BNOS Electronics display featured a new 70cm 50watt linear/preamp, the LPM432-10-50. This was the first time this had ever been shown running, and the initial response for BNOS seems very favourable indeed.

Of course all-British manufacturers of quality equipment were represented throughout the exhibition. These included muTek, who describe the response they received at the exhibition as 'superb'; Metalfayre, kept busy with their range of antennae; and Microwave Modules, whose METEOSAT display attracted tremendous attention.

On entering the exhibition one could not miss Allweld Electronics, with their own Altron Towers on show including the Altron SM30PM trailer-mounted mast and a display version of their

CONVENTION 1984

telescopic tiltover tower. Also on show was their AQ6-20/2E compact 4 band antenna, which demonstrates a remarkably high standard of engineering including unique fully-sealed loading coils.

MB Radio included in their display a new closed-circuit TV system which attracted a great deal of interest.

The display from Radio Shacks Ltd included a new satellite receiver system not yet on sale in this country, and in addition they were selling Hamsoft software for amateur RTTY.

WPO Communications had their latest kit on sale, the single band HF SSB/CW Transceiver mentioned in last month's *'Straight and Level'*, and the response they received for it was very good indeed.

Waters and Stanton found particular interest in 70cm equipment, demonstrating the level of participation in this often neglected band. In addition they sold their wide range of rigs and aerials, with the Yaesu FT-290R and FT-757GX proving especially popular. Also on sale was the range of ARRL handbooks.

The Flea-market

As well as the main exhibitions, those in the flea-market achieved a staggering level of success, making this part of the exhibition, bigger than ever this year, at least as popular as the main exhibition.

It is wrong to be mislead by the word 'flea'; firms like Bonex Ltd were carrying a comprehensive range of components, including inductors,

Activity in the flea-market

worthy of their role as Ambit's West London agents. Similarly Garex Electronics, with their popular range of scanners, monitors and FM detectors were to be found doing good business here.

A new firm, Duckbill Anchors Ltd, generated considerable interest with their attractive, well-designed ground anchors, new to the market.

The flea-market in general did much to illustrate the wide range which the hobby covers, with RTTY and television well represented in particular with equipment, components and spares, both new and secondhand, in abundance.

Competition here was just as fierce as amongst the 'majors' and there were some real bargains to be had. Anyone who believes that the age of the home constructor is nearly over need only take a look at the numbers scouring the tables here to see that the 'black boxes' do not have things entirely their own way.

The RSGB

Of course, the RSGB Exhibition was not only about manufacturers and retailers. Clubs catering for various aspects of the hobby were well represented.

Foremost among them was obviously the RSGB itself, whose stall directly opposite the main entrance to the hall was always busy.

Over the course of the weekend almost 250 new members joined the organisation. In addition, their bookstall was kept constantly busy selling all their guides and accessories.

As well as this, all the various RSGB committees were represented with informative displays and experts on hand to advise on any queries.

The VHF, HF and microwave committees, with their contest divisions, and the group for propagation studies, were amongst those present.

An interesting display was also provided by the West Midlands RAYNET illustrating the nature of this organisation's important work.

Solihull ARS operated a

special talk-in/talk-out station, GB8NEC, with an additional station, GB4NEC, working CW. Both stations were very active on the bands whilst also attracting much interest within the hall.

Affiliated Societies

Besides the RSGB itself, several other clubs were there to meet and assist members and non-members alike. The BARTG stall with its working teleprinter displays was a constant centre of activity, showing just how popular RTTY and its descendants have become.

Indeed, to underline this point, by midway through Sunday afternoon they had enrolled almost 150 new members. They also provided a service to many with their sales of PCBs and kits, and their new format magazine *'Datacom'* is a must for anyone interested in this aspect of amateur radio.

The British Amateur Television Club were also on hand with information, advice and membership forms. They were also in business selling books, manuals and PCBs related to ATV.

The G-QRP club was also busy with displays and information on this increasingly widespread form of operation. The genuine enthusiasm of the low-power lads manning the stall was obviously passed on to all those who spoke with them. The club's President, the Rev George Dobbs G3JRV (whose construction article appears elsewhere in this issue), also chaired the home-constructors forum on Saturday afternoon.

In the flea-market we met the Microwave Society, whose purpose is to promote and assist the use of amateur frequencies above 10GHz. Several members were on hand to give practical help to both those wishing to start up and those already active on these bands. During their stay at the NEC they enrolled 57 new members, bringing their total membership to over 300 people from 8 countries.

Lectures

Of course, since this was a convention in the fullest sense of the word we must not forget the wide-ranging programme of lectures and discussions taking place over the two days.

All of these, without exception, were well-attended to the point of overflowing. As usual they provided just the right mixture of information and controversy, and it is certain that many of the points raised will continue to be discussed outside the confines of the NEC. Certainly anyone taking or teaching the RAE in the near future could have done much worse than attend Saturday's lecture/forum on that matter.

Overall

One point that must not be overlooked is the particular care taken by the organisers from the RSGB and NEC in catering for disabled visitors to the exhibition. In this same vein, it was heartening to see the degree of interest shown in the RAIBC stall.

Indeed, any review of the exhibition must thank the organising committee of the RSGB for the obvious care taken to ensure the smooth running of the entire convention. These were: Norman Miller G3MVV (Chairman), Les Hawkyard G5HD, Robin Hewes G3TDR, William McClintock G3VPK, Gillian Tong G8ENO, Martin Shardlow G3SZJ and Ron Kingstone G4HHB.

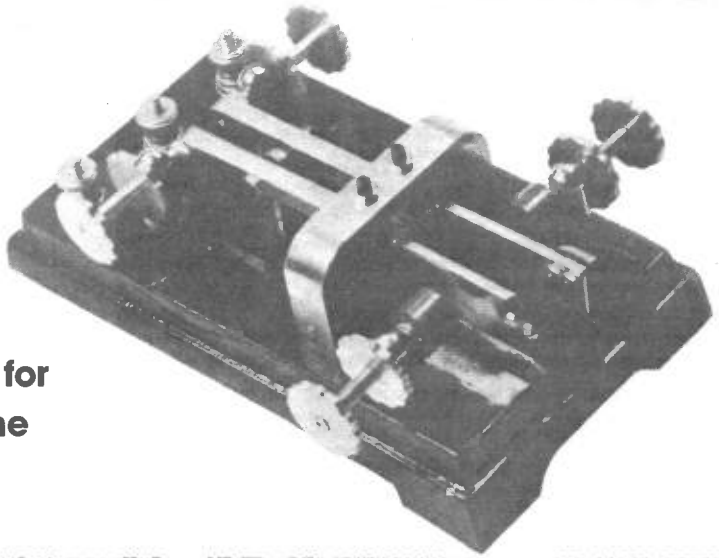
1985

All in all it seems that the 1984 RSGB convention has been a success whichever way you like to look at it. Indeed, with the exhibition only 48 hours past, the organising committee had already received over 40 major bookings for *next year's* exhibition.

All that remains to be stressed is the amount of pleasure to be gained merely by meeting fellow enthusiasts, be they new acquaintances or old chums. It adds so much to your enjoyment of amateur radio when names and numbers become faces and friends. What better reason to hope that we see you all again next year.

MR MORSE AND ALL THAT

Dave Green G4OTV



Some sound advice for those who dread the learning of Morse

Samual Finley Breese Morse has a lot to answer for! The code which he introduced all those years ago and which is still used extensively by radio amateurs and professionals, has been responsible for many a headache in the learning of it.

Learning the code takes self discipline and determination to succeed to the extent that you will be translating every bit of written information into dits and dahs in your mind. If you are out to beat the code in the shortest possible time, you will find yourself eating and sleeping Morse!

But, having mastered it there is a certain, impossible to describe, satisfaction in being able to send and receive Morse well. Once the bug has bitten there is really no turning back.

Do not be misled by those who will tell you that this is an antiquated, out-dated mode of communication with no future in these days of sophisticated AMTOR and packet radio systems. Excellent and fascinating as these new ways of transmitting data are, there is an inherent challenge and skill in using Morse well which can never be replaced and which ensures its future popularity.

When comparing CW with speech modes, it is unquestionably true that the code will still get through when the going gets too tough for SSB.

In my view there are three distinct stages in learning Morse. The first stage consists of learning the code and passing the test; the second covers the early days of using CW as a transmission mode (this can last up to a year or two depending on the time that is available for operating); and the final stage is the rest of your life.

The first two stages involve effort, determination and dedication but the third stage will amply repay all the time and hard work spent on the first two.

Pre-determined plan

Stage one is best tackled according to a pre-determined plan. Many clubs organise Morse classes where full use can be made of the expertise that the tutor will be able to provide. Mechanical aids are useful, particularly courses on cassette or record or one of the better computer programs. Also, once the alphabet has been mastered, the RSGB and other slow Morse transmissions are worth their weight in gold. Electronic Morse tutors such as the Datong unit can also prove very helpful; and it is worthwhile listening to Morse being sent from a number of sources, both off air and direct and both hand sent and electronically produced Morse.

In the early days a student should make himself a commitment to work on his Morse for brief periods but frequently. Something like fifteen minutes, three times a day, works very well for many people.

Those starting from scratch should learn the code in small easy stages starting, say, with the letters A to E. These letters must be learned thoroughly and at the correct character speed before moving on to the next group, say F to J. When the second group has been mastered, it is essential to go back and revise all the letters from A to J. This process is repeated adding a few new letters each time until the whole alphabet is completed. Once this has been achieved the gap between letters can gradually be reduced, thus beginning to build up speed.

Figures can be learnt by the same method except that here there are only two groups involved, the first of which is the numbers 1 to 5 and the second is 6 to 9 plus 0. Few students have many problems with learning numbers since they are formulated in a logical way.

Morse is learnt by teaching the brain to recognise the sound which each character makes. It is NOT learnt as a combination of dots and dashes. For example, the letter P should always be thought of as di-dah-dah-dit (which is what it sounds like) and not as dot dash dash dot!)

Concentration

When receiving it is important to concentrate on the letter that has been sent, but if it has not been decoded by the time the next letter is transmitted, then the original one should be discarded and concentration moved to the latest character. If this is not done, you will find that several more letters have been missed whilst you are still worrying about the one you are stuck on.

It will be found useful to get into the habit of writing in script rather than capital letters since this takes much less time. As proficiency increases it will be found possible to decode some words without writing them down; this is a technique which is very useful after the test has been passed.

It is important to be proficient at receiving Morse at a speed of at least 8 words per minute before beginning to practice sending. It helps a great deal to get an experienced Morse man to help with the initial stages of sending to make sure that no bad habits are being developed. It helps also to make recordings of your sending for playback later.

The Morse key should be held between the thumb and first two fingers keeping the wrist high and flexible.

It is important not to rest the wrist on the table. (No wrist resting!)

The time to apply for the test is when proficiency at sending and receiving at about 12wpm has been achieved although practice should be continued so that by the time of the test, Morse is being copied at about 15wpm. This additional margin will give extra confidence to face the Morse test man.

Once that brand new G4 or G0 call arrives, the real learning begins! The first real live CW QSO is often a fairly traumatic experience but this should not be allowed to deter you from mastering the mode. Making a sked with a local, understanding CW fan will allow for a gentle introduction.

At this stage there is still much to be learnt including abbreviations, some punctuation and procedural signals but all becomes clear with use. In many areas there is now considerable CW activity at the bottom end of the 2 metre band of which advantage can be taken.

Even after the licence arrives, time spent listening to Morse, particularly on the HF bands will be time well spent.

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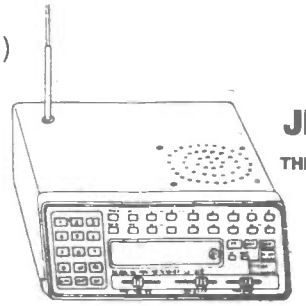

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ICOM IC-R71E GENERAL COVERAGE RECEIVER REVIEWED BY ANGUS McKENZIE, G30SS

The ICOM R70 receiver has already been well established, and the new R71 has many similar design features, but takes a few additional ideas from the IC751 transceiver, which I reviewed quite recently.

The R71 incorporates FM, AM, SSB, CW, and RTTY, with several switchable filters available. It tunes over the range 100KHz to 30MHz with continuous coverage. You can either enter a desired frequency using a number pad, or by tuning a VFO knob. Three tuning rates are available, with 10 and 50Hz per step on the slow rate, and 1KHz per step on the fast one. In the slowest position the step size increases to 50Hz when the knob rotation speed is increased, as in the 751 transceiver. Another switch selects normal VFO tuning or MHz steps.

Thirty-two memories are available which can be selected by rotating a multiturn click step knob round and round. The memories retain both frequency and selected mode, but the latter can be changed by pressing one of the mode buttons, FM/AM, CW, USB, LSB and RTTY.

The review sample was fitted with the narrower SSB filter, an AM filter and a fairly narrow CW filter, these being switchable on any mode except FM, which has a fixed, and rather too wide, bandwidth. The FM unit is an option, incidentally, as are some of the filters. Push buttons select VFO or memory operation, the VFO working from the memorised frequency as well which is fabulous. Other buttons select speech read out (optional), VFO A=B (thus two independent VFOs), VFO A or B, and memory right. If the second function button is pressed before memory right, the relevant memory channel is completely cleared.

When using the key pad, you have to press in the frequency including the required 100Hz step and after this you go to the required frequency when you depress the enter button. You can press in just MHz followed by enter, in which case the receiver tunes to the bottom of the MHz band, eg 14.000.

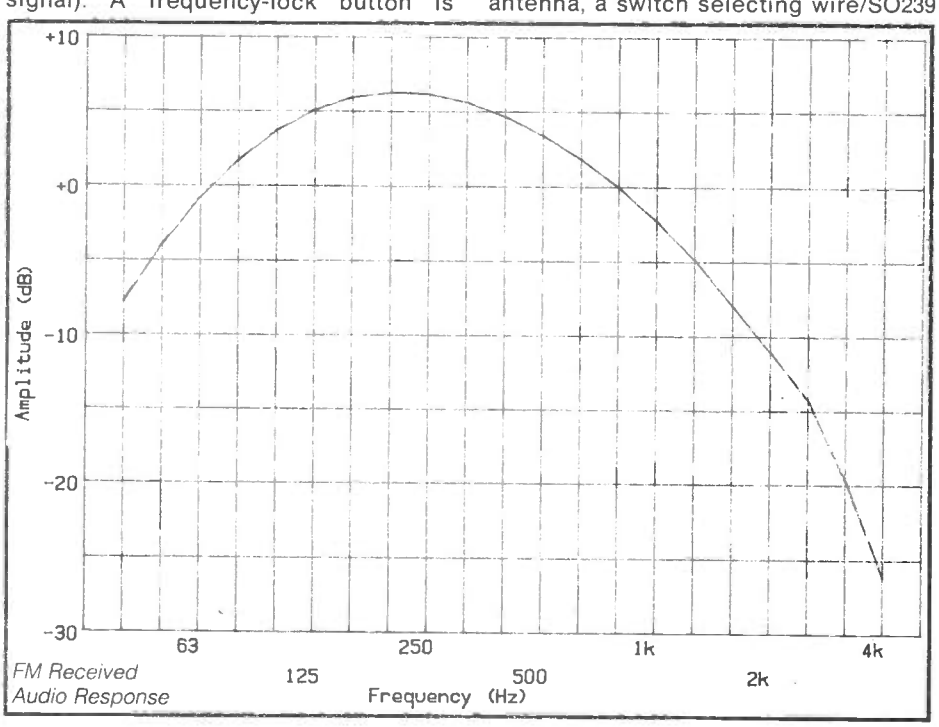
Above the key pad is an infra-red sensor which works with an optional infra-red transmitter for remotely operating many functions including frequency control. On the left side of the front panel are push buttons for noise blanker on/off and wide/narrow, with a rotary control for varying the blanking threshold. A three position switch selects AGC fast, slow or off. A three position slide switch selects RF preamp in/out or 20dB attenuating whilst to the right of this are two filter switches selecting wide, normal SSB, or CW filters.

A dim button when selected dims the basic displays, whilst a scan start/stop button is just below it.

A mode-selective scan button allows memory channels to be selected having the required mode inserted, memories with other modes being ignored. Three concentric pairs of rotaries provide RF and AF gain, tone/squelch level, and pass band tuning/notch filter, the notch filter having an in/out switch with it. On the front panel are sockets for headphones (quarter-inch mono jack) and tape recorder feed (3.5mm jack giving around 150mV output from a strong SSB signal). A frequency-lock button is provided together with an adjustment for tuning knob friction control.

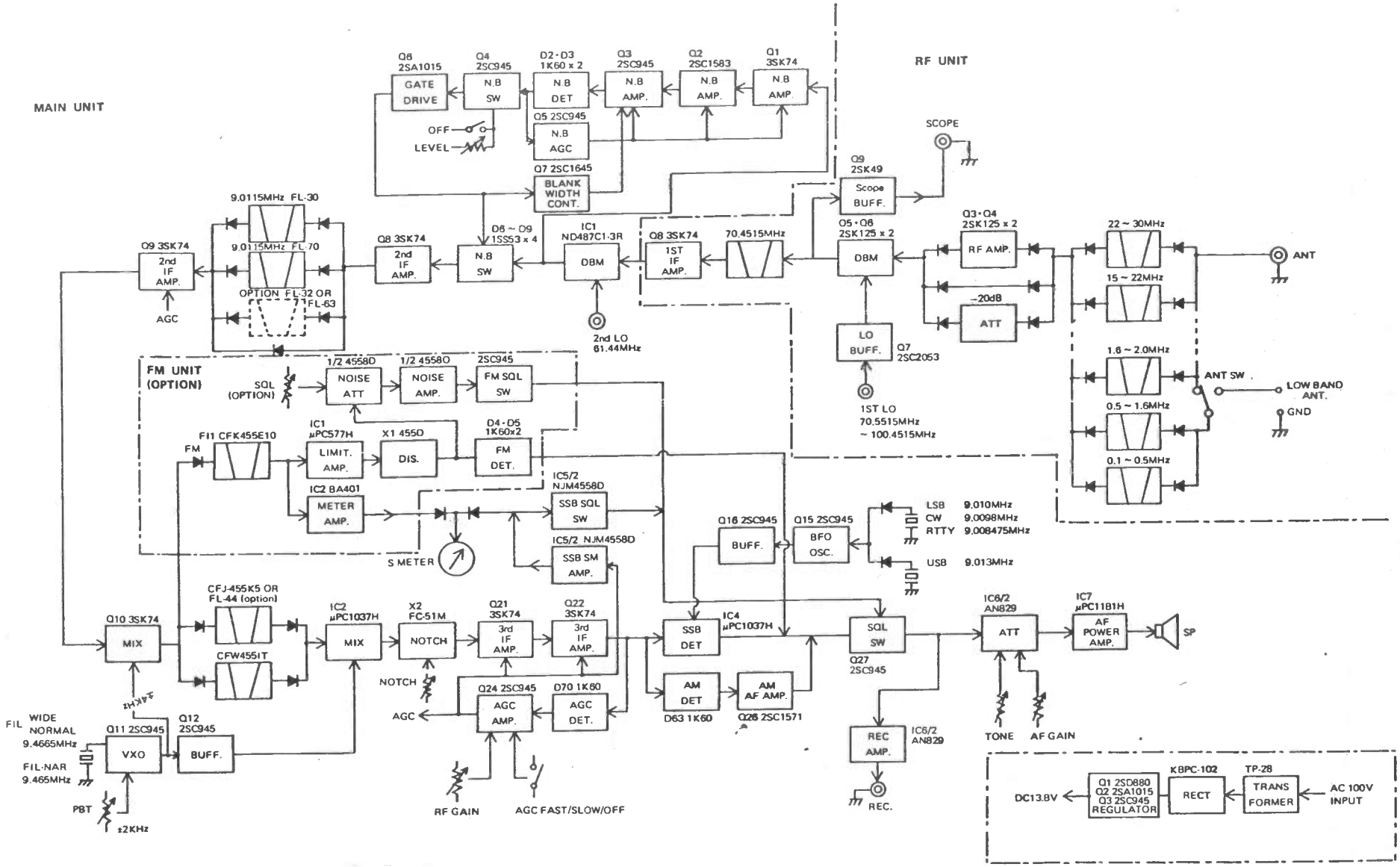
The frequency display is of a blue fluorescent type indicating frequency with 100Hz resolution and details of mode, VFO and memory. Indicators show when an FM signal is correctly tuned in and when the receiver is unsquelched.

The R71 is in a military green matt finished metal case which is quite attractive, having a carrying handle on the left side and feet on the right side. Underneath the chassis is a pull-out metal bail which allows the front to conveniently tilt upwards. On the back panel are two antenna inputs, an SO239, for LF/HF, and a separate spring loaded terminal specifically for an LF wire antenna, a switch selecting wire/SO239



FM Received Audio Response

RF/MAIN UNITS



separate for LF and HF, or the SO239 for all frequencies. A large spring-loaded earth clamp is provided. The mains input is on an IEC standard socket above which is an accessible fuse.

A 3.5mm jack socket is provided for interconnecting an external speaker, although the internal one is reasonably adequate and quite sensitive, it throwing audio upwards from the top of the receiver.

A phono socket is provided to give a feed to an external panadaptor which would allow display of the IF passband (around 6MHz wide) before filtering. The output impedance of the 70MHz IF socket is 50ohms, but unfortunately the level is some 20dB down on the antenna input level with RF preamp switched in, and this level is further reduced if the output is loaded with 50ohms, or the RF preamp switched out.

It would have been so simple to have made this socket much more useful by complimenting it with a switchable gain rather than a loss for external monitoring etc. It is also odd that the output is not mixed down from 70MHz to a more useful lower frequency, for how many scopes can satisfactorily display 70MHz?

A panadaptor is of course rather like a spectrum analyser, but a scope could also be useful if you wanted to monitor a very strong input signal in the lab. Another phono socket is provided for muting, so that the receiver can be used with a transmitter.

A panel on the back is fitted over a cut out into which an optional computer interface can be fitted, which can allow you to operate most of the facilities from a home computer, but no details were available on this at the time of writing.

Finally, another 3.5mm jack provides an earth when the squelch opens, which can be used to switch an external tape recorder on and off for logging purposes.

Ergonomics

As good as the IC751 is, I think the R71 ergonomics are even better, and it is delightful to be able to access any desired frequency faultlessly by using the push pad.

The speech readout is an optional extra which will be a boon to blind or partially sighted users, but as delivered the read out speed was incredibly slow. This could be speeded up quite easily by cutting just one wire. A preset speech output gain control allows the level to be set at any desired volume, the level being irrespective of the main audio gain setting.

I much prefer the positive click steps of the memory control to the 751 memory changing system. The pass band tuning control is centre indented, which allows one to get back to square one very conveniently. On the 751, it was a little irritating to have to use the second function button every time one wanted to change side band, and for this the R71 is much more convenient, although the second function button unfortunately still has to be used for FM/AM switching.

It was useful to have the front end gain switch on the front panel, and the filter selection is much less confusing, as you know where you are. The main audio gain control seems to operate in the most extraordinary manner, for there is virtually no audible difference between around halfway and flat out, gain reducing much too suddenly below halfway. Most of the time, I found I was using it at around 9 o'clock which seems a bit ridiculous, and there seems to be virtually no gain reserve at all *(see lab tests)*.

The gain control operates by varying a dc voltage which controls the gain of the audio IC. The tone control had a wide range of adjustment, but the squelch control covered only a comparatively small range, and there are times when you might want only a very strong signal to open the squelch, but even weak signals opened it at minimum sensitivity.

The notch filter notched out an annoying carrier extremely well, the notch itself being very narrow. The band pass tuning was very useful in selecting the position of the required IF pass band, but it seemed to alter this position too rapidly across the centre.

The noise blanker worked well, and the facility of choosing wide or normal pulse monitoring greatly improves its usefulness. The S-meter seemed to cover a less than optimum range of levels on SSB, whilst FM readings seemed to be much more sensitive, strong signals bringing the meter well above S9.

I very much liked the feel of the tuning knob assembly, and I soon got used to the automatic two - speed tuning rate on the slow tuning position. I found that I preferred the faster tuning rate for AM and, of course, FM. I was sorry to see no lower frequency IF output at a high level which could have been very useful at say 9MHz, especially if it came before the main filtering, but after the wider roof filtering.

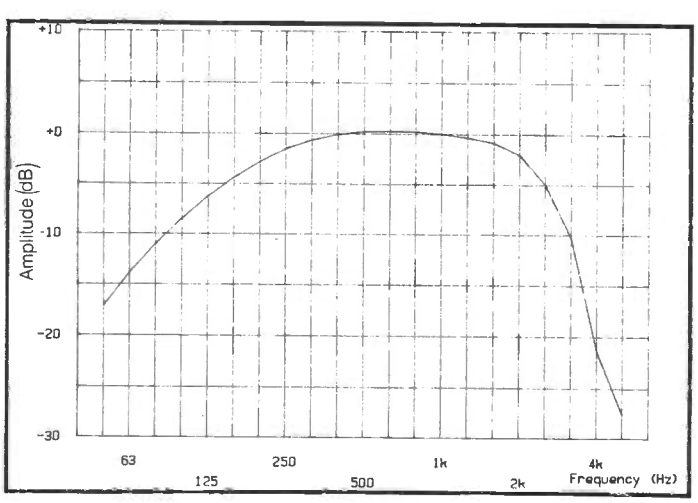
At this stage, I have to bring up an extremely controversial subject, that of the frequency indicated referred to the true input carrier frequency. On FM and AM the R71 is right on channel when the appopriate mode is tuned in. However, for some inexplicable reason when changing mode, the R71, like the 751 actually changes frequency by 1.5KHz, including the frequency read out.

I found this incredibly irritating. Even more irritating is the situation with SSB. I feel extremely strongly that the receiver should be correctly tuned when the read out represents the frequency at which the carrier would be if it were transmitted.

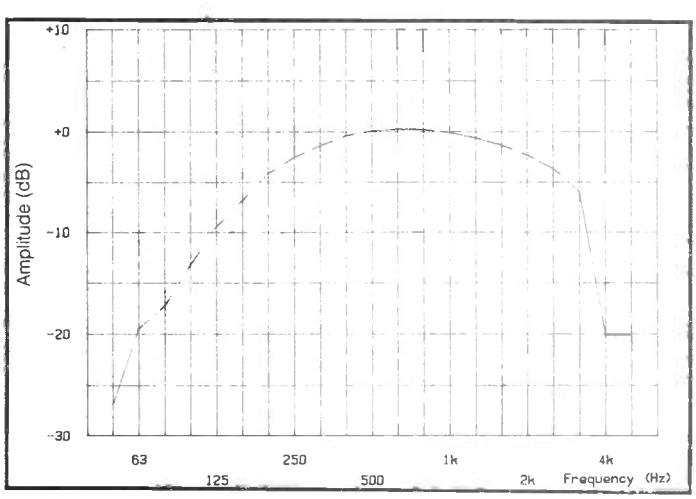
I also feel that when you change from one side band to the other, the frequency read out should not change, and neither should the equivalent carrier frequency, so that if one tuned in an AM signal on SSB, you would hear either one or the other side band at the right pitch without retuning.

On SSB there was an offset of 500Hz between zero-beating the carrier and the frequency indication. Furthermore, when simply changing the side band, the read out frequency changed by 3KHz, but the actual tuned equivalent carrier frequency only changed by 2.5KHz. If you can understand this you are a better man than I, and matters become even more baffling.

On LSB, the frequency readout coincided perfectly with the equivalent carrier frequency, but on USB there was a 500Hz offset. When we come to CW, the frequency indication is supposed to be



AM Received Audio Response



SSB Received Audio Response (Wide Filter)

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offset by 900Hz from the zero beat frequency, but the review sample had a 780Hz offset.

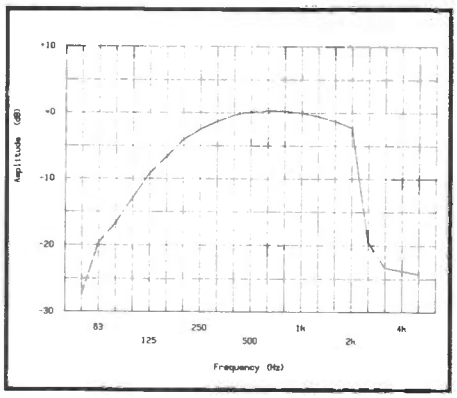
A very similar, and what appears to me to be a barmy situation appears with the ICOM 751, and several other ICOM rigs. I would here like to make a concrete suggestion to sort out matters in future, for there is not only a thoroughly inconsistent situation between manufacturers, but between different models made by the same company!

I realise the reasons behind the aggro are concerned with the positions of filters, etc, but it should be a simple matter in modern synthesised rigs to achieve the right tuned frequency together with the right dislayed one. I suggest that the readout should always be that of the carrier, or equivalent carrier frequency, and when selecting USB or LSB, the rig should select the appropriate side band referred to the same carrier frequency.

On CW, the displayed frequency should correctly indicate when there is a zero beat produced. This then allows a transceiver to offer a transmit frequency which is zero beat with the received one. The RIT control could then be adjusted to give the required beat note.

I feel very strongly that this very annoying inconsistency should be settled once and for all, so please write in with your opinions and thus air the problem. My suggested solution would allow more accurate transceiving on CW, and does seem more logical for SSB. Incidentally, the Trio TS830 does exactly what I suggest.

I did find the MHz bands much more easy to select with the press pad than by rotating the tuning dial in the MHz position. I wish that a decimal point could have been inserted which would have allowed quicker access to a frequency than the existing method which requires you to enter five or six digits. It would also have been convenient to have had the facility for QSY up and down by an entered frequency increment.



SSB Received Audio Response (Normal Filter)

I have been playing with this rig for two or three weeks and have listened to all types of transmission both during the daytime and in the evening on all bands and appropriate modes, using my normal LF and HF antennas interconnected with it, with an appropriate ATU when necessary.

The RF sensitivity seemed fairly good throughout, although I think I have had better sensitivity on 10m FM from one or two other boxes. What was particularly amazing was the superb front end performance right across the board, and RFIM problems just did not seem to exist.

When tuning in very weak CW signals I was struck by the excellent separation and the absence of muck around them. The 7MHz band always proves to be a hard test for a receiver, and the R71 was superb here.

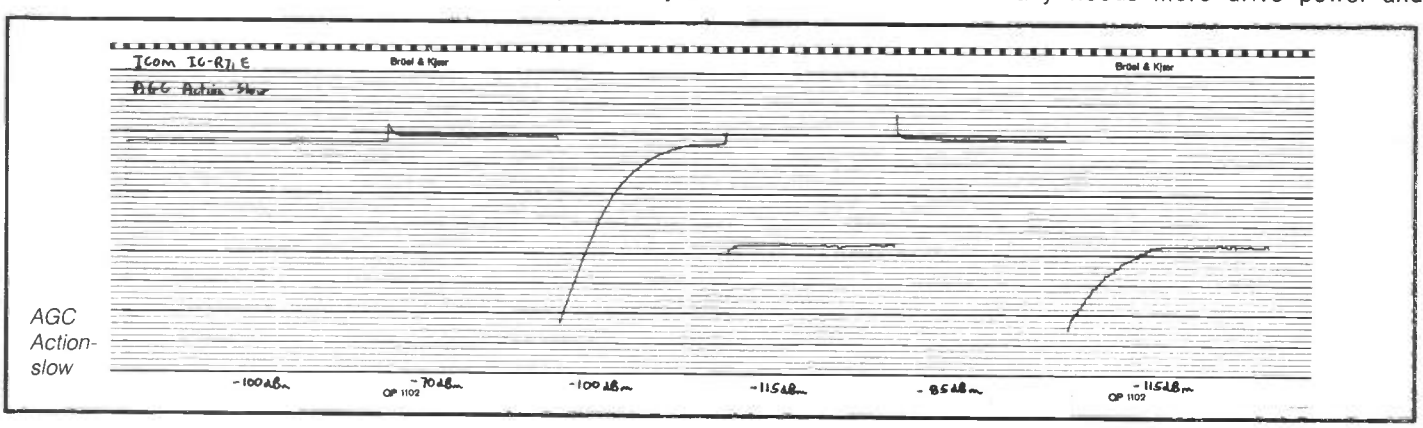
The fast and slow AGC speeds seemed well optimised, but it was useful also to be able to switch off AGC and use manual RF gain control. The AGC does not affect the RF or first mixer stages, but it does not really need to as these were so well designed.

FM quality was excellent, but the filter failed to separate 10KHz channelling anywhere near well enough, and ICOM should do something about putting in narrower filters here.

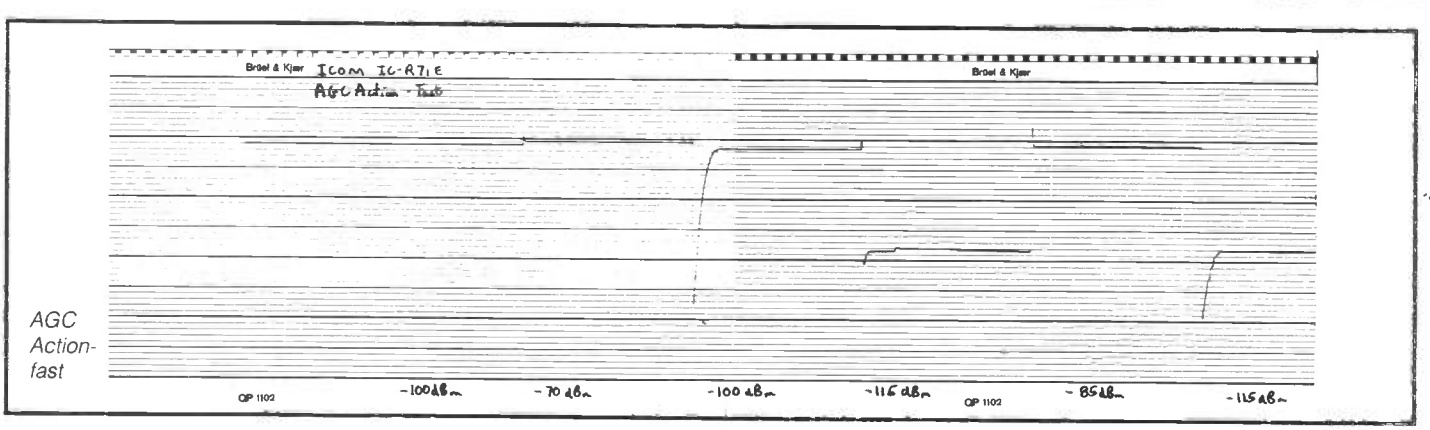
The SSB and CW filters were superb, and the AM wide one provided just the right pass band for best communication quality on speech, consistent with excellent rejection of adjacent channel interference. Whilst SSB audio was good, the AM quality left a lot to be desired.

In a comparative test with the Surrey Elecronics modified Yaesu FRG7700, the ICOM's reproduction showed up bad base distortion combined with only mediocre quality at middle frequencies – good enough for communication but nowhere near good enough for pleasurable listening to long, medium and short wave broadcasting. ICOM desperately need to improve on their very poor AM detector quality.

There did not seem to be any real audio output stage, and yet this did not seem to clip, which is puzzling. The internal speaker goes plenty loud enough though, but a higher quality external one usually needs more drive power and



AGC Action-slow



AGC Action-fast

gain, which is missing here.

We tuned over the entire range covered by the receiver (having tightened up too many loose internal screws), and there were very few spurious carriers around, which in any case were very weak.

One of the internal screws was on the verge of falling out, and ICOM must tighten up quality control, although the ride between Japan and the UK can be rather rough, causing the usual loose screw aggro.

The performance of this set from an RF and IF point of view is almost beyond criticism, and its ability to receive very weak stations on long or medium wave is quite astonishing, showing that the dynamic range that this receiver can cope with is as wide as any that I have tested, the IC751 being virtually identical though.

Lab tests

The RF input sensitivity was clearly inferior to that of the IC751, and quite frankly it was not particularly good, which is rather puzzling. One does not need sensitivity below 21MHz, but one certainly does on 10m, and perhaps the RF preamp could usefully have had more gain on the HF bands which could have helped greatly, since after all you can switch the preamp out to improve RFIM.

The FM sensitivity was also poor, partly because of the wide FM filter. The RFIM performance measured stunningly well, and a receiver with such a high RF intercept point shows superb front end design.

To put matters into perspective, this rig has an RF intercept point well over 30dB higher than that of the Trio R2000 which I recently reviewed, so that intercept points with RF preamp in will be over 60dB down on the levels that would be noted on the Trio, and this really is saying something.

What can one say about a receiver that has a reciprocal mixing ratio as high as 104.5dB at only 20KHz off frequency, extending to 123dB at 200KHz which is probably stretching my test equipment!

These sorts of figures are particularly amazing for a synthesiser controlled rig, showing just how far we have come in a few years.

IF selectivities are very similar to those of the 751, it being easily possible to note that 80dB down is only twice as wide as 3dB down! How about 6KHz bandwidths for AM wide at the top, and only 8.6KHz wide for 80dB down. There are not many rigs on which you can make any sensible measurement at all at -80dB!

The CW narrow filter was also very good but was not quite matched as well as the one on the IC751. We measured the FM selectivity with both old and new methods, and whilst the side skirts were very steep indeed, the filter was clearly too wide for 10m FM, although slightly narrower than the filter on the IC751.

FM capture ratio measured well, and the ratio between the FM 12dB sinad point on 10m, and the quieting performance at the same level showed minimal distortion on weak FM signals. The 3dB limiting point was at the same level as the 12dB sinad one, and perhaps it should have been at a lower level.

AGC slow was very slow indeed, giving an excellent audible dynamic range on a strong SSB signal. Fast AGC is very effective at medium and high levels, gain recovery taking around half a second or so. Note from the pen charts that gain does not come up very much on low level signals, which is fairly normal.

The S-meter sensitivity for S9 was just about right with RF preamp in on SSB, but we were amazed to find that fairly weak FM signals came right up to the top, showing FM calibration to be around 31dB more sensitive than SSB! Putting it another way, an S9 + 20 FM signal would not even read S1 on SSB.

The audio distortion performance was checked on FM, AM and SSB for 1V out across 8ohms. FM was very satisfactory, whilst AM was diabolical. Distortion at 1KHz might be just acceptable, but 35% distorition at 80Hz shows that something is severely wrong with the design of the detector.

Distortion does not seem to go down that much at lower modulation depths, and it only falls slowly as the modulation frequency is increased above 80Hz. I suggest that ICOM engineers could do a lot worse than study Trevor Brook's excellent AM detector ciruitry! SSB distortion, however, was much better, and completely satisfactory.

After much scratching of heads, we found that we were unable to get enough audio gain to produce clipping, either of FM or SSB into 8 ohms, so it seems that you will have to be content with around 1W output which is not really enough for an external speaker. The FM audio response is well controlled up to 4KHz, with maximum output at around 250Hz, falling gently at LF.

The AM wide response is reasonably flat between 500Hz and 1.6KHz falling steeply above 2.5KHz, and gently below 250Hz. This is about ideal for communication, but is a little too narrow for the reproduction of music on AM. The normal SSB response shows that the pass band tuning centre indent point cuts a little bit too much HF, the pass band being slightly too near the carrier, but it is simple to correct it.

The overall ultimate signal-to-noise ratios were excellent on FM and AM wide showing no particular problems or nasty breakthroughs. The notch filter was remarkably good, and far better than that of almost any other rig tested in the last year.

Conclusions

There can be no doubt that there is much to praise highly in this new Icom receiver, but I have to be a little harder when criticising a receiver than the receive section of a transceiver, for a receiver has to stand or fall by its receive performance. I have no qualms at all about SSB or CW, but the AM quality is very poor indeed compared with so much of its competition, just because of a thoroughly dreadful AM detector.

The FM side is better than many competitors, but whilst the filter will be adequate for use with transverters or converters from higher frequencies, it is inadequate for the established spacing on 10m FM.

If you are purely interested in receiving all modes within the range of the R71 at communication quality, then you will be delighted with this model which is so good ergonomically, and in many ways the performance comes up to professional standards.

In view of the AM problem I don't think that this receiver is one for the short wave quality receiving enthusiast who likes to potter around and listen to entertaining programmes from all over the world.

It seems so ridiculous that Icom have got a simple matter wrong, and surely

Capture Ratio, FM	5.4dB
Audio Quieting, FM (at 12dB Sinad Point)	15.4dB
3dB Limiting Point, FM	-119dBm
Distortion, FM (at 125mW audio output/8 ohms)	
0.5KHz deviation	1.4%
3KHz deviation	2.7%
5KHz deviation	3.1%
Product Detector Distorition, SSB (-80dBm)	1.0%
Maximum Audio output into 8 ohms, (10% THD not reached)	1.0watts @ 2.7% THD
Maximum Audio output into 4 ohms (10% THD not reached)	1.3watts @ 2.7% THD
Best obtainable Signal/Noise, FM	55dB at -69dBm RF Level
CCIR/ARM weighted	49dB
Best obtainable Signal/Noise, AM	57dB at -70dBm RF Level
CCIR/ARM weighted	56dB
Recorder output level	150mV on strong SSB Signal
Squelch Sensitivity, FM	
Maximum	-122.5dBm (0.17μV)
Minimum	-110.5dBm (0.68μV)
Notch Filter depth	>40dB
AM Distortion, 1KHz, 90% mod	AGC Slow . . . 5.9% AGC Fast . . . 4.8%
80Hz, 90% mod	AGC Slow . . . 34.5% AGC Fast . . . 35.4%

ICOM IC-R71 HF RECEIVER LABORATORY MEASUREMENTS

Sensitivity for 12dB Sinad, FM	
29.6 MHz (1KHz modulation, 2.5KHz deviation)	-115.5 dBm (0.35μV)
Sensitivity for 12dB Sinad, SSB (1KHz beat note)	
28.4 MHz	-119.0dBm (0.24μV)
21.3 MHz	-120.5dBm (0.21μV)
14.3 MHz	-120dBm (0.22μV)
7.05 MHz	-119.5dBm (0.23μV)
3.7 MHz	-116.5dBm (0.34μV)
1.85 MHz	-114.0dBm (0.45μV)
1.0 MHz	-95.5dBm (3.8μV)
Sensitivity for 10dB Signal to Noise, AM	
15.2 MHz	-106dBm (1.12μV)
7.1 MHz	-105.5dBm (1.28μV)
1.0 MHz	-82.5dBm (17.2μV)
200 KHz	-91dBm (6.4μV)
RF Preamp gain (15.2 MHz)	9.5dB
RF Attenuator Value at 15.2 MHz	20dB

Selectivities;	SSB	AM(Wide)	CW(Narrow)
3dB Bandwidth	2.1KHz	5.8KHz	0.2KHz
6dB Bandwidth	2.4KHz	6.3KHz	0.4KHz
40dB Bandwidth	2.8KHz	8.5KHz	0.8KHz
60dB Bandwidth	3.6KHz	8.6KHz	1.9KHz
80dB Bandwidth	4.2KHz	8.6KHz	2.0KHz

Selectivity, FM	
Blank Carriers off channel to degrade Sinad by 3dB (ref. 12dB Sinad)	
-/+12.5KHz spacing	62/62.5dB
-/+25KHz spacing	78/78.5dB
Selectivity, FM 2nd Method (see text and article p60)	
Carriers off channel modulated with filtered white noise (ref 12dB Sinad)	
-/+10KHz spacing	9/12.5dB
-/+12.5KHz spacing	27/31.5dB
-/+25KHz spacing	78/79dB
Reciprocal Mixing Performance (ref noise floor), SSB	
RF Level required off channel to degrade Sinad by 3dB	
20KHz spacing	104.5dB
50KHz spacing	112.5dB
100KHz spacing	118.5dB
200KHz spacing	123.5dB
RFIM Performance, FM	
RF Level of carriers off channel for 12dB Sinad product (ref. 12dB Sinad)	
+50/+100KHz	86.5dB
+100/+200KHz	86.5dB
Calculated RF intercept point	+13.5dBm

RFIM Performance, SSB at 28.4KHz
Carriers spaced at +100/+200 KHz for 12dB Sinad Product

	RF Level(ref. 12dB Sinad)	Calculated RF Intercept
28.4MHz	88dB	+13dBm
7.1MHz	85dB	+9dBm
3.7MHz	80.5dB	+7dBm
1.9MHz	88dB	+18dBm
1.0MHz	77dB	+20dBm

S Meter; RF Levels Required to give the following readings.

		FM	SSB
S1	-130dBm (0.08μV	-97.5dBm (3.1μV)	
S3	-115dBm (0.4μV)	-94dBm (4.4μV)	
S5	-111dBm (0.64μV)	-89dBm (8.0μV)	
S7	-108dBm (0.9μV)	-82dBm (17.2μV)	
S9	-105dBm (1.3μV)	-74dBm (47μV)	
S9+20dB	-101dBm (2.0μV)	-60dBm (220μV)	
S9+40dB	-84dBm (14.5μV)	-41dBm (2mV)	
S9+60dB	******* Not Calibrateed *******		

S9 Level Variation, SSB	
28.4MHz	-74dBm
14.2MHz	-75dBm
3.7MHz	-70.5dBm
1.0MHz	-58dBm

they will be able to put it right in future. You can now purchase a plug-in external touch pad frequency control for the IC751, but this too has rather high distortion on AM, the circuitry being very similar.

I think the R71 may well be of great interest to professionals, for it is so much cheaper than many professional receivers which it might well outclass. Icom do need to look more carefully though at minor items such as the 70MHz IF output to gild the lily.

It has been particularly fascinating reviewing this receiver which in so many ways far outclasses all other amateur radio communicaton receivers that I have tested, so it can be strongly recommended, but with the provisos already mentioned.

Just before going to press, the importers, Thanet Electronics supplied the infra-red remote control unit type RC-11. A hand operated unit is supplied complete with an extra board which has to be inserted inside the receiver. This combination allows many functions to be remoted, once the remote button is pushed in on the front panel.

The remote control, measuring 175 x 63 x 20mm, is very easy to use and incorporates batteries. Buttons on the front panel of the remote controller select mains on/off, audio volume up and down, frequency increments up and down (50Hz or 1KHz, dependent upon main rig step setting), receive mode AM, FM, USB, LSB, CW and RTTY, audio mute on/off, speech synthesiser (if fitted), VFO A or B, VFO or memory and memory channel.

At the bottom of the panel is a duplicate of the normal 3 x 4 number touch pad, including clear entry and enter. It is possible to select both frequency and memory channel in the normal way, the latter requiring just the memory button to be pressed followed by the number of channel and then enter.

The memory channel is then accessed when the VFO/memory button is pushed for memory. I found this remote control extremely useful and fun to operate, but I have just one criticism. Due to the way the rig is designed, it was not possible to remote the wide/normal IF selectivity facility, so you either have to listen to all modes in wide selectivity, which is tiresome for everything other than AM, or with the SSB filter which is then impossible for AM.

This will just mean that you will occasionally have to uncurl yourself from your armchair, put feet on ground, and stagger across to the selectivity switch, perhaps when you are in a bleary state, to change IF band width!.

Now that I realise that the audio gain can be varied remotely, I can see why I found the audio gain control circuit very odd. I still feel that it could be improved, so my main remaining grumble is still that of the AM distortion. I feel that the remote facility finally gilds the lily, and the rig is that much more recommendable.

What price

HF Equipment

IC–751	All band AM,FM,SSB,CW + Gen Cov Rx. 32 Memories.	1049.00
PS35	Internal switched mode power supply	149.00
SM6	Desk microphone	34.50
HM12	Hand microphone with up/down scanning	16.50
EX310	Voice synthesizer module	39.00
RC10	Frequency controller unit	29.95
CR64	High stability xtal unit	49.95
FL32	9MHz CW/RTTY filter – 500Hz	39.00
FL63	9MHz CW/RTTY narrow filter – 250Hz	39.00
FL33	9MHz AM filter – 6KHz	32.50
FL70	9MHz SSB wide filter – 2.8KHz	35.50
FL52a	455KHz CW/RTTY filter – 500Hz	79.00
FL53a	455KHz CW/RTTY narrow filter – 250Hz	79.00
IC–745	All band SSB,CW,AM(Rx only), Gen Cov Rx. 16 mems.	839.00
PS35	Internal switched mode power supply	149.00
SM6	Desk microphone	34.50
HM12	Hand microphone with up/down scanning	16.50
EX310	Voice synthesizer unit	39.00
EX242	FM unit Tx & Rx	32.50
EX241	Marker unit	15.95
EX243	Curtis keyer unit	39.00
FL45	9MHz CW filter – 500Hz	45.00
FL44a	455KHz SSB narrow filter – 2.4KHz	79.00
FL52a	455KHz CW/RTTY filter – 500Hz	79.00
FL53a	455KHz CW/RTTY narrow filter – 250Hz	79.00
FL54	9MHz CW/RTTY narrow filter – 270Hz	39.00
IC–740	No longer available. Accs still in stock.	
PS740	Internal switched mode power supply	149.00
SM5	Desk microphone	34.50
EX241	Marker unit	15.95
EX242	FM unit	32.50
EX243	Curtis keyer	39.00
FL44	455KHz SSB filter – 2.4KHz	79.00
FL45	9MHz filter – 500Hz	45.00
FL52	455KHz CW/RTTY filter – 500Hz	79.00
FL53	455KHz CW/RTTY narrow filter – 250Hz	79.00
FL54	9MHz CW/RTTY narrow filter – 270Hz	39.00
IC–730	10–80 Mtrs compact transceiver	659.00
PS15	External power supply – 20amps	119.00
PS20	External power supply with speaker – 20 amps	176.00
SM5	Desk microphone	34.50
HM7	Hand microphone with pre amp	14.95
EX202	LDA unit for use with AT100/500	13.50
EX203	CW audio filter	14.50
EX205	Transvertor unit	14.00
EX195	Marker unit	17.00
FL44	455KHz SSB filter – 2.4KHz	79.00
FL45	9MHz CW filter – 500Hz	45.00
FM04	FM unit Tx & Rx	49.00
IC–720A	No longer available. Accs still available.	
PS15	External power supply – 20 amps	119.00
PS20	External power supply with speaker 20 amp	176.00
CF1	Cooling fan for PS20	24.00
SM5	Desk microphone	34.50
FL32	CW narrow filter	39.00
FL34	AM xtal filter	34.00
BC10	Memory back up unit	5.95
FM03	FM unit Tx & Rx	89.00
IC–R70	General Coverage Receiver 0.1–30MHz	549.00
EX257	FM unit	32.50
FL63	CW narrow filter	39.00
FL44a	455KHz SSB filter	79.00
CK70	DC cable kit	5.75
7072	Interface unit to transceive with IC720A	97.50
IC–R71	All mode Gen Cov Rx, k pad entry, 32 memories	649.00
RC11	Remote control unit for above	49.00
IC–2KL	1KW PEP Linear, auto band switching, complete with –	
2KLPS	Power supply to run 2KL linear	1303.33
IC–AT100	100Watt Automatic antenna tuner	269.00
IC–AT500	500Watt Automatic antenna tuner	369.00
IC–PS30	Systems power supply, 25 amps continuous	229.00
IC–AH1	Mobile antenna, 3.5MHz–30MHz	199.00

VHF Equipment

IC–271E	Multimode base station, 25w, 32 memories	629.00
IC–271H/E	High power version of above, 100w	789.00
PS25	Internal switched mode power supply	89.00
EX310	Speech synthesizer unit	39.00
AG20	Internal receive pre-amp	49.00
SM6	Desk microphone	34.50
IC–290D	25W Multimode mobile, 5 memories, scanning mic	469.00

IC-751, £1049.

The IC-751 now has an interesting and useful addition, a remote push-button frequency selector pad, so you can either twiddle knobs or press buttons.

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options. The 751 is fully compatible with ICOM auto units such as the AT- 500 and IC-2KL.

Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, direct feed mixer in the front end, full break-in on CW and AMTOR compatibility.

For more detailed information on this excellent set, please get in touch with us.

IC-R71E, £649.

The best has just been made better! The ICOM IC-R70 receiver has had some important additions made to its specifications and this model is named the IC- R71E. Here are some details:–

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70 MHz 9 MHz and 455 KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100 db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct entry keyboard into twin VFO's with 32 programmable memories. Auto squelch tape record function.

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

The IC-R70 will still be available at £549.00. Ask for a leaflet giving the full details of these two fine receivers.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Tha

perfection?

IC-27E	25W FM mobile, 9 memories, multi function display	319.00
UT16	Voice synthesizer unit	25.00
IC-25H	45W FM mobile, high power version of old IC25E	359.00
BU1	Memory back up unit for mobiles	24.50
	DC leads (flat pin or square 6 pin)	4.50
	DC Plugs (flat 4 pin)	.30
	DC Sockets (flat 4 pin)	.30
IC-2E	Synthesized hand portable, 1.5 watts	169.00
IC-O2E	Synthesized hand held, keypad entry, LCD display	229.00
ML1	10 watt booster unit for 2E	69.00
BP3	Standard battery pack	25.00
BP2	Low volts high capacity (long life)	38.00
VP4	Empty battery pack, takes 6 x AA size cells	7.95
BP5	High volts high capacity (high power)	48.00
BP7	High volts high capacity (for use with O2E ONLY	59.00
BP8	Low volts high capacity	49.00
DC1	12v regulator pack (2E ONLY)	12.50
CP1	12v charger lead for cigar lighter	4.95
FA2	Helical antenna	7.50
LC1	Leatherette case (BP5)	5.00
LC2	Leatherette case (BP4)	5.00
LC3	Leatherette case (BP3)	5.00
LC11	Case for O2E (BP3)	5.00
T/L1	Heavy duty leather case (all batt packs)	21.27
BC25E	240v wall charger for 2E	6.69
BC25U	110v wall charger for 2E (USA)	6.69
BC16E	240v wall charger for O2E (BP8/BP7)	9.95
BC30	Desk top drop in charger (fast and slow) old packs	56.35
BC35E	Desk charger all packs new & old (fast/slow)	56.35
HM9	Speaker microphone	16.50
IC-202S	SSB Portable, + CW, 3 watt output	199.00
BC15E	AC Charger 240v	41.80
BC20	DC Charger 13.8v	41.80
	DC lead	1.75
	Telescopic antenna	1.50
LC25	Leatherette carrying case	8.25
FA1	Helical screw in antenna	7.50
UHF Equipment		
IC-471E	Multimode base station, 25watts, 32 memories	699.00
PS25	Internal switched mode power supply	89.00
EX310	Voice synthesizer unit	39.00
SM6	Desk microphone	34.50
IC-490E	Multimode mobile, 10 watts, 5 memories	495.00
IC-45E	FM mobile, 10 watts, 5 memories	329.00
BU1	Memory back up unit for mobiles	24.50
	Spare DC leads (flat 4 pin or square 6 pin)	4.50
	DC plugs & sockets (flat 4 pin)	.30
AG1	Mast head pre-amp for 471/451/490	49.00
IC-4E	Synthesized hand portable, 1.5 watts	219.00
IC-O4E	Synthesized hand held, k'pad entry, LCD display	T.B.A.
FA3	Flexi 1/4 wave antenna	7.50
	Accessories same as IC2E/O2E	
IC-402	SSB portable + CW, 3 watts output	257.00
BC15E	AC charger 240v	41.80
BC20	DC charger 13.8v	41.80
	DC lead	1.75
LC25	Carrying case	8.25
1.2 GHz Equipment		
IC-120	FM mobile, 1 watt output, 40MHz coverage mems	439.00
BT23E	Bit Zero 23e, 1296MHz linear, lw in – 7/8w out	179.00
50 MHz Equipment		
IC-551	Multimode base station, supplied SSB/CW only	379.00
EX106	FM unit	112.00
EX107	VOX unit	49.00
EX108	Pass band tune unit	97.50
IC-505	Multimode portable, 3/10watt, supplied SSB only	382.00
EX282	FM unit	28.50
BP10	Nicad pack	59.00
BC15	Charger unit	6.50
LC10	Carrying case	22.50
Mobile Mounting Brackets		
MMB5	Mount for 251E, 451E, 720A, 730	12.50
MMB6	Mount for 240,	12.50
MMB7	Mount for 245E	12.50
MMB8	Mount for 255E, 260E	12.50
MMB9	Mount for 290E, 490E	12.50
MMB10	Mount for 25E, 45E, 120	12.50
MMB11	Mount for 22U, 24G	12.50

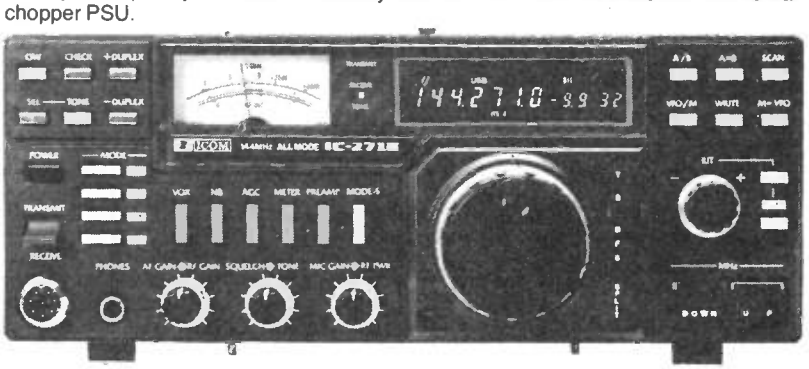
IC-02E, £229.

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

Some of these features include: scanning, 10 memories, duplex offset storage in memory & odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:– HS10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay.

IC-271E, £629.

The IC-271E,2 meter VHF and IC-471E,430-450 MHz are the 'terrific twins' in Base multimodes at the moment. The design is based upon a new CPU chip that is easy to operate and offers the maximum number of functions available. Power can be adjusted up to 25W on all modes, squelch works on all modes and a listen-input facility has been added for repeater work. RIT shift is shown on the multicolour fluorescent display. 10Hz tuning facilities are included on both machines. Options for the 271E and 471E include - switchable front-end pre-amp, SM6 desk microphone, speech synthesizer announcing displayed frequency, 22 channel memory extension with scan facilities and an internal chopper PSU.



Model	Description	Price
MMB12	Mount for R70, 740, 271E, 471E	12.50
MMB16	Mount for 2E, 4E, O2E, O4E	6.95
MMB18	Mount for 751	T.B.A.
SS1	Shoulder strap for handhelds	7.50
Microphones		
HM3	4 Pin hand microphone (IC240)	12.50
HM5	4 Pin hand microphone noise cancelling	20.00
HM7	8 Pin hand microphone (IC–24G, 730, 720A)	14.95
HM9	Speaker microphone for hand helds	16.50
HM10	8 Pin microphone with up/down scanning	29.00
HM11E	8 Pin microphone with up/down scanning + tone call	22.50
HM12	Up/down scanning mic for new sets (271/471/751/745)	16.50
SM2	4 Pin base microphone	34.50
SM5	8 Pin base microphone	34.50
SM6	Base microphone for new sets (271/471/751/745)	34.50
Ext Speaker/Headphones/Headsets		
SP3	Matching speaker for ICOM sets	45.00
SP4	Mobile speaker with magnetic mount	19.55
HP1	Good quality headphones	28.50
HS10	Headset and boom mic for ICOM hand helds	18.40
HS10SB	PTT switch box for HS10	18.40
HS10SA	VOX unit for HS10	20.70
ICOM Global digital clock		
	Attractive gold colour, gives time in cities all over the world. Pulsating red LED's, LCD readout with alarm. 195mm	59.00
TONO CW/RTTY/ASCII Terminals		
9000E	Communications computer, RTTY, CW, ASCII, TX/RX	669.00
550	CW/RTTY decoder, inc CW practice, and CW transmit	299.00
5000E	Comunications terminal & k'board, inc AMTOR, VDU	799.00
9100E	As 9000E with amtor	699.00
CRT1200G	High quality video monitor with green display	136.00
TONO Linears		
MR250W	144–146MHz, 10–15W drive, 180–200W out, RX pre-amp	325.00
MR150W	144–146MHz, 10–15W drive, 120–140W out, RX pre-amp	169.00
MR100W	144–146MHz, 10–15W drive, 80–90W out, RX pre-amp	99.00
2M50W	144–146MHz, 1–3W drive, 30–45W out, no pre-amp	59.00
NEW "G" Series		
2M40G	144–146MHz, 1–3W drive, 20–35W out, RX pre-amp	79.00
2M90G	144–146MHz, 10–15W drive, 70–90W out, RX pre-amp	115.00
2M130G	144–146MHz, 10–15W drive, 110–130W out, RX pre-amp	160.00
4M60G	430MHZ, 3–15W drive, 40–60W out, RX pre-amp	159.00
TONO Pre-amps		
RX144	2 metre mast head pre-amp & control box	65.00
RX430	70 cm mast head pre-amp & control box	70.00
TELEREADER Equipment		
CWR685E	CW/RTTY/ASCII terminal & k'board, with VDU, TX/RX	730.99
CWR675E	RX only version of 685E, with inbuilt printer/VDU	599.00
CWR670E	CW/RTTY/ASCII RX only, use with TV or VDU	349.00
	12 pin plug for 670/675/685	6.00
CWR610	CW/RTTY decoder, slow morse practice	159.00
CWR610E	As 610 with adjs baud rate from front panel (45–600)	175.00
	13 pin plug for 610/610E	4.75
CM40PS	40 character dot matrix printer, 11.5cm paper roll	199.00
ZENITH Monitors		
123E	12 inch with green display, good quality	109.25
122E	12 inch with amber display, good quality	125.00
TAL, ASP Series System 6 antennas		
ASP2016	138–512MHz 1/4 wave whip with threaded adaptor	2.56
ASP3976	66–138MHz 1/4 wave whip with threaded adaptor	5.21
ASP3936	130–174MHz 1/2 wave whip with barrel/spring, 3dB	18.63
Mounts for above		
K57	Fits 1/2 wave, 3/8 inch hole, snap-in type	3.10
K440	Fits 1/4 wave, 3/8 inch hole, snap-in type	1.55
K145	Fits 1/2 wave, 3/4 inch hole, snap-in with claw mount	5.43

IC-27E, £299.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H × 144mm W × 177mm D. IT has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:– 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5 Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price 299.00 and 39.00 for the optional speech synthesizer.

IC-745, £839.

Hearing is believing, the IC745, a new all band HF transceiver with SSB, AM (receive only), CW, RTTY, FM option, and a 100KHz-30MHz general coverage receiver.

The IC745 has a terrific combination of features found on no other transceiver, at such a low price. The IC745 is the only transceiver today that has so many standard features, options and accessories.

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

FOR GOOD FIX

ANGUS McKENZIE G30SS

Now that thousands of newly-licensed amateurs have come on to the 2m and 70cm bands, *all* amateurs must take up the minimum space to enable other users to enjoy their contacts in peace. Every now and then a new amateur connects up his new equipment and overdrives it; in such cases it is the duty of established users of the band to point out politely that the new amateur is spreading and to help him or her fix it.

Recently in an SSB contest over a weekend there were perhaps some of the worst spreading transmissions ever heard in a contest, and unfortunately, many well-equipped stations were forced to throw in the towel because almost the whole band was covered up by poor transmissions. The RSGB contest committee must do something about this, so this article sets out some ideas which could, with everyone's cooperation, fix the present highly undesirable situation.

I realise that I may be classed as a moaner, but I am prepared to stick out my neck and voice opinions openly, which too many are unwilling to do. When I hear a newly-licensed amateur putting out a badly spreading transmission I try calling him and pointing out the problem. If my head is not bitten off, I like to spend a considerable time assisting the station in getting things right, and so frequently it is just a matter of adjustment, or better understanding of some basics. I was extremely angry recently when I was explaining the matter to a rather green young amateur, who was listening with much interest, and giving full cooperation, when another amateur called in, without giving his callsign, and made an extremely rude comment that the amateur concerned should have known better, and said 'What on earth is the RAE for?'. I just cannot tolerate this type of unwelcome intrusion by a station too cowardly to admit his own callsign, and furthermore, it sets a very bad example to a newly licensed amateur.

I am perfectly prepared to admit that I made all sorts of slip-ups when I was a new boy, and even today, when I do make a mistake, I am quite prepared to listen to someone telling me that I am putting out a bad transmission, even if this is said with apparent glee! We really must not be selfish, and we should all realise that our wonderful hobby of amateur radio is to be enjoyed, and should not be taken too seriously all the time. Whether the new amateur has come up from CB or not is immaterial, for what matters is that the person concerned has joined the brotherhood in which everyone is the same.

Typical problems

Let's have a look at some typical problems, and how best they should be fixed. The most common one is made by the 'WARLD' merchant, who hollers into his microphone until he can see that he is putting out full power from the incredible noise that he is making, after which he starts talking sensibly, but further screws up the mic gain until he sees full power nearly all the time. Almost all meters under-read speech transients by 6-8dB. If you get full power on a whistle, then you should not expect to see more than 25 percent power on speech, unless you are using compression. A good compressor might increase the duty cycle, as detected by the meter, to 35 or 40 percent, but this is still 4dB down or so. If you turn the wick up too much you will be driving the equipment far beyond its ALC limits, and possibly spreading quite badly. A normal SSB transmission should occupy no more than 6KHz of band space or so, but I baulk at one that is 80KHz wide, particularly in a contest.

Too often the problem is not only in the exciter, but in overdriven transverters and linears. If a set up is adjusted by its owner at a portable site, it may well perform quite reasonably to begin with, but when a second operator takes over, the troubles start. He grabs the mic, shouts like hell, and after a few 'warlos' turns the wick up and starts spreading very badly. The first common problem is that when many HF transceivers are used to feed a transverter, there is no ALC present in the exciter drive. ALC is normally derived from the PA stage, and if the PA is disabled there is no ALC voltage present. A few rigs keep the PA ALC active by allowing the heaters to retain cathode emission, and thus RF drive to the grids creates ALC action even if the screens are earthed. All too frequently, there is no ALC voltage coming back from the transverter or linear, so if the mic gain is set up on a quiet voice initially to give the right output, even the odd louder transient can cause a problem, since it is not limited.

Of course matters get worse when somebody with a voice like a foghorn takes over, for the signal at say, 28.25 MHz is already spreading as it leaves the exciter. I, therefore, make a plea that ALC should be fitted into any installation to allow for voices of different volumes, *and* in different emotional states.

In such circumstances it can often be better to use a compressor (please, not a grotty one), and set up the entire equipment as follows. Switch the compressor in first, then whistle into the microphone, and adjust the entire system for full output. After this adjust the system gain after the compressor so that the output falls back by around 15 percent. If the compressor is a good one, transients will be limited to this slightly lower level, and the equipment should produce a clean output signal. This simple procedure should at least help at an early stage, but unfortunately, there are many other problems which can be encountered.

Honesty pays dividends

One new amateur went on the band with an FT290, CFFTBBTF (crammed full fit to bust back teeth floating), with the rig plugged into a transistorised linear switched to the 1W input position and 100W output. I heard several other new amateurs give him good reports, and I realised that everybody put politeness first, and honesty second. I chatted to the bloke concerned, who honestly imagined that the linear had less gain in the 1W position than in the 3W one. No useful purpose would have been gained by my referring to the chap as a wally, so I just suggested that he should try the 3W position. The splatter decreased considerably but was still rather poor. I asked him to switch off the linear and try again, and it was then evident that his barefoot output was rather worse than it should have been. I gave him the tip about readjusting or changing the PA bias resistor, and he had never heard of this one. He admitted that he had fiddled with the PA tuning to get maximum power output on FM. He was thus putting

NESS SAKE IT!

out about 3.5W PEP of distorted SSB into a linear which should in reality not be driven at more than 2W or so for acceptable linearity on its 3W input.

A few days later I heard him again, this time putting out a much better transmission and making more contacts, as his cleaner signal was that much more readable at a distance.

Specifications

I am thoroughly fed up with seeing the specifications of linear amplifiers quoted as the input required for giving the specified output power, where the latter power is more or less saturation output. So often, a manufacturer quotes the conditions for optimum output of a so-called linear for FM operation, where, of course, the width of the transmission should depend entirely on the FM deviation present, and not the biasing class of the PA stage. Many transistor linears will give at least 80% of the output power rating when driven at half the input power specification. Thus a linear rated at 10W in, and 100W out will work much better with 5W input, and thus cause much less disturbance to other band users.

The problem is that many 2m SSB rigs rated at 10W, actually give out, as set up, perhaps 12 to 14W, which of course makes matters even worse. Many people want to see their main rig for mobile at full power, but want to use the linear at their home station. Obviously, one does not want to continually readjust the preset ALC within the rig every time one takes it in and out of the car, so surely the best situation would be for all transistor linears to have a built in pad to decrease their sensitivity for SSB working.

I suggest that matters would be optimum if a 14W SSB rig were fed into a linear having a nominal 25W input requirement for saturation output, so that one could set it for 25W for SSB, and be happy with a clean 80W output, whilst turning it to the 10W position, with a 100W output for FM or CW.

In a recent contest one club station was using an SSB rig capable of at least 25W output into a Dressler valve linear, and wondered why he was getting complaints that he was taking up 150KHz of band space.

For a kick off, he was using the RF sensing facility on the Dressler, and every time this clanked in and out it caused momentary splattering. He tried to turn the drive down on his multimode rig, but this had been inadequately aligned, if at all, by the dealer, so the transmission still ended up at around 50KHz bandwidth for the remainder of the contest, despite many protestations. I suspect that one of the problems was that the low level gain is not reduced on their particular rig when the power control is reduced, and that transients kept on hitting the ALC with such violence that it could not hold them down. What particularly disturbed me was that the operators went on transmitting, knowing full well that they were causing aggro.

Many rigs have a reputation for spreading as delivered, and all I can say about these is to avoid purchasing them, new or secondhand, for the sake of others. Surely there must be a little heaven where bad rigs eventually end up happily talking to one another in some outlandish place. I have often wondered what happens to all these bad rigs, for they are eventually put aside by a disillusioned owner!

RST for SSB

Now I would like to come to the crunch and make a suggestion which could clean things up remarkably quickly if the RSGB contest committee could agree. Ever since the early days of amateur radio, reports for CW have included three numbers, the first representing readability on a 1 to 5 scale, the second representing signal strength between 1 and 9, and the third for tonal quality, 9 representing a very pure crystal-like note. The letter C is added to designate a chirp. It would seem perfectly reasonable to adopt the same system for SSB contacts, adding C for a transmission having some FM on board.

I suggest that 9 would represent good clean audio, with no RF problem, 8 fairly good audio, 7 poor audio but still with no RF problems, whilst 6 and below represents transmissions having more and more RF problems present. We should all be much stricter with our reporting. A quality report of 4 would designate the onset of annoying spreading, and by the time you are down to 1, you could expect a visit from the DTI fairly imminently!

Now the crunch: since all reports have to be written down precisely for the contest entry logs, and the contest station has to assume that the station giving a bad report also sends in his logs, then it will be seen that the contest committee can check the number of bad audio reports and see if the station has been given more than, say four reports rated at 4 or less. In these circumstances, the station could be disqualified, so the contest station would not in these circumstances perhaps bother to send in the log at all!

What I suggest could happen in practice, is that after receiving two bad reports, a station operator will begin to get jittery, and perhaps do something about the problem, and after three bad reports he will certainly have to do something. At this stage, all operators will be requested to keep the wick well down for fear of getting another bad report.

Monitors

There are, of course, some snags in this, for some groups might start giving others lousy reports towards the end of the contest in order to remove competition! The contest committee would in these circumstances have to look at reports given by some of the main stations to see if foul play was going on! There should be a number of stations acting as monitors who could also send in logs which could be trusted. I have normally found that contest stations that cause problems are consistently bad, whereas others put out quite reasonable signals throughout. I think we all know the identity of the offenders, and my suggested somewhat frank reporting system is a means by which we can all feel less embarrassed by the situation.

Stations should be asked only to give bad reports of quality when they are absolutely certain that these are fair and just, and not their preamps hopelessly overloading their rig front ends. A bad report should never be sent unless you have turned your beam off the station and you have confirmed that the spreading is just as bad. You should also be encouraged to switch out your preamp as a check on this. I gave a few of these

strange new reports during the recent contest, and nobody protested, and all thought it was a good idea, including the spreaders!

Now for discussion

I do hope that readers will air their opinions, whatever they may be, and I will always be pleased to discuss my proposed system on the air. It is only by discussion on the bands, and by general consensus, that a new system can become viable. Of course there are many snags which have to be overcome by reasonable modifications to my proposals but it is very evident that something will have to be done, and here at least is a good opportunity.

I hope regular readers will not mind me repeating some comments that I have made before in this magazine. A compressed signal which is probably heavily clipped as well, is likely to cause much more spreading than one which is not compressed, but which is automatic level controlled, peaking at the same level. A clipped transmission fills up the band width of the IF filter much more than a clean one, so the energy in all the intermodulation products is much higher. This means that high order products which could be barely audible under normal conditions, may increase by 20dB or so when compression etc is used. This is not necessarily due to a faulty compressor, or even an inadequate filter, but is of course due to a later stage being overdriven. Sensible alignment of gain can mean that a compressed signal can be narrower than an uncompressed one, as previously explained, so please bear this in mind.

If you buy equipment for a contest, then do set it up at the home base first, and check it very thoroughly with several locals and get it fixed before you take it out to a contest site and subsequently get disqualified. Even more important, always try to give honest reports, and check a station's transmission either side to see if it is spreading. Nobody should mind being told that there is something wrong, for many an expensive output stage device can last a lot longer if it is not overdriven.

If you hear somebody who obviously has a problem, then call in and try to help them to fix it rather than tuning away from it and becoming apathetic. Remember that a good clean transmission can be more easily heard at a distance, and an incorrect callsign or QRA noted down as a result of a poor transmission is one scrubbed contact when it comes to the final analysis.

Phonetics

A final word is a plea for the use of standard phonetics. Time and again I have had to ask a station to repeat a call sign or locator because it is gabbled. When calling CQ, why not give a brief location occasionally which allows someone who can only just hear you to turn the beam in the right direction and thus get a stronger signal before QRM covers up the calling station. I am always amazed that so few stations give even a brief location on a CQ call, or when replying. Just the word 'Sheffield' or 'North Wales' is enough to make all the difference. I know that I have now put myself in the glasshouse again, and I shall have to be that much more careful to keep the wick down!

It might be said that I can hardly stick my neck out on any band again, but if I am putting out a bad transmission then please do tell me, and I can do something about it. Please give a call sign, and don't say something incredibly rude which can be hurtful to anyone, for this often feeds back on the unkind operator who may not be anonymous, for many of us have an unhappy knack of recognising voices all too quickly! If something has to be said, then say it openly and reasonably and you should never cause offence. By the way, I know that the fans on my linears can peak S9 if I am very strong, but they shouldn't spread! Let's hope we'll all have happy narrow transmissions in the next contest – something which should help everyone increase their scoring rate.

THE MARCONI STORY

ON QSL CARDS

by John D Heys G3BDQ

The name Marconi is almost synonymous with wireless in popular opinion, and the writer well remembers the time when any youngster with a bent for dabbling with radio gear was labelled as a 'young Marconi'.

This article will not attempt at a comprehensive history of the life and times of Gugliemo Marconi, for anyone who is deeply interested in him can ask at their local Public Library for a selection of the many books that have been written about him.

Although many Patents were taken out in his name Marconi never invented anything! He was a great innovator and would rapidly seize upon the tentative ideas of others and develop them into working components or systems. He lusted for the achievement of communication over greater and greater distances, and in this respect closely resembled today's DX fields! His business acumen ensured that his infant 'Wireless Telegraph and Signal Company' founded in July 1897, (which incidentally was the first company in the world devoted entirely to the manufacture of wireless equipment) mushroomed into a powerful multinational enterprise. It was re-named 'Marconi's Wireless Telegraph Company in 1900.

Marconi Patents had a stranglehold over the manufacture and sale of wireless equipment by other firms and it held back receiver development in the early 1920s. In this country a stiff royalty had to be paid over to the Marconi Company for each valve holder used in every radio receiver manufactured. This was one reason for the slow development of multi-valve superhets in Britain. Most receivers were limited to two or three valves during the early days of broadcasting. It was not until 1928 that a successful legal action by receiver manufacturers and others resulted in a reduction of the royalty fees.

Marconi himself was greatly honoured during his lifetime. In 1914 he was made a senator of the Kingdom of Italy and in that same year our King George V bestowed upon him the Honorary Knighthood of the Grand Cross of the Victorian Order. He shared a Nobel Prize in Physics in 1909 and was actually a delegate to the Peace Conference following World War I and signed the peace treaties between Italy and its former enemies Austria and Bulgaria. The fascist dictator Mussolini showered Marconi with honours – honours which today would do little to enhance one's reputation!

Firm support

Marconi was one of the first two Honorary Members of the RSGB. This probably resulted from his firm support of the amateur cause after 1918 to reintroduce receiving and transmitting licences. He wrote a leading article to that effect in the March 1919 issue of Wireless World. Later, however, he was less than kind in his lukewarm reaction to the first successful transatlantic amateur contacts between the USA and Britain on December 8th 1923. The ARRL President sent the following message to Marconi; 'The American Radio Relay League presents its respects and this evidence of the Dawn of International Amateur Radio'. Marconi's cable in return offered no real congratulations to the amateurs who had striven for years to bridge the Atlantic and had eventually succeeded.

Later the first ever QSO between a British station and New Zealand when young Cecil Goyder G2SZ worked 4AA in October 1924 was something that even the mighty Marconi Company with its enormous resources had not achieved, other than by the use of intermediate relay stations. I have no knowledge of Marconi's response to Goyder's success!

Historical survey

Amongst the writer's collection of old QSL cards there are a considerable number dedicated to the commemoration of Marconi. These cards are very interesting and when put together they make a fascinating historical survey of his achievements. Marconi was born on 25th April 1874 and he died in 1937. A QSL put out by Australian VK4PO in 1974 has a picture of Marconi and carries the inscription, 'The world's first amateur radio society commemorates the centenary of the birth of the Father of Radio and the world's first radio amateur'. During those first years of experiment and tentative communication by wireless Marconi was undoubtedly an amateur, but this status rapidly evaporated when he successfully transmitted a message over a distance of 2 miles on Salisbury Plain and filed his first, and the first ever wireless patent in June 1896.

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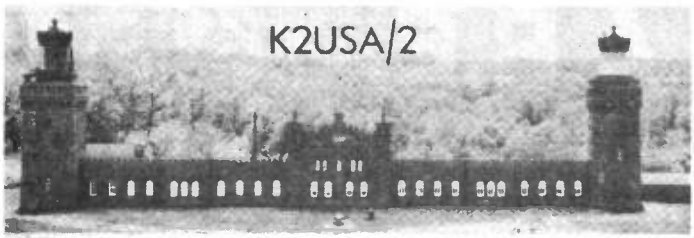
THE MARCONI STORY



Twin Lights, Highlands, New Jersey

1959 FIELD DAY SITE

THE FORT MONMOUTH RADIO CLUB DEDICATES THIS CARD TO GUGLIELMO MARCONI, WHO MADE HIS FIRST RADIO CONTACT IN THE UNITED STATES FROM THIS SITE IN SEPTEMBER 1899

A 1951 QSL produced by GW3EUS whose QTH was then Lavernock near Penarth in South Wales has a neat line drawing of the buildings and scenery at the site of Marconi's station in 1897 when he was able to transmit across the Bristol Channel. Those tests carried out in May 1897 are often called the Marconi-Kemp Tests. George Kemp was then Marconi's senior assistant. At first, signals were sent between Lavernock and Flathold Island, and a few days later communication between South Wales and Brean Down on the Somerset coast was accomplished.

The Barry College of Further Education Radio Society set up Special Event stations in 1971 and 1972 to commemorate the Marconi-Kemp Tests. An attractive QSL card in the form of a folder containing illustrations and extracts from George Kemp's diary was produced and used to confirm contacts with GB3F1 set up on Flatholm, and GW3VKL/A and GW4BRS/A at Lavernock Point in Glamorgan. These QSL cards are not rare and I have several examples. The stations worked on all the HF bands using AM, CW and SSB. During May 1972 the lads from Barry were using the callsigns GB3MKT and GB3BCT, and were operating again from Lavernock and Flatholm respectively. This time they were on VHF too; their attractive QSLs included the QRA locators of both sites.

Commercial use

In 1898 Marconi and Kemp installed a wireless link between Ballycastle and Rathlin Island to report ships passing that island to Lloyds of London. This was perhaps the first commercial use of wireless.

One year later in 1899 Marconi made a rather unsuccessful trip to the United States in an attempt to interest their Navy in his wireless system. He was still using untuned circuits and the US Navy's official historian wrote, '...the interference was perfect'. The Fort Monmouth Radio Club in New Jersey ran a special Field Day in June 1959 and their QSL pictures the Naval establishment known as 'Twin Lights' at Highland NJ, where Marconi made his first radio contact in the United States. The Field Day station used the call K2USA/2, and their QSL cards are now scare.

After the American debacle Marconi refined his equipment and improved his receivers by using a tuned transformer between the aerial and the detectors which were then still coherers. The new receivers contributed to his spanning the English Channel, and in November 1899 he transmitted information to the USS St Paul 66 miles away from his site on the cliffs by the Needles on the Isle of Wight. The information sent was used to publish the first newspaper ever printed at sea. At this Isle of Wight site a special event station with the call GB3TT worked during November 1969. Their QSL is printed on a colour postcard which shows the Needles and the lighthouse off the point. The equipment used by GB3TT was a KW2000A transceiver, a trap dipole, a long wire and a 3-element beam.

Centenary

In 1974 the Chelmsford Amateur Radio Society installed the station GB2CCS to commemorate the 100th anniversary of Marconi's birth and also the 75th anniversary of the first wireless factory in the world in Hall Street, Chelmsford. Their card has a clear photograph of the works and the station was operated by G3KRZ, G3PMX, G3WFF and G4CUT.

The first spanning of the Atlantic by wireless was perhaps the most important factor contributing to the rapid growth of the interest in wireless communication through the early years of this century. It was an event which gripped the imagination of most ordinary people throughout the world and yet it was really accomplished almost magically. On December 12th 1901 signals from the 40KW spark transmitter at Poldhu in Cornwall were received by Marconi at his special receiving station at Signal Hill, St John's, Newfoundland. 1901 was a year of high sunspot activity and it is now suggested by propagation experts that high frequency harmonics from the Poldhu transmitter were picked up under 'skip' conditions, and that had Marconi waited a few more years before making the attempt he may have failed!

Whether the feat was accomplished by long wave fundamental or by short wave harmonics it does not detract from the initiative, drive and far-ranging imagination of Marconi who only four years earlier had been striving to bridge the Bristol Channel!

Diamond Jubilee

QSL cards to celebrate the 1901 success coincided with the Diamond Jubilee of the event. On this side of the Atlantic the Marconi Radio Society had a station at Writtle near Chelmsford with the callsign GB2MT. On the HF bands a Marconi NT201 transmitter was used and the receiver was an Eddystone 888A. The antennas were a 264ft end fed wire and a 14MHz dipole. On the GB2MT card is written, 'in association wih GB3MSA Poldhu'. This latter station was installed on the site of the old Marconi station at Poldhu and it was operated by members of the Cornish Radio Club. Their QSL card shows the obelisk erected by the Marconi Company to mark the Poldhu site; for the original station closed down in 1934. It is still possible to see the foundations of the former antenna towers and the buildings remain intact.A visit to this romantic site is surely a 'must' for all radio historians.

Over the Atlantic the Society of Newfoundland Radio Amateurs also set up a special station to remember the events of 1901. Their station used the call VB1MSA in 1971 and their QSL has a picture of early radio towers with symbolic 'lightning' coming from them.

In 1971 the Cornish Club operated another special event station at Poldhu. This agajn used the call GB3MSA and their nice QSL card opens up to display the circuit of the old Marconi transmitter, a photo of the Poldhu station in 1901 and full technical details of that early rig. An interesting technical point described was the keying arrangement. Keying the 20,000 volt spark Tx was done by shorting RF chokes in the ac input which then allowed RF to leak back via the alternator and not get passed forward to the antenna! This was surely a rather dodgy and dangerous way to key, but no doubt it was the only way possible.

THE MARCONI STORY

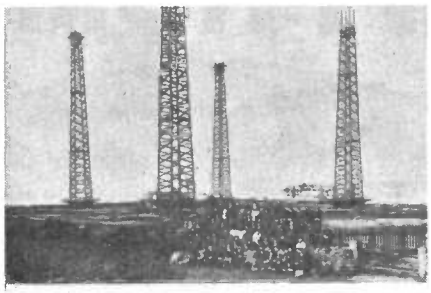
Atlantic crossing

The first two-way wireless communication across the Atlantic was achieved in January 1903. The original stayed masts at Poldhu had been replaced by four wooden aerial towers but the transmitter was little changed. On the American side was the Marconi Rotary Spark Gap station in South Wellfleet, Massachusets.

An attractive QSL card was sent out by the operators of KM1CC, the special event station sponsored by the town of Barnstable Radio Club at Cape Cod, in January 1978. This card portrays a youthful Marconi with some of his early equipment.

Coincidental with this operation at Cape Cod, GB3MSA operated yet again from the Poldhu site. This time the Cornish Radio Club surpassed themselves and their superb QSL card marking the 75th anniversary of the first two-way contact has an excellent and striking motif in colour on its front. Inside there is once more the transmitter circuit diagram, and a photo showing the wooden towers just before their completion. The back of the card has a clear map of Cornwall which shows the location of Poldhu, the Arms of the County and also the RSGB logo.

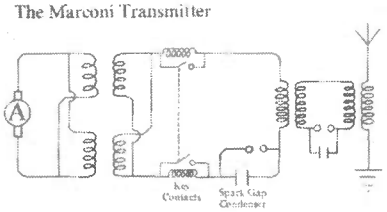
These fine cards are not uncommon and are well worth the chasing by collectors.



The Poldhu Wireless Station in 1903

The Poldhu Transmitter

The Marconi Transmitter



I am indebted to George Benbow G3HB, who sent me examples of modern QSL cards relating to Marconi. The Marconi Radio Society, which has an address at Stanmore in Middlesex, has a Club Station which now uses the callsign G2MT. 2MT was the call used by the Marconi Company in the early days of broadcasting before the BBC was set up.

On 2nd July 1983 the Marconi Radio Society re-inaugurated G2MT and it was operated from the headquarters of the Marconi Company at Stanmore. The picture on the G2MT QSL card shows the original hut at Writtle in Essex which once housed the famous '2 Emma Toc' transmitter. Only about 150 of these cards were used so they will become quite desirable collectors' items in the future.

Perhaps this description of some special commemorative QSL cards will help to kindle an interest in and an enthusiasm for QSL card collecting and show that such an activity need not be an aimless accumulation of pasteboard. There are so many different themes and topics displayed on QSL cards that it ought not to be difficult to build up a collection around one's 'pet' subject or interest. It is hoped to follow up this article with another one dealing with some different QSL – related interest at some time in the future. Good card hunting!

THE VIEW FROM THE TOP

A HISTORY OF COMMUNICATIONS SATELLITES by Peter Dodson

On the face of it, throwing a few million pounds' worth of satellite into space in the interests of science and improved communications is not a subject calculated to capture the enthusiasm of the unemployed victims of world-wide economic recession! And yet, the spin-off of micro-technology – the chip and the semi-conductor – have brought unparalleled repercussions not only to commerce, but also to the home: fifteen years ago, who would have dreamed that a micro-computer system would become available for only £139 – or an all-singing-all-dancing pen-watch for only £1.99!

But, what is equally important, is that the same technology has been of considerable importance to the Radio Amateur. Quite apart from reducing the amount of space he requires for accommodating his equipment, the equipment itself is more sophisticated, not to say reliable. And although the purists might say that the skill and expertise in spanning vast distances by ionospheric refraction have been reduced by using artificial aids such as the OSCAR 10 satellite, there are more ways than one of skinning a cat!

Ionospheric refraction, for those not into such things, is, briefly, the 'bouncing' (or multi-'bouncing') of radio waves off ionised layers high in the sky, to ultimately land at their destination. During daylight hours, a higher layer is available to refract signals high in the HF range, thus getting them to the receiver in one 'hop'. During the night, however, the refracting layers are lower, so requiring lower frequencies, resulting in a series of 'hops' and producing a corresponding loss of gain.

That description is very much an over-simplification of a subject which whole books have been written about: wave propogation and the study of ionised layers were, until the 1950s, very important to those responsible for communications systems. For one thing, ionised layers were not always dependable despite the efforts of the Marconi Company who produced charts showing, among other things, MUF (maximum usable frequency).

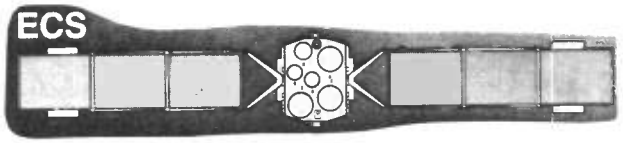
The layers were subject to sporadic inconsistency such as tilting and lack of density, producing signal-fade: many round-the-clock communications systems employed day, and night frequencies with alternatives. And, of course, communications were subject to natural phenomena such as sun-spot cycles and solar flares.

The communications satellite put an end to all the uncertainty. The theory was that if a reflecting medium could be placed at a known and consistent distance from the earth to give a 'footprint' (or pool of illumination) on a required part of the globe, uninterrupted signals could be exchanged. Alternatively, if a satellite was rotated around the earth at a known velocity so that its exact position in space could be calculated at all times, similar desirable effects could be achieved. And that is exactly what the scientists did: the geostatic and orbiting satellites had been born – refraction was made-to-measure!

Travel in space

As far back as the turn of the century men like Russian schoolmaster Konstantin Tsiokovsky were thinking about travel in space: in 1932, Johnnes Winkkler was taking practical steps towards getting there, using liquid fuel. But possibly because the imagination of man had been dulled by a world war, his conception of space travel had not progressed beyond that of H G Wells and the authors of space fiction. Even in the mid '50s, when Russia was proposing to launch the first-ever satellite, their Sputnik, her invitation for international comment received all-but scorn from reputable journalists: they could neither forsee practical uses for such devices,

VIEW FROM THE TOP



nor envisage their innovation in the 20th century.

How wrong they were: in 1957, the USSR put the first earth satellite vehicle into orbit to herald an era of space-evolution which still, after 28 years, appears to have boundless horizons. During that time the value of satellites to the electronics industry in terms of research and development has been enormous, as it has in the communications field. The adaptation of such technology for military (and even more sinister) purposes was inevitable: the cost, on the other hand, has been incalculable!

Compared to the hi-tech make-up of today's satellites, Sputnik 1 was a simple affair – just an aluminium ball with little more than a transmitter aboard. It weighed only 83.8Kgs, had a diameter of 58cms and its instrumentation was restricted to the measurement of air temperature and density, and an electron counter. At an altitude varying between 329 and 947Kms, Sputnik 1 circumnavigated the earth once every 96 minutes at a speed of 17,000mph for 92 days and captured the interest of the world: to the students of space literature it was the manifestation of fantasy. To scientists and communicators it was the awakening to untold possibilities.

Somewhat embarrassed at being upstaged by Mother Russia, the Americans were also worried: if this satellite could be put into space from an ICBM (intercontinental ballistic missile) launcher, what were the ultimate possibilities? While they continued to bite their nails in the White House, the Russians gave them cause for further concern by launching Sputnik 2 in November 1957. Not only was it heavier, at 508Kgs, but it also carried life throughout its 162 day journey, in the shape of a dog called Laika, together with the necessary technology to measure its condition in weightlessness. More grey hairs in Washington – the launcher necessary to throw 500Kgs aloft *had* to be many times more powerful than current American ICBMs!

In their haste to re-establish the USA as a contender in the satellite race, it is conceivable that the Americans got their sums wrong: on December 6 1957 they put their Vanguard 1 on the launch-pad – only to watch it fall off almost as it ignited! Marginally more successful was the launch of a second Vanguard in February 1958, which at least rose to a height of 5Kms before falling over! Undaunted, and within three months, the Americans tried again with Explorer 1 – this time more successfully. Smaller than the Sputniks, the American satellite weighed only 4.8Kgs, was less than a metre in length and had a diameter of 15.2cms.

Operating at altitudes between 356 and 2548Kms, Explorer 1 had instrumentation to measure cosmic rays. It was followed, on March 26 1958, by the launch of Explorer 3. It must be said that despite their lack of size, the feed-back of information from the Explorer satellites with regard to the presence of electrically charged 'Van Allen' zones constituted a major scientific discovery.

Sputnik 3

Meanwhile, Sputnik 3 was the heaviest satellite to be launched to date, weighing-in at 1,327Kgs, 970 of which constituted instrumentation designed to measure solar radiation, cosmic rays and the environmental situation in the upper atmosphere generally: the manned satellite was just around the corner.

There were many basic physical and mechanical problems not only of putting a satellite into the air, but also in placing it in the desired position – and keeping it there. Having overcome these, the next priority was to capitalise on satellites for the benefit of all interested parties, hopefully to recoup some of the many millions that had already been spent: the word 'payload' started to creep into the vocabulary of space technology! The interested parties included those who simply wanted to get to the moon and those who wanted to use the new technology for improved communications – be they in the interests of commerce or as navigational and meteorological aids.

Geostatic orbits

So, in 1945, the suggestion was put forward by Arthur C Clarke, for a 'communications relay station' to be available 22,300 miles above the earth. At this height, the orbiting speed of a satellite would equal the rotational speed of the earth and would, in effect, be 'stationary' in respect of it. But as a single communications satellite, it would only be of use as a refracting medium on parts of the earth's surface: at least three such ESVs would be necessary for universal and constant communications.

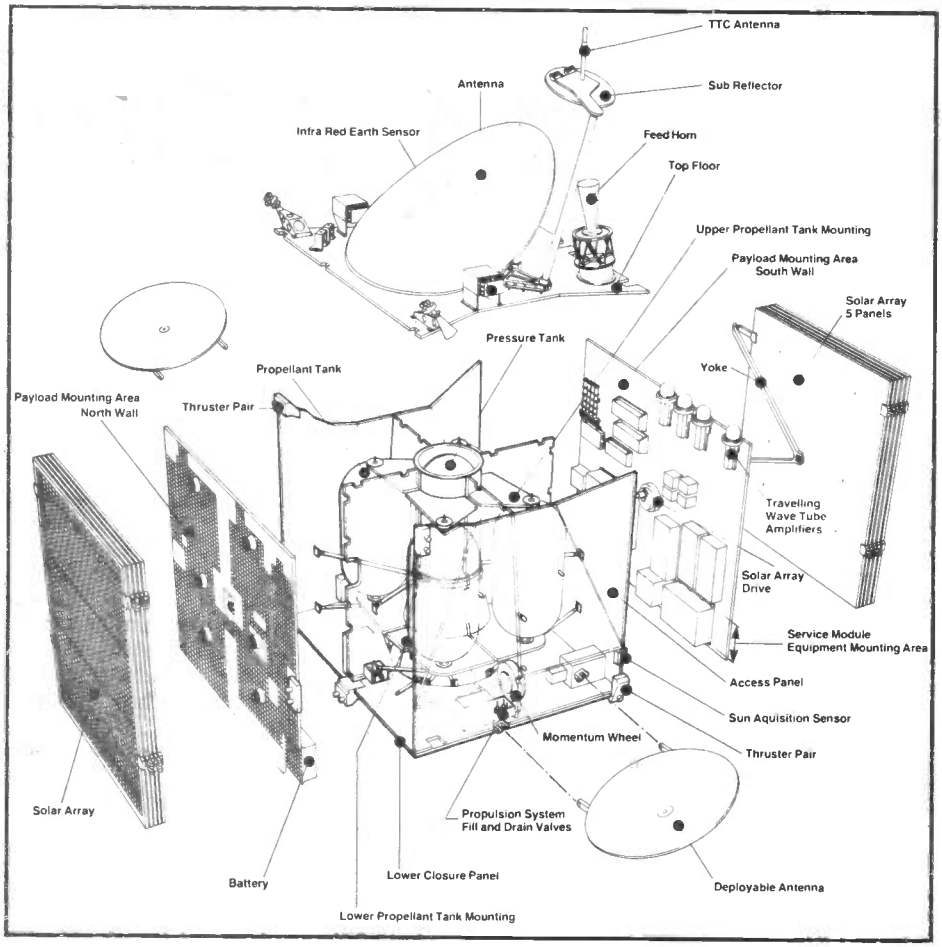
The alternative, as used by some communications organisations, was an 'orbiting' satellite, which would be placed at a lower altitude, would not rotate at the same speed as the earth, and which would therefore be 'in view' from any given point on earth for only a restricted period of time. To achieve continuous communications would still require a series of satellites, working, as it were, in relays. Perhaps the only advantages of a single orbiting ESV would be that it could be used between different points on the earth's surface as it passed over. One way of overcoming the problem was 'dumping'. As early as 1960, the American Courier 1B had a delayed repeater system. Capable of storing and repeating 68,000 words a minute, this military satellite was driven by solar cells – an improvement over its predecessor 'Score'. Score was an Atlas-minus-booster ESV launched in 1958, which bore a recorded Christmas message from US President Eisenhower – himself no enthusiast of space technology!

Early experiments in artificial refraction were made on balloon satellites such as the 135 foot Echo 1 and 2, and even the moon during a solar storm in 1955! Echo 1 and 2 were made of aluminiumized Mylar, but were somewhat restrictive and used mainly by geodetic scientists as mapping beacons. For the first communications satellite proper, we have to thank the American Telephone and Telegraph Company, who funded Telstar 1. Launched in July of 1962, this 170lb ESV was put into orbit at 592 x 3500 miles. A year later, Telstar 2 was sent up to join her sister. To receive the signals, three ground stations were built, our own being at Goonhilly Down in Cornwall, with others in the USA and in France, their reception periods being limited to 20 minutes per orbit.

Intended as an engineering project to evaluate the problems, Telstar revealed very few – apart from the disintegration of solar panels resulting from radiation, a limiting factor in the life of any satellite. Further experimental satellites were launched in December 1962 and January 1964 in the shape of Relay 1 and 2, but merely as stepping stones to more sophisticated systems such as Syncom 2. Based in synchronous orbit over the Atlantic in February 1963, this satellite suffered radio-control failure which gave it the wrong angle of inclination, but continued to be useful in linking the United States, South America and Africa for short periods when used in conjunction with Relay 1.

Early Bird

Conversely, Syncom 3 proved highly successful, giving the world a look at the opening ceremony of the 1964 Olympics. Not the least to be impressed was US President JF Kennedy, whose immediate



support gave impetus to the formation of the International Telecommunications Satellite Organisation, membership of which by 1980 included no fewer than 105 nations. Within a year this new organisation had launched its first communications satellite – Intelsat 1 – known better perhaps as Early Bird. Carrying 240 telephone circuits, this 72cm wide, 59cm high cylinder weighed only 39Kgs on station. Launched in June 1965, its solar panels provided 40W of power and was spin-stabilized, like a child's top; designed for a life-span of 18 months, Early Bird stayed around for four years!

1967 saw the launch of Intelsat 2. Bigger, with a weight of 86Kgs and using 75W of power, the ITSO were able to actually *reduce* the cost to members from $30,000 to $10,000 per circuit. Stationed over the Pacific, Intelsat 2 managed to overcome one of the remaining problems of communication satellites – the facility to link stations on opposite sides of the equator. The launch of Intelsat 3, on the other hand, gave a further reduction in cost to members to $2,000 a circuit, whilst the power consumption rose to 120W to serve no less than 1,500 circuits. The eight satellites in the complex used mechanically-despun horn antennae systems – an improvement on the wasteful omni-directional units as used on Intelsat 1 and 2; this was important if the five-year life of the system was to be realised.

Probably of more significance to television viewers was the introduction of Intelsat 4, capable of coping with 4,000 telephone circuits or two television channels. A drum, some 2.38 metres wide by 2.82 metres tall, with antennae extending a further 2.46 metres, Intelsat 4 included the use of spot-beams in its capacity to increase broadcast efficiency. However, Intelsat 4A increased the circuit-availability to 6,000 by the use of more spot-beams and polarized signal systems – at no increased cost to the membership. Building on the success of its predecessors, Intelsat 5 was able to cope with 12,000 speech circuits *plus* two colour TV channels, with access to the 14/11GHz band as well as the 6/4GHz band used by other satellites. In terms of failure-rate, 21 of the 27 Intelsats launched by 1977 have made it at a cost to members of $570 a month – almost one fifth of the 1965 rate; British Telecom could well learn from these guys!

However, America does not have a monopoly on communications satellites. Canada has already successfully launched a series of Anik ESVs since November 1972: the third was put up in May 1975 to serve some 50 Canadian ground-stations, and Anik 4 was launched in 1978. Calculated to cater for the communications problems of isolated communities in North America is the Anik B system, whilst the Anik C will be available for commerce and national administration.

Similarly, the US Department of Defence have their own network of satellites – the DSCS system. DSCS 1 uses a single 8/7.3GHz channel through a toroidal antenna, and ten operational DSCS 2 units are in the pipeline. On the other hand, the DSCS 3 series, weighing around 745kgs, should be operational by now, using two 19-element antennae with an anti-jamming capability. Other US service satellites include the Navy's FLTSATCOM, the Air Force AFSATCOM and the Army's SATCOM. Then, of course, there's NATO. . . !

Molniya

As far as the people who started it all – the Russians – are concerned, they are still at it! Now having the world's biggest domestic satellite system, they went into the Satcom business in 1965 with their Molniya (lightning) series being highly elliptical orbiting satellites with a zenith over the Northern hemisphere. Molniya 2 was launched in 1971, and Molniya 3 in 1974 with a capability of handling both 4 and 6GHz: reception is by way of low-noise 12 metre dishes. However, in December 1975, the Soviet Raduga (or Statsionar 1 in international terms) series was launched, largely performing the same tasks as Molniya, but as a geostatic system. Since then, Ekran has been put into orbit, its particular function being to provide domestic television through its very high-power transmitter, and in 1978, the Gorizont series, to serve an estimated audience of 2,500 million TV viewers for the Moscow Olympics in 1980. Others to get in on the sat-act include Indonesia, the Arab States, Australia, Brazil, India and China: even the United States has half a dozen internal systems and in Europe there is the ECS.

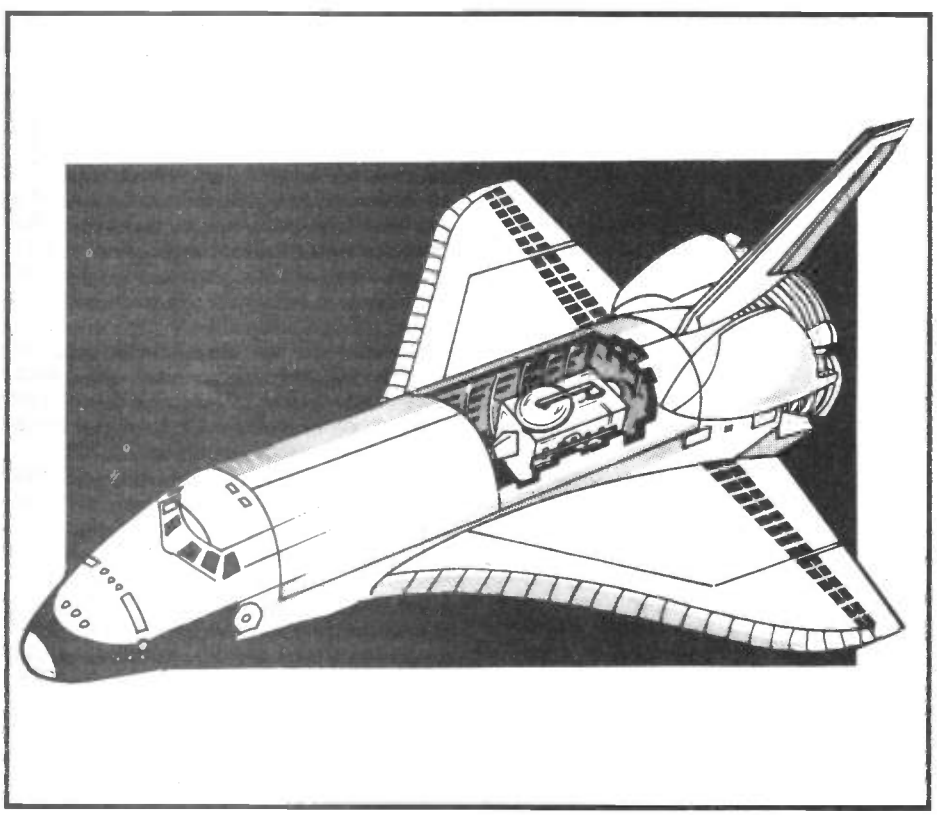
Communications by satellite have been found by the professionals to be the most efficient, quickest and economic way of working. It has been said that should the satellite system break down in the 1980s, it would have dire effects on commerce, let alone the environment; in the 21st century it would spell disaster. Even for the amateur, progression to the use of artificial refraction was made available when the OSCAR 10 satellite was put into orbit in 1983. Despite the fact that the satellite was orbiting, it was high enough to give several hours of availability before going 'out of sight'. With two modes available, amateurs could transmit on, say, 435MHz and the satellite would transpond the signal to a down-frequency of 145MHz – both allocated amateur bands.

Contrary to popular belief, dish aerials were not absolutely necessary, as reasonable results could be obtained using helical beams or cross-polarized yagi antennae. On the other hand, as with all orbiting satellites, accurate aerial-direction capability is essential, and home-computer programmes have been made available for individual locations. Now, in the spring of 1984, a new and even more exciting project awaits amateurs – Eurosat 2. For the amateur with time on his hands, coping with the vagaries of the ionosphere may be his idea of pitting his wits against nature: the point is, in the 21st century, will anyone be listening?

ON THE BEAM

VHF UHF MICROWAVE

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



It now seems quite likely that there will be more space shuttle activity. It is known that NASA were impressed with the interest in the previous activities and the large amount of publicity that it got. This publicity seemed to keep the public's mind off the generally abysmal performance of the official part of the proceedings. In fact most amateurs would probably claim that the amateur radio part was equally rough, but the publicity gave no indication of that.

It now seems that there is a strong possibility of two more amateur space flights in the next eighteen months. The next amateur into space will probably be Tony England (W0ORE) who is due to fly on Flight 51 in November of this year. This incidentally is the Spacelab 3 mission and will use the Challenger shuttle. If the proposed operation is approved the intention would be to use 29MHz as well as 144MHz FM; this would allow practically worldwide operation from most points in the orbit.

Other ideas are that the 144MHz equipment might be operated on an automatic basis. Last time you shouted your call in the hope of at least hearing it come down in the list of calls heard, this time you could end up just shouting your callsign and then waiting to see if you get a QSL card. Is that really a contact?

As the shuttle is flying at no great height and, bearing in mind that the only losses on the path are free space, it is obvious that anyone running 10W to a small beam is able to get a signal up to the shuttle, so what is really achieved? Probably no more than another excuse for every idiot in Europe to have a great time being a nuisance!.

One of the major problems on the first mission was the use of 'indoor' aerials on the shuttle. It seems possible that the next flight will use external aerials; suitable coaxial lines are available on board but permission will be required to make use of them.

Another possibility being discussed is the use of the 144MHz equipment as a beacon, when normal operating is not possible due to official commitments. At least you would if you had heard the shuttle because the idiots would have a real problem duplicating the exact Doppler shift of frequency that will be on the shuttle signal. A lot more difficult than playing recordings of the space operator's voice to fool people into thinking they had heard the shuttle.

The next possibility for space operation may come in March 1985 during the Spacelab 2 mission which, in the nature of things official, will of course come after Spacelab 3! The crew for this mission have not yet been chosen but it is known that Dr Owen Garriott (W5LFL) is interested in doing another flight and may well be included.

Special event

The D-Day landings in the last war were certainly a special event and to commemorate the occasion G6APD and G4RTT will be operating during the first week of June from Arromanche in Normandy, the site of the landings. No details are available as to bands and modes but they should be easily workable from Southern England at least.

AMTOR

This is a form of RTTY in which the system effectively corrects errors during receive by asking the transmitter to resend the corrupted data; this relies heavily on computer techniques to send small batches of data and to keep on repeating them until the receive station signals that they have been correctly received, when the transmitter then sends the next batch.

This is a very simplified description, and there is a lot more to it than that, but it will suffice. Because of the fact that

there is only a certain amount of time allowed by the system for error checking it was thought that it would not be possible to use this system on Oscar 10, due to the time it takes the signal to do the round trip to the satellite and back. A contact has been made on this mode via Oscar by 9M2CR and DC8AM. This took place on orbit 540, which was on the 2nd March.

Now that it has been proved possible we look forward to more use being made of this form of transmision. It is a rapidly growing mode for normal operation and commercial equipment is now available at reasonable cost. Something new for you to play with?

Contests

June is a busy month for the contest man. Let's see what we can tempt you with. We start off on the 3rd with the 70MHz contest which also includes a listener section. The 9th sees the 1296 MHz contest and on the 10th we have the 432MHz Trophy which also has a SWL section.

On the 17th June we have the second leg of this year's 10GHz cumulative contest, if you want to check up on what is going on listen for 'talkback' around 144.170 MHz. The same day has the contest for the 3.4 GHz enthusiasts.

We move on to the 24th and the 144MHz phone section of the 'Worked All Britain' award. A great opportunity to add some of those rare squares and counties to your score.

The really big one comes on the weekend of the 7th July with VHF NFD, a contest that you really must not miss taking some part in. There is no better chance to up your score on all the bands and to give some encouragement to all those who have manhandled what can easily amount to a ton of gear up to a near-inacccesible site.

DBS TV

There is some cause for concern about the specification for the new Direct Broadcasting Satellites in that the intermediate frequencies proposed for the receivers include both the 144MHz and 129MHz amateur bands. As those receivers are intended for general home use it is difficult to see who could come up with such a crazy specification.

By their very nature these receivers are going to have a lot of gain to make the weak satellite signal usable, and high gain IF systems centred on the amateur bands do not make sense! New talks are being held to try and stop this problem before it gets off the ground; let's hope that we win, or else we are in for a really trying time in the not too distant future.

Data dumps

A pleasant pastime on two metres is the sending of computer programs. This leads us into a veritable jungle of problems. If the program is one that you have developed then there is no problem, as you own any copyright which might exist, and you are free to do with it as you wish.

If the program is of a commerical origin, or you have copied it from a friend's tape or broadcast, then it is not your copyright and you cannot make it available for copying. At least that is what the distributors would have you believe, but is that, in fact, the case?

At the moment there is no clear decision on the matter as the facts have not been tested in court, although this may soon be done. There is also the fact that you are not getting any financial advantage from sending the program. If you were you would be breaking the terms of your licence.

If you are sending the program as a test of your station's capability to send data, and the other man's ability to receive it, are you in breach of copyright?

If he later decides to run the program, or even to sell it, have you got any control over his actions and could you stop him doing so even if you wanted to? The whole question of copyright of computer programs is a mess and, until a definite decision has been arrived at in the courts, will remain so. Even a decision on the copyright question would have to be followed by another on the legality of sending them for the purposes of testing a data transmission system.

My advice to you is not to transmit commercial programs unless you are prepared to get into long running, and certainly expensive, legal arguments.

Repeater news

A new 1.3GHz repeater is now operational from Crawley, using the callsign GB3CP, with the input on 1291.075 and output on 1297.075MHz

In common with all 1296 repeaters the polarization is horizontal and when not called up for repeater use it transmits in beacon mode. This provided an excellent indication of conditions. Reports would be welcome and should be sent to G3GRO or G4EFO.

Certificates

We mentioned last month the range of certificates available from VERON, the Dutch equivalent to the RSGB. Having put in my claims the certificates arrived by return of post and are certainly very impressive, even if the English is a little shaky, but then, in fairness, how well do you speak Dutch? All excellent additions to the shack wall.

Details have also been received of the new Microwave Society awards (which are also available to SWLs).

For 10 GHz a minimum distance of 50 Km, upgraded every 25 Km
For 24 GHz a minimum distance of 20 Km, upgraded every 10 Km
For 47 GHz a minimum distance of 5 Km, upgraded every 5 Km

All contacts must have been made since 1st January 1984 and more information is available from the society at 81 Ringwood Highway, Coventry.

Please send details of any awards for operation on VHF and microwaves that you know of but which may not be common knowledge.

Packet Radio

This is a form of transmission which is not yet legal in this country but which is generating a lot of interest. There have been several articles published recently giving details of the system and it seems as though it could well be included in the amateur licence within the near future.

As this is a data type of transmission it comes within the scope of BARTG and, in the Spring issue of their magazine *'Datacom'*, they announce plans for setting up a special interest group for this activity. If you are interested contact Ian Wade, G3NWR, who is QTHR or can be contacted on 05255-4760.

A lot of experience of Packet Radio has come from the USA and Canada where the system is legal and it seems certain to attract a lot of interest in this country.

RTTY Repeaters

Not quite in the form you may think. During the recent RTTY contest it was noticed that several contestants who wanted to avoid the QRM did so by the simple expedient of moving on to the input frequency of a repeater that was not in use in their area. This caused considerable problems elsewhere, of course.

Repeater R7 was particularly plagued by this activity, although it was also noticed on other channels during the contest. While admitting that the band plan is not legally binding, this type of activity does not help to keep up the good image that BARTG has enjoyed over the years.

Beacons

A similar problem affects the beacon section of two metres which FM operators tend to use on the grounds that, as they can't hear a beacon, they can't be doing any harm! The whole point of the beacons is that they give as much information on conditions when they can't be heard as when they can.

The real problem now is that there are so many special interest sections in the band that it does not leave much room for general operating, perhaps a good reason for trying a move on to 70cms? Plenty of space up there and the band is frequently open when two metres is only average. Why not give it a try?

The final word

And so we come to the end for this month. Lots of interesting news and lots of nice activity to look forward to over the coming months. By the time that you read this we should be well in to the Sporadic E season.

Hearing all those more distant continental stations, coming in at tremendous signal strength, for the first time is something you will never forget. Write and let us have your views and news on all matters to do with the bands above 50MHz. Good DX.

Getting the best from ROOFSPACE AERIALS

by Ken Williams

Since the dawn of amateur radio, magazines have published thousands of words describing the design and construction of ever more efficient aerials. Quite rightly so, for on the adequacy of the aerial system rests the station's ability to radiate a worthwhile signal.

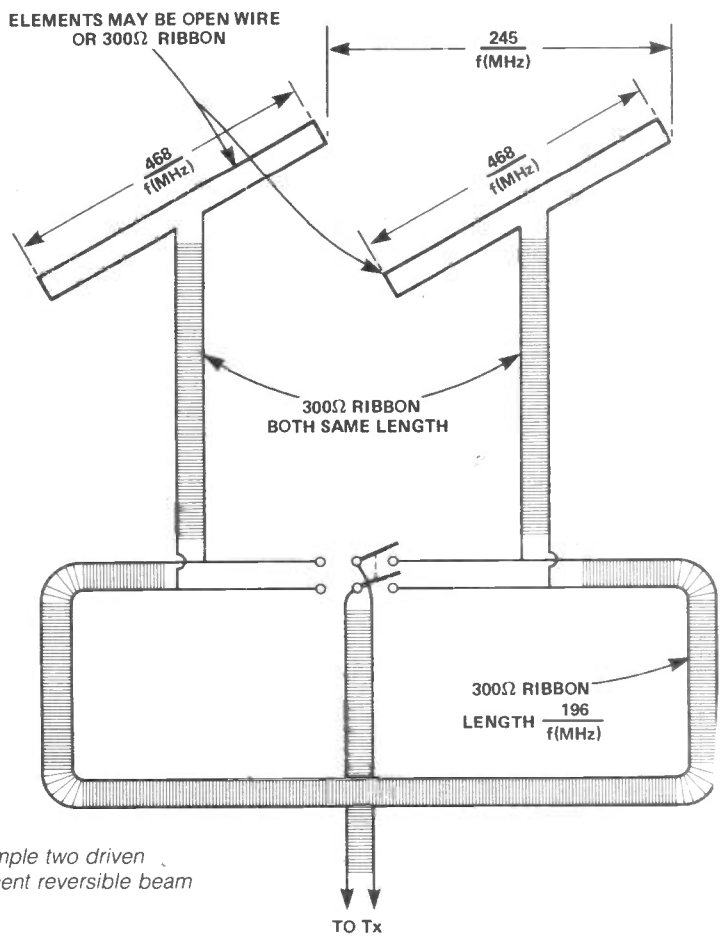
In general, these articles assume that the reader has a garden, or other area of reasonable dimensions. Unfortunately, not all amateurs are so blessed. In consequence many, quite unnecessarily, restrict themselves to VHF operation using small aerials and forego the pleasure of HF operation altogether. There is no need for this, for it is always possible to construct a reasonably efficient window or loft aerial which is capable of making many enjoyable contacts.

In a restricted environment, the first task is to ascertain the degree of restriction. The authorities may have decreed 'no outside aerials', but the internal roofspace of the house may be available. In other cases, the amateur may be a flat dweller, with or without a balcony – a far more difficult proposition.

In each and every case though, there will be a solution to the problem which, although not necessarily capable of DX operation, will permit European working and when conditions are good, contacts from further afield.

In the first case, loft aerials are quite a viable proposition. At the higher end of the HF spectrum, on the bands between 10 and 20 metres, the space available may well be sufficient for a dipole or even a small fixed beam. The element lengths may have to be modified slightly to compensate for the proximity of house wiring, water tanks etc, but even outdoor aerials should be individually tuned to allow for the effects of nearby trees, houses etc. Some advantage may be gained by using a folded dipole made from 300ohm ribbon with a suitable balun, for these tend to be less affected by nearby objects.

If the orientation of the roofspace is suitable, it may well be found possible to erect a reversible, two driven element beam constructed from 300ohm ribbon. Outdoors, this feeder is often suspect as its impedance and losses can vary widely under the influence of climatic conditions. Indoors, these effects are absent and it is an extremely convenient material to use for aerial construction.



A simple two driven element reversible beam

Interesting problem

It is when the decision is made to operate on the LF bands, 40, 80, 160 metres, that the problem becomes interesting, for it is no longer possible to erect a half wavelength of wire in a single run.

The problem then arises of how to achieve the maximum radiated signal from the space available. The solution to this is helped somewhat by the fact that the majority of the signal is radiated by the two thirds of the antenna carrying the most current and the remainder of the aerial may be left in a random fashion or substituted by inductive or capacitive loading without ill effect.

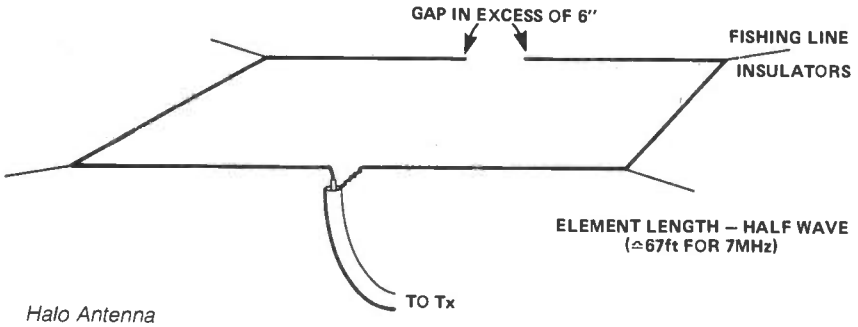
On 40 metres, however, except in the smallest houses, no loading is necessary. The aerial wire may be mounted adjacent to the rafters around the roofspace to form a 'halo' antenna, similar to that used by 2 metre mobile operators in the days before vertically polarised FM operation became popular.

When erected, the length should be optimised by use of a grid dip oscillator. Even then, it will probably be found that the VSWR is relatively high, but on a short feeder run (say half a wavelength or less) losses are likely to be insignificant, provided an Antenna Matching Unit is used to match the feeder to the transmitter. Even this may be unnecessary if the transmitter is an old valve type with a Pi output circuit.

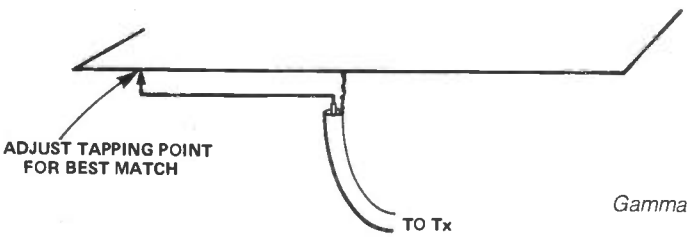
If the feeder run is significantly longer than half a wavelength, it may be worthwhile to fit a gamma match to the aerial to reduce the VSWR on the feeder.

Few, if any, normal houses have sufficient room within the roofspace to install a resonant aerial for either 80 or 160 metres and a loading system therefore becomes necessary.

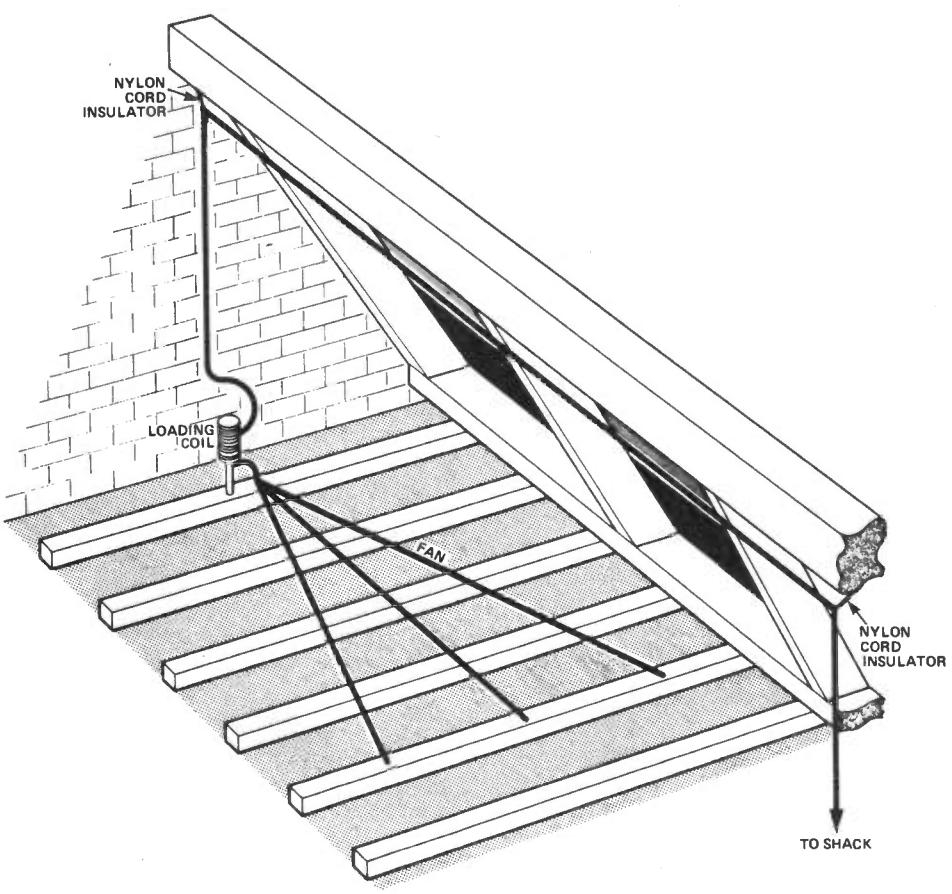
This may take several forms, the general principle being the same as that employed by mobile operators in the



Halo Antenna



Gamma match



The layout of the loaded loft aerial

hey-day of 160 metre mobile operation in the late 1950s and early 1960s. In the present case, three factors make the task far easier:

1. The aerial is much longer.
2. The aerial does not have to survive a 70mph slipstream.
3. The use of an Aerial Matching Unit removes most of the aerial – to – transmitter compatibility problems.

Design

In designing the antenna, the first requirement is to ensure that the section carrying the most current is as high as possible, for this is the source of the strongest radiation. The main length of wire should therefore be run just below the apex of the roof and then down to ceiling joist level at either end. The most convenient of these ends should then be extended into the shack and the aerial loading system attached to the other.

The aerial loading system comprises an inductance and a 'fan' of wires which act as a 'top capacitance' to the aerial.

As every installation will be different, it is suggested that the inductance could take the form of a coil of wire, two to three inches in diameter (a length of plastic water pipe could make a good former), tapped alternate turns. Thirty turns, spaced one wire diameter, would make a good starting point for 80 metres and sixty turns for 160 metres. Under certain conditions, and particularly if high power is being used, a considerable voltage may be developed across this coil, so it is advisable to mount it on an insulated base, well clear of the woodwork.

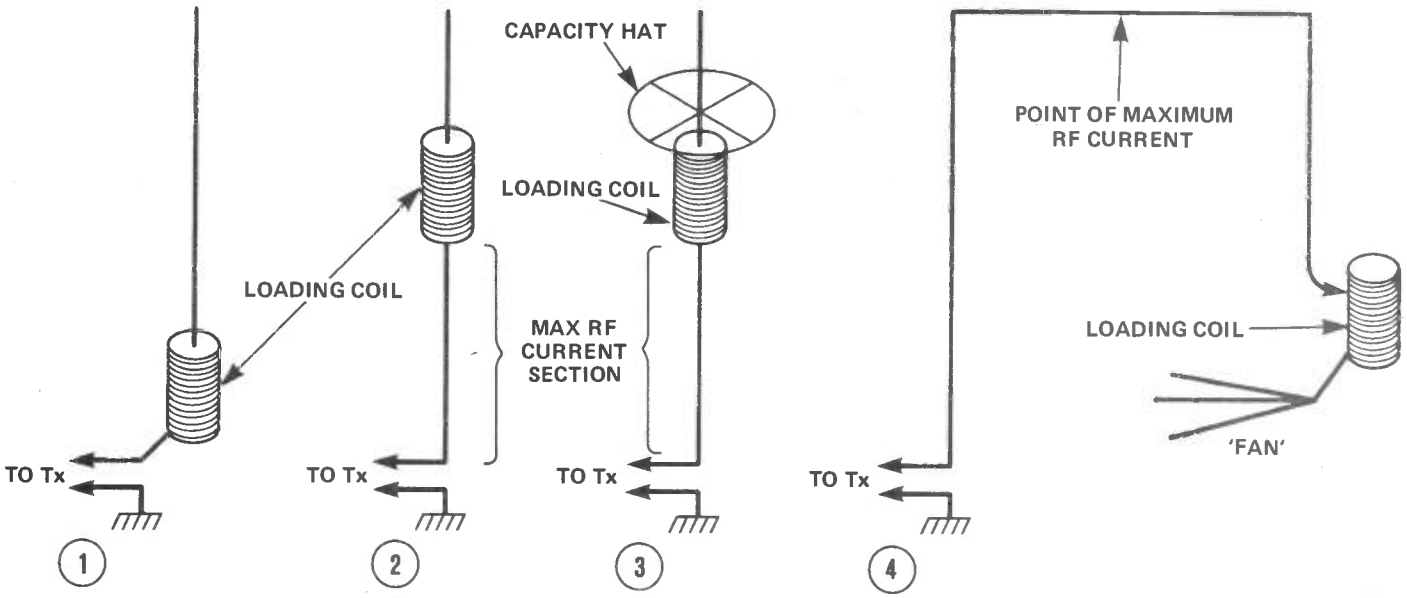
The fan of wires which form the top capacitance comprises three or more wires, each 8-12ft long, resting across the ceiling joists. Again, under certain circumstances, these may carry a considerable voltage, so well insulated wire is necessary. In addition, as these are primarily a capacitance (the other plate being ground), the greater their diameter the better. Old coaxial cable is ideal for this purpose, the connection being made to the braiding.

Connect the aerial to the top of the inductance, using a crocodile clip and the 'fan' to the other. Fit an aerial current indicator to the centre of the span of wire along the inside of the apex of the roof.

Return to the shack and adjust the Aerial Matching Unit for correct loading of the transmitter. Note the transmitter power and also the reading of the aerial current indicator in the roofspace.

Now move the crocodile clip down the coil by two taps and again match the transmitter to the aerial. If the aerial current increases with the same transmitter power, repeat the process until taking the aerial another tap down the coil decreases the current reading. Having now gone through the maximum, backtrack, one tap at a time to find the current peak.

Should the aerial current indication decrease as soon as you start tapping down the inductance, the loading is



Development of indoor antenna from a mobile whip

obviously insufficient and either the number of turns on the inductance or the number of wires in the fan will have to be increased. When maximum current indication is achieved, the system is ready for operational use.

Good theory

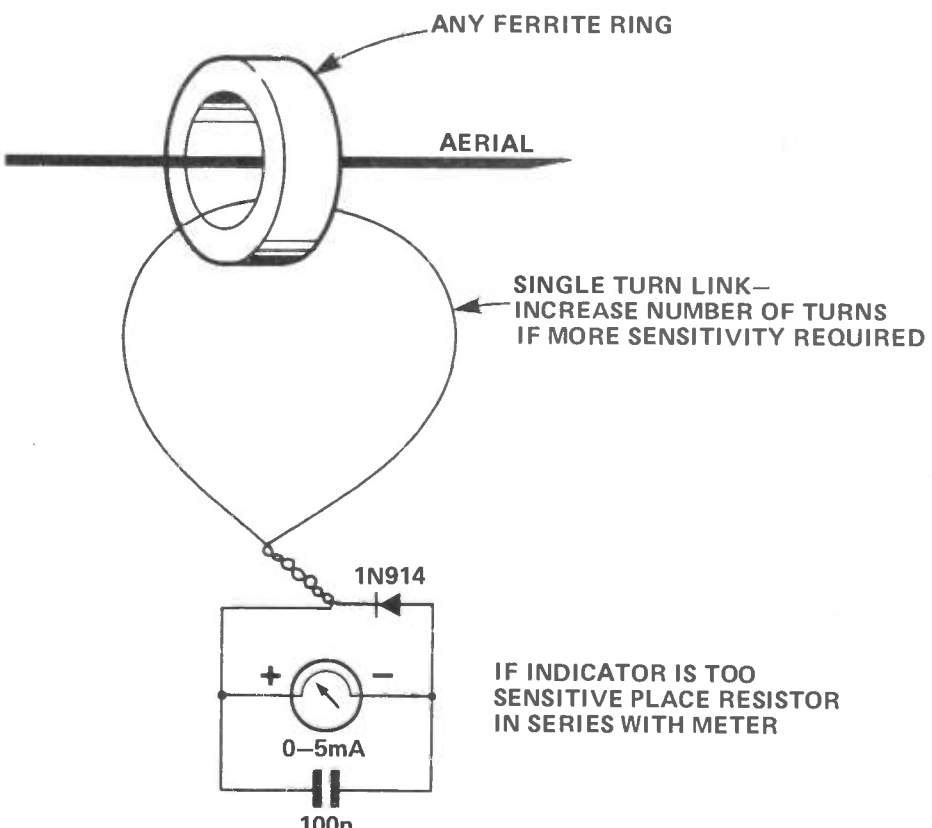
This method of loading would appear to be rather long and complicated, so let us consider what has been achieved and why it should be better than the far more simple method of just stringing a wire across the attic and doing all the loading from the base.

As all the good theory books will tell you, the greater part of the radiation is from the high current portion of an aerial. By positioning the current indicator in the centre of the span of wire under the apex of the roof, we have put the high current section of the aerial exactly where it should be – at the highest possible point.

Also, in any Marconi type aerial (and all end fed aerials tuned against ground are), the impedance of the earth system has to be taken into account in assessing the aerial efficiency.

So, a quarter wave vertical, whose feed impedance is normally considered to be around 36 ohms (but which Moxon claims with justification to be nearer half this) working in conjunction with an earth system of impedance 20-30 ohms, cannot possibly show an efficiency of more than 50%.

Shorter than quarter wave aerials will be less efficient than this if base loaded, for the maximum current portion of the aerial will effectively be inside the Aerial Matching Unit. By resonating the aerial in the manner described, the downlead will not only contribute to the radiation, it will also raise the matching impedance, which, when considering the system efficiency, will give a further boost to the effectiveness of the aerial.



Aerial current indicator

Practical considerations

In erecting indoor aerials, many of the constraints of external construction are absent – such as the ability to withstand gale force winds and the provision of insulators which will still efficiently perform their function in a deluge.

Other factors, however, raise their heads and these are mainly a consequence of domestic service equipment such as water tanks and electrical wiring.

In both instances the aerial should be mounted as far as possible from the offending objects. In the former, the presence of a large earthed water tank can absorb considerable quantities of power whilst any RF induced into house wiring may cause a number of problems.

An extreme case of this was suffered by a friend many years ago in the days of HF AM. He lived in rooms where he had installed a 150W AM station feeding a 20 metre dipole in the roofspace. His landlady was interested in his hobby and often visited him when he was operating.

Sometimes, however, when he returned from work he had the feeling that the operating bench was not quite as he had left it. One evening, returning home early, he found his equipment switched on and radiating a carrier. Full of indignation, he charged downstairs – to find his landlady struggling to read by the light of a barely glowing ceiling light – powered by induced RF from the equipment upstairs. The landlady was under the impression she was saving electricity!

Whilst induction problems are rarely as severe as this, other problems can occur such as TVI (straight from the mains to the video stage), and interference to hi-fi's, recorders or any other domestic electronic equipment.

The only solution is to ensure that the aerial is kept as far from electrical wiring as possible and if it cannot be avoided, ensure that the aerial wire crosses the power wiring at a distance of several inches from it at as near a right angle as possible.

Not all is on the dark side, however, for the absence of wind and rain means that the type and diameter of the aerial wire used need only be constrained by its current carrying capacity whilst adequate insulation will be obtained from short lengths of nylon fishing line. In the same vein, on one version of this aerial used in the past, the author dropped the loading coil over the neck of a milk bottle to provide the coil insulation mentioned previously.

Multiband operation

The author has only used this aerial for single band operation for he has always possessed a modest garden over which it is possible to erect an aerial for most bands. In consequence, roofspace aerials have only been used when the airspace over the garden has been otherwise engaged. The requirement for multiband operation has therefore not arisen.

However, it would appear that by provision of more than one loading system, dual or multiband operation should be possible. In such cases it would be necessary to minimise coupling between the loading systems, by separating the loading 'fans' and spacing the two loading coils. It is probable that the two or more loading systems would interact to a degree, thus it might be advisable to resonate the lowest frequency system first and proceed, band by band, to the highest. Having completed this, return to the lowest frequency and re-check each band in turn. The development of a system along these lines could provide quite an interesting project.

Conclusions

Using this system several years ago in conjunction with a single frequency, crystal controlled, five watt CW transmitter, the author worked over 50 stations in twenty five countries during two weeks operating.

Within recent months, using a hundred watts of SSB, a foray onto 80 metres produced 89 reports from as far afield as the Azores, North Africa and Moscow.

The author cannot claim to have had long, continuous experience with this system for he has always had the availability of outside aerials. However, when the use of indoor aerials has been necessary, this system has proved effective in each and every case. He has, therefore, no hesitation in recommending it to any person who, for any reason, is limited to those aerials which he can fit in his roofspace.

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BATTERY HOLDERS

HP7 2 per side, end to end	0.28
HP7 2 per side, side by side	0.28
HP11 4 end to end	0.37
HP11 2 rows single sided	0.37
PP9 Press Stud	0.10
PP3 Press Stud	0.10

CRT-VALVE BASES

T20 CRT Base	1.35
Toshiba CRT Base	1.40
B9A EHT Base	0.55
B7G Ceramic	0.55
B9A Ceramic	0.55
B10B	0.55

TRIM TOOLS

Twin Bladed Bronze-Phosphor	0.25
Long Plastic, Hex at one end	0.11

FOCUS UNITS

RRI T20	1.80
Thorn 8500	1.90
Focus Rods	1.10

CAPACITORS

MIN PLATE CERAMIC 63V

1.8PF to 12,000PF	0.05
10,000PF to 12,000PF	0.06

POLYSTYRENE 160V

10PF to 820PF	0.07
10,000PF to 15,000PF	0.09

TANTALUM BEAD

.1MF 35V	0.16
.15MF 35V	0.16
.22MF 35V	0.16
.33MF 35V	0.16
.47MF 35V	0.16
.68MF 35V	0.16
1MF 35V	0.16
1.5MF 35V	0.16
2.2MF 35V	0.17
3.3MF 35V	0.18
4.7MF 35V	0.18
6.8MF 35V	0.20
10MF 35V	0.20
22MF 16V	0.24

MIXED DIELECTRIC

.01 1000V	0.24
.01 1500V	0.25
.022 1000V	0.28
.033 1000V	0.28
.1 1000V	0.30
.1 1250V	0.46
.1 2000V	0.75
.22 1000V	0.48
.22 1250V	0.60
.47 1000V	0.79

8KV DISCS

180PF, 210PF, 270PF, 330PF, 500PF	0.30

POLYESTER 250V

.01MF	0.06	.022MF	0.06
.033MF	0.06	.047MF	0.06
.068MF	0.06	.1MF	0.07
.22MF	0.08	.33MF	0.08
.47MF	0.13	.68MF	0.13
1MF	0.16		

MYLAR FILM 100V

.001MF	0.06	.0022MF	0.06
.0047MF	0.07	.01MF	0.07
.022MF	0.07	.033MF	0.08
.047MF	0.08	.068MF	0.09
.1MF	0.09	.22MF	0.13
.47MF	0.22		

DISC CERAMIC 50V

.01MF, 022MF, 047MF, .1MF	0.04

S CORRECTION

.91MF G11	0.55

ELECTROLYTIC 25V

10MF	0.08	22MF	0.08
47MF	0.09	100MF	0.09
220MF	0.15	470MF	0.22
1000MF	0.33	2200MF	0.50

ELECTROLYTIC 40V

470MF	0.30	2200MF	0.70

ELECTROLYTIC 63V

1MF	0.08	2.2MF	0.08
4.7MF	0.08	10MF	0.08
22MF	0.11	47MF	0.12
100MF	0.19	220MF	0.30
470MF	0.42	1000MF	0.65

ELECTROLYTIC 100V

0.47MF	0.10	1MF	0.10
2.2MF	0.10	4.7MF	0.10
10MF	0.12	22MF	0.16
47MF	0.17	100MF	0.26
220MF	0.45	330MF	0.55

ELECTROLYTIC 250V

0.47MF	0.11	1MF	0.14
10MF	0.28	22MF	0.31

ELECTROLYTIC 450V

10MF	0.50

SMOOTHING CAPACITORS

Decca 200/200/400 350V	2.70
Decca 400/400 350V	2.90
Decca 400/800 350V, 250V	2.90
Philips 600 300V	2.50
Philips 2200 63V	1.55
Philips 470 250V	2.00
Philips (G9) 600 300V	2.80
PYE 200/200/100/32	2.85
PYE 600 300V	2.80
RRI 2500/2500 30V	1.20
RRI 220 400V	2.90
Thorn 150/160/100 300V	1.90
Thorn 4700 25V	0.85
Thorn 1000 70V	0.70
Thorn 200/100/100 350V	2.85
Thorn 175/100/100 400V	2.40
Thorn 400 400V	2.50

PUSH BUTTON UNITS

Decca 30 4 way	6.80
Decca 30 6 way	7.80
GEC 2110	11.00
GEC 2112	12.95
GEC 2136/7	8.90
GEC 2112 Conversion	13.00
Hitachi 190 4 way	8.95
ITT CVC5 7 way	10.00
ITT CVC8/9	12.85
ITT CVC20/30 6 way	8.00
ITT CVC 25 6 way	8.50
Philips 520	11.00
Philips 550	13.55
Philips G11	22.50
PYE 713 4 way	8.70
PYE 715 6 way	13.50
PYE 725 (UHF-VHF)	13.50
RRI 823 4 way	8.75
RRI 823 6 way	9.50
RRI T20 6 way	10.50
RRI Z718 6 way	9.50
Thorn 3500 6 way	2.75
Thorn 8500 6 way	2.75
Thorn 9000 6 way	2.75
Thorn 1615 4 way	8.70
Telpro 4 way	8.50

FUSES

20mm A/S (10 Pack)	
100mA, 160mA, 250mA	1.50
315mA	1.20
500mA, 630mA, 800mA	0.95
1A, 1.25A, 1.6A, 2A	0.95
2.5A, 3.15A, 4A, 6.3A	0.95
20mm Q/B (10 Pack)	
160mA, 250mA, 316mA, 500mA, 630mA, 800mA, 1A, 1.6A, 2A, 3.15A	0.45
1¼" A/S (10 Pack)	
250mA, 500mA, 630mA	1.50
800mA, 1A, 1.25A, 2A	1.50
2.5A, 3A, 5A	2.30
1¼" Q/B (10 Pack)	
250mA, 1A, 1.5A	0.60
2A, 3A, 5A	0.60
Mains Fuse (10 Pack)	
2A, 3A, 5A, 13A	0.90

LOUDSPEAKERS

8 x 5 16 ohm	2.98
6 x 4 16 ohm	2.60
6 x 4 25 ohm	4.30
8 x 3 70 ohm	3.40
5 x 3 50 ohm	3.00
7 x 3½ 16 ohm	3.00
5¼ x 3 80 ohm	2.90
Thorn 1590 large	4.00

TUNERS

1043/05	7.95
1043/06	7.95
U321	7.25
U322	7.25
G8	11.75

RESISTORS (CARBON)

½ Watt IRO to 10M (10 Pack)	0.18
1 Watt 2R2 to 10M (10 Pack)	0.39
2 Watt 4R7 to 10M (10 Pack)	0.60

RESISTORS (WIREWOUND)

2½W OR22 to 10R	0.15
5W OR47 to 6K8	0.15
7W OR47 to 12K	0.15
11W OR1 to 18K	0.18
17W IRO to 6K8	0.24

PRESETS

Horizontal and Vertical Standard and sub mid sizes 100R to 4M7	0.12

MAINS DROPPERS

Decca 20 mono	1.35
Decca 30 3R9	0.60
Philips G8 2R2 + 68R	0.84
Philips G8 47R	0.50
Philips 210 (no link)	1.10
Philips 210 (with link)	0.95
PYE 725 3R3	1.79
UMc B69 6BL + 56R	1.40
PYE 725 + 56R + 3R	1.55
RR1 823 56R + 68R	0.85
Thorn 1500	1.55
Thorn 1600	1.45
Thorn 3500	0.97
Thorn 800	1.20
Thorn 8500	0.97
Thorn 8800	0.97
Thorn 9800	0.90
GEC 2110	0.85

CONVERGENCE CONTROLS

5R, 7R, 10R, 12R, 15R, 20R, 100R, 200R, 500R	0.38
G8 Metric 10R, 15R, 20R	0.50
Thorn 50R, 200R	0.50

THERMISTORS

PT34P	0.85
PT37P	0.85
PTH451A	0.75
VA1026	0.50
VA1104	1.00
GEC Dual	1.60
G11 Transient VDR	0.42

VALVES

30FL1	1.20
DY86	0.75
DY802	0.75
ECC82	0.75
PCF80	0.85
PCF802	0.95
PCL82	0.85
PCL84	0.85
PCL85	0.95
PCL86	0.95
PFL200	1.20
PL36	1.25
PL504	1.60
PL508	2.30
PL509	5.80
PY800	0.89
PY500A	2.30

EHT TRAYS

Decca 1830	5.90
Decca 2230	6.25
Decca 80	6.25
Decca 100	6.25
GEC 1028	6.25
GEC 2040	6.25
GEC 2110	6.25
GEC 2200	6.25
Grundig 5011	6.25
ITT CVC 5/8	6.25
ITT CVC 20	6.25
ITT CVC 45	6.25
Korting 90°	6.95
Philips 520	6.50
Philips 550	6.50
Philips G9	6.25
Philips 570	6.50
Philips KT3	8.95
PYE 691/697	6.30
PYE 713 5 lead	6.50
PYE 713 4 lead	7.60
PYE 725/731	6.25
RRI 823	7.75
RRI T20	6.50
Tandberg TV2-2	6.50
Thorn 1500 3 stick	4.95
Thorn 1500 5 stick	5.50
Thorn 3000/3500	7.70
Thorn 8000	4.95
Thorn 8500	6.80
Thorn 9000	7.80
Telpro 561	7.00
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TV11	0.85
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Autovox 90°	9.75
autovox 110°	9.75
Decca 1700 Mono	9.80
Decca 1830	9.80
Decca 2230	8.30
GEC 2110	9.50
GEC 20AX (diode split)	12.00
Grundig 1500 mono	13.70
Grundig 5010	11.50
ITT CVC5/8	10.25
ITT CVC20	10.75
ITT CVC30	8.75
ITT CVC45	9.75
Indesit mono	10.75
Korting 90°	10.75
Korting 110°	12.50
Philips 210	9.90
Philips G8	8.90
Philips G9	8.50
Philips G11	12.95
Philips K30	14.95
Philips KT3	7.95
Philips 570	9.50
PYE 691 P.C.	13.00
PYE 725	8.95
PYE 731	8.95
PYE 169	10.75
RRI 640/793	11.75
RRI 774	12.90
RRI 823	11.90
RRI T20	12.90
SABA	12.50
Skantic	12.50
Thorn 1500 20"	7.00
Thorn 1500 24"	7.00
Thorn 1591	10.50
Thorn 1615	10.00
Thorn 1690/1	8.75
Thorn 9000	10.90
Thorn 9600	10.00

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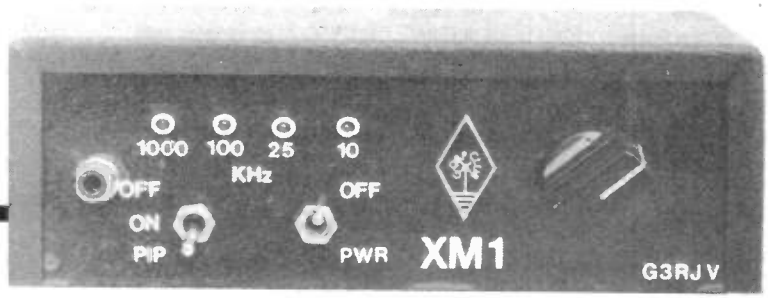
BUILD THE XM1

Know where you are, and be legal with this beginners kit

by Rev George Dobbs G3RJV



Keen RAE students will know that the Home Office Regulations have a requirement, laid down in Appendix H, that a station has a crystal reference source for frequency determination. I recall in the golden days when the GPO were the licencing authority and the inspector's knock could come at the door anytime; usually at least once a year, having a difficult time during a station inspection when my crystal standard failed to operate. Looking the inspector in the eye with all the conviction of a used car salesman, I told him that it had worked last week. These days the inspector's knock may not come in the night but it is not only a legal requirement but very useful to be able to determine one's frequency accurately. The usual method is to use some form of crystal calibrator with a series of outputs obtained by dividing down frequencies from the crystal standard. Many suitable items of equipment are made and sold for this purpose; some are good; some are limited; many are over-priced. The XM1 is a versatile crystal calibrator sold in kit form by CM Howes Communications.

Advantages of the XM1 kit

Kits are a good way for the beginner to cut his teeth in home construction of radio equipment but are very variable. Some are over-priced; some contain almost incomprehensible instructions; others are just adult jigsaw puzzles and the builder learns nothing of his work. The Howes Communications range of kits avoid most of these pitfalls. The XM1 kit contains all the components to build up a crystal calibrator printed circuit board. The builder is left to provide all the hardware and the housing for the unit. This has the advantage that the difficult bit for the beginner, the electronics, is made easy but the constructor can add his own individual stamp to the project in the mounting and housing of the printed circuit board. The instruction leaflet assumes that the builder is a complete beginner. The method of construction is stage by stage following a fitting plan with a check list to inspect the completed board prior to use. All component lead-outs are given and even the resistor colour-coding is explained. The project should be possible for someone who has never done any electronic construction in the past.

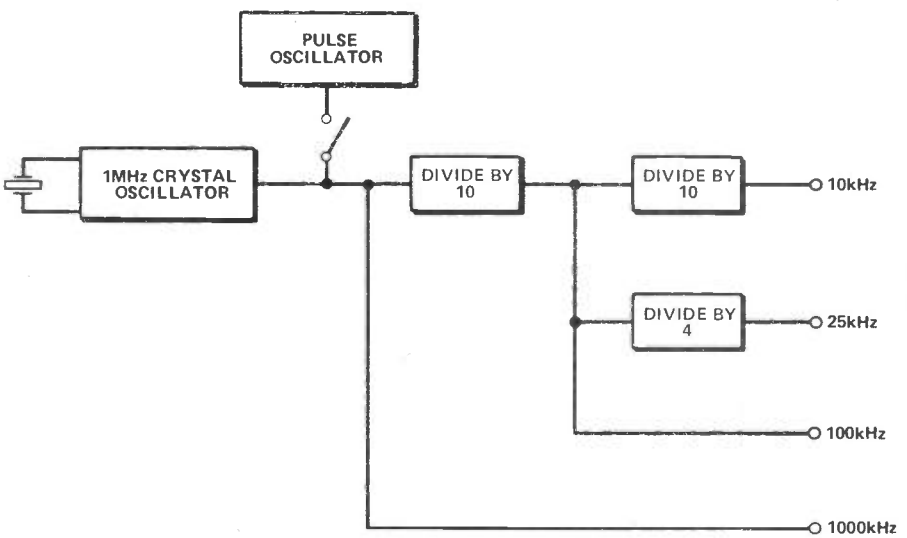


Figure 1 *Frequency dividing block diagram*

Figure 1 shows the block diagram of the XM1. The basic frequency standard is a 1MHz crystal oscillator. This oscillator naturally gives a usable calibration point every 1MHz (1000KHz). This signal is divided by ten to give calibration points at 100KHz. Another divide by ten stage gives the 10KHz calibration points. The 100KHz signal is also routed through a divide-by-four stage to give 25KHz calibration points on the receiver. It is possible to mistake other signals for the required calibration signal. In the XM1 a pulse oscillator may be switched into the circuit to give a very distinctive bleeping signal from the calibrator. Quite a versatile unit, since the XM1 gives calibration points on the receiver every 1MHz, 100KHz, 25KHz and 10KHz. The logic dividing circuits produce outputs very rich in harmonics and it should be possible to hear the calibration signals throughout the HF spectrum and into the 2 metre band.

The circuit

The circuit of the XM1 is shown in *Figure 2*. The circuit uses seven integrated circuits; one of these, IC7, is a voltage regulator to give the 5 volt supply voltage for the rest of the circuitry and another, IC5, is the pulse oscillator. The frequency generation and dividing is done with 74LS TTL integrated circuits. The 74LS series use a Schottky process to provide a five times power consumption reduction and twice the speed of the standard TTL series.

The 1MHz oscillator around IC4a and IC4b is a simple multivibrator circuit frequency-controlled by the 1MHz crystal with a trimmer, TC1, to allow fine adjustment of frequency. The output is buffered through the two remaining gates of IC4, IC4c and IC4d. IC4c also mixes in the pulsed output from the pulse oscillator IC5. IC5 is controlled by a centre-off toggle switch. With the switch in the centre the signal passes through IC4c unimpeded; switched to E (ground) the signal path is closed; switched to P the pulsed oscillator is added to the signal.

Three integrated circuits provide the frequency division. IC1 and IC2 are divided-by-ten stages and IC3 is the divided-by-four stage. Each of the four available outputs is buffered by a gate from IC6 and capacitively coupled to output points. IC1, IC2 and IC3 are all decoupled close to their supply leads with R7/C1, R8/C2 and R9/C3 – a wise precaution because TTL dividing circuits are very rich in harmonics and can be

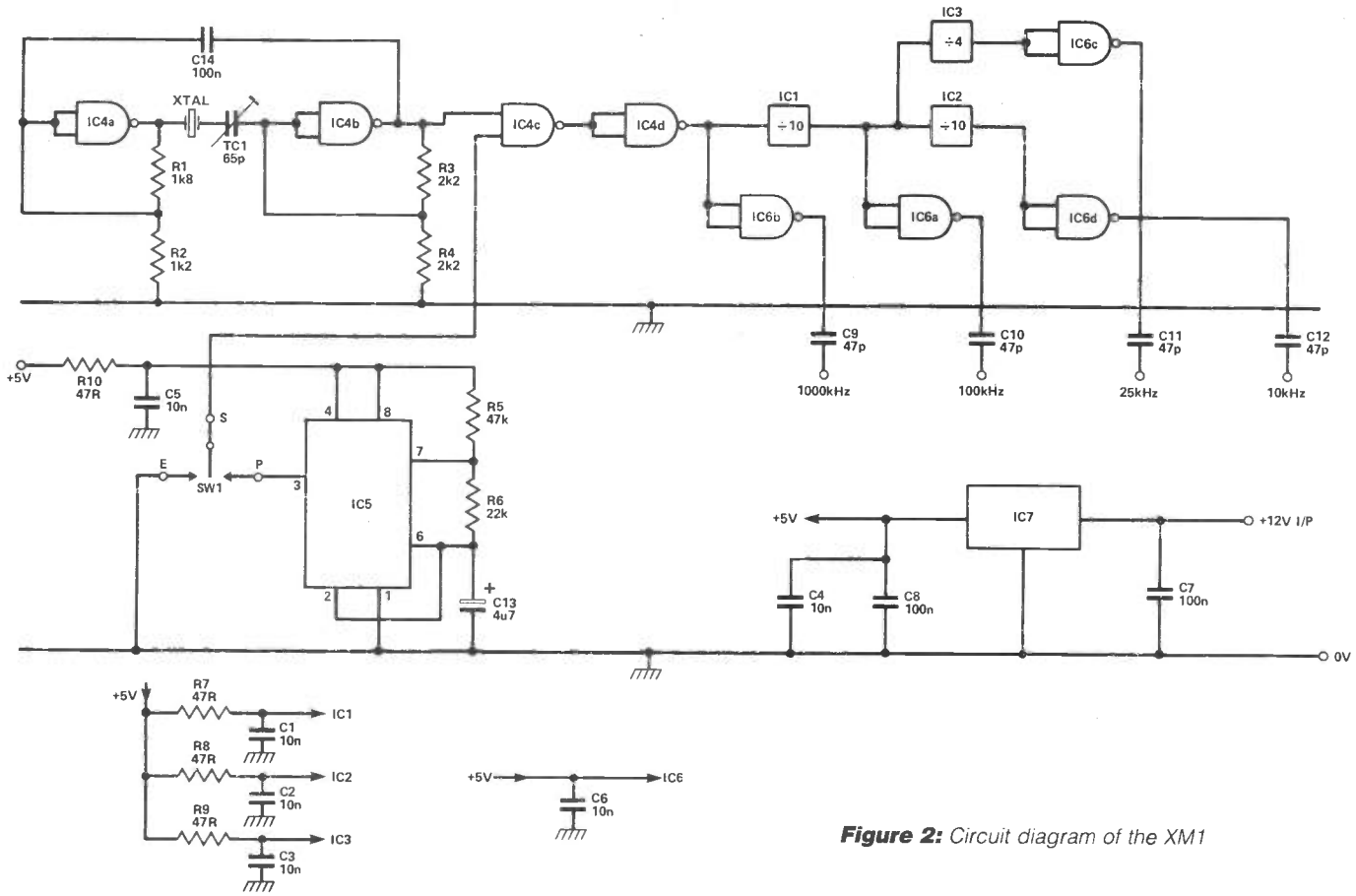
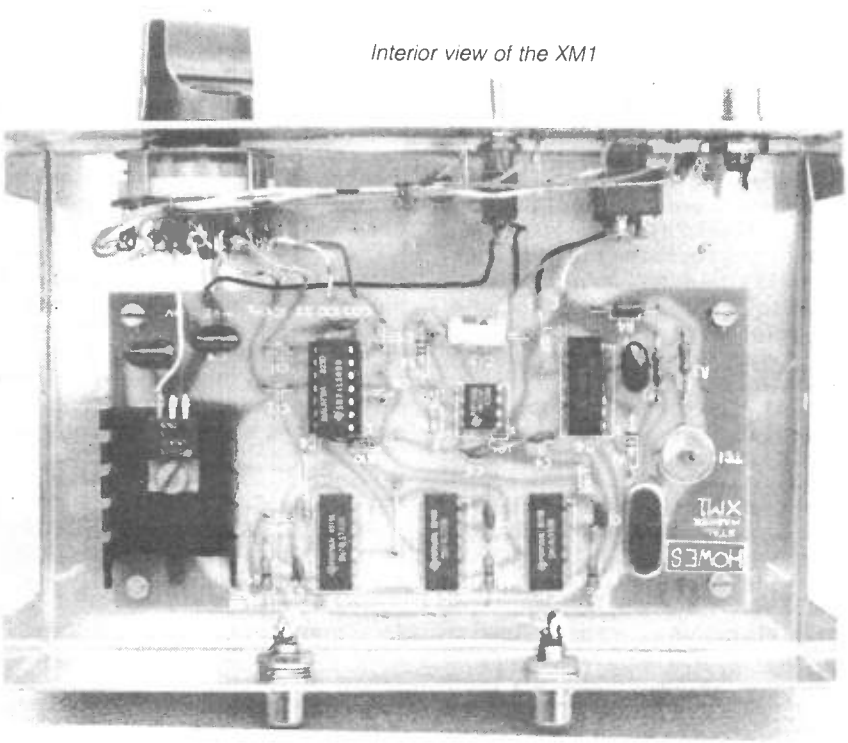


Figure 2: *Circuit diagram of the XM1*

great generators of radio frequency interference.

I recall building a TTL dividing calibrator several years ago and leaving out the power supply coupling. The unit not only wiped out the medium wave receiver in the shack but produced lovely bars on the television in the next room. The XM1 has none of these antisocial products. There might appear to be a minor epidemic of 0.01uF capacitors in the XM1 but they are a wise design feature.

Interior view of the XM1



The PCB

It is difficult for an experienced constructor to judge a kit designed for beginners but I faithfully followed the instructions supplied with the kit as if launching into completely uncharted waters. They were clear and concise and appear to cover all aspects of the task. The printed circuit board is screen printed with a layout plan for the components so the difficult part of translating the circuit diagram to a layout on the board is reduced to a simple 'pop 'em in and solder 'em up' job. The instructions describe a step by step approach with a final circuit check against a check list. The only real problem I can foresee for the beginner is the ability to make good solder joints onto dual-in-line integrated circuit pins. I would advise a complete beginner to buy some dual-in-line integrated circuit holders and solder these onto the board rather than adding the ICs directly to the board. I'm not a beginner but even I did it. The kit does contain some basic instructions on soldering.

Housing the XM1

Having built the printed circuit board the constructor will want to house the XM1. Having to provide one's own housing provides the constructor with the chance to match up the XM1 to existing equipment if required. The photographs show the layout I adopted for my XM1. The box is designed to match up with my Argonaut 515 transceiver so I

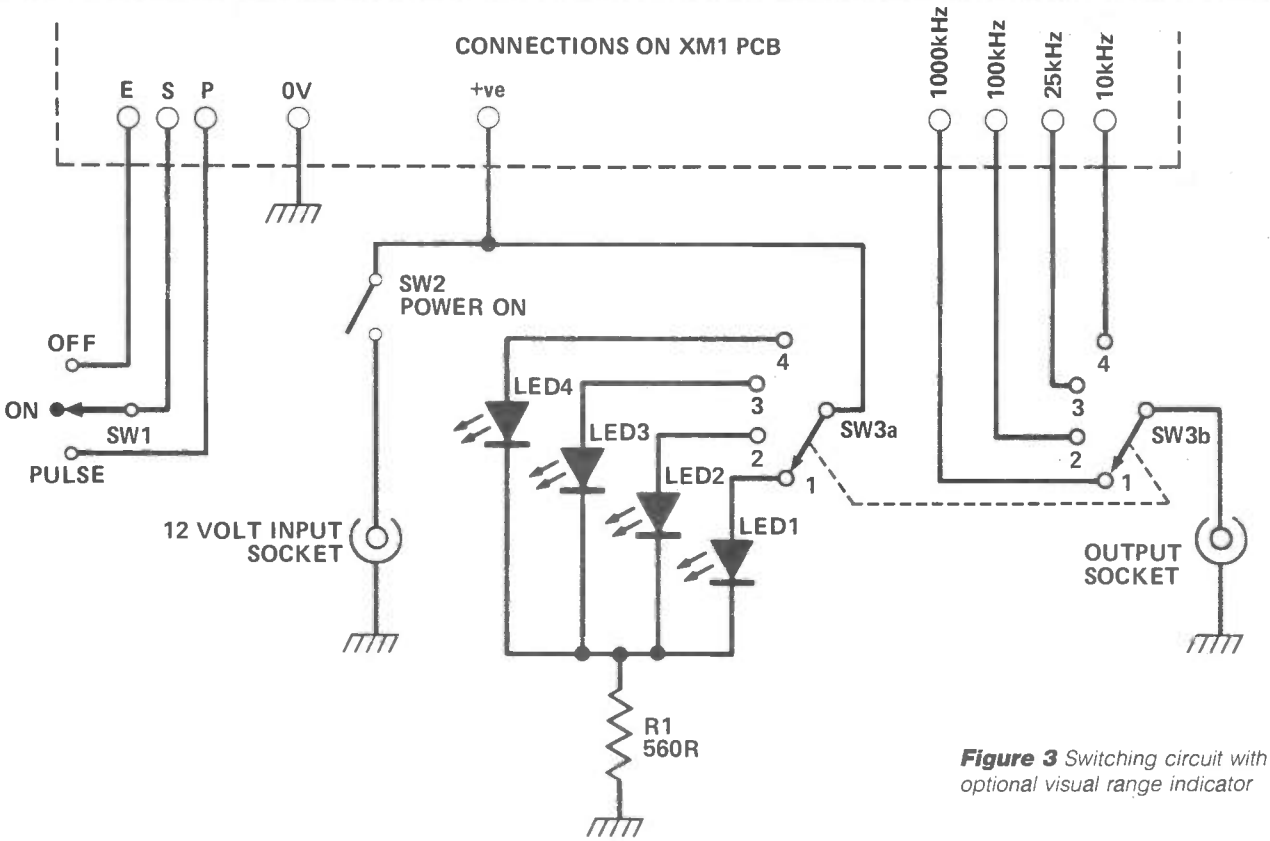


Figure 3 *Switching circuit with optional visual range indicator*

used a Ten Tec Knob and a black case. Buyer beware! It is possible to spend more on cases and hardware than on the electronic content of a project. The skilled and equipped constructor may like to fabricate his own case but we lesser mortals tend to buy ours. I bought a case type J6 (4in x 2in x 6in) from Minfford Engineering, a company that supplies inexpensive hardware for the amateur. These are instrument cases with an aluminium front and back panel and PVC-coated lid. Three coats of flat black car spray gave the black finish and the legends were added with white rubdown lettering. I added a layer of sticky-backed clear plastic film to the front panel for a more durable finish. This is the plastic film sold by W H Smith and other stationers for covering books.

The basic XM1 calls for two switches and four output sockets but I decided to add a few 'bells and whistles' as our American friends put it. *Figure 3* shows my layout for switch and indication around the completed board. The outputs are switched to one output point using a 4-way wafer switch. Most 4-way wafer switches are 3-pole; that is they have three sets of 4-way switching contacts. It seemed a waste to only use one section of switching so I added visual indication of the output by having a spare set of switching contacts operate a line of four light-emitting diodes (LEDs). The output switching is shown around S3(A and B). S3(B) simply chooses the required output and in the same switching action one of the LEDs (D 1 to 4) is lit. R1 is a common current-limiting resistor for whichever LED is in circuit. The LEDs are marked 1000, 100, 25 and 10 as appropriate. A simple idea but it adds a little touch of class to the XM1. Beginners could be confused by all the contacts on a 4-way 3-pole wafer switch, so if in doubt check them out with a multimeter on the ohms range. The LEDs are a push fit onto holes drilled in the front panel. The leads will probably hold them in place but I did a belt and braces job with a blob of Araldite on the back.

The power supply (12 volts) input is via a socket on the back of the case and is switchable with S2. In my case both the power socket and the output socket are phono types as these are standard in my shack but any suitable type might be used. The miniature toggle switch for the power and the centre-off toggle switch, for the pulse/on/off, are standard items. Slide switches are cheaper (but less reliable) and could be used. I also added an extra output socket on the front panel as my XM1 is 'plumbed' into the station and I may require the calibrator for other testing purposes.

Calibration and use

The XM1 requires setting up before accurate use. The easiest way is to connect a long lead (unscreened) to the output socket and calibrate the crystal against the Radio 4 transmitter on 200KHz. Lay the lead near a Radio 4 receiver and switch the XM1 to 100KHz output. Tune in the radio signal to the centre of the Radio 4 transmission and adjust TC1 to obtain a zero beat signal on the radio. Thanks to the BBC but only for a short while because Radio 4 is being moved slightly off 200KHz. However it is possible to adjust the frequency using one of the standard frequency transmissions on the short wave bands.

How does one use the XM1? Well it provides outputs for a receiver every 1MHz, or 100KHz, or 25KHz or 10KHz. The output is enough not to have to connect the XM1 directly to the circuitry of a receiver. I used a lead (unscreened) which just rests inside the case of my station Antenna Tuning Unit. If an ATU is not used the lead may provide enough injection by wrapping it around the input lead to the antenna socket on a receiver or transceiver. If the screening is too great, introduce the lead into the case of the receiver or transceiver and place it close to the antenna socket inside the case. The dividing method is such that the odd frequency outputs are higher than the even frequency outputs but this is usual with this type of calibrator and not a fault of the constructor.

The XM1 provides an easy way to comply with the legal requirements of the amateur radio licence and also provides a handy bit of test equipment in its own right. There are a lot of calibrators on the market but the XM1 works well and allows the satisfaction of building one's own station equipment.

Kit from:
CM Howes Communications, 139 Highview, Vigo, Meopham, Kent, DA13 OUT, who will, for a stamp, provide details of the XM1 and their other kits.
Boxes from:
Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd, LL41 4NE, who supply a range of cases and hardware for the amateur constructor and will provide their lists for a sae.
Photos by Jo-Anna Dobbs.

SHORT WAVE LISTENER

by Trevor Morgan, GW4OXB

You know, it may sometimes seem that I am trying to teach granny to suck eggs, as the saying goes, but the fact remains that the number of short wave listeners is increasing in leaps and bounds. Many of our readers are old hands who have had a bash at most things, but there are many that don't know a windom from a hole in the ground! It is for this reason that this column is written in an easy to follow manner and consists of many things that are 'old hat' to some. It is gratifying to hear from readers who have tried something new in the hobby as a result of an article. Thanks for your letters...I hope I've been of help.

Talking about new things, I've been asked by many about the use of Morse readers for copying fast Morse and RTTY, so I put out feelers with the result that this month we have reviews on two morsereaders.

Before we get going I must explain that like many amateur stations and listeners' set-ups, I have little in the way of test gear so the reviews are done in a way that can be understood by the newcomer to the hobby. I just opened the boxes and plugged 'em in. Now for the results...

The MBA-RO reader

First appearances are always impressive and this unit is a very attractive one indeed. I am one of those many people who discard the instruction manual and try my own way first. With the MBA-RO I couldn't go wrong as the markings on the front panel were self-explanatory.

Luckily I had a few leads lying around the shack with the necessary 3.5mm jacks fitted as these are needed to interconnect the various sockets with my set-up. Leads were connected from my station transceiver speaker output to the audio input of the reader and my extension speaker was plugged into the audio output socket. An old key was plugged into the key input on the MBA-RO. Power was taken from my main station PSU and we were in business. On switching on, a row of asterisks was displayed on the built-in vacumn fluorescent display in a very bright blue legend.

Tuning the shack transceiver to around 14.050, I set the controls on the reader to CW and the mode setting to Morse. Finding a fairly clear Morse signal, I turned the tune control until I began to receive a readout corresponding to the Morse being received. The readout moves from right to left at a speed related to the sending speed which was fine when slow but a bit difficult to read at high speeds. I tuned down to 3.589MHz and found an amateur RTTY station. With the settings of the front panel controls to RTTY narrow filtering and a baudot speed of 60 I obtained a perfect copy despite quite a bit of noise on the band. At the time, I could not find an ASCII signal to decode but would expect an equally competent reading.

Going down to the CW end of the band, I found a QSO in progress between a DL and a G4 at around 20 wpm. Copy on the unit was very good from the DL signals with just a few errors cropping up which were caused by bad spacing by the sender, resulting in a false code being passed to the reader. This was later found to be the major problem with amateur CW and not only with this unit.

If you want to see how good (or bad!) your own Morse is you can do so easily by using the MBA-RO as a practice monitor. Your sending speed is shown on the right of the display and as you send each letter it is displayed in a running series. If you drop a dot or put one in where it shouldn't be you can get some funny readouts, but I found that the biggest advantage was the fact that bad spacing resulted in a real mess!

To summarise the MBA-RO is a nicely presented piece of equipment, obviously well thought out aesthetically and very well constructed. I liked the easily understood controls and the easy set up procedure. I'm afraid I found the readout a bit bright for me (however, I have a sight problem so most people would probably find it OK), and I didn't like some of the symbols used such as the letter V and the 'null' character which tended to appear frequently.

However, these are niggling points and as a Morse reader it does its job well. The Morse training facility is a bonus and is first class. As you don't need a TV or monitor it can be used almost anywhere – it only draws 500mA at 10-16V dc, so it's good for mobile use.

The Code Master

This unit was supplied by Dewsbury Electronics (my thanks to Tony, G4CLX for his help) and was a much more conventional looking piece of equipment in a slim lowline cabinet.

It was obviously well made and the necessary controls were well marked. The front panel carries a row of neat push buttons to operate the various functions and were

marked power, monitor, mode, code practice, page and speed. Red LEDs were provided for monitoring and power.

The rear panel looked a bit complicated with multiway sockets provided for outboard units. All sockets were again clearly marked and consisted of RF output, clock frequency adjustment, printer output, clock checking output, TTL input, external speaker output and AF input.

Leads were provided to interconnect the unit with a receiver or transceiver and a television or video monitor. The Code Master is set up for either video or TV by the supplier before delivery. Setting up the Code Master was simplicity itself. The connecting leads were plugged into my Trio TS130V and my 5 inch TV and the speaker plugged into the unit. It looked rather attractive on top of the rig being finished in standard 'rig grey.'

After switching the unit on it took seconds to tune the television to the required signal and adjust the controls to the desired contrast and brightness.

The mode was selected as CW and the legend 'Morse code' was seen at the bottom left of the screen with a cursor at the top left. Tuning the rig into a CW signal around 14.035, the cursor began moving to the right and the letters appeared rapidly on the screen. The first contact received was a typical 'postage stamp QSO' with simple RST, QTH and name exchanges. It was noted that although the CW could be read quite easily (a speed of about 14wpm), a number of errors were seen on screen. Next I tuned to 3.557 and heard a DL chatting to a G4. The speed was around 20wpm and the readout was practically faultless despite considerable QRM which, at one time, caused the DL to ask for a repeat of the details.

A number of QSOs were listened to and Morse speeds from 6wpm to over 25wpm were copied with varying success. It soon became obvious that the Code Master was doing its job admirably but the problem lay in the actual sending. When reading Morse one tends to cater for slight discrepancies such as long gaps, extra dots and even no gaps worth mentioning depending on experience. The Code Master has to be preset within certain parameters and, in this case, the ratio of 3-1 is used as a basis with the unit able to distinguish dash lengths of 2 to 4 units. Less than 2 units will result in a dot while if the dash is more than 4 units long it could be interpreted as a dash or a space, or be run into the next letter group. If an uninterpretable sequence is received, an underline mark (minus sign) is shown.

An important factor was keeping the signal within the unit's very narrow bandwidth but this was easily controlled by use of the RIT control. The fine tuning control could also be used. Unfortunately, many Soviet stations had the habit of drifting considerably and some weird readouts were obtained.

The decoder would make alphabet stew of 'squawky' signals or keyed carrier signals but signals 'in the noise' were coped with extremely well due to the narrow bandwidth of the unit and, occasionally, a tweak on the rig.

Finally, I had a QSO on 3.5 that lasted all of 25 minutes which rather endeared me to the Code Master as I was able to press the 'page' button and refer to items mentioned early in the contact. My memory has always been awful especially while trying to hold a CW QSO and the memory was a godsend. The capacity is 612 characters each page.

My grateful thanks are extended to the gentlemen who suffered my attempts at using a new electronic keyer at the time. Sorry lads!!!

RTTY

On RTTY reception the unit incorporates a phase-locked loop system which means that it will decode amateur, meteorological and commercially sent RTTY. You simply select RTTY on the front panel, tune in the signal until the monitor LED flashes and you're in business.

Finding an amateur transmission was the main problem but once found the decoding was carried out faultlessly. The commercial code was dealt with just as well.

Morse practice

The next operation was the CW practice mode which takes two forms. On one 'page' the screen shows a selection of five letter groups and as the cursor selects each letter in turn the letter is shown separately lower on the screen. After transmitting thirty groups of five letters, pressing the CP UOS button will bring up a new set of random letters.

The other method of practice starts with a blank screen (except for the 'mode' legend at the bottom of the screen), and as each letter is transmitted it is displayed until thirty groups of five random letters are on screen and if you haven't watched the display you can then check your result. Much better than the usual practice machine which sends random letters, as with them you have no check...if you believe di-da-di-dit is the letter F you will not be corrected. With this unit you can see your errors.

Sending practice is simple as you set the unit to CW receive and plug the output of your oscillator into the port at the rear of the unit. Quite honestly, you don't realise how bad your sending can be until you've used one of these. An electronic Morse sender dosen't teach you anything – this unit tells you how many errors you make and if your gaps are too short you can see it at a glance.

I bought an electronic keyer (Katsumi 121) during the time I had the Code Master and imagined sending beautiful morse at 30wpm...no problem. How wrong can you be! An hour or so after getting on the air I had all sorts of egg on my face and my contacts must have thought I'd gone barmy! I quickly went back to my old pounder!

To summarise, I had a lot of fun using this Code Master and it did everything the book said. Obviously, it has its limitations as any machine of this type has but it surprised me by reading CW that was very weak and, at times, surrounded by noise. The slower speeds tended to show up errors due to bad spacing but messages were quite easily read.

Value for money? For what it offers I think it is good value considering the price of a computer, accessories and a program to do the same job. It is very compact and nicely made. If you're an RTTY buff it offers an easy way of listening in to that mode. All in all an excellent piece of luxury shack equipment at a reasonable price of £179.

Next month

Well there you are, another month over and next issue we'll have a look at making printed circuit boards. This should be fun as I've never made one before so you can have a laugh at my mistakes and avoid making them yourself! Meanwhile, thanks to all who have written in and especially to the lads who said hello at the Swansea Rally in April. It was nice meeting you.

Good listening, es 73, Trevor.

MEASURING FM SELECTIVITY

A rebellious Angus McKenzie G3OSS describes his new test methods for selectivity on FM. 'I intend using these new methods,' he says, 'unless someone proves to me that they are inappropriate.' The gauntlet is thrown down. Anyone care to pick it up?

I am inclined to be something of a rebel as far as test methods go, and over the years I have discarded each long-established test procedure after another when I have found that the results do not seem to correlate with subjective testing.

One of the problems is that for a test method to become established generally, many years may elapse after its invention, so by the time it is in common use it is out of date. I have been engaged in testing consumer and professional hi-fi equipment for 15 years and have evolved many new test methods, many of which have now been taken up as part of IEC standards.

In looking over test procedures, used conventionally for checking NBFM transceivers, there seems to be one glaring example of an unsatisfactory status quo in the measurement of FM selectivity, and whilst I was prepared to toe the line for a year, I recently felt rebellious again, and this article describes a test method which my colleagues and I intend to use unless someone proves to me that for some reason that hasn't struck me, it is inappropriate. Let's take a look at some of the established methods, and see what may be inappropriate about them.

Subjective

Unfortunately, FM selectivity, as we note it subjectively, can be a result of IF selectivity, local oscillator reciprocal noise, limiting characteristics, and the design of the discriminator circuits, together with general alignment. When looking at a black box, there is not time to delve very deeply into a design and fully isolate all the different areas, and what readers are primarily interested in is how a rig is going to perform in practice on today's crowded bands.

If we have a look at how band 2 FM tuners are tested for sensitivity, we can see that there are two established methods, one formulated in the German DIN standard, whilst the second was originally introduced by the American Institute of Hi Fidelity. The former method is a test of quieting, regardless of the effect of the IF selectivity, limiting characteristics and discriminator distortion. This method is purely an indication of real sensitivity, as opposed to usable sensitivity. No matter how distorted full modulation might be, the method, in effect, measures signal to noise ratio. Some sets distort badly at full modulation on weak signals, and it is just the same with amateur radio FM equipment.

Too Narrow

Some receivers having too narrow a selectivity, or poor limiting characteristics can distort so badly at very low RF input levels as to make the modulation almost unreadable. For this reason, both FM tuners on band 2, and NBFM amateur radio or PMR receivers, are measured in the presence of modulation. The technique is called 'sinad rating'. With this rating, it is possible to measure the ratio between all the sound present on a modulated carrier against what remains when the fundamental modulation is removed from the conglomerated sound with a distortion meter. Three separate noises contribute to a sinad rating; the first being hiss produced within the limiter and discriminator because the carrier level is very low; the second is a crackling noise introduced by non-linearities in detection with modulation present, and the third source of noise is distortion of the modulation itself.

12dB sinad means that there is a 12dB ratio between all the noise output of the receiver, and the noise output with the fundamental modulation sucked out. It is approximately the minimum usable sensitivity of an NBFM system for good copy.

In the case of domestic FM tuners, the ratio is conventionally taken for 30dB, and is again sinad, but called '30dB IHF' rating. Now the bearing of this on the measurement of selectivity; if we connect a signal generator into a rig and transmit modulation of 1kHz at a deviation of, say, 3kHz then most rigs will pass this through without too much trouble. As the RF level goes down, crackling and noise comes up, and sometimes distortion increases near the 12dB sinad point. If we increase the deviation to perhaps 6kHz, then distortion will be much greater, and will proportionately become a major part of the 12dB sinad ratio.

You can thus get different ratios between 12dB sinad and the signal to noise ratio between different receivers. The point at which 12dB signal to noise ratio, with modulation turned on and off, is always at a lower RF input level than that of the 12dB sinad point, and so many manufacturers like to quote quieting (NB not quietening) as the number looks better! If FM selectivity is reduced, then distortion for a fixed modulation deviation increases, so the optimisation of selectivity is one between basic signal to noise ratio on the one hand, and distortion with modulation present on the other. The narrower the selectivity, the better is the rejection also of adjacent channel interference.

Well-known

Two well-known methods for measuring NBFM selectivity are as follows. In the first method, a signal on the wanted channel is modulated at perhaps 60% of the maximum designed system deviation at a frequency of, say, 1kHz. A sinad rating of 12dB is reached. The interfering signal at a quoted spacing is then increased in level having modulation on it of, say, 400Hz at a specified deviation level until the 12dB sinad rating deteriorates to 6dB.

Many factors come into play here, for depending upon the limiting and discriminator characteristics, measurements may or may not be consistent. A slight change of modulation frequency or deviation on the unwanted carrier can cause a very different measurement to be given, and I have found this technique very unreliable. The second method is to increase the unwanted signal, without modulation, for a decrease in sinad rating on the wanted channel by 6 or 3dB, whichever one selects. This measurement can be interfered with because of reciprocal mixing problems, and is not

really a true indicator of selectivity.

Interference in a realistic case is usually from a carrier off-frequency with modulation on it, usually speech, in our context, but speech contains an extremely broad spectrum of energy, typically from a few hundred Hz to around 3kHz. Most FM transmissions are, in effect, phase modulated, although the modulator may be a frequency modulation type, and phase modulation can be described as identical to frequency modulation but with a 6dB per octave pre-emphasis, ie with HF up and LF down.

A perfect phase modulated transmitter, feeding an FM receiver having no de-emphasis would appear to have, for a flat audio input response, an output rising 6dB per octave as the audio frequency goes up. FM black boxes incorporate an HF filter to cut off modulation frequencies above around 3kHz which thus decreases the peak deviation available outside the communication speech band. It occurred to me that whilst the wanted channel could perfectly reasonably be fed with sine wave modulation, and I usually use 3kHz deviation of a 1kHz tone, the unwanted carrier should be modulated with filtered white noise from 300Hz to 3kHz in such a way that the peak deviation is just higher than 3kHz when measured on a peak reading deviation meter.

In my set-up the wanted carrier was derived from one Marconi 2019 generator set at say 144.8MHz, modulation frequency 1kHz, and deviation 3kHz. The output from the generator is fed into an accurate Mini Circuits Lab coupler, having 3dB loss, into the receiver via a 10dB attenuator at the receiver end. The other input to the hybrid coupler is fed from a second 2019 generator which is modulated by white noise. We used a Bruel and Kjaer generator having pink and white noise available. An output potentiometer can set the required source level. This is fed into a Kemo high and low pass filter set with cutoffs at 48dB per octave, set to 300Hz and 3kHz, thus giving white noise within the required passband.

Averages

We measured the average level of the white noise peaks such that an average deviation of 3kHz was given by the 2019 generator (the peak to peak input level was 2.83V). This signal was checked on a deviation meter and then used in our tests. My dissatisfaction with the normal procedures has caused rumblings in my lab for some months, and finally, when I found that the Icom 751 was hopeless at rejecting an interfering signal 10kHz above the wanted channel, I decided to try and devise a test which would show the problem up immediately.

I reviewed the TW4000A in the December issue of ***Amateur Radio*** and quoted the selectivity for 12.5 and 25kHz spacings, using the old method, at an average of 45dB and 80dB respectively. In practice, whilst having no trouble whatsoever from any 25kHz spaced signals, just occasionally I have noted some splatter from 12.5kHz spaced interference, and I assumed that the problem was over-deviation of the interfering signals, and as it turns out this was the primary cause.

When testing with the new method, and noting the difference in level between the two generators, which caused degredation of 3dB in sinad rating, there was a difference between the required levels with interference low and high. With interference low, the ratio was +26dB; ie, the interfering signal with white noise on it had to be 26dB higher than the wanted signal for 3dB degredation. This is a very good performance for 12.5kHz spacing. With interference high, the ratio fell to 16dB, thus the average was 21dB. In each case we altered the frequency of generator two, whilst maintaining generator one and the TW4000A at 144.8MHz. We then checked results for 25kHz spacing and found the average to be +79dB, which in effect means that you would have to have an incredible interfering signal to cause just a slight problem, ie an amateur almost next door! The original selectivity measurement here was 80dB, so the addition of the white noise made only a very marginal difference. I can thus confirm the excellence of the Trio rig, even with my new cruel test.

Original

With my colleague, Mike Hatch, G1DEW,I then tried the IC751.

The original selectivity results averaged at 43dB at 12.5kHz spacing, and 77.5dB at 25kHz. I grumbled that 10kHz selectivity was inadequate, and so I am not surprised to see that the new test revealed that the filter was far too wide. When the interfering signal was low, at 29.59, with generator one and 751 tuned to 29.6, 3dB degredation occurred when the second generator was a mere 7.5dB higher in level than the wanted channel.

When we placed the second generator 10kHz HF, its level was actually 7.5dB below that of the wanted channel for the same interference, thus showing a lopsided selectivity, and virtually no selectivity on the high side! This ties in beautifully with the troubles that I have experienced when using the rig in the last few months for 10m FM.

We checked 12.5kHz high interference, the worst side and found the second generator level required was +7.5dB, whilst low required a much higher level. This showed that 12.5kHz spacing selectivity was rather poor when used in conjunction with a transverter. We then checked 20kHz selectivity and found it to be excellent, +76dB low, and +66.5dB high, thus showing excellent rejection of alternate channel on 10m, let alone 25kHz spacings with transverters which would give no trouble at all in practice. It is hardly surprising that all amateur radio FM transmissions sounded cleaner than usual, as the 751 had a selectivity that was so wide.

However, it is fair to point out that the skirt shape is superb as shown by the enormous differences between the 10, 12.5 and 20kHz readings. This FM selectivity is, I am afraid, typical of HF transceivers on FM, and since 10kHz channelling has now been adopted internationally, it seems essential that manufacturers in future incorporate narrower filters to give much better adjacent channel rejection. There would be a point in having switchable selectivity on FM of, say, 10 and 15kHz bandwidth, the 15kHz position being obtained by the action of the roofing filters, whilst inserting a 10kHz filter additionally would give both the required selectivity for 10m FM, and an improved skirt shape.

New IC02E

The new IC02E was reviewed in the last issue of ***Amateur Radio***, and we used the same technique for selectivity measurements. I have discussed the new testing procedure with many professional testing engineers, and every one of them has suggested that it seems a good idea, so I look forward to hearing comments about my proposed new method.

If anyone wants to tear it to pieces, then perhaps they can come up with a better one, for all that I am interested in is adopting a method that more closely couples testing procedures with subjective performance. A white noise generator is very easy to make, and chips are easy to obtain that can be used to give the required bandpass characteristics.

No other specialised gear is necessary for the method which I hope will be adopted by others.

There of course remains a debate about the precise response characteristics desirable from the white noise modulation. White noise within a given passband is constant average output per Hz of bandwidth. This means that with my system, there is equal energy between 2.5 and 3kHz as there is between 300Hz and 800Hz. The sound of the noise on a typical black box is thus fairly hissy rather than muddy, but quite justifiably, there might be a case for some additional pre-emphasis.

Pink noise, incidentally, is noise having equal energy per octave, ie, per log of bandwidth. If I had substituted pink noise, then there would be the same energy betwen 300 and 600Hz as there would be between 1.5 and 3kHz. Pink noise is the same as white noise, but having a 3dB per octave continuous HF cut applied, and it may be felt desirable to use pink noise with a 6dB per octave boost which thus makes it 'toppier' than white noise. This would be an even crueller test, which would be valid provided the deviation was held to that specified.

Clearly the deviation measurement is that of the total peak value of the noise over a time period. It is vitally important to apply a low pass filter at the appropriate frequency to avoid unrealistic deviations or frequency components.

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OB2WA	1.25
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65
PCF82	0.60
PCF84	0.65
PCF86	1.20

PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.78
PCL85	0.80
PCL86	0.85
PCL200	1.60
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN4DD	2.00
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PFL200	1.25
PL21	2.50
PL36	0.95
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.96
PL509	4.85
PL519	4.95
PL802	5.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
Q13-110BA	47.50
QB3-300	30.50
QEO3-10	3.50
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEO3-12	6.50
QQEO3-20	27.00
QQEO6-40	39.50
QQVO2-6	16.50
QQVO3-10	5.50
QQVO3-20	18.50
QQVO3-20B	32.00
QQVO6-40A	19.50
QQVO7-50	63.50
QQZO3-20	42.50
QQZO6-40A	45.25
QS72/20	1.50
QS75/40	3.00
QS92/1D	6.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	2.00
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50
QU37	11.50
QVO3-12	4.95
QVO5-25	1.75

QVO6-20	29.50
QVQ8-100	145.00
QY3-125	49.50
QY4-250	65.00
QY4-400	71.95
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	52.50
RK2K25	62.50
RG4-1000	10.00
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	37.00
RR3-1250	65.00
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/800	5.00
SC1/1200	5.00
SC1/2000	9.00
SD6000M	45.00
SP2	1.50
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2.5/3000	60.00
TB2-300	45.00
TD1-100A	25.00
TD03-10D	35.00
TD03-10E	28.00
TD03-10F	28.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TY2-1254A	60.00
TY4-400	70.00
TY7-6000A	365.00
TY8-600W	365.00
TYS2/250	375.00
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	1.75
UBC81	1.50
UBF89	0.60
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	1.20
UCH42	1.35
UCH81	0.65
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80

UF89	2.50
UL41	3.50
UL84	0.85
UU5	2.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP4B	4.50
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66L	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG2-6400	35.00
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XP1002	29.00
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y63	1.50
Y65	6.95
Y602	12.00
YD1100	75.00
YJ1060	265.00
YL1020	29.00
YL1070	115.00
YL1071	109.00
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.60
Z759	19.95
Z800U	3.00
Z803U	18.95
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1001	5.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1050	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1AC6	1.20
1B3GT	1.95
1B5	2.50
1B22	10.00
1B24	14.95
1B35A	29.50
1C1	1.20
1C5GT	1.00
1D5	1.00
1FD1	0.90
1G3GT	1.00
1L4	0.60
1L6	1.50
1LA6	1.00
1N5GT	2.50
1S2	0.55
1T4	0.70
1U5	1.00
1X2B	1.40
2C21	1.00
2C39A	23.50
2C39BA	39.50
2C40	37.00
2C40A	55.00
2C42	29.50
2C51	0.75
2C53	32.00
2CY5	1.50
2B7	1.50

2D21	0.95
2D21W	2.50
2E26	7.95
2J42	93.00
2K25	24.95
2K26	95.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3AW2	3.35
3B2	3.00
3B7	4.50
3B26	24.00
3B28	12.00
3C4	1.00
3C45	24.00
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3W4GT	2.50
4B551B	115.00
4BQ7A	1.75
4-65A	59.00
4-250A	65.00
4C27	25.00
4C28	25.00
4CX250B ITT	37.50
4CX250B EIMAC	**58.00**
4CX250B surplus ex-government	12.50
4CX250B tested ex-equipment	6.00
4CX350A	71.50
4026	75.00
4GS7	2.25
4GV7	2.25
4JC6A	2.95
4J52	75.00
4X150A	25.00
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-206K	10.00
5A-180M	9.00
4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
5B 110M	10.00
5B-254M	14.50
5B-255M	14.50
5B255M	19.50
5B/256M	9.00
5B-257M	9.00
5B-258M	14.50
5C22	40.00
5R4GB	2.80
5R4GY	2.80
5T4	5.95
5U4G	1.95
5U4GB	2.50
5V4G	1.25
5Y3GT	1.95
5Z4GT	0.85
6/30L2	0.70
6A/203K	9.00
6A8G	1.50
6AB8	0.66
6AC7	2.00
6AF4A	2.50
6AF9	4.15
6AG5	1.50
6AG7	1.95
6AH6	1.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.00
6AK6	2.00
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.50
6AN5	3.95
6AN8A	2.95
6AQ5	1.50
6AQ8	0.85
6AR8	3.95
6AS5	1.50
6AS6	1.50
6AS7G	7.50
6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75

6AW8A	2.95
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BD4	1.50
6BD6	1.00
6BE6	0.72
6BF5	1.60
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.20
6BK4	4.00
6BK7A	1.95
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	2.75
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	0.65
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BS8	2.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6B26	2.50
6BZ7	2.95
6C4	1.10
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C15	2.50
6C18	2.50
6CA4	0.60
6CA7	4.50
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CH6	10.35
6CL6	3.50
6CL8A	2.00
6CM5	1.60
6CS6	0.75
6CW4	7.25
6CY5	1.00
6DC6	2.95
6DK6	1.15
6DQ5	3.35
6DQ6B	2.50
6EA8	2.50
6EB8	1.75
6EU8	1.75
6EW6	1.50
6F1	2.00
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F22	0.70
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	17.00
6FG5	1.95
6GH8A	0.80
6GK5	1.50
6GK6	2.00
6GV7	2.50
6GW6	2.50
6H3N	1.10
6H6	1.35
6H6GT	1.20
6J4	1.10
6J4WA	3.15
6J5	1.95
6J5GT	1.50
6J6	0.65
6JB6A	3.95
6JE6C	4.95
6JS6C	4.95
6J7	4.15
6K7G	0.70
6K8Y	3.95
6KD6	5.50
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC (GE)	3.95
6L6GT	1.15
6L7G	0.75
6LD20	0.60
6LF6	4.50
6LQ6	4.95
6N7	2.50
6N7GT	1.50
6P15	1.50
6P25	4.00

6P28	2.00
6Q7	1.20
6Q7GT	1.20
6S4A	1.50
6S7	1.10
6SA7GT	1.00
6SC7	1.50
6SG7	1.20
6SH7	1.20
6SJ7GT	1.20
6SK7	0.80
6SK7GT	1.20
6SL7GT	0.85
6SN7GT	0.65
6SQ7	0.80
6SS7	1.95
6U4GT	1.75
6U5G	1.50
6U8	0.85
6U8A	1.50
6V6GT	0.85
6X2N	1.00
6X4	0.96
6X5GT	0.55
6X5GTY	1.00
6X8A	2.25
7A7	2.00
7AD7	1.75
7B7	2.50
7C5	3.00
7C6	2.50
7J7	3.50
7Q7	2.00
7V7	4.15
7Y4	1.95
8B8	2.50
8EQ7	1.95
85A8	1.50
10D2	1.25
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD11	1.00
10LD12	0.65
11E2	16.50
11E3	55.00
12AG8	1.50
12AL5	1.00
12AT6	0.65
12AT7	1.15
12AT7WA	2.50
12AU6	1.50
12AU7	0.55
12AV6	0.80
12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	3.50
12BA6	1.50
12BE6	1.05
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CX6	1.20
12E1	17.95
12E14	28.00
12GN7	4.50
12HG7A	4.50
12JGT	0.70
12K5	1.00
12K7GT	0.60
12K8	1.10
12Q7GT	0.50
12SA7GT	1.00
12SG7	4.75
12SH7	1.00
12SK7	1.00
12SJ7	0.60
12SN7GT	1.85
12SQ7GT	1.50
13D3	3.20
13D7	3.20
13DR7	2.95
13E1	115.00
14S7	1.00
17EW8	0.95
17JZ8	2.75
18D3	1.60
19G3	17.00
19H4	23.95
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20D4	1.75
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.05
20P5	1.15
21LU8	2.50
24B1	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95

30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
33A/158M	19.50
44A/158M	19.50
35A5	4.50
35L6GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
47	6.00
60B5	1.60
50C5	0.95
50CD6G	1.15
60JY6	2.96
52KU	2.00
61SPT	4.50
75B1	2.50
75C1	2.95
84	3.00
85A1	6.50
85A2	1.50
90AV	10.00
90C1	2.70
90CG	13.50
91AG	9.00
92AG	12.50
92AV	12.50
95A1	6.50
108C1	1.50
150B2	6.95
150C2	1.50
150C	2.15
155UG	26.00
274A	15.00
1858T	1.50
307	5.00
328A	15.00
388A	17.50
425A5	8.00
431U	2.00
572B	35.00
705A	8.00
708A	8.00
715A	6.00
715C	45.00
725A	275.00
803	14.95
805	39.00
807	1.60
810	55.00
811A	12.95
813	18.50
813 USA	59.50
833A	115.00
866A	3.50
872A	19.00
873	60.00
884	5.50
930	9.95
954	1.00
955	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
2050W	9.50
2050	7.00
3545	4.00
4313C	4.00
4328D	9.00
5642	9.50
5651	2.50
5654	1.95
5663	1.95
5670	3.25
5672	4.50
5675	23.50
5687	4.50
5692	3.50
5696	3.50
5704	3.50
5718	6.50
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	2.00
5751	3.50
5763	4.95
5814A	3.25
5840	3.50
5842	11.00
5879	3.90
5894	39.50
5899	4.50
5963	2.00
5965	2.25
5993	8.00
6005	1.95
6012	10.00
6021	3.95
6057	2.50
6059	3.75
6060	2.25
6062	4.50
6063	2.00
6094	3.25
6067	1.95
6072	4.20
6080	4.75
6080WA	8.50
6096	2.85
6132	10.00
6136	2.50
6146B	7.50
6157	2.50
6201	6.95
6211	2.50
6267	1.50
6350	2.00
7025	2.50
7247	2.00
7360	9.50

WIREWOUND RESISTORS PREFERRED VALUES

	2K2-6K8	0.18
4 Watt	4R7-1K8	0.16
	2K2-6K8	0.18
	R47-4K7	0.18
	5K6-12K	0.19
7 Watt	15K-22K	0.20
	1R-10K	0.20
11 Watt	15K-22K	0.24
	1R-10K	0.26
17 Watt	15K-22K	0.28

BASES ETC.

B7G	0.15
B7G Skirted	0.30
B8G	0.70
89A	0.20
B9A Skirted	0.30
B108	0.16
B13B	0.50
8 Pin DIL	0.14
14 Pin DIL	0.15
14 Pin DIL/Q	0.30
16 Pin DIL	0.17
OCTAL	0.35
CANS	0.27
B9A PCB	0.15
B5	0.75
B9G	0.38

ZENER DIODES

BZX61 0.15

6V2 7V5 8V2 9V1 10V 11V 12V 13V 15V 16V 18V 20V 22V 24V 27V 30V 33V 36V 39V 47V 51V 56V 68V 75V

BZY88 0.07

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

THERMISTORS	
VA1040	0.23
VA1056S	0.23
VA1104	0.70
VAT8650	0.46
VA1097	0.25

BATTERIES

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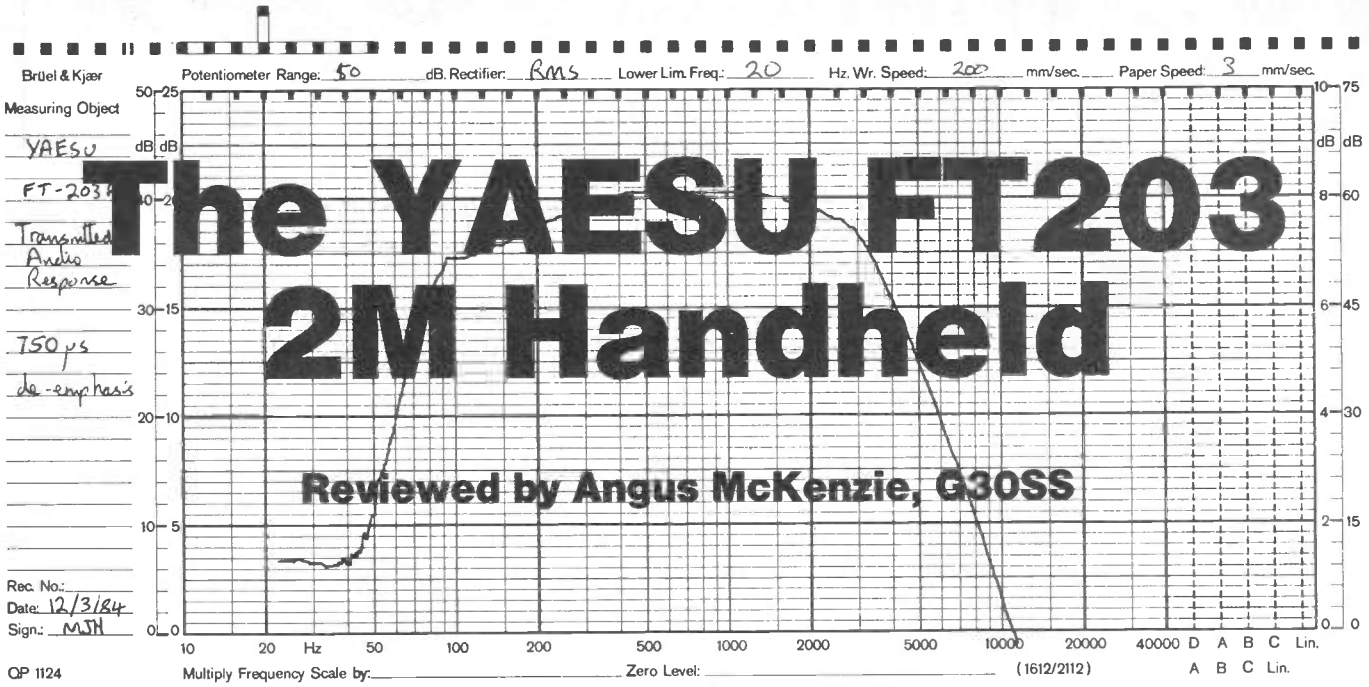


The YAESU FT203 2M Handheld

Reviewed by Angus McKenzie, G30SS

Last month I reviewed the Icom IC02E and Standard C110 handhelds but, unfortunately, this Yaesu arrived too late to be included with them.

The FT203 offers very similar facilities to the Standard C110, also having thumb wheels for frequency setting, a small push button which increment the frequency upwards by 5KHz, a high/low power output button, an audio gain control with off switch, but a far better squelch control which was very easy to use (the C110 had a very awkward one).

The top panel also contains a BNC socket on to which you can fit a rubber duck or other antenna, and a miniature S-meter is provided, which is fairly easy to read.

The front panel contains the loudspeaker and microphone and the battery fits onto the bottom of the rig by sliding it across sideways. The battery lock slide clamp is extremely stiff and it is not too easy to remove the battery in a hurry, but perhaps after much use it would become easier. On the bottom of the battery pack are sockets for interconnecting with a fast charger, not supplied for review, or external dc power *(absolute maxumum 13.0V, and not 13.8V dc, so note this well!)*.

Optional accessories include a wall charger type NC9C, a cigarette lighter car socket charger/PSU type PA3, a headset type YH2 and a speaker microphone type MH12. The rig is supplied with a leatherette case, a carrying strap, a belt clip on the back and a rubber duck. Built in vox works with the headset, which could be very useful.

On the back of the rig are slide switches to select repeater -/+ shift, and vox off/high/low. On the left side of the rig is a very easy to use PTT bar above which is a small button for toneburst. On the right side is a spring-loaded button for lighting up the S-meter.

We are all very much agreed that this little Yaesu rig is far better styled than the Standard, is very easy and smooth to hold, and just feels more rugged. The MHz wheel could be set between 0 and 9, but it actually alternately tuned 144 or 145, so without modification, the rig just covers 2m. I feel reasonably sure that it would be a simple matter to modify internal connections to the microprocessor so that it could receive over a much wider range.

Subjective tests

I compared the rig with both the IC02E and Standard C110 rigs and obtained several reports. The general consensus was that the modulation quality was far better than that of the Standard, but not as good as the 02E.

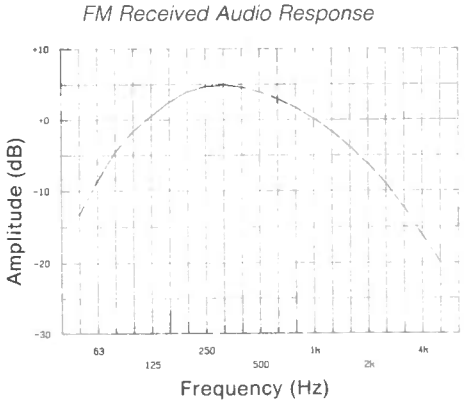
However, despite my grumbles about the Standard in its review, it did have a tremendous punch to it which would assist in communication, whilst the Yaesu had clearly less gain, and thus tended to underdeviate unless you spoke very close to it.

The transmission lacked extreme top, but deviation was well controlled, and there was far less splatter from it in an adjacent 12.5KHz channel.

As far as reception goes, it was slightly less sensitive than the Standard and Icom rigs, but it will probably be adequate. As with the other handhelds, it had very poor RFIM performance when used with a home base station antenna, and at worst some intermod products were produced from out of band Police transmitters etc. Reproduction quality was very good for the small speaker, and greatly preferable to that of the C110.

I enjoyed this little rig, which seems to be quite well designed in most areas. The charger was easy to use, but as delivered the nicad battery pack supplied had a dry joint internally which we had to resolder, for it would not initially take a charge.

FM Received Audio Response



Laboratory tests

The RF sensitivity was indeed just over 3dB poorer than the Icom, and 4dB worse than the Standard, and I feel that Yaesu should improve on this. The RF intercept point was very poor, but in the same region as the other handhelds were.

Selectivity by the new method was very impressive, the 12.5KHz measurements showing that it will cope well with this spacing, let alone wider ones. The selectivity was slightly lopsided though, but this should not be a problem. The reciprocal mixing performance was satisfactory but not good close in, and this did not improve enough at wider spacings, although it was similar to that of the other handhelds. The first indicated reading on the meter is at just above the 12dB sinad point, whereas full scale was obtained with a signal around 23dB higher, which is useful.

Audio distortion at an average level output was reasonably good at 3KHz deviation, whilst maximum output into an external load was as much as 0.8W, and even higher into 4 ohms which is very good for a walkie-talkie.

The capture ratio measured unusually well, showing that the rig will reject weaker carriers very well behind stronger ones. The audio quieting at the 12dB sinad point showed that there was

comparatively little distortion at low levels, excellent consideraing the narrow IF, and so the discriminator was obviously very well aligned. The 3dB limiting point was at a very low level which again is good. Although the unweighted ultimate signal-to-noise ratio measured fairly well, the weighted measurement was poor, showing that quite a lot of noise was present in the region 1 to 4KHz.

The squelch control had a fairly useful range of adjustment, but as usual, I would have liked even more range. The current drawn on Rx with squelch on was very low, and this did not increase by too much when receiving a signal at a reasonable volume. The current on Tx was reasonable at high power, but slightly high on low power.

The internal speaker was of quite good quality, and the microphone reasonable for its purpose. The maximum transmitted output power was betweem 2.8W and 4W depending upon power source, thus better than the specification. Low power was perhaps set a little on the high side, which explains the slightly high current consumption here.

Frequency accuracy was amazingly good, an error of only 40Hz being most commendable. Repeater shift was accurate, the toneburst frequency right on target, although its deviation was a little high. Main audio deviation was set about right, and was far better controlled than on the C110.

The harmonic output, whilst being low, was marginally worse than that of the other rigs for the second harmonic, whilst third was below the bottom of the analyser screen.

The transmitted audio response was relatively flat from 150Hz to 3KHz, with de-emphasis set on the test equipment at 750uS. LF is attenuated very rapidly below 150Hz, and HF falls moderately steeply above 3KHz, the rate being substantially steeper than on the Standard, which explains the well controlled deviation. The receive response was curtailed rapidly again below 125Hz which is excellent, and HF de-emphasis was just about right, matching the transmission quite well.

Conclusions

Yaesu offer in their FT203 quite a good little walkie-talkie which will obviously become quite popular. The rig should now be widely available, and can be well recommended, although it is a pity that the RF sensitivity was no better than most rigs of yesteryear. It is very well presented and should be very useful if you don't want to QSY too frequently. As usual, I found the thumbwheels annoying and awkward to use, although they seemed to be more positive than those of the Standard.

I would like to thank Amcomm of Harrow for their kindness in sending the rig for review at very short notice.

It is extremely difficult to come out with a best buy, for the Standard was more sensitive, but in every other way I preferred the Yaesu. The IC02E is in a class of its own, being rather more expensive, but offering some very useful facilities, although you should note its ergonomic problems referred to in last month's review.

YAESU FT–203R — LABORATORY MEASUREMENTS

Receiver Measurements	
Sensitivity for 12dB sinad (1KHz modulation 3KHz deviation)	
144.025MHz	−120.0dBm (.22μV)
144.975MHz	−120.5dBm (.221μV)
145.975MHz	−121.0dBm (.2μV)
Selectivity:	
Blank carriers off channel to degrade sinad by 3dB (ref 12dB sinad)	
−/+12KHz deviation	37.5/29dB
−/+25KHz deviation	63/63.5dB
Selectivity: second method	
Carriers off channel modulated with filtered white noise (ref 12dB sinad)	
−/+12.5KHz spacing	29.5/17dB
−/+25KHz spacing	63/63.5dB
−/+50KHz spacing	74/72.5dB
RFIM performance: Carriers off channel for 12dB sinad product (ref 12dB sinad)	
50/100KHz spacing	58.5dB
100/200KHz spcing	59.0dB
Calculated RF intercept point:	−32dBm
Reciprocal mixing performance at 144.05MHz	
RF levels required off channel to degrade sinad by 3dB (ref noise floor)	
25KHz spacing	80dB
50KHz spacing	86dB
100KHz spacing	89dB
200KHz spacing	99dB
S Meter: RF levels required for the following readings	
S1	−118dBm (.28μV)
S3	−109dBm (.8μV)
S5	−105dBm (1.28μV)
S7	−102dBm (1.8μV)
S9	−98.5dBm (2.9μV)
Full scale reading	−96dBm (3.6μV)
Capture Ratio	4.2dB
Audio Quieting	15.0dB
3dB limiting point	−124dBm
Maximum audio output (10% THD into 8 ohms)	0.8W
Maximum audio output (10% THD into 4 ohms)	1.2W
Audio distortion (125mW into 8 ohms)	
1KHz deviation	1.5%
3KHz deviation	2.5%
Best obtainable signal/noise ratio (approached at -92dBm (5.8μV) into rig)	
Unweighted	47dB
CCIR/ARM weighted	37.5dB
Current drawn on receive (squelch on)	24mA
Current drawn on receive (-60dBm signal)	45mA
Current drawn at 10% THD audio output	215mA
Squelch Sensitivities	
Minimum	−102dBm (1.8μV)
Maximum	−117dBm (.32μV)
Transmitter measurements	
RF output power (external power supply at 10.8V)	
144.025MHz	2.9W
144.95MHz (High/Low)	2.9W/.35W
145.975MHz	2.8W
RF output power (fully charged nicad battery pack)	
144.95MHz (High/Low)	3.5W/0.5W
Carrier frequency accuracy	−40Hz
Harmonic output (ref fundamental)	High/Low
2nd harmonic	−62/−61dB
3rd harmonic	<−67/<−68dB
Peak deviation	4.5KHz typical
Tone burst deviation	3.7KHz
Tone burst frequency	1750Hz
Repeater shift accuracy	+20Hz
Current drawn on transmit (High/Low)	560/300mA
Power output (external power supply at 13V)	
144.95MHz (High/Low)	4/0.5W

24cm AMATEUR TV

5

Andy Emmerson, G8PTH, with more trade news and a single tube PA suitable for all modes – even SSB

Welcome back to the leading edge of ATV technology (only joking), and before launching into the constructional project a few notes to update the trade section of part three.

The conversion of a Microwave Modules downconverter to give 52MHz output, suitable for the Wood & Douglas FM demodulator is now available, and I hope to give a test report in the next, and final, part of this series.

A stock crystal is used to convert the normal simplex frequency of 1255MHz down to 52.56MHz. The additional work to the converter costs £12. Regular prices of the converter are:

Bipolar style – MMK 1296/144 £59.75

GASFET style – MMK 1296/144G £79.95.

The prices include VAT but not insured postage and packing, which costs an additional £3.

The units should be ordered direct from the factory as they are not a stock item; supply is normally within a few days.

Correcting an earlier note – the twin slug tuner from Silverstone Electronics is now finished, which gives an opportunity for some other enterprising supplier.

Also now available is the 1296 bare preamp board from muTek, although an improved unit is promised.

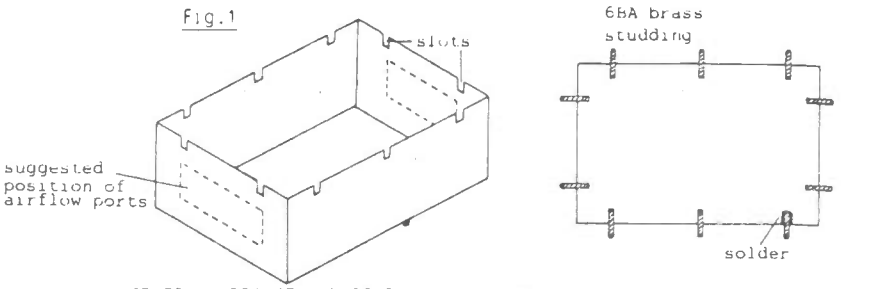
New products

LMW Electronics launched some interesting new products at the Leeds rally. Of particular interest is their two-stage solid-state power amplifier which will take the 2W output of your Fortop transmitter (or 1296MHz SSB transverter) up to 10W. If you intend to drive a twin-tube PA or just require a bit more power, this little module will do the trick. Order code is 1296TT10, with a price of £105 plus £2 postage for an assembled and aligned unit. Parts are also available separately.

G8LMW also makes a receive converter without demodulator (for ancient modulation heretics) and some very nice pre-amps. Send 30p for his catalogue, the address is given at the end of the article.

Other new items: Wood & Douglas have promised new goodies for launch at the BATC gathering at Crick on May 13th; and Sandpiper Communications have introduced a very nice looking 20 turn helical antenna. This has a gain of 17dBi and, of course, will have equal gain across the whole 23, 24 and 25 cm band. It looks ideal and several have been purchased by BATC members for evaluation. Price is £30 plus £4 post and packing.

Fig.1



GENERAL ARRANGEMENT OF CAVITY SHOWING SLIDING GRID PLATE TECHNIQUE.

PA construction project

And now, as promised, the single tube PA. Unlike a number of previous designs this one is guaranteed to work! It does not rely on finding the right make of diecast box, nor on having a Drummond lathe in the shack. It is fully tunable and uses only 'kitchen table' constructional methods. Credit goes to G8VBC and G4FZL for developing it, and it has since been constructed by several ATVers with expected results.

In FM use, an input of two or three watts (easily achievable with 10W of 70cm into a varactor tripler or with a Fortop TVT-1300) will drive the tube to full output of about 35W. This is with an anode voltage of around 850V and 110mA current, which is realistic for a ceramic 2C39 clone. Higher anode voltages and currents will produce more output, but at the expense of reduced tube life.

Suitable tubes for this amplifier are the ceramic varieties of the 2C39, viz. 2C39A, 2C39AB and 3CX100A5. The 2C39 itself, with the glass envelope, is considered less suitable for continuous 'key down' operation.

As the price of new tubes is pretty fearful rally bargains may indeed prove to be what you think they are. If they draw at least 100mA quiescent current they probably still have some life left in them.

Apparent lookalikes of the 2C39, but with unfamiliar type numbers, may or may not be suitable, so you ideally want to get hold of the Eimac data book. The fact that some tubes are rated for pulsed radar service is no hindrance, but different grid-cathode capacitances may make it impossible to resonate the tube in your cavity.

Make sure you buy only tubes with the full size anode radiator (1.2in). The ones with the smaller fins are suitable only for pulsed radar service and for low power level amplification.

Also to be avoided are boxed, unused, valves of the early 1970s or older; these tend to be very disappointing on account of 'poisoning'. I would also advise against paying more than £5 for an untested specimen; it may well be quite good since many tubes are taken out of service after a fixed length of time, regardless of how 'caned' they are, but can you afford to lose £5 if not? The going price for new, unused surplus market tubes is around £20. From a distributor they may be £50 or more.

Specification

So much for the homilies; down to hard facts. Here is the specification for the PA under consideration:

Power output	30W min
Drive power	2–4W
Anode voltage	800–850V
Current consumption	100–120mA
Amplifier gain	at least 10dB
Efficiency	40 per cent
Heater voltage	5.8V

All these are typical figures.

Description

The starting point for this design was the original by G2RD, which has figured in RSGB VHF Handbooks for many years.

The difficulty with this design is in resonating the cavity formed by the diecast box, probably because of variations in size between examples.

To overcome this problem a cavity box, constructed from 1/16in sheet copper is employed and the grid plate cut so as to be a sliding fit within the cavity. This method affords easy coarse tuning of the amplifier over a considerable frequency range. Slots are cut into the sides of the cavity and corresponding screws are

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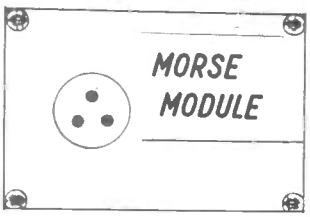

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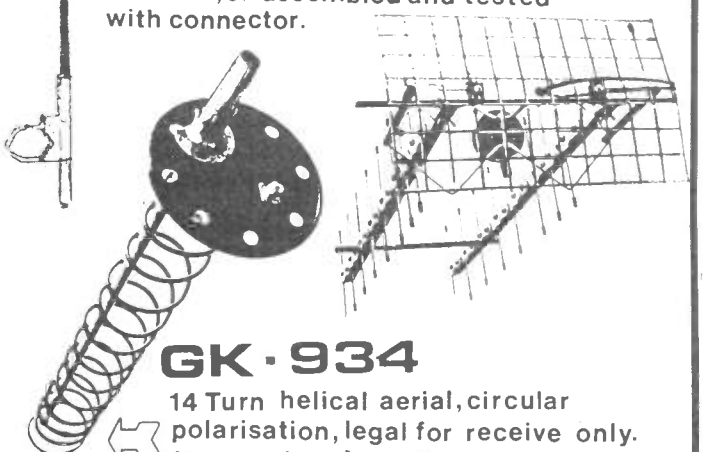

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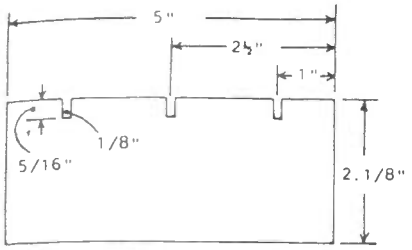
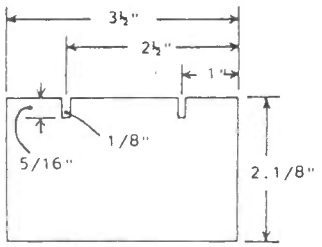
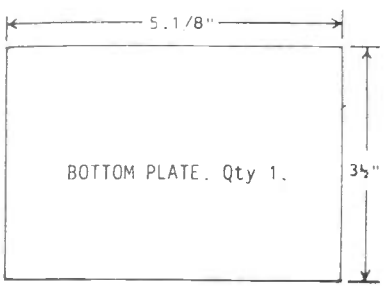
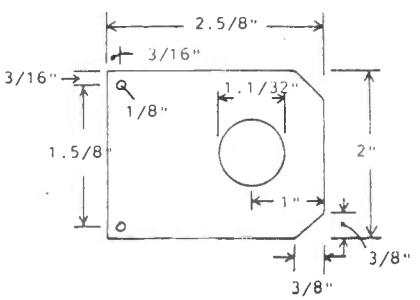


SIDE WALLS. Qty 2.



END WALLS. Qty 2

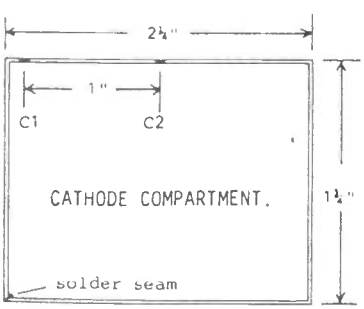




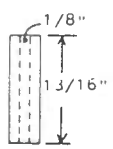
ANODE LINE, L2.

Material for all parts 1/16" thick (16swg) copper or brass sheet.

Fig.2



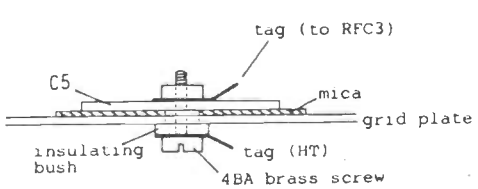
ANODE BYPASS CAPACITOR PLATE, C5.



¼" PTFE tube

L2 SUPPORT PILLARS. Qty 2

Bent from 1" wide copper or brass strip, 1/16" thick



DETAIL OF C5 INSULATION.

attached to the grid plate to allow it to be fixed firmly after initial tuning (see *Figure 1*).

Construction

Here is a tip intended to protect your sanity! Read the article through (including the next, concluding part) before starting to build. There are a number of options and substitutions possible, and it is a good idea to visualise the whole thing before starting. You have been warned!

The cavity is constructed first. Accurately cut out the sides, ends and bottom according to *Figure 2*, and assemble the box using vice or clamps.

With the aid of a blowlamp or gas torch, solder the joints together using only a small amount of solder. Each finished joint should be smooth.

After assembly check that all is square and the internal dimensions are 5in x 3⅜in x 2⅛in.

The air vents can be made in two ways, by drilling many small holes or by covering a large aperture with fairly fine wire mesh or gauze. Whichever method is used, avoid large gaps as this will disturb the RF field and will allow RF leakage.

Exact details are not given for the cooling arrangements since there are many different types of blower fans and air ducting available. Remember that those 110V rally bargain blowers are a bargain after all: they can be run on 250V mains with a 2.2uF 400V non-polarised capacitor in series. Adequate cooling is essential to avoid inferior performance and damage to the valve.

The grid plate should be cut to the size shown in *Figure 3* and should be tailored to make a good sliding fit inside the cavity. Drill the holes in the plate as shown in *Figure 3.*

The fingering used for connection to the valve electrodes plays an important part in the final results, and it can be obtained in three ways – by home-brewing, out of surplus equipment, or from a dealer.

Firms which have advertised fingering are Greatech and Modular Electronics.

If home-brewing, fingerstock can be made using phosphor bronze draughtproofing strip. The material should be about ⅝in wide and slots should be cut as in *Figure 4* leaving fingers about ⅛in wide.

All burrs should be removed with a fine file.

The fingers should then be bent to the shape shown.

The finished fingering should be formed to fit into both the grid plate and L2, ensuring that it is a good firm fit over the valve flanges.

Form the cathode compartment into the shape shown in *Figure 3* and solder the following onto the grid plate:

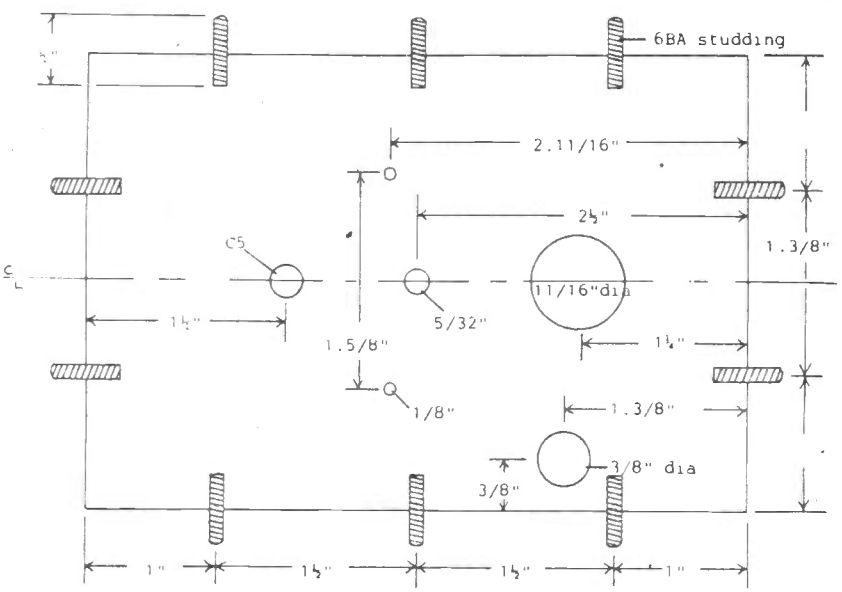
1. Cathode compartment
2. Grid fingering
3. 6 BA brass studding (10 pieces)
4. Anode tuning capacitor, C4
5. Anode tuning screw nut
6. Aerial output socket support nut.

The studs do not have to be 6BA; a similar metric size could be used. Ensure that the studs line up with the slots. To simplify attachment of the stud they can be fixed to the grid plate using eyelet solder tags (see *Figure 5*). These can then be bolted down into position through holes drilled into the grid plate. These holes should be countersunk on the underside.

Avoid excessive heat on the finger stock as this will soften it. Copper is an excellent conductor of heat and it is therefore quite difficult to solder parts onto the plate without unsoldering those parts already fitted. This may be avoided by applying tissue or cloth soaked in cold water or even an old potato to act as a heat shunt, thus conducting heat away from those components already soldered. This technique may take a little practice to perfect.

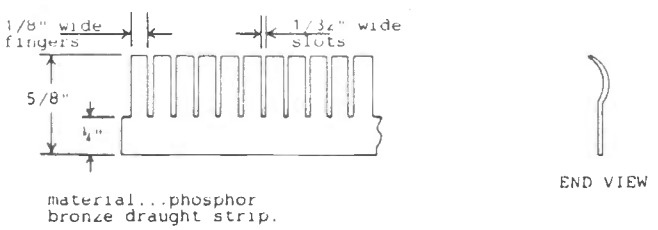
Parts for this project can be obtained from:

Greatech Electronics Ltd, Hay Lane, Braintree, Essex, CM7 6ST. Tel: 0376 - 27117, 42494.
LMW Electronics, 102 Stamford Street, Ratby, Leicester, LE6 0JU.
Microwave Modules Ltd, Brookfield Drive, Aintree, Liverpool, L9 7AN. Tel: 051-523 4011.
Modular Electronics Ltd, 95 High Street, Selsey, Chichester, Sussex. Tel: 0243-602916.
Sandpiper Communications, 40 Trehafod Road, Trehafod, Pontypridd, Mid Glamorgan. Tel: Porth 685515, Aberdare 870425.



GRID PLATE, INCLUDING DRILLING DETAILS. Material: 1/16" copper sheet.

Fig 3



CONTACT FINGERING.

Fig 4

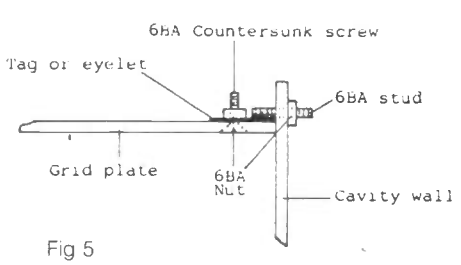


Fig 5

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

FOR SALE

■ Icom IC-2E 2m FM with IC-DC1 and case. Little used, as new. £110. Paul. Tel: 0427 872724

■ Mini-Quad HB1 10-20m beam antenna only 6 months old, but slight storm damage. Complete with new rotator, instruction manual etc. Only £65. Also hy-gain vertical 10-80m £50 ono. Buyer collects. Chas Elliot, 78b Hendon Lane, London N3 1SL. Tel: 01-346 8597

■ Yaesu FRG7000. General coverage communications receiver 0-30MHz digital frequency display, very good condition. £150. Tel: (Hampton) 01-941 0993 after 5.30pm.

■ Mini Beam 10/15/20m unused. £78 including postage. Tel: 0983 402273

■ Yaesu FRG7. In good condition, with manual, suit beginner. £125. Tel: (New Milton) 0425 612007

■ Racal receiver. Covers amateur bands, £75. WW2 equipment. Offers. Also Bendix loop aerial with cable etc £40. Labgear televerter £12. Tel: (Neath) 0639 820356

■ Datong active antenna, indoor model, mint condition, complete with power supply unit. £30. Tel: (Bradford) 0274 593769 between 6-7pm.

■ Collaro Conquest 4 speed autochange. Collaro 3 speed 3 motor tape deck. Mains XFR, CRT for Solartron CD1014 oscilloscope. Various Cossor CRT for 1045 etc. Offers. C A Cooper, 11 Radical Ride, Wokingham, Berks. Tel: 0734 734312

■ FRG-7700, FRV-7700, FRV-7700B, as new, boxed, with manuals. £300 ono. Tel: (Huddersfield) 27885

■ Hammarlund HQ170A. Recent aligned by KW. £95 ono. Buyer to inspect and arrange carriage. Tel: 01-889 4431 anytime.

■ Yaesu FRG7700 and active antenna, six months old with manual. Perfect condition. £220. Tel: 0709 898118

■ Icom SP3 speaker. Bargain, only £35. Tel: (Wombourne) 896625 after 6pm.

■ Icom 251E with speaker, as new. £425. Tel: 01-803 1234

■ Trio TR7010 SSB/CW 10watt 2metre mobile, boxed, as new £100. Trio TR2300 2metre FM portable. NiCads, charger, PSU. £100. Realistic Pro-2008 scanner £75. Or exchange HF transceiver. Tel: (Glasgow) 041 882 0140 evenings

■ Bearcat 220 scanner receiver. Mains/12volt synthesised 32-50, 118-136, 144-174, 421-512MHz. £135. G8RHU. Tel: (Newhaven) 0273 516801

■ Trio 2300 NiCads PSU £100. Standard C58 2metre Multimode, NiCads, case ⅝ whip charger. £250. Realistic DX200 general coverage receiver £85. Realistic PRO2008 U/VHF scanner. £75. Belcom LS102L 26-30MHz. £200. Tel: 041 882 0140 evenings.

■ FT101EE CW filter, works well on 10MHz, also spare PA and driver tubes (new) with mike and all accessories. In good order. First £275 secures. Walt Hazelden. Tel: (Hants) Emsworth 6177

■ Icom-IC240 10W FM with mobile mount £100. Sony-ICF2001, boxed with manual £85. Creed 444 with 45 and 50 baud gears £35. DD KSR 390 (KSR 33) RS232 IF110 baud £50. Garrard SP25 MkII with cartridge £15. All items in working condition. Will deliver reasonable distances. Haylett. Tel: (Bracknell) 0344 52612

■ FT221 with muTek board and Datong speech clipper. £340. Hansen SWR/Power meter FS710V. £50. FRG7 £125. Yaesu desk mike £15. All perfect. Tel: (Clows Top, Worcs) 029 922 279 anytime.

■ Icom IC740 with FM marker PSU20, as new. £550. Swan ST2A, all band ATU 2KW. £100. American 'Vomax' split band audio processor. £60. Western aluminium trap dipole. £25. G4EMG. E. London. Tel: 01-534 3460

■ Sommerkamp FL200B transmitter 80m-10m 240W vgc. £80. FT290R with MM 30W linear. £230. Europa transverter (10m in, 2m out) complete with power supply. £45. All complete with handbooks. John Jocys, 28 Vaudrey Drive, Timperley, Altrincham, Cheshire. Tel: 061 969 0619, or 061 236 9278 (work)

■ MBA-RO Morse RTTY ASC11 reader. Perfect. £85 ono. Sephton, 16 Bloemfontein Avenue, Shepherds Bush, London W12 7B7. Tel: 01-749 1454

■ Wavemeter Class D, needs case and crystal. £4 with valve. 40 channel CB set FM, boxed, as new. £27 less twig. Table microphone stand, adjustable 15in-22in Vitavox CN224. £15. 2MFD 600 V WKG capacitors. 90pence. 25 Glenmore Road, Birkenhead, L43. List, stamp + SAE

■ Yaesu FT902 DM all-mode transceiver HF. Lovely condition, complete with electronic key, (marble base) desk, microphone PTT foot control, G5RV antenna. £625. Consider computer plus cash. All letters answered, sorry no phone. John McCurdie, 80 Thornyflat Road, Ayr, Scotland

■ Reftec. Perfect working order. £200. Tel: (Brighton) 0273 774381 after 6pm or weekends

■ Eddystone 830/9 Rx; 15 valve, 9 bands 300KHz-30MHz, double s/het, variable bandwidth, crystal control facilities. Good condition. £125. Carriage extra. Sommerkamp TS802 80 channel 2watt handheld transceiver; mic, case, NiCads, charger. £100. GM3TBV. QTHR. Tel: 0250 2520

■ Yaesu 101 ZD MkIII FC902 ATU, excellent condition. £525. Tel: 0634 400635

■ Trio 22009 2m FM transceiver, S19, S20, S21, S22, S23, six repeater freq. Mobile mount. Mic, NiCads, charger. Vgc £70 ono. G4OWY. Tel: (Weymouth) 786930

■ Sommerkamp Soka 747. Equal to FTDX401, used only for SWL, Tx capabilities unknown. May need attention, offers around £100. Or consider swap for Sinclair ZX Spectrum. Mike. Tel: 051 327 6440 after 7pm.

■ Colt 320DX LSB USB AM High mid low. Offers. 19 radio, good condition. Offers. Tel: 0283 221870

■ FRG7 Yaesu communications receiver, excellent condition. Also 2 metre converter. £135 for both. Tel: (Yateley) 0252 875810

■ HF on the cheap! KW204 10-160 metre Tx, newish PA valves, Trio 9R59DS general coverage Rx, revalved. £150 the lot. Steve G4SXW. Tel: 0795 28230

■ Trio R820 transceives with TS820, the ultimate receiver. Covers BC bands, notch filter VBT, IF shift, four filters, digital readout, original packing. Mint condition. Cost over £600. Sell for £375. G4LW QTHR. Tel: (Trowbridge) 3166

■ Large quantity components. SAE IIst. M Gathergood G4KFK, 80 Moorfield Road, Denham, Uxbridge UB9 5NF

■ DX302 communications receiver 10KHz-30MHz, AM USB LSB digital display BFO bandwidth filters. Excellent condition, boxed. Cost £289. Sell for £125 ono. Tel: 03552 21732 after 6pm

■ Offers. Trio com-receiver GR-59DE, little used, boxed; R1155 with mains unit, good condition; bound back numbers of RSGB bulletins

■ Bearcat 220 FB Scanner with discone. £150. Pair FM/CB handhelds with helicol antennas and NiCads. £20. Tel: (Swansea) 467384 after 5pm

■ FT290R with NiCads, case and charger. £200 ono. Or swap HF receiver plus cash. Tel: (Derby) 0332 372696

■ Rotator Hirschmann 250 with extra lower bearing, almost new £25. 2 power supplies, 5amp, 6amp. £10, £18. 4 element Quad £15. Tel: 01-540 3959

■ Icom ICR70 Rx, as new, 6 months old, owner having passed RAE going VHF. All as supplied, including original packing etc, with FM board fitted. Cost £525, accept £425. M S Byford, 24 Humphries Close, St Cleer, Liskeard, Cornwall. Tel: (Liskeard) 42384

■ Racal RA117E receiver, ATU, five position aerial switch, synthesiser with power supply, RA218 SSB unit. Contained in rack system console with spare valves, crystals, manual. £550. Brian Robinson. Tel: 0543 74521

■ Trio/Kenwood general coverage receiver, covers 0-30MHz digital display clock and timer AM, LSB, USB and CW. Many other useful controls. Excellent radio, ideal for beginner of serious SWL good condition cost £310 new, will accept £195 ONO or will swap for Yaesu FT290R or FT230R. Ian tel: 01 385 2373 Monday-Friday (evenings only).

■ 2m rigs: AR240A FM handheld, with case, spkr/mic and helical, as new, £90. Totsuko TR2100M 15W pep SSB transceiver, mint, £90. Tel: Colchester (0206) 572685.

■ Trio TS780 2m/70cm multi mode, new Dec 83, in mint condition with box £650, cost £790 when new. Tel: Milton Keynes 678928 after 5pm. Buyer must collect evenings only.

■ Panasonic DR31 receiver with Yaesu FRT7700 antenna tuner and headphones. All excellent condition £150, no offers. Buyer collects. Tel: 01 959 7129.

■ Yaesu FT208R, NC8 base charger, NC9C compact charger, FBA-2 charger sleeve, YM24A speaker mike, case, rubber duck, PA3 car adaptor with boxes £215. Yaesu FRG7, perspex dust cover, 2m converter, ATV £135. Graham G6XUJ Tel: Tring 2276.

■ Kenwood TS130, hardly used, no longer needed. Offers? DNT 10m rig, never used £35. Many old radio magazines. PW Radcom SWM etc. Offers? WHY. Martyn Bolt, 112 Leeds Road, Mirfield, W Yorks WF14 0JE.

■ Racal RA17L mint with handbook £175 ono Yaesu FT101E transceiver with FV250 transverter FM board fitted. All with handbooks, £400 or offers. G6DAW J Barton, 19 Leigh Place, Welling, Kent, DA16 3JD. Tel: 01 854 4926.

■ KW77 ham-band Rx £70. SX27 VHF 27-143MHz and discone ant £55. Hammarlund SP600JX 500KHz to 55MHz, a 'Rolls Royce' Rx £150. Howard 450 Rx, C1937, with xtal filter, good working order, a collectors item £100. Hallicrafters SX71 gen cov' and band spread £80. Trio JR 310 ham-band, no mods £65. Racal diversity unit £20. Hallicrafters SX 24 'Defiant' in immaculate condx, another collectors piece £75. 125 A/HR HD 12V battery, new, £30. Want, HRO Rx, and also odd coil packs. Will haggle and exchange. Also want RA63 SSB. Tel: Milton Keynes 0908 314095 after 3pm.

■ Complete STN. Swan 700CX Transceiver SSB/LSB/USB/CW, matching PSU 10 crystal oscillator. Shure 526T mike with Pre-amp. Spare PA valves and numerous others. New spare relay handbook and circuit diagram. £400. Collect or carriage extra. Tel: 0202 579115.

■ Heathkit HA14 linear amp. 1KW HP24 PSU. Connecting leads, handbooks. Collect or carriage extra. £175. Tel: 0202 579115.

■ Sanyo RP 8880 9 band receiver BFO AFC Xtal markers band spread tuning, Gyro antenna long, medium, VHF, five SW bands. 2.3 – 30 MHZ. Mains or battery. Cost £170, accept £90. Tel: Slough 28654.

■ Eddystone 960 solid state HF receiver plus manual £100. Also Eddystone 770R VHF receiver plus manual £80. Tel: (084 428) 448.

■ Collectors item; HMV 650 table grand broadcast receiver 10 valves 5 bands Circa 1937 with service manual capacitors replaced some years ago. Offers as seen or exchange for something useful. Tel: 0875 610778.

■ HF receiver, realistic DX160 150KHz to 30MHz. £80.00 John G6KBS Tel: Baldock 892831.

■ FT221 with muTek preamp fitted 10 Xtal channels speech processor and desk mic, £350 ono Tel: Hull 859445.

■ Yaesu FT101E HF trans 160m to 10m mic etc

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boxed £285 ono. Yaesu FRG7700 G/C Rx vgc. £255. KW2000A HF trans mic, £160 G40WY Tel: Weymouth 0305 78690.

■ SP600 Rx 500KHz – 54MHz, £160. 1155N Rx, no p/pack £25. BRT 400 Rx 150KHz – 30MHz £80. SX27 VHF 27MHz 143MHz inc, discone ant, £50. Hacker Helmsman port £14. Howard 450 Rx, collectors item c1937 £100 ono multi meter £12. Stereo amp Sansui 40 x 40in £20. Or swops. Tel: Milton Keynes 314095.

■ HF linear TL911. 2KW spare tubes. Excellent condition, £260 ono. Buyer collects D Mavin, 52 Bywell Rd, Ashington, Northumberland NE6 3OLE. Tel: Ash 815143.

■ Transvert from 2 metres to 70cm. MMT432/144R, full 10 watts output, 1.6 shift, linear mode, standard attenuator suits 10 watt rigs plus 7dB attenuator to suit 3 watt (FT290R) rigs, £14.50 list) plus free 70cm wavemeter packer WM7 with helical fitted. All mint, £110 ono. Or exchange for 2 metre mobile FM Tx/Rx or IC2E or something interesting why? Ring 01 247 6097 daytime.

■ SEM transmatch 160-10 metres Ezitune fitted, as new, £70 Tony G4SVY Tel: Sandown (0983) 405190

■ Icom IC751 complete with microphone, 6 months old, little used, £825 ono Mr Wood (Junior), Tel: 044 93 7764.

■ Icom IC120, £340. IC25H, £245. IC45E £195. All mint. G8VVK QTHR Tel: Yarmouth 667597.

■ Belcom LS102L 26.000 MHz – 29.999 MHz. All mode, original box, mint cond, £200 ono. Consider 10-80 mobile Px or 2 mtr multi, WHY letters only please. Will reply to all offers, Colin, 'Sunnyside', Spinney Close, Grimoldby Louth, Lincs LN11 8SY.

■ 2m FM transceiver FDK, multi 8, 24 channel 15 xtalled, plus separate VFO, mains operated. Rig. can be used 12 volt mobile or off VFO. No mi. Good working order, £100. Would consider exchange, general coverage Receiver SSB AM in good condition OWHY. T M Clayton, 10 St Nicholas's, Bracon Ash, Norwich, Norfolk NR14 8HG. Tel: Mulbarton 78120.

■ Icom 25E 2 metre FM scanning mike, 25 watt, 5 memories, £185. Standard C78 70cms FM portable NiCads, mobile bracket, case, £160. Original packing and both as new. 2in JVC B/W portable TV/radio UHF/VHF mains/batteries, incluing magnifier and leather case, £60. G410F QTHR Tel: 01 486 8286 daytime 01 722 7040 evenings.

■ Trio 7010 2m SSB Tx/Rx, mic, mobile mount, manual, full working order, good condition, £100 ono.

■ Dressler 2m linear amplifier, 200W 240V sell or exchange for HF Linear amplifier. Datong RF speech clipper, £25. 80/40m trap dipole, £20. Tel: Ingrebourne 73366

■ Collection of valve wireless receivers and spares, odds and ends. SAE for list. M Small, 8 Cherry Tree Road, Chinnor, Oxon, OX9 4QY.

■ Yaesu 200R 2m FM mobile, £115. Pye PF1 Tx and Rx xtalled for RB2, complete with NiCads, £25. Pye PF1 NiCad charger Tx and Rx 12 way £10. RAF 2m AM Tcvr 24V valve truss supplied, £40. Tel: Waterlooville (Hants) 61399

■ Two 10 metre rigs, one AM one AM FM 10W, freq coverage 28.36 to 29.70 in 3 bands, £70 each. Will swap for small interesting marine curio ship model etc or radio gear. Looking for VHF marine hand held. Ivor Halsey, 1 Darnbourgh Street, York YO2 1JH. Tel: York 23893 work hours.

■ Racal RA17L receiver KW Viceroy mkII, Tx, KW mkII, PSU spare valves for above and manuals. T/R relay. Katsumi EKM-12 sidetone osc £230. Buyer collects. Tel: Liskeard 43900

■ Communication receiver GEC 402K professional series, rack mount beautiful unmarked condition, built in crystall calibrator and ATU variable selectivity, both crystall or IF. Complete with H/Book. Made to a standard not a price! About 1950. Exchange for VHF or UHF equipment preferably with SSB facility. Tel: Clive, Bradford 881894.

■ GEC BRT 400, £40. Realistic DX100, £50. CA70 DX receiver, £20. BC433 receiver, £40. 20 x 20 watt amplifier, £20. Leak Delta 70, £30. A Baker, 34, Wenny Est, Chatteris, Cambs PE16

■ Realistic DX160 communication receiver in good conition, still in box. Tunes all the amateur and Beardcast bands and much more, also have Tandy science fair globe patrol in good working order, with instruction book and 33 various radio magazines in good condition. All must go, owner selling up. £75.00 ono the lot. Tel: Gainsborough 617622

■ Yaesu short wave communications receiver, FR50B FT101. Will accept £300 or nearest offer. Good condition circuit diagram available. David Blay, 31 Woodruffe Drive, Basingstoke. Tel: Basingstoke 27328

■ Realistic DX200, vgc, manual £65 Zenith trans oceanic model 30001 vgc £65. H C Bach, 52 Tudor Close, Belsize Av, London. Tel: 01 794 9790

■ Yaesu FT101ZD mkIII, fan warc, mint condition £410 ono. Clive Tel: (0279) 28857

■ HRo5T receiver with mains PSU plus complete set of nine general coverage coils 50KHz – 30MHz, in wooden container, clean working condition with handbook £60. Buyer to collect or will exchange for Trio 9R-59DS with handbook and speaker. K Pullen, 210 Hollett Rd, Penfilia Est, Treboeth, Swansea SA6 9ER

■ Trio R1000 communications receiver, excellent condition, £210. Tel 0352 4342 after 17-30 hrs, 051 339 4181 ext 338 daytime.

WANTED

■ Exchange Realistic Pro 2001 scanner, brand new, programmable with memories. Covers all VHF, UHF bands, for HF transceiver. Tel: St Albans 39333.

■ Instruction manual + schematic diagram or photo-copies of same for Tektronix oscilloscope type 545A 15 MHz dual trace. Postage/costs etc paid. Gordon Tel: 0375-79274 (evenings).

■ Service manual for CR100 (Admiralty B28) receiver particularly regarding mains supply plug pin lay-out. A mains plug would be appreciated. Richard Hughes Tel: 01-445-7093.

■ Exchange. Have Dragon 32 computer, joysticks, recorder, tapes, games, leads and instruction manuals. Little used, value £250. Want 'Code Master' CWR 610 or MBA-RO RTTY/CW reader. J Le-Cornu, 17 Chapelwood Grove, Perry Barr, Birmingham, B42 2LL. Tel: 021-356-8773.

■ Icom IC202. John Jocys, 28 Vaudrey Drive, Timperley, Altrincham, Cheshire. Tel: 061-969-0619, (work) 061-236-9278.

■ Swap Yamaha XS250T, runner for multi-channel 70cms hand held or multi-channel 70cms or 2m rig, TV transmitter or decent rotator. Any useful radio gear considered. G61LO QTHR. Tel: 0842 64989 (Thetford).

■ Have signal generator Marconi TF144G will exchange for MMS 1 or 2 or 2m gear or WHY. Tel: 0302-842959.

■ Realistic PRO2002 50 channel scanner or Gemscan 70 or similar. G8RHU Tel: Newhaven (0273) 516801.

■ Manual or copy of, for Azden PCS3000 2m transceiver. Will pay postage Tel: Cuffley 872772.

■ Yaesu SP901 ext spkr to match FR101RX. Also full set of Xstals for broadcast bands (60 thru 11 metres) for this Rx. F Southworth, The Dell, Watling St South, Church Stretton, Shropshire. Tel: Church Stretton 723860.

■ RF-4900 FM/AM 11 band communications receiver, excellent condition, covers all amateur bands, mains or battery, will exchange for FT290R or any good 2 metre base or handheld. Tel: Derek G4VJF Ryde 66298.

■ National Panasonic portable video recorder with coloured camera. Power supply, mains and tuner timer, little used. Exchange for radio equipment Tel: 0277 823434 after 5pm.

■ Nato 2000, FT707 or FT101 Tel: 0283 221870.

■ Pocketfones or burndepts for use on 70cm. Tel: Swansea 467384 after 5pm.

■ Panasonic DR 31, three months old. Exchange for Sony radio 230-220 or Zenith 7000 or similar radio with analogue dial or both digital and analogue. R Lawrence, 10 Cobhall Close, Red Hill Estate, Hereford. Tel: Hereford 271091.

■ AM portables. Low band charity organisation requiring several sets. Must be reliable and reasonably priced. Tel: 021-704 4775.

■ October 1983 issue of Amateur Radio please. K Parker, 21 Lundy Drive, Hayes, Middlesex UB3 4ES.

■ Any of the following valves (new boxed) 6DC6, 6AQ5, 5Y3GT, OA2, 6BA7, 12AT7, 12AX7, 6AL5, 12AU7, 6BA6. Tel: Manningtree 4336.

■ Buy or copy manuals or circuits for STC starphone UHF/FM Tx/Rx, Dymar Lynx 1050 UHF/FM Tx/Rx. M Gathergood G4KFK, 80 Moorfield Road, Denham, Uxbridge, UB9 5NF.

■ Exchange new 70cm FT-790R Yaesu transceiver with all accessories for Yaesu 2 metre transceiver or similar. J J Whyte, 5 Derby Road, Old Skelmersdale, Lancs. Tel: Skelmersdale 26368.

■ 1155 RAF receiver, any condition, or Murphy B40 receiver. Preferably in or near N Ireland. John Moloney, 19 Lansdowne Pk, Belfast 15.

■ Cheap HF transceiver, £200. Tel: Stokesley (0642) 710806.

■ Accessory crystals for programming Drake SPR-4 receiver, also book entitled, Confidential Frequency List. Please write with details to Radford, 10 St Pauls Avenue, Hyson Green, Nottingham NG7 5EB.

■ 2 mtr handheld with charger or mobile exchange ELMO 350SL Macro Super 8 sound camera, supersound projector screen. Terry Tel: 01-622 0809.

■ Exchange two 19 sets minus 12V PSU plus 240 V PSU, two boxes spare valves, for CB transceiver set or why in 35mm camera. Tel: Newcastle upon Tyne (0632) 651333 evenings.

■ Racal RA63 SSB adaptor or RA98 Racal F/counter 801m etc. Tel: Milton Keynes 314095.

■ Exchange Arado IBA-95 VLF metal detector, new, worth £295, for FT290. Tony G4SVY Tel: Sandown (0983) 405190.

■ Yaesu FT902 DM HF all bands tranceiver. Yaesu FC902 ATU. Yaesu FT901 HF, all bands tranceiver. Charles Robinson Tel: Paignton 557982 after 5pm.

■ RAE course, rotator. Tel: 05645 2987 (West Midlands).

■ Exchange Atari 400, tape deck, dust cover, software. PSU's for IC202S/E, liner 10/430, TR2300, or WHY. A Smith, 40 Enfield Road, Rowley Regis, Warley, West Midlands, BG5 9NP.

■ Sony CRF-160 13 band FM-MW-LW, ten short wave bands mains, battery or car, BFO, AFC, calib-dial, scale lamp, dial map, teles antenna, very compact portable Rx. Like attache case, weight 7KG, mint with manuals. Also mint Toshiba personal tap-audio stereo unit with cans exchange for 934 rig or sell individually – or – WHY. Tel: Chelmsford 400760 evenings after 6pm.

■ Discone or 2 metre colinear antenna damaged or needing repair considered. Reasonable price. Required by disabled SWL. R Williams, 62 Kingscliffe Road, Grantham, Lincs, NG31 8ET. Tel: Grantham 66047.

■ Hammarlund HQ170A transmitter in good working order. Sensible price paid. Offers to Alan Tabelin. Tel: (050) 279688.

■ TS430S and PSU, also FC902 or AT230 ATUs. Clive, Tel: (0279) 28857.

■ Handbook/manual for KDK FM2025. Also mounting bracket for the same. R Baker, 22 Ledbury Way, Hunters Hill, Guisborough, Cleveland TS14 7PQ. Tel: 0287 36766.

■ Frequency counter audio oscillator SWR/PWR meter. G3VXS QTHR. Tel: 0782 625661.

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer readers the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space. We will accept ads not on our order form. Send to ***Amateur Radio,*** Classified Ads, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

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

FREE CLASSIFIED AD ORDER FORM

Send to: Amateur Radio Classified Ads · Sovereign House · Brentwood · Essex CM14 4SE

Classification: (tick appropriate box) If you want to insert ads under more than one classification use separate sheets for second and subsequent ads

For Sale ..... ☐ Wanted ..... ☐

USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone							

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

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

COMING NEXT MONTH

Amateur RADIO

ANGUS McKENZIE G3OSS –
tests the new Trio 2m and 70cm FM mobiles and the new Icom 2m mobile

24cm ATV – ANDY EMMERSON G8PTH
The concluding part of the single tube PA project

TEN METRE FM
John Petters starts a series on the VHF characteristics of this band

COLLINEAR AERIALS FOR THE HF BANDS
John Heys G3BDQ with simple but effective designs

PLUS SWL, DX Diary, On the Beam, your letters and all the regular features

DON'T MISS the July issue – on sale 28 June

To be sure of your copy of ***Amateur Radio*** complete the newsagents order form in this issue or take out a post free subscription

COMING NEXT MONTH

Amateur RADIO SMALL ADS

Ant Products

All Saints Industrial Est
Baghill Lane, Pontefract West Yorkshire
Telephone (0977) 700949

TIGER LY9 70 Cms Antenna

New from Ant Products, a superb addition to the range of renowned antenna, the Tiger LY9 for 70 cms. A light weight antenna with a heavy weight signal. Offering a high 11db gain on a 58 inch boom length. Great for vertical or horizontal mounting. Supplied in matched pairs for the ultimate Oscar station complete with all hardware for mounting with elevation control. Precisely adjustable for angle in order to get the best performance. Also including matching unit for circular polarisation. Right or left hand can be chosen with equal efficiency. Last but not least our famous two year guarantee and full back up service.

Write now for full details enclosing a SAE plus 25p in stamps

G3SRK MORSE KEY (Direct form Manufacturer)

As used by Govt. Establishments in over 60 countries
NOW AVAILABLE TO AMATEUR FRATERNITY
£9.00 inc. VAT and carriage UK
J SYKES, 7 Top o'the Hill, Slaithwaite, HUDDERSFIELD HD7 5UA

Complete, full-size sets, any published service sheets £2 +large SAE - except CTV's/Music Centres from £3 +large SAE.
Manuals from 1930 to latest. Quotations, free 50p magazine, price lists, unique technical publications, for large SAE.
Repair data/circs almost any named TV/VCR, £9.50. The only comprehensive TV Repair Course (bound), £9.50. The only comprehensive Radio Repair/Servicing Course (bound), £9.50. All by return post.

TIS(AR)
76 Church Street, Larkhall, Lanarkshire ML9 1HE
Phone: 0698 883334

RTTY
THE EXPANDING MODE

Build your own terminal unit to interface your micro to a receiver or transceiver.

PL1	
FP1	
PLL T.V. . . . Kit	£13.50
built module	£18.50
Power supply & pre-filter Kit	£11.25
built module	£14.65

Software also available – please enquire
For full catalogue send s.a.s.e. to
Please ad V.A.T to all prices

PNP Communications (AR)
62, Lawes Avenue, Newhaven
East Sussex BN9 95B
Telephone (0273) 514465

MORSE READING PROGS

Work on clean signals without hardware interface. ZX81 1K UNEXPANDED MEMORY. Translated code, with work and line spacers for easy reading Automatic scroll action **£7.00 Incl.**
Spectrum 16-48k. Scroll action with 10 page scrolling memory, instantly accessible page by page **£8.00** inc. All types variable speeds feed signal direct into EAR socket
Pinehurst Data Studios, 69 Pinehurst Park, W Moors, Wimborne, Dorset BH22 OBP.

SOUTHDOWN RADIO SUPPLIES
40 TERMINUS RD EASTBOURNE
Tel: (0323) 639351 *(opp. Railway Stn.)*
Open: Mon-Sat 10-6 (Closed Tues)
Amateur Radio Equipment Yaesu, Icom, Standard, Tonna, Drae, Kenpro, Halbar, Wood & Douglas, Daiwa.

Booth Holdings Bath
See you at Longleat
Sunday June 24th
6 Golf Club Lane
Saltford, Bristol
Tel: 02217 2402
Open Tues-Sat 9am-9pm
closes Mondays

G2VF DIY LOOP ANTENNAS

Circuit, Parts List, Assembly data 80 to 10 Metres £5 Long Medium Short Wave 40 to 10 Metres £3 Ideal Caravan and Flat Dwellers.

FG RYLANDS, 39 PARKSIDE AVENUE
MILLBROOK, SOUTHAMPTON SO1 9AF

Amateur RADIO SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £7.00, 3 — £6.60; 6 — £6.30, 12 — £5.60.

AMATEUR RADIO SMALL AD ORDER FORM

TO: **Amateur Radio · Sovereign House**
Brentwood · Essex CM14 4SE · England · (0277) 219876

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue.....☐ 3 issues.....☐ 6 issues.....☐ 12 issues.....☐

COPY enclosed.....☐ to follow.....☐

PAYMENT ENCLOSED:..... £ — Cheques should be made payable to Amateur Radio. Overseas payments by International Money Order

CHARGE TO MY ACCOUNT.....☐

COMPANY .....

ADDRESS .....

SIGNATURE ..... TELEPHONE.....

.....

C P I

NEXT ISSUE OF Amateur RADIO ON SALE Thursday 28th June

AERIAL BOOSTERS

Next to the set fitting
B45H/G-UNF TV, gain about 20dbs, Tunable over the complete UHF TV band **PRICE £8.70.**
AMPLIFIED SET TOP AERIALS for UHF TV, trebles the gain, **PRICE £11.70.**
All Boosters we make work off a PP3/006p/6F22 type battery or 8v to 18v DC **P&P 30p PER ORDER.**
ELECTRONIC MAIL ORDER, 62 Bridge Street, Ramsbottom
Lancs BL0 9AG. Tel (070682) 3036
Access/Visa Cards Welcome SAE Leaflets

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

depth mm x width mm	ad space	1 issue (colour rates exclude cost of separations)	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono display ad	small ad	mono artwork	on sale
Jul 84	30 May 84*	6 Jun 84	8 Jun 84	28 Jun 84
Aug 84	28 Jun 84	4 Jul 84	6 Jul 84	26 Jul 84
Sept 84	26 Jul 84	1 Aug 84	3 Aug 88	23 Aug 84
Oct 84	30 Aug 84	5 Sep 84	7 Sep 84	27 Sep 84
Nov 84	27 Sep 84	3 Oct 84	5 Oct 84	25 Oct 84

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations.

Printed — web-offset.

PAYMENT
All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by the publication date.
Overseas payments by International Money Order.

FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Commission to approved advertising agencies is 10%.

CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

DEWSBURY ELECTRONICS

G4CLX

APPROVED TRIO DEALER

AMTOR SPOKEN HERE — SEE THE FAMOUS ICS AMT-1
Always on demonstration in Stourbridge.

NEW FROM AEA IN THE U.S.A.

THE "MICROPATCH"
A NEW LOW COST METHOD OF USING THE COMMODORE VIC20 or CBM64 on the air with RTTY or CW

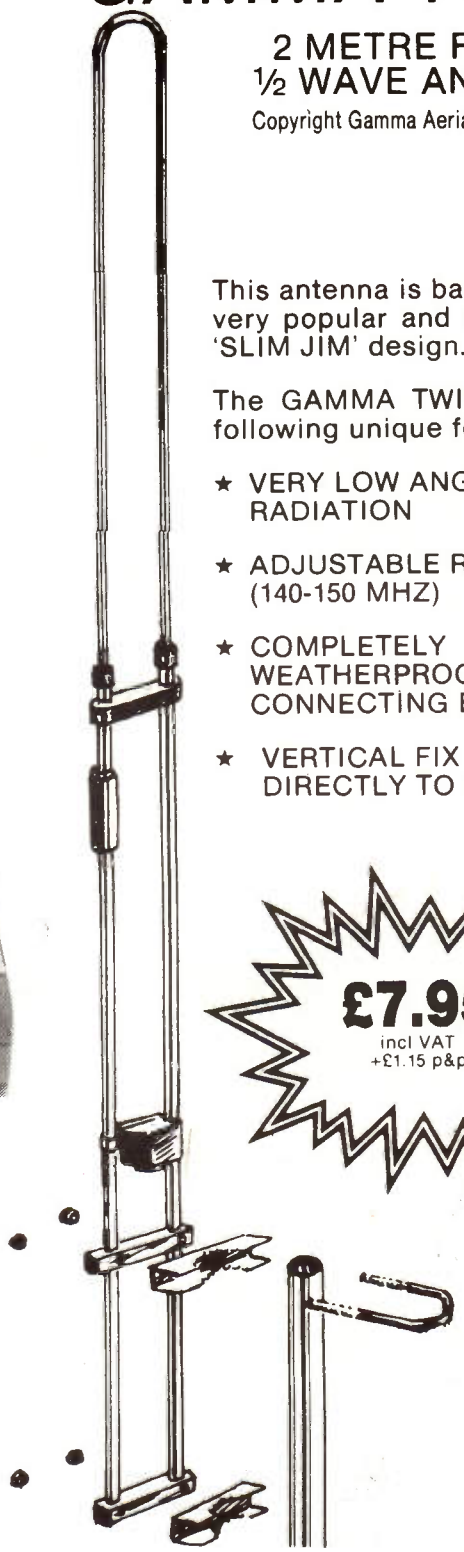
SIMPLY PLUG IN TO YOUR MACHINE'S EXPANSION PORT AND OFF YOU GO. Auto Tracking CW speeds. Type ahead Buffers. TRY ONE AND SEE. It's Foolproof. Well at least it's G4CLX proof. If he can use it so can you. 5Z4CX thinks it's great.

£129.00 inc. VAT, pp £1.50. SAE ENQUIRIES.

ACCESS/BARCLAYCARD ACCEPTED LICENCED CREDIT BROKER

GAMMA TWIN

2 METRE FOLDED
½ WAVE ANTENNA



This antenna is based on the very popular and successful 'SLIM JIM' design.

The GAMMA TWIN has the following unique features:

- ★ VERY LOW ANGLE OF RADIATION
- ★ ADJUSTABLE RADIATOR. (140-150 MHZ)
- ★ COMPLETELY WEATHERPROOF CONNECTING BOX
- ★ VERTICAL FIX DIRECTLY TO MAST

£7.95
incl VAT
+£1.15 p&p

Dewsbury Electronics offer a full range of **Trio Equipment** always in stock.
We are also stockists of DAIWA – WELTZ – DAVTREND – TASCO TELEREADERS – MICROWAVE MODULES - ICS AMTOR – AEA PRODUCTS – DRAE

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063

Closed Monday

Instant finance available subject to status
Written details on request

MICROWAVE MODULES LTD

AS IF YOU DIDN'T ALREADY KNOW . . .

Microwave Modules Ltd. Is a full time professional organisation, established over **15 years** ago in **1969,** and currently employs over **30 full time,** on site staff based in our two modern, purpose built factories. In addition, a similar number of 'Outworkers' are involved in assembly and mechanical operations.

OUR EXTENSIVE RANGE . . .

Our product range now exceeds **50 individual items** in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become **the largest** and **most successful** designer and manufcturer of R F Products, such as **Linear Amplifiers** and transverters, but also designers and manufacturers of **innovative** microprocessor and digital products such as **The Morsetalker,** MMSI, and the RTTY to TV decoder, MM2001.

ALL BRITISH . . .

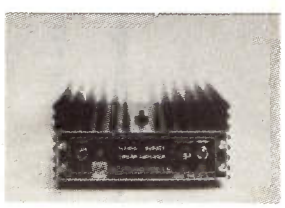
Every product in our range is designed and manufactured in the UK by our own employees, and wherever possible British Components are utilised.

GUARANTEED . . .

All Microwave Modules Products are **Fully Guaranteed for 12 months.** This includes all semi-conductors and **PA Transistors.** We have built our reputation around our customer service and back-up and it is second to one.

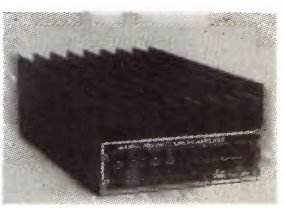
OUR RANGE OF LINEAR AMPLIFIERS . . .

MML144/30-LS



MML144/50-S

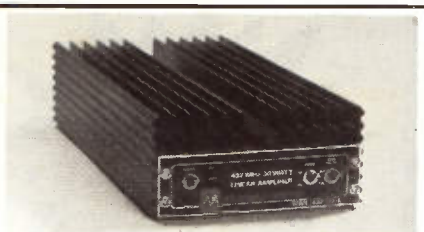
MML144/100-LS



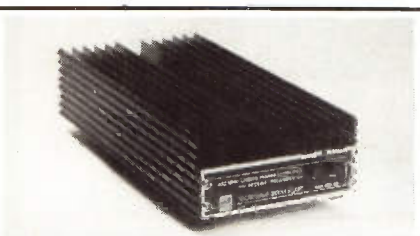
MML144/200-S

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	Pre Amplifier GAIN	Pre Amplifier NF	POWER REQUIREMENTS	RF * VOX	PRICE INC VAT
MML144/30-LS	**1 or 3W**	30W	SSB.			13.8V @ 4A	√	£75 (p&p inc £3)
MML144/50-S	10W	50W	FM.			13.8V @ 6A	√	£92 (p&p £3)
MML144/100-S	10W	100W		12dB	**<1.5dB**	13.8V @ 12A	√	£149.95 (p&p £3.50)
MML144/100-HS	25W	100W	AM.			13.8V @ 12A	√	£149.95 (p&p £3.50)
MML144/100-LS	**1or 3W**	100W				13.8V @ 14A	√	£169.95 (p&p £3.50)
MML144/200-S	**3, 10 or 25W**	200W	CW.			13.8V @ 30A	√	£245 (p&p £4.50)

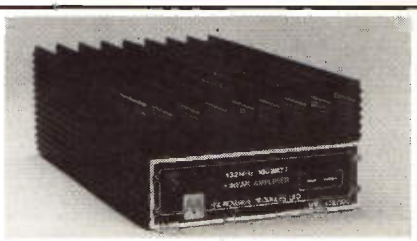
* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED



MML432/30-L



MML432/50



MML432/100

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER GAIN	PRE AMPLIFIER NF	POWER REQUIREMENTS	RF* VOX	PRICE inc VAT
MML432/30-L	1 or 3W	30W	SSB.	12dB	2dB	13.8V @ 6A	√	£139.95 (p&p £3.50)
MML432/50	10W	50W	FM. ATV.	12dB	2dB	13.8V @ 8A	√	£129.95 (p&p £3.50)
MML432/100	10W	100W	CW.	—	—	13.8V @ 20A	√	£245 (p&p £4.50)

*THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED.

CONNECTORS . . .

144MHz Products — Our standard connector on these products is SO239. We use a high quality PTFE socket of superior quality, but we are able to supply the choice of BNC or 'N' type at no extra charge. Please specify

432 MHz Products — The MML 432/30-L's fitted with BNC connectors, 'N' type available, please specify. The MML432/50 and MML432/100 both have BNC input sockets and 'N' type output sockets. If this is not to your preference please specify when ordering.

DATA SHEETS . . .

A full printed data sheet is available on each product, and is free on request.

CATALOGUE . . .

A copy of our latest catalogue can be obtained by sending a large SAE (23p) or by sending 40p in stamps to the address below.

RALLIES & EXHIBITIONS . . .

We shall be attending most of the 1984 rallies and exhibitions. Come and see our products for yourself.

AVAILABILITY . . .

Our products are normally available from stock, either direct from ourselves or any of our 75 UK outlets.

ACCESS VISA

WELCOME

MICROWAVE MODULES

BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011. Telex. 628608 MICRO G
CALLERS AE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E & O.E.