NOVEMBER 1984 99p

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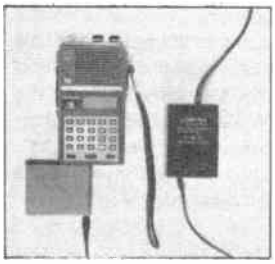
Amateur RADIO



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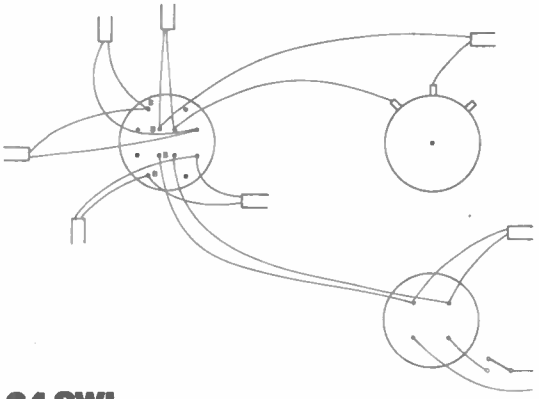
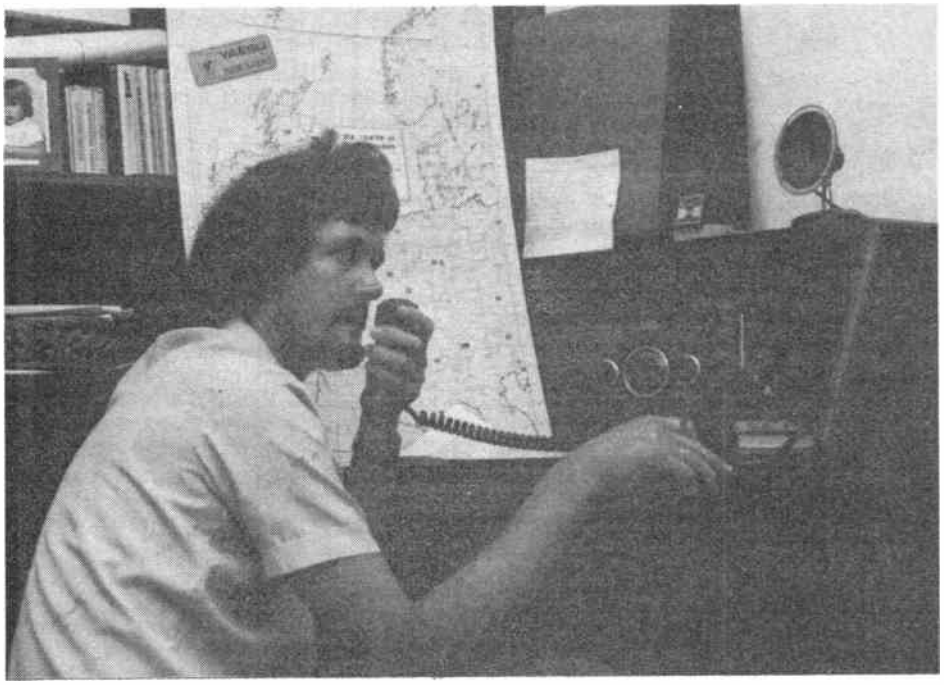


SERVICES

TWO METRE DX INTO PORTUGAL

Steve Anderson G6VBU worked Sporadic-E into CT-land on S20. Why didn't he QSY?



'Would the Charlie Tango station please QSY from S20?'

Traditional ethics may well have prompted the request, but it was one of those rare occasions when protocol had to give way to mere common sense. I was not begging the question. Suppose the local FM net needed the frequency to arrange an important sked? Or perhaps the newly-licensed G1 down the road was itching to try out his home brew collinear? And what about that mobile's abortive CQ calls?

Such thoughts, such nagging self-doubt, such inner turmoil and soul-searching. . .such hypocrisy! As I discovered while monitoring the two metre SSB calling channel, it is each to his own when the Big One promises super DX and the prospect of working new squares and new countries. There's nothing quite like Sporadic-E for demonstrating that amateur radio is not quite the gentleman's pursuit that it is sometimes made out to be. In fact, such conditions tend to prove that in the law of the jungle, the strongest and most cunning are the least likely to starve.

Anyway, back to 145.500MHz late one sunny afternoon earlier this year – 30 June to be precise. Tropospheric propagation was producing nothing extraordinary and that old benchmark, GB3VHF, was being received at its typical 4/1 strength at my unsophisticated station in the Vale of York. I figured it was time I went for tea.

Intuition

Whether it was by intuition I'll never know, but, having nothing better to do than wash the pots, mow two lawns, rub down the exterior paintwork, walk the dog or kick the XYL(!), I returned to the shack 45 minutes later for a quick check on band conditions. GB3VHF – permanently locked in the memory of my FT290R – was still well down in the noise; the Cornish beacon, GB3CTC, was inaudible, and the distant repeaters were as distant as ever.

But a two-second listen on 144.300MHz was sufficient to ensure that my routine check had paid dividends. Chaos ruled. The loudest signal was from an EA station going through the pile-up motions on Sporadic-E, with half a dozen further Iberian operators bending the proverbial needle either side of the calling channel. I heard later that one particular amateur in the North of England claimed to have logged 15 new squares that evening, but it was soon apparent that my 2.5 watts of RF into an eight-element yagi were unlikely to establish any contacts further south than Watford.

It is not, of course, that you need any great power, height or a high-gain antenna to work good DX. But around 6.45pm on a Saturday is hardly conducive to a quiet time on two metres, and it was obvious on this occasion that the licensed listeners (a bitchy comment there – Ed.) were shaking the dust from their PTT buttons and, coupled with the ever-active and more powerful stations on 144MHz, making it virtually impossible for the QRP enthusiast – the under-privileged? – to link up with Spanish or Portuguese operators.

Usual tactics

I tried the usual tactics, of course, including calling CQ away from the rabble, using the term QRP and, in desperation, asking those who had been successful if they would bring me into the next brief QSO. As I said earlier, it was each to his own, and it was remarkable just how deaf the average English station had suddenly become. Perhaps they were all using unmodified FT-290Rs?

Not even the fact that my home's name is Spanish – *Mi Amigo* – made any difference to my efforts. By now the opening had lasted for more than 45 minutes and our borrowed time must have been coming to an end.

In frustration, I listened on the FM portion of two – and, with the exception of local stations, 145MHz was quiet. Using horizontal polarisation I called CQ DX on S20 and, within a matter of seconds, two or three foreign stations came back to me.

They were immensely strong, of course, and shared the unfortunate characteristic of speaking not a word of English. I could not even make out one callsign, let alone exchange the all-important details.

A minute later my CQ call was answered by a station south of Porto – by CT1BR, to be precise – and all the particulars, both here and in Portugal, were noted without difficulty. I'd made it! It was my first excursion into CT-land, my furthest-ever DX – about 979.5 miles, according to an amateur colleague at Burstwick, near Kingston-upon-Hull – and my most impressive contact for weeks on S20. Now what about trying to

LOWE SHOPS

Whenever you enter a LOWE ELECTRONICS' shop, be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that, along with a courteous welcome, you will receive straightforward advice. Advice given, not with the intention of ''making'' a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio shops and after-sales service. The shops are open Tuesday to Friday from 9.00 to 5.30 p.m., Saturday from 9.00 to 5.00 p.m. and close for lunch each day from 12.30 till 1.30 p.m.

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

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

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

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

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

For many years.....

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

Since those days.....

things have changed and many receivers have come and gone. When compared with the large pieces of surplus equipment once used by the short wave listener in his shed at the bottom of the garden, today's equipment looks ''very HI-FI''. Most of the receivers carry the description ''general coverage'' meaning that it will tune without gaps frequencies from around 100 kHz to 30 MHz. Such wide coverage means that not only can you listen to amateurs and short wave broadcast stations worldwide, you can also hear Radios 1, 2, 3 and 4 and Laser on 588 kHz. To the short wave listener this is a great advantage over rigs which only have selected bands. It is usually the band you particularly want that the manufacturer had decided you could do without. The receivers which I now describe are all ''general coverage'', and I might add are each capable of giving you the satisfaction which I describe above.

the R600.....

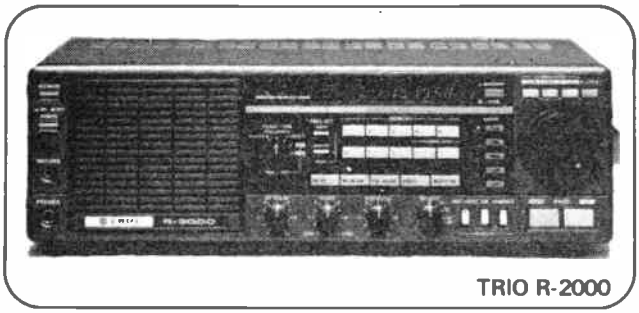
TRIO R-600

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

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

the R2000.....

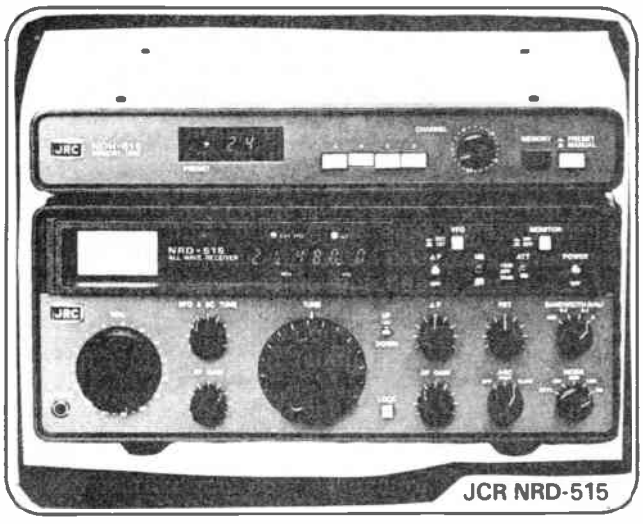
Moving upward from the R600 we find the TRIO R2000. The receiver covers frequencies from 100kHz to 30MHz and has, in addition to the facilities found on the R600, a ten channel memory to hold for quick access your favourite stations. Memory operation is versatile, each memory retaining not only the frequency but the mode of operation. Each memory can be also used as a separate VFO. In addition to AM, USB, LSB and CW the R2000 is fitted with FM which, when used



TRIO R-2000

with the VC10 internal vhf converter, enables the amateur 2 metre band to be fully listened to. Another advantage over the R600 is that the R2000 tunes continuously up the band and not in 1 MHz sections. Three rates of tuning are provided enabling the band to be either searched diligently or quickly "scanned". With the optional VC10 fitted the R2000 adds to its frequency range the VHF section from 118 to 174 MHz and, of course, operates on AM, FM. USB, LSB and CW. Fast or slow AGC can also be easily selected using a front panel switch. Altogether a fine receiver and ideal for today's listener. **The TRIO R2000 costs £436.75 including VAT.** The optional VC10 costs £117.00 including VAT and is easily fitted inside the receiver.

from JRC, the NRD515.....



JCR NRD-515

There are amongst us a discerning few for whom only the best is good enough. For them there is only one receiver: this is the NRD515 manufactured by the JAPAN RADIO COMPANY. The receiver is built to professional standards and is designed to give its owner the ultimate in listening pleasure. Covering 100kHz to 30MHz the NRD515 has pass band tuning, slow and fast AGC and a preselector covering the broadcast bands from 600 kHz to 1.6 MHz. Optional accessories include a 96 channel memory unit (NDH518 £264,00 inc VAT), a remote frequency controller giving keyboard frequency entry, plus an additional four memories (NCM515 £169.75 inc VAT) and a matching speaker (NVA515 £45.41 inc VAT). **The NRD515 short wave monitor receiver costs £965.00 inc VAT.**

and the AR2001....

It is rare to use a piece of equipment so refreshingly new as to be devastating. Although it has been my pleasure to use numerous receivers over the past years nothing has so captured my attention as has the AR2001 from the company AOR. Authority On Radio, AOR, sums them up exactly. In the past there have been several receivers covering parts of the HF/VHF/UHF spectrum but never before a receiver

AR-2001

tuning continuously from 25MHz to 550MHz. Never before a receiver having AM, narrow band FM and wide band FM. Never one that could be afforded by all enthusiastic listeners. The AR2001 is the new concept in receiver design combining user friendly controls to aid listening with a carefully designed receiver that actually works. The receiver with its continuous coverage between 25 and 550 MHz enables its owner to listen to a multitude of transmission sources. The provision of three modes, AM, narrow band FM and wide band FM are essential when one considers the variety of information that can be received. AM for the VHF/UHF airband channels, narrow band FM for amateur radio, CB and business radio and finally wide band FM for broadcast and TV sound. Digital frequency readout is combined with visual reminders of receiver state and for night time listening the panel is illuminated. Scanning, memories, memory scan, programmable band scan are all part of the receiver and to aid operating the memory not only remembers the frequency but the mode of operation. **The AR2001 receiver costs £345.00 inc. VAT.**

CURRENT COMMENT

CROESO Y CYMRU

This year's Welsh Amateur Radio Convention took place at the Oakdale Community College in Blackwood, Gwent on Sunday, 29th September. In the past the event has been to a large extent neglected by large sections of the amateur radio press, and on arrival we soon realised that the scale of this well organised event and the range of activities on offer deserved better coverage.

In addition to the trade stands and bring-and-buy, many groups and clubs were represented, films were on show and there was even an opportunity for class B operators to take their Morse test on the spot. Without doubt however, the major attraction at this year's convention was the appearance of NASA astronaut Dr Anthony England W0ORE, who had come from America especially for this event.

In the halls

Although many of the big names were absent, some large firms, such as Dewsbury Electronics, had made the long journey to Wales to set up their stalls. Supplementing these, dozens of smaller firms more local to the area were in attendance, with a particular emphasis on components, spares and working or non-working surplus and secondhand equipment. There were certainly several bargains to be had amongst the wide range of electronics and radio gadgetry on offer.

A local firm, Newbridge TV, included a demonstration of Russian satellite TV on their stall, making use of a roof-mounted dish from Wolsley Electronics Limited.

The RSGB and BARTG were represented, the latter offering their full range of books, PCBs and kits as well as selling secondhand RTTY equipment and club accessories.

Several repeater groups were also represented, including GB3BC (Bristol Channel), GB3WW (West Wales), GB3BB (Brecon Beacons) and GB3SG (South East Wales). The Mendip Repeater Group was also represented. This group maintains GB3WR (Wells, 2m) GB3UB (Bath University, 2m), GB3VS (Bridgewater, 70cm) and is soon to put the GB3UT Bath University 24cm ATV repeater on the air.

Coincidentally, on the way down to Wales from London, one of our group had worked through the Wells repeater into Tiverton in Devon (while we were in a traffic jam on the Severn Bridge), so it was nice to meet and talk to members of the group who had made it possible, and to find out more about them.

The nucleus of the group got together in 1978, with their first repeater (WR) going on the air in September 1980, and the group now has almost 500 members. The group's organisers made the point that attendance at conventions such as this gives them the chance to meet their members, enrol new members and generally put the repeater on the map, as well as keeping it on the air.

The organisers of the event – Blackwood Amateur Radio Club – operated talk-in on 2 metres, and manned an HF special event station GB0ORE, the callsign issued to mark Tony England's presence at the event. Our photo shows Tony at the mike, watched by the mayor of Islwyn Borough Council, Bob Cooke.

Highlight

The highlight of the event was the illustrated talk by Tony England. Using film of the last shuttle mission and slides, he explained details of life and technology in space, including the astronomy payload of 51F on which he will be a mission specialist.

He then outlined the amateur radio activity planned for this mission, including the exciting news that a second American licensed amateur will be present on 51F, thus doubling the potential operating time on the flight.

He then answered questions on the proposed experiments, and on subjects ranging from 'zero-gravity' to the politics of space exploration and even toilets on the shuttle!

Despite a busy schedule during his short stay over here, Dr England was kind enough to grant a special interview to *Amateur Radio* magazine, which appears on the next page.

Overall, the organisers are to be congratulated for an event which provides a model for many others. Without doubt it was considerably more friendly than gatherings such as Woburn or the NEC convention, yet it was not 'low-key', for it managed to make headlines in the world of amateur radio and beyond.

CURRENT COMMENT: W0ORE

During the Blackwood convention *Amateur Radio* had the privilege of a special interview with the next radio amateur in space – Dr. Anthony England. Dr. England is forty-two years old and has been involved with NASA for seventeen years. He will be a mission specialist on flight 51F next year. Here then are his comments on forthcoming amateur radio activity on the shuttle:

Q: Can you tell us about your amateur radio background?

When I was twelve years old I became interested as an amateur. I think I got my licence when I was thirteen. All through high school several other young fellows and myself experimented with building things – not nearly as sophisticated as people have now – but we had an awfully good time.

I remember we even built a little CW system that we could operate up our sleeves. It would buzz against our elbow and we would squeeze tweezers up our wrist, so that when our teacher was lecturing we could sit there and talk to each other with our code systems. I suppose most amateurs have done something like that.

Q: Can you tell us the details of expected activity on your flight?

Spacelab 2 flies next Spring, April 17th. It is primarily intended for solar astronomy and some stellar astronomy, and these major objectives in the sciences are what the mission is all about. Amateur radio is an add-on and it's done in our spare time. The equipment is built and all the co-ordination is done by enthusiasts in the United States and amateurs who are also engineers at NASA.

When I operate the amateur radio system in orbit I'll be doing so on my 'off' shift – it won't detract from the primary objectives of the mission. What we hope to do as part of the amateur experiment is a little bit of communicating, like Owen Garriott did last year in Spacelab 1, but we hope to do it in a slightly more structured way.

There were thousands of amateurs all over the world who wanted to talk to Owen, and there's only a limited time to do it, so we're concerned that we use that time as effectively as we can. This time we'll try to do more scheduled work with clubs, particularly school clubs. We, and I'm talking about a group of us, are interested in promoting amateur radio and technical careers among young people, and we just want to give a boost to that community of young folk who are interested in the sciences, and who perhaps don't get as much recognition as football players, etc. So this seems a good way to use the resource of amateur radio in space.

The other things that we hope to do are intended to allow a lot more people to participate in the amateur experiment on the shuttle.

Firstly, we intend to use what we call a 'repeater mode', where the amateurs would be able to talk up on one frequency and their signal would come down on another frequency. We can just leave that on without our involvement, so it won't take up any time, and if the shuttle flies over you can talk up on 2 metres and come down on 10 metres, so that will be a good experiment.

Also, we're in the middle of the F2 layer, which is an ionisation layer. We believe that this will act as a wave guide and that the 10 metre wave will travel a long way around the earth within that F2 layer, and then be scattered off and downwards. We're not sure what the propagation will be on 10 metres but we anticipate that this 2 to 10 metre link may go most of the way around the earth. It is part of the experiment to see how this works.

The other thing we hope to do on 10 metres is to have slow-scan TV on board, which will just be set up in the background so you can see the crew at work. This scene will be sent down on amateur TV.

Q: Are there any particular effects encountered with propagation from the shuttle?

It's a relatively straightforward operation. It's a bit like where I grew up in North Dakota; there weren't many amateurs there, so with a relatively modest antenna and a modest rig, I could transmit to any place in the world. The shuttle is a little bit like that – there aren't many other transmitters up there. So we can, with just a few watts, do a pretty good job of communicating.

We were concerned, for instance, on the first mission when the antenna was on a window inside the vehicle, and we couldn't get the antenna outside. As it happens, when Owen was talking to the ground, the window wasn't often facing the earth but facing out to space. There were enough currents in the ground system reacting against that antenna in the window, that these currents to the belly of the orbiter were, in fact, what was radiating and he didn't have a bit of trouble communicating.

Q: Did NASA take much persuading to let you take amateur radio on board the shuttle?

During the first experiment I think that they took some persuading. Not that NASA was against it, but they wanted to be sure that it was a meaningful activity. So they sounded a lot of people out in the community as to whether or not this was a genuinely positive thing for NASA to be involved with.

It worked out so well for Spacelab 1 that I think they've made things a lot easier for us, and so far we haven't found much resistance.

We've got approval in concept for what we're going to try to do, and right now we're making an evaluation to ensure that our plans don't affect anything else on the orbiter. We've got to be very certain that we're not contaminating communications between the orbiter and the earth, or affecting the science in some way with our radios.

Q: On the first mission there was alot of trouble with jamming and people talking on the downlink. Do you know from Owen Garriott what it actually sounded like up there?

Owen wasn't aware of people transmitting on the downlink because he wasn't listening on his downlink, but one thing that he did notice was that the squelch on the rig he was using was based on the signal-to-noise. This was achieved by comparing the power of the channel he was listening to with adjacent channel power.

There were so many people transmitting up on all the channels with very high power that the signal-to-noise between the channel he was listening to and nearby channels was nearly one. At this point it would turn his radio off. So there were whole passes where he would cross over the country and not hear anybody at all because there were so many people trying to talk to him.

We've modified, or rather Motorola have modified that radio and we won't have that problem again. But one of the things that I think is kind of unfortunate is that now we won't have that problem we'll be captured by the stronger signal, that is by the super stations, running a kilowatt with a ten element beam and all that kind of thing. That's really not in the spirit of what we wanted to do.

Q: What tips do you have for people trying to contact you?

We will do some random communications and if folks are trying to catch us on that, I think the main tip is to understand *when* we're going over and *what* we're really doing, to avoid disappointing alot of people who weren't able to talk to us last time, because they were transmitting to us when we were really beyond the horizon and couldn't get to them anyway.

Even on passes where we go overhead there will only be certain times when I'll be free to operate the radio. We'll probably use some sort of protocol like

Owen did, where we transmit for so many seconds then listen for so many seconds – that seemed to work pretty well.

All I can say is, if you know *how* it works you'll have a fair chance of getting at it, but again there is the problem that we will be captured by the powerful stations.

Q: So really, you're making a request to keep the power down?

I would like to have people keep the power down and some people will honour that and some people won't. It isn't a matter of power – it only takes a few watts to do it and all the rest of it is just being down there.

Q: What equipment will you actually be using in the shuttle?

We'll have the Motorola transceiver for this 2 metre up and down. We're going to use a 2 metre scanner that is a receiver only. I'm not sure what make has been chosen, they're looking at several – the Bearcat and others.

What this will do is sample a set of frequencies that we've chosen, which will be published in *QST*. It will pick out one transmission and then turn it around to a single 10 metre frequency and transmit it back down. So you can transmit up on any of those frequencies and the scanner will walk across and capture one of them, turn it around on 10 metres and send it down, and then walk on to the next one.

This will be on whenever the TV isn't on, so I think there's a good chance that somebody could get that, and if somebody does hear you then we'll be glad to provide a QSL card with the fact that you were able to get through the system.

On the slow-scan TV, we haven't decided yet whether to use a spare orbiter camera or a commercial camera. The orbiter camera has its advantages, but the problem is that it's a balanced load output and it's a scene-grabber – it takes a snapshot of a scene and scans itself inside and sends that down on slow-scan, so you don't have all that smear-out problem which you have with normal slow-scan TV.

It's a robot system, which is a commercial rig, that has an unbalanced output, so we'll have to build a balanced/unbalanced amplifier on the front end of that, or we'll have to go out and buy a commercial TV camera. We haven't decided which we want to do yet. That will be sent down on 10m FM, the same frequency that the repeater will operate on. It will be one mode or the other.

Q: Will the antenna again be inside?

We've got a pass-through for co-ax through the bulkhead which we've been promised access to, and part of the technical feasibility is that we know it exists – Rockwell have said that they could hook it up for us and they won't charge us for it.

Some of the water closets, as you folks call them, have to be removed to get to the bulkhead. We normally take that out between each flight anyway – so we don't think it will be a problem, but until everybody says 'yes, that's what we'll do', we can't be sure we'll get that pass-through. If so, we're going to have a loaded whip for 10 metres in the payload bay. We'll still use the window for 2 metres: that way if the other system fails in some way, it will be separate and we can still do the 2 metre transmission.

There is another experiment we're going to do in the amateur radio area. We have an electron gun on board that sends out an electron beam (it's only a tenth of an amp).

This beam propagates along magnetic field lines and forms a charged conductor, essentially, that may be 100km long and the diameter may be 30-40 metres or something like that. We're going to set down a bunch of these and they persist for 15-20 minutes. It's like a meteor burst. We'll set down a series of these and you can try to bounce your signals off them. So that too, should be a very interesting experiment.

Thank you for sparing the time to give this informative interview – and good luck with the mission.

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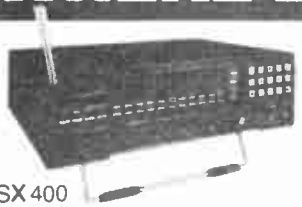
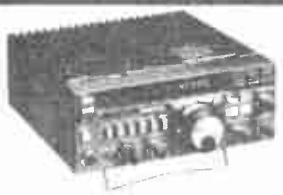


SX 400



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STRAIGHT & LEVEL

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

TAU SPC-3000

After the success of their unique SPC Transmatch ATU in kit form, TAU Systems are now set to launch their new SPC-3000 ATU, essentially the SPC Transmatch in a robust, high quality cabinet.

With its roller coaster tapered pitch inductor, the SPC-3000 offers continuously variable tuning from 1.5 to 29.35MHz, and the unit has a built-in 1KW 4 to 1 impedance ratio balun. The spaced-plate capacitors of the series/parallel capacitance (SPC) format are rated at 5KV (tested to 7KV), and there is a five position antenna switch for five input/outputs. Twin meters give SWR and power readings.

The SPC-3000 is solidly built (in Britain) to traditional precision engineering standards, and will last a lifetime.

It is available direct from TAU, or from selected retailers, for £349.95 inc VAT.

TAU Systems Ltd, 51 Greenhey Place, East Gillibrands, Skelmersdale WN8 9SA.
Tel: (0695) 24662.

POWER BUFFERS

The NIKE product range of power buffers safeguard computers against momentary and short duration mains failures. They are also effective against certain types of mains borne interference.

The range is compatible with the Oric ATMOS, 16K/48K Sinclair Spectrum and the ZX81.

Rechargeable nickel cadmium cells are kept on float-charge by the mains power pack. When the mains supply is lost, the cells take over the task of supplying the computer. Over 30 minutes of back-up is provided.

More rapid charging of run-down cells is achieved by keeping mains power on with the computer switched off. Manufacturer's original power packs must be used.

The units include batteries and are ready for use. An ON-OFF switch for the computer is provided. Two coloured LEDs act as status indicators.

Helpful SAVEing techniques are given in the User Notes.

For further information contact: Cambridge Microelectronics Ltd, 1 Milton Rd, Cambridge CB4 1UY. Tel: (0223) 314814.

PORTABLE IRON

Greenwood Electronics is launching a new butane powered portable soldering iron, the Oryx Portasol.

Little bigger than a felt tip pen (175mm x 19mm), the Portasol works on different principles from conventional gas-powered irons. There is no flame during operation, the chemical energy of the butane gas being converted directly to heat by means of a patented catalytic converter in the solder tip.

Conversion rate is adjustable to provide control over tip temperature and, at its maximum setting, the iron delivers power equivalent to a 60 watt electric soldering iron, the tip temperature being adjustable between 250 and 450°C.

The Oryx Portasol iron will run for up to 60 minutes on its internal gas supply, and refuelling, which takes seconds, is identical to filling a gas cigarette lighter.

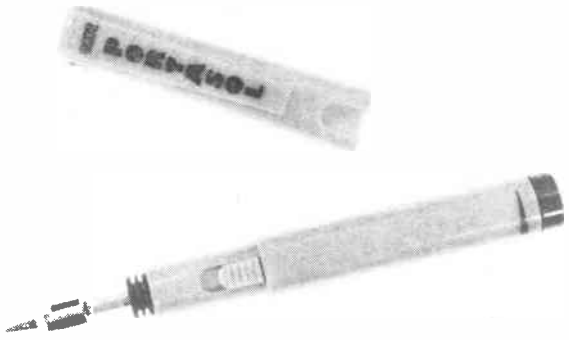
The same principles that make gas cigarette lighters safe are applied to the Portasol.

The Oryx Portasol can be carried in the pocket. It is supplied with a protective cap and is immediately ready for use, the cap including an igniter to start the catalytic conversion.

The introduction of this compact new iron brings a new dimension to soldering. Equally invaluable to the engineer, the wireman, the repairer and the hobbyist, the Portasol offers the advantage of eliminating all risk of electrical damage to sensitive components.

Replacement tips – which include the converter – are readily available.

For further information please contact: Greenwood Electronics, Portman Road, Reading,Berks. RG3 1NE. Tel: (0734) 5958441.

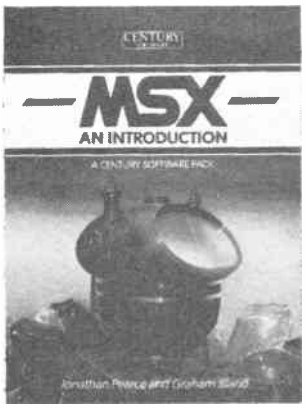


'MSX – AN INTRODUCTION'

Century Communications has published *'MSX – An Introduction'*, the first book giving a step-by-step introduction to the revolutionary new range of MSX home computers due for UK launch this Autumn. The first machines to be launched will be those from such giants of the consumer electronics industry as Sony, Toshiba, Sanyo, JVC, Phillips, and Yamaha, and these already appear destined to capture a significant proportion of the pre-Christmas micro boom.

The difference between MSX and the previous generation of home micros is that any MSX program written to run on any MSX micro will run on any other, irrespective of the manufacturer. The same goes for peripherals and other add-ons conforming to the MSX specification.

The implications of this for the consumer are that rather than being tied to a single manufacturer's products and software, MSX buyers will have immediate access to a wealth of add-ons from a variety of suppliers – a situation which has long been accepted in an area such as



hi-fi, but which to date has been impossible in the home computer industry.

'MSX – An Introduction', by Jonathan Pearce and Graham Bland of Reflex Communications Ltd, takes the uninitiated from the most basic concepts of computers and their programming, through to complex techniques involving the advanced features of MSX-BASIC. The style of the book has been made as conversational as possible, unlike many other books on the market which imply a mysticism in programming that does not really exist.

To further aid first-time users, the book is available in two forms, one including a cassette of MSX-BASIC programs, thereby saving the tedious and unnecessary volume of typing generally associated with learning to use a computer. The book will also be widely available at the points of purchase of MSX computers, being supplied through top retail chains including W H Smith, Boots, John Menzies, Dixons and Laskys.

The book takes a new approach to the means by which a programming language should be learned. Following the introductory stages of the book, MSX-BASIC commands are dealt with one by one so that the user is familiar with their scope and function before being asked to write programs. Basic programming techniques are then covered, with the programs used making the fullest possible use of MSX advanced graphics features.

Later stages of the book look at more complex techniques, together with MSX-BASIC's most powerful features – its graphics and music capabilities. It is here that the optional cassette tape really comes into its own, particularly with the 'Paintbox' program, which allows the user to draw on the screen in a variety of colours, and using tools including brushes, pencils, compasses, a spray can and an eraser. This program demonstrates effective use of sprites (the things that allow space invaders to move about on a screen, for example) in MSX.

In addition to providing a full and readily understandable MSX-BASIC specification, appendices to the book also cover MSX-BASIC functions, error codes and messages, full screen editor control keys, and a summary of the difference between MSX-BASIC and SV-BASIC – the language supplied by Spectravideo with its SV-318 and SV-328 micros – thus allowing these micros to be programmed.

The price for the book only is £7.95 and £12.95 for the book and software pack (book together with cassette) respectively.

For further information contact: Century Communications, Century publishing Co Ltd, Portland House, 12-13 Greek Street, London W1V 5LE. Tel: (01) 434 4241.

NEW FROM ICS

ICS have brought out what they claim is the ultimate in computer games, DOCTOR DX, which will be of particular interest to those wishing to practice contest operating skills or improve their Morse.

With this module plugged into the rear of a Commodore 64, an amateur radio transceiver appears on your TV screen in colour graphics. Touch the function keys and the tuning scale moves up and down. Touch other function keys and the transceiver switches bands.

Listen to the loudspeaker, and you will hear stations sending Morse as you tune across them – complete with background noise. You are in the middle of a CQ worldwide DX contest, with stations working each other, calling CQ etc. If you enter your latitude and longitude and time of day at the beginning, you will find that the countries you hear are appropriate to the propagation from your location at a sunspot maximum. All 304 DXCC countries are represented – with a density weighted according to the amateur radio population of each country.

Plug a Morse key into DOCTOR DX and you can call each station. If your operating is good, it will call you back with a full contest exchange. Your score is kept on the screen. At the top of each band are slow Morse stations. At the bottom are faster and more 'expert' stations.

DOCTOR DX is now available in the UK at only £96.95 including VAT, plus £1.50 P&P.

Previously known for their more expensive, high quality AMTOR and RTTY terminal units, ICS has now introduced a new, versatile low cost terminal unit for the beginner, experimenter or VHF operator.

Requiring 12 volt dc input at 150mA, the RM-1 connects to a home computer via either TTL or RS232 level interfaces (both are supplied as standard). It can be used to send and receive RTTY or AMTOR at up to 100 bauds with 170Hz shift.

Also available are CW send and receive and wide band ASCII communications at up to 1200 bauds. European IARU tone standards are supported and the wide band receive mode can be used for receiving commercial 425, 850Hz shift RTTY, as well as data transmissions from the UoSAT series satellites.

A range of software and cable packages for the RM-1 is available from ICS for many of the more popular home micro computers. Most other RTTY software on the market can also be used with the RM1. It is plug compatible with other ICS terminal units.

Packaged in an attractive screen printed enclosure, with a comprehensive manual, the UK made RM-1 lacks the extensive filtering of ICS's more expensive terminal units, but is ideal for most medium to strong signal applications.

Altogether, surprising value at £70.50 including VAT and £1.50 P & P.

For further information contact: ICS Electronics Ltd, PO Box 2, Arundel, West Sussex, BN18 ONX. Tel: (024 365) 590.

STRAIGHT & LEVEL

MORAY MARATHON

The Moray Marathon was held on August 12th, was organised by the Moray District Council Recreation Department among others, and was a 26 mile race through towns and villages in the area. The race started and finished at Cooper Park, Elgin, with well over 200 competitors taking part from all over Scotland.

The Moray Firth Amateur Television Club (callsign GM8AVT) took the opportunity to send live pictures of the race to a receiving station at Cooper Park from two sites, one at Covesea, which is about 4½ miles north on a high part of the road between Lossiemouth and Hopeman, and the other at Lesmurdie Road, about 1½ miles north-east on the outskirts of Elgin. These sites were chosen to show the runners after the start and again in the latter stages of the race.

TV amateurs taking part in this exercise included GM4VRE, GM4IZY, GM4GUQ, GM6UHC, GM4PMT, GM8AZS, GM4HMN, GM4WJA, GM8ETF and GM4XKG, showing clearly that ATV is a very active mode in the north.

23cm TV REPEATER

A number of people have expressed interest in a 23cm TV repeater for the Southampton/Bournemouth area. Several possible locations are being discussed.

Suggestions have been made that it may be better to have two repeaters – one for the Poole/Bournemouth area, and one for the Southampton area. This would permit better coverage of the low lying areas in the central parts of Southampton, Bournemouth and Poole.

In order that any proposals can take into account all interested amateurs in the areas concerned, it would be most helpful if those genuinely interested in 23cm TV operation in the areas in question could contact *Nick Foot, G4WHO, 47 Mallard Road, Colehill, Wimborne,* and let him know of their interest.

2m DXPEDITION

A major DXpedition is currently being planned by members of the West Kent Amateur Radio Society (G3WKS) who are located in Tunbridge Wells.

The objective of the expedition is to establish a station at an identified, if somewhat inaccessible, location in Eire, and attempt a *direct* contact between Europe and North America on the two metre band – 144MHz. Such a contact could be a considerable accomplishment on the band and the group believe that with the right preparation and effort this world-first contact could be achieved.

The group is currently looking for sponsorship in the form of both radio and other equipment to help achieve the goal. It is intended to make a video presentation of the preparations and the expedition, which will be made available to clubs who are interested. More details will be available as plans progress.

For further information contact: Nigel Peacock (G4KIU), 64 Cleveland, Tunbridge wells, Kent TN2 3NH. Tel: (0892) 33586.

THANKSGIVING

For the fourth year, a hands-across-the-sea commemorative station, callsign WA1NPO, will be on the air on America's Thanksgiving Day, Thursday 22nd November.

The station will be located in Plimoth Plantation, near Plymouth, Massachusetts, within the precincts of a living-history museum which vividly depicts life in Plimoth Colony, the first permanent English settlement to be established in the New World.

The museum's exhibits include a reproduction of a complete pilgrim village as it existed in 1627, and a full-size replica of the Mayflower.

On the UK side, a complementary station, callsign GB2UST, will be operated by Sidmouth (Devon) Amateur Radio Society from the astronomical observatory 200ft above the town, which is set in the heart of the Sir Walter Raleigh country.

Both stations will be operating from 1300 GMT to 2000 GMT on frequencies 14180, 14255 & 14345KHz SSB on 20 metres, and 21260 and 21385KHz SSB on 15 metres. WA1NPO will be looking for calls from any UK station, and an attractive certificate featuring the Mayflower will be available for confirmed contacts.

Further details are available from: Peter Jackson, G3ADV, 32 Brown Avenue, Parkfield, Nantwich, Cheshire CW5 7DH. Tel: (0270) 627149.

ANDY TIPS by Deejay

Andy says:
"Cheap and simple insulated spreaders for open-wire antenna feeder can be made from lengths of plastic moulding used for holding loose pages in folders. This plastic 'spine' material is then drilled the correct distance apart and slid into place on the two wires. The plastic grips the wires, but a blob of glue adds extra security."

RACAL USER GROUP

The Racal User Group is a non-profit organisation which aims to enhance the interest and enjoyment of amateur radio enthusiasts who own or use communications equipment manufactured by Racal, which is now available on the surplus market.

Considering the number of RA17/117 receivers that have passed into amateur hands over the last few years, there should be many amateurs who could benefit from a group like this.

So far the group has had several enquiries, each of which have received a copy of the Racal User Group newsletter. The newsletter costs 70p to produce, so the subscription for the first four issues will be £2.80 and all support would be appreciated.

For further information please contact: Peter Barker G8BB2, the organiser of the group, at 8A Alwyne Place, London N1 2NL.

COMPONENTS FAIR 1985

On the 10th March 1985 (11am to 4.30pm) the 1985 Components Fair will be held at Carleton Community Centre, Pontefract. The event is based on the Mobile Radio Rally but the difference is that it is aimed at the home constructor.

Traders are invited to sell components, surplus equipment, instruments and antennae only; new black box type equipment is not allowed.

For further information contact: N Whittingham G41SU,7 Ridgedale Mount, Potefract, WF8 1SB. Tel: (0977) 792784.

PRICE CHANGE

The price in the Dewsbury ad (inside front cover) should read £159 and not £129.

L·E·T·T·E·R·S

JUSTICE?

I have just read the 'Justice/injustice' article in the *October* issue of ***Amateur Radio***, and I am spitting blood. I have no doubt that the anonymous writer of the article wrote it in good faith, but turning his excellent advice into practice whilst being 'turned over' is not an easy task.

The article mentions 'reasonable times' for inspecting stations and sympathises with someone who's wife gets called on by two men in the afternoon. I have been 'frog marched' out of my laboratory by two Customs and Excise officers, accompanied by two engineers of the Radio Regulatory Division, and had my vehicle (equipped with legal 2m and 70cm rigs only) thoroughly searched.

On a separate occasion, I was stopped on my way to work by two uniformed police officers and charged for possessing an illegal CB set. I was then locked up in a police cell for three hours whilst my vehicle, containing the same equipment, was searched by officers of the Radio Regulatory Divison.

Readers may care to dwell on the technical guidance given to the police: 'If a transceiver has more than 16 channels, it is an illegal set'.

It is interesting to note that the inspectors refused to sign the log book of my station; I was also refused a solicitor.

I have complained to the Radio Regulatory Division (then controlled by the Home Office) and was told that the definition of a 'reasonable time' would have to be determined by the courts.

The advice offered in the article about the inspection being carried out by only one person would be humorous if it did not bring back such unpleasant memories. The Customs and Excise and police officers both threatened to arrest me for failure to co-operate when I asked for the station to be inspected only by the properly authorised person. I have had my equipment operated by unlicenced police officers despite my protests.

The writer of the article may also be interested to know that I was threatened with arrest for 'failure to co-operate' when I refused to transmit when ordered to do so by a uniformed police officer.

To sum up, although the article gives good advice, it is impossible to follow when being threatened with arrest or locked up in a police cell. Incidentally, (eventually) I was offered £12 compensation by the police. Hush money?

The Chief Constable of Essex no longer wishes to discuss my arrests and no charges were brought against me. I should also like to point out that I have always used completely legal amateur equipment.

Hugh Allison G3XSE, Birchanger, Essex

RSGB DEMOCRACY

We might find it easier to comment on the letter from Mr Bragoli G6RBY *(October)* if that gentleman had told us which of his interests is not promoted by the RSGB.

He speaks first of all about an undetermined percentage of radio amateurs, then mentions the majority, all without much of a clue about the point he is trying to make.

Why on earth should the RSGB hold a referendum on each major issue? Like most other organisations, it elects a governing body, be it a committee, council, or whatever, to act on the members' behalf for a given period, at the end of which anyone can make their opinions known by means of the ballot box. This applies from Parliament right down to the local ladies' club. When did Mr Bragoli's MP last canvass his constituents before voting on an issue?

In the case of our national society, there are plenty of opportunities for one's voice to be heard. One can always contact the devoted but hard-pressed headquarters staff, one's area representative, regional representative, or the zonal council member..If these are not enough, anyone can raise points in either the formal or informal sessions of the AGM or, if sufficient members desire, they can ask for an Extraordinary General Meeting.

Mr Bragoli speaks about changing the representations put to the DTI, and I am wondering if he is one of the mini-minority who want an easy passage onto the HF spectrum without taking a 12wpm Morse test. I always get suspicious when people talk about democracy-they so often propose just the opposite. Every minority has the right to speak, but this does not mean that their opinions should over-rule those of the majority.

Mr Bragoli does not agree with the RSGB, so he has made his point by not joining. So be it, but he really should not then criticise from outside until he is in possession of all the facts. Why not join and put your ideas forward in the proper (democratic) manner?

E G Allen, G3DRN, London SW20

'OLD TIMER'

In answer to J H Clifton's letter in the *October* issue, may I say that in my opinion we 'old timers' do not have the 'holier than thou' attitude. Maybe some newly licenced amateurs who constantly quote regulations to others could fall into that pigeon hole.

I passed my RAE in 1964, but was operational long before that as a communications engineer on the Hamble river and around the south coast.

I have several would be 'Hams' calling on me for help and instruction in radio etc, and at 68 this keeps me on my toes. My late father operated CW and later AM from 1912 to 1927, except for the war years when he was the electrical manager for Camper & Nicholson where he remained until his retirement in 1959.

At the age of 5 years he took me aboard the MY Electra, Marconi's yacht, at the time anchored at Southampton's town quay where he had been rewiring the WT office. This was a very well remembered time in my life.

I have rebuilt his old spark Tx with the original spark generator and Morse key.

I was giving a talk on sparking and introduced the Tx at the Three Counties Radio Club at Liphook a couple of years ago, and was taped by Radio 210 Reading. The talk was put out on the air and this certainly gave my ego a boost, but at no time has there been a 'holier than thou' attitude.

PG Robins G8BSK, Southampton

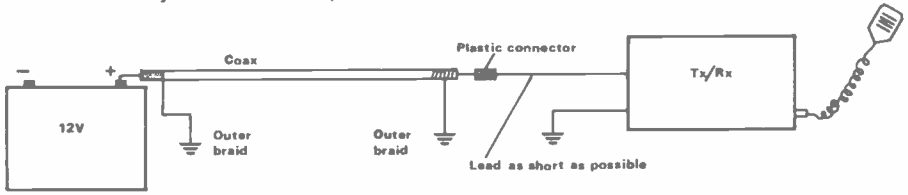
IGNITION INTERFERENCE

Regarding your request in *Current Comment* (October) for any tips or mods for readers to pass on, here is a simple means of reducing ignition interference to a vehicle fitted transceiver.

Take the power supply from the vehicle battery as normal (giving smoothest supply), observing earth polarity. The lead from the battery to the rig should be replaced by coax – the supply via the centre core, with the outside braiding being earthed out at both ends (battery and rig), hence a shielded supply. A plastic connector between coax centre and rig leads will suffice, only leaving the rig earth to be taken to the nearest good earth point.

This has cured 99% of mobile 27MHz and two metre ignition interference in my experience.

Craig Booker, ex VP8AQQ Rochester



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NEWS & VIEWS

Some 27 years ago when G3LST was newly licenced your scribe remembers with some affection a used equipment dealer who described his wares with many a well-turned phrase. Nowadays we do things a little differently. Our ever-changing stock of used equipment is now on a very clever programme on the Company Computer written by Adam G6MON our resident expert, and is up-dated after every few sales/purchases. If you would like a copy just send us a stamped self addressed envelope (several if you like). Just to return to the old days – my own FT9010M is for sale having just been lovingly re-aligned, new 6146's etc. The receiver is really superb @ £485 it's a snip . . .

Our most successful Glasgow shop has a problem, it's just not big enough. Bill & Jim have been running RAE classes 'in the shop' If you want to try for the RAE contact Bill on 339 6445 (The success rate has been exceptional – congratulations to pupils & tutors . . .) Both Bill & Jim are now Class 'A' further congrat's & are deeply into PACKET RADIO. If you would like to know more about the latest developments send an SAE to Glasgow shop. If you would like copy programms FREE – please send a tape or mini disc.

NEWS

The new TS711E Trio/Kenwood 2m base station is really quite remarkable, and at the time of writing is available from stock – please 'phone for price.

New stocks of the TS780 dual bander should also be in stock. We had great fun playing with the TR2600 and it's callsign generator. This excellent handy has VOX facility also. Ex stock at £260.

Although we are pleased to have the FT20/700 2M & 70cm FM mobile. Yaesu's answer to the TW4000A if only it could have been all-mode. Perhaps Yaesu have this up their sleeve's? We're sure it would be another winner.

Rumours abound of an FT100 – successor to FT102 – probably FT757GX circuitry & power supply in a base station configuration. If you send us an SAE we will mail details as soon as it appears in Tokyo . . .

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DX DIARY

News for HF operators compiled by Don Field G3XTT

I write this column having just returned from the Clipperton DX Convention in Paris. International gatherings of this sort are a marvellous opportunity to meet people with a common interest, many of whom one has previously spoken to over the air. Under such circumstances language problems seem to vanish. This was my first Clipperton Convention (so named because it was started by the group of French DXers who put Clipperton Island on the air in 1978), and it enabled me to meet, among others, DJ9ZB (who has operated from all over the world and was a member of the abortive Clipperton Island expedition earlier this year), I8UDB (who has operated from many of the islands off the Italian coast), DK6XR and DK7XN (who have conducted several operations from the Pacific), TL8GE/ST0, FM7CD, and many other French and overseas DX personalities.

The programme at the convention included a number of slide presentations of DX and contest operations, enough to make the mouth water and to create a desire to have a go oneself. On the other hand, conditions can sometimes be anything but hospitable in these remote DX locations. This is something brought home by some of the slides but often forgotten by those of us who sit at home and complain when we think the DXpedition is not giving us the attention we deserve.

The Colvins

One of the presentations at the convention was about the South American operations last year of Lloyd and Iris Colvin (W6KG and W6QL), who I mentioned back in the February column. By the time you read this, Lloyd and Iris will have set out on their 1984/85 expedition, this time to Africa to operate from those African countries which they have missed on their previous visits. These will primarily be countries in Southern and South-Eastern Africa. Their tour was due to begin on October 1st and will continue until April 1st 1985.

Lloyd and Iris have now made more than 1 million contacts on their travels around the world, and have a collection of about half a million QSL cards, all carefully filed, back home in California. The QSL address for this year's trip will be the same as always: *The Yasme Foundation, PO Box 2025, Castro Valley, CA 94546, USA.*

San Felix or San Fiasco?

For most DXers the great event of recent weeks has been the appearance of CE0AA from the South American island of San Felix. Among European DXers, San Felix ranks as the most wanted 'country' in the world. There had been only two previous amateur radio operations from the island, the first under the callsign CE0XA in 1965, and the second by W9IGW/CE0X and K9KNW/CE0X in April 1972. This latter operation was primarily on CW and most contacts seem to have been with the USA.

The consequence of San Felix's rarity is that, at least for the first week or so of this latest operation, there has been pandemonium on and around the CE0AA frequency, hence the San Fiasco heading which is taken from one of the US DX bulletins. Operation during the first few days was mainly on 14110KHz, to lists taken by various South American stations earlier in the evening (or in some cases the previous day) on 15 metres. CE0AA has subsequently appeared on 21050KHz CW, and with SSB on 21245, 7075 and 3735KHz. At the time of writing most SSB operation continues to be by list, but the pile-ups are starting to diminish and some UK stations have now worked CE0AA on 4 bands. So far there has been no suitable propagation on 10 metres.

The San Ambrosio and San Felix Islands, to use the full name of this island group, are a territory of Chile and consist of several islands and rocks of volcanic origin about 540 miles off the Chilean coast.

In recent years a number of amateur groups have tried to obtain permission to operate from the islands, but there has been marked reluctance on the part of the authorities to allow anyone other than Chilean nationals to visit the islands. In 1981 there was a furore when KF10/CE0X appeared on the air claiming to be on San Felix. He said he was there to install some kind of radio beacon and had been able to get a permit to operate. Subsequently the operation was disallowed by the ARRL when evidence was submitted from South America to the effect that KF10 had never been off the mainland.

Curiously, however, there has recently been a reference to the fact that the latest CE0AA operators are using some of the equipment installed on the island by KF10 back in 1981! Perhaps the truth will never be known. However, the good news is that this latest operation most certainly will count, having been conducted by Chilean nationals under the auspices of the Chilean amateur radio society. QSLs will be available from PO Box 700, Santiago.

Contests

Once you have recovered from the October contests you can start to think about the OK DX Contest which takes place on 11th November. This is similar in format to the CQ WW but lasts one day only, with both SSB and CW contacts permissible. However, a station can be worked only once per band, either on CW or on SSB.

The following weekend (10/11th November) is the occasion for the RSGB's second 1.8MHz contest, a short but frantic affair, especially now that almost every country in Europe has a 160-metre allocation. UK participation in RSGB contests is restricted to RSGB members only, one good reason for joining your national society.

The last full weekend in November (24/25th) is the setting for the CQWW CW (see G3TXF's article last month). I used to operate the full 48 hours with an old-fashioned straight key, but

gave in a couple of years ago and bought an electronic keyer. To achieve a high-ranking score in the all-band category requires a lot of effort and determination, but otherwise why not have a dabble and practice your CW for a few hours?

Another CW only contest is the TOPS 80 metre contest on 1st/2nd December, starting at 2000 GMT the first night and running for 24 hours. TOPS is a club of enthusiastic CW operators, but all amateurs are invited to take part in this event which takes place at the bottom end of 80. Remember, if you take part, that the bottom 5KHz of the band are, by tradition, reserved for intercontinental working only and, indeed, the contest rules last year stipulated that the bottom 12KHz should be kept clear of local traffic.

French news

One of the benefits of attending amateur conventions is that you pick up various snippets of news. The Clipperton Convention was no exception. In conversation with F6FYD I learned that he will be QSL manager for a new operator on Kerguelen Island, FT8XA, who will arrive on the island in late November. The operator's name is Rafik and he will be active mostly on CW using an FT-101E. Another attendee at the convention was TL8GE who has previously operated from the South Sudan as TL8GE/ST0. It seems that his job will continue to take him there for about one week in every month and he will take a transceiver with him whenever possible. Finally, it appears that a group of French amateurs are looking into the possibility of an operation from Mali either late this year or early in 1985.

Other news

VE3FXT, George, is another amateur whose feet never seem to touch the ground. George operated for a long period from Thailand, and has also been active from many other rare spots. His latest project is to operate from 100 countries in the course of a 12 month period, starting in the UK in mid-October. George promises some sort of award to anyone who works him from all 100, though I doubt that he will have many takers!

One country that has become increasingly rare in recent years is A6 (United Arab Emirates). At one time there were many British residents operating under the old MP4T prefix but, since independence, there have been very few legitimate operations (though several unlicensed stations have appeared). Thus the news that Dennis Shepherd, G3LCS, will shortly be in A6 working for a member of the A6 royal family, who holds the call A61AA, must be very welcome. We can only hope that Dennis will be able to use his royal connections to get an A6 licence.

For those still needing a contact with China, BY5RA shows up on Wednesdays and Saturdays on 14180KHz from 1200Z with DU9RG, who runs a list operation for the BY. On the Wednesday asked a special effort is made to work Europeans.

Having said this, I checked the frequency today (a Wednesday) and was able to hear DU9RG quite well but the BY was inaudible. However, on at least one such occasion there has been propagation to the UK.

By the time you read this, VK0GC should be back on the island of Macquarie for another tour of duty. During his last tour he put an excellent signal into the UK, especially in the mornings on 40 metres. As far as I am aware, he is exclusively an SSB operator.

Turning again to the continent of Africa, a recent arrival on the bands has been J5WAD, whose home call is UB5WAD. So far he has been limited to operation on 14157KHz because his current rig is crystal controlled, but he will be there for 15 months and hopes to get a multiband rig in the near future. His QSL manager is UA4PW (via the USSR bureau).

Also from Africa, WA2HZR hopes to be active from some of the South African homelands later in the year. In particular he is expecting to operate as WA2HZR/V9 (Vendaland) from November 21st to 28th and as S8HZR (Transkei) from November 29th to December 5th. Later on he may operate as S42HZR and as WA2HZR/ZS. All operation will be on CW, 80 through 10 metres, and QSLs go to his home address: D Church, Box 592, Mexico, NY 13114, USA.

Wake Island

Now to the Pacific. A letter I have from Tom, AH3AA/KH9, tells me that he and Dave, AH9AB, are still on Wake Island but rather inactive at present. This is because there is no power to the main shack and they are having to operate from their living quarters with wire antennae. However, they hope to put matters straight in the near future and intend to give particular attention to working Europe during the autumn DX season.

Another one to look for, if you were prompt in buying your copy of this magazine, is ZK1 (South Cook Is). Two Dutch amateurs are there until November 5th, operating as ZK1XC (SSB) and ZK1XD (CW). QSLs go to PA3BFM.

Derick, 9K2BE, is now back in Kuwait for his final tour of duty. He will leave there in mid-December to travel overland back to the UK. In the meantime he will continue to be active on the bands and is happy to arrange skeds. His telephone number in Kuwait is 5314242.

Ron Stone GW3YDX and Nigel Cawthorne G3TXF at the 1984 HF convention

T30AT

Just a few days ago I had the pleasure of meeting Alan, T30AT, who was back on leave in the UK. I mentioned in the September column that Alan was hoping to return to Kiribati if his contract was renewed, and when I saw him he confirmed that he would be on his way back in October. He hopes to do more LF band operating when he returns, and also said that he may be able to make a second visit to Kanton Island as T31AT sometime in 1985.

On his visit there earlier this year he made about 3000 contacts, using the large log periodic antenna left there by the Americans, who used to have an airstrip on the island. The reason Alan was unable to make more QSOs was that he was on the island to do a job of work and was only able to go on the air during his free time. In any case, he had to cycle the length of the atoll to reach his operating site, not an easy ride he tells me, especially in the dark. The resident population of Kanton Island is 17, mainly maintenance staff who keep the various government equipment on the island in working condition.

Kiribati, east to west

The three DXCC countries T30, T31 and T32, are all part of the Republic of Kiribati, spread across 2000 miles of ocean. It is particularly difficult for the government to administer such a geographically dispersed nation, and Alan commented that there are unlikely to be many DXpeditions by outsiders because flights to the main centres of population are infrequent and unreliable, and the more remote islands are served only by boat.

T30DB has now left the islands and is operational from St Lucia as J6LDB, so Alan and T30BY are now the only DX- minded amateurs left on Western Kiribati. T32AB and T32AF continue to be active from Eastern Kiribati, putting a potent signal into Europe on 20 metres.

So there we are for another month. News, views, etc can be sent to my home address: 63 West Drive, Caldecote, Cambridge CB3 7NY.

THE ANGUS McKENZIE TESTS

TEN-TEC CORSAIR HF TRANSCEIVER

Some twenty years ago there were many manufacturers of HF transceivers outside Japan, and even six years ago there was much stiff opposition, particularly from the States. Japanese competition though has been so great in recent years, and their factory production methods are so efficient, that one by one European and US manufacturers have closed down production lines as they just could not make a competitive rig.

In an effort to make products even more economically, Japanese manufacturers have found that synthesisers installed to control local oscillator frequencies are cheaper to produce in large quantities than normal VFOs, and thus the tendency for almost all modern rigs is to employ synthesiser microprocessor controlled circuitry.

This has had advantages, in that it is easier to add many bells and whistles, including memories, but the disadvantage is that of local oscillator phase noise near the carrier, and in some instances quite a long way out as well.

Normal VFO

The Ten-Tec Corsair has been designed to offer a normal type VFO system for tuning with very low inherent carrier phase and amplitude noise, using the latest techniques, to return to the benefits of such circuitry in a rig and give improved performance which has not been available for quite a long time to the amateur, outside the few very expensive and specialised rigs.

The Corsair only includes CW and SSB on all amateur bands, including the new ones, from 160 to 10m. The very fact that it excludes both AM and FM is the reason that its performance is so amazing on the modes provided, and no compromise has been reached in order to accommodate the wider bandwidth modes.

The transceiver offers an outstanding performance in many areas for an operator who wishes to specialise in DX and contest operating, with the ability to winkle out weak signals very close to strong ones, whilst hardly knowing that the strong ones are actually present.

If you look at a Corsair you will see that it does not have a modern high-tec appearance and you will not find an amazingly compact but cluttered front panel. Instead, its front panel is, indeed, very well laid out with plenty of space around all the controls, all of which I found very easy to use, although I have some reservations about the VFO.

Receiver facilities include RF and AF gain; variable band pass tuning with a centre indent; a very effective notch filter tunable right across both side bands; AGC fast, slow and off; an offset control with a switchable narrow or wide range, which is also switchable to operate on receive only, transmit only or transceive; and three filter positions, the normal one being 2.3KHz bandwidth, and the other two being optional, a choice of 1.8KHz, 500Hz and 250Hz being available. The review sample included 1.8KHz and 250Hz.

A large band change switch selects 500KHz wide bands, 10m being accommodated therefore in four chunks. The mode switch selects normal SSB (USB above 14MHz and LSB below it), reverse SSB and CW, a fourth position locking the transmitter on for test purposes.

Five rotary controls are provided for vox gain setting, vox delay, compression threshold and on/off, noise blanker and ALC threshold. A row of three position lever switches, which feel quite chunky, select vox/QSK fast or slow (this brings the Rx gain up very rapidly or slowly for break in operation). The other levers provide functions already described.

A Tx drive control is provided for setting the PA and driver gain to the required level (effectively a mic gain on SSB and a carrier level for CW).

A four position meter switch selects PA cathode current, forward power, SWR, and compression indications on transmit, whilst it gives a conventional S-meter indication on Rx, although for some inexplicable reason the S-meter is disabled if the switch is left in the PA current position.

A push button near the VFO knob allows the 750Hz tone to be heard for beating with an incoming CW signal in order to obtain perfect transceive. Two review samples were checked and the 750Hz injection on the first was at a reasonable level, but on the second it was barely audible!

The frequency digital readout has 100Hz resolution, LEDs being provided to indicate RF amp on (when this is switched out a 10dB attenuator also comes in on Rx to further improve the front end RFIM performance); offset on; processor on and ALC threshold having been reached.

Underneath the rig is a large hole through which one can put one's digit to adjust CW side tone level and pitch.

Back panel

On the back panel some extremely useful sockets are provided, so often missing on competitive rigs or, if they are fitted, more awkward to use. Three phono sockets in a row give audio input direct to the microphone input circuitry; audio output in parallel with the built-in speaker and not switching the latter off when a plug is inserted; and an open on Rx/short on Tx for controlling an external linear (NB the outer of the phono socket is grounded).

A quarter inch mono speaker jack is also provided which does cut out the internal speaker when a jack plug is inserted. Three additional phonos are for PTT, Morse key and auxiliary 12V dc (always live and providing up to 2 amps).

A VFO in/out connector is fitted which is normally bridged but can, of course, be used with a Ten-Tec external VFO unit for additional flexibility allowing internal or external VFO control, or split in either direction for Tx and Rx. Another auxiliary 12V dc phono socket is provided adjacent to the VFO socket which is also rated at a maximum of 2 amps.

A multi-pin accessory socket provides

12V on Tx, 0V on Rx on pin 1, 8V regulated on Tx and Rx on pin 2, 12V dc maximum 2 amps on pin 3, shift voltage (external input) on pin 4, 12V on Rx only on pin 5, internal VFO enable on pin 6 (normally bridged to the +8V regulated line), external relay switching open on Rx and short on Tx ref earth on pin 7 (maximum 2 amps at 12.5V), ground on pin 8 and a relay contact which is closed on Rx and open on Tx on pin 9.

Relays

I discussed with Chris Ridley at KW Ten-Tec whether higher voltage relays could be used with this socket and he was of the opinion that voltages up to 200V dc could be used satisfactorily, provided that the current was not too high under short circuit conditions.

Another socket is provided for interconnection with a Ten-Tec linear, although it could be used with other models. The socket provides ground (pin 1), 12V on Tx (2), 12m enable (3), common (4), and 160 to 10m excluding 12m on pins 5 to 12. Thus, this socket provides logic switching for the required frequency band as well as Tx/Rx.

A large earth wing nut is fitted just below this socket for the provision of a solid earth connection. The 13V power socket has four connections including reverse control lines to knock off the power supply if excessive current is drawn.

The back panel includes a very substantial heatsink for the PA transistors and an SO239 socket for the main antenna or linear RF interconnection, a subsidiary phono socket providing either for a separate Rx antenna or a feed to an external receiver, this being switchable with a small countersunk switch.

The loudspeaker is underneath the rig, and four feet underneath are complemented by a bail stand which can be pulled forward to lift up the front of the rig, thus allowing the speaker's output to be thrown forward rather better.

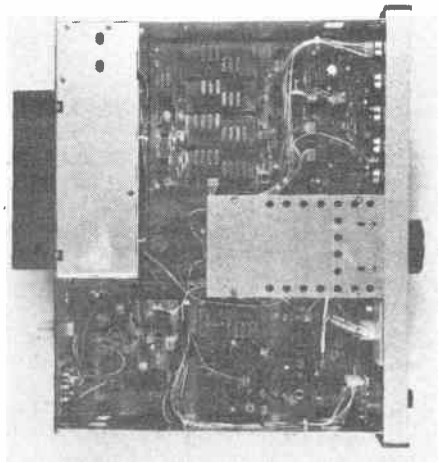
The riv is housed in a metal cabinet and both the top and bottom covers can be easily removed to allow the inside to be seen. There is plenty of internal space and whilst the wiring is not as neat as that in most Japanese rigs, it is so much easier to get at everything, and there is plenty of room for adding modifications and, for example, extra sockets on the back.

My colleagues all felt that the rig would be quite easy to service and not the sort of *nightmare* that requires most Japanese rigs to be returned to the dealer! Whilst on this subject, I also applaud the helpful instruction manual which includes sections on dealing with problems that could be encountered, and in providing most helpful information regarding the relevance of the Corsair's performance when in actual use.

There is no nonsense in this booklet and I digress here by commenting that it was a relief to see that there were no idiotic remarks, such as 'if the rig does not work, plug power supply into the mains' or 'do not use rig on icy ski slopes as it will not operate very well' or, finally, 'do not drop rig on floor as tatami mat might get broken!'

I am not joking here for we have seen all these quoted remarks in one instruction book or another. I must also state that the importers are extremely helpful and an excellent technical back-up is available with superb after sales service, which counts for a lot.

Top view



It is fascinating to see exactly why the front-end and IF performance of this rig is so good. The output from the first mixer goes straight into a 12-pole crystal ladder filter with around 2.3KHz bandwidth at 9MHz, which is then followed by a frequency change down to a second IF of 6.3MHz. The VFO is permeability tuned and runs from 5.0 to 5.5MHz at around 18KHz per revolution of the tuning knob.

The VFO beats with crystal controlled oscillators and the output feeds directly into the first mixer. The second local oscillator is controlled by the offset control but is nominally at centre position unless switched in. By having the first filter immediately after the mixer the blocking performance is outstanding, and this makes an enormous difference when tuning across the LF bands.

The review sample was fitted with the optional additional 8-pole IF filter type 220, which I strongly recommend. The transmit section is at 9MHz which is then mixed up to the final frequency with the same oscillator mix as is provided for the first Rx mixer.

The transmit filtering is taken care of by a 9-pole crystal ladder, which is amazingly effective at filtering out the unwanted side band and further improving the carrier rejection.

Subjective tests

The first sample to arrive, whilst working quite well, seemed to have a rather poor RF sensitivity, and the IM performance, although good, failed to come up to my expectations, particularly on 40 and 15m. For this reason, a second sample was substituted and we ran many of the tests in the laboratory in front of the importer's technical representatives who were completely satisfied with the test procedures.

Superb

The second sample produced what I can only describe as a superb performance on the LF bands, 160, 80 and 40m, which I have not known from any other rig. What seems so outstanding about the Corsair was not only the general absence of any muck in the background, but the extraordinary ability of the amazing IF filters to reject almost completely co-channel interference which was remarkably close.

It made me realise that whilst in the past I have been undertaking reciprocal mixing tests to as close as 20KHz spacing, I should have been taking measurements very much closer still. The Corsair's performance actually demonstrated what is possible in a very well designed rig in which the main SSB filter comes immediately after the first mixer.

RF sensitivity was as good as one would ever need from 160 up to 18m, but it was just reasonably good on 15m, and only adequate on 10m. I would have preferred the 10m sensitivity to have been 3 or 4dB better so that very weak stations could be more easily received when band noise was very low, and there is a distinct advantage to be gained by using an additional pre-amp for such circumstances. In general practice, you would probably find the sensitivity satisfactory, but quite a few modern rigs are better.

I must emphasise that whilst the sensitivity on the lower bands is theoretically poorer than average, in practice this is totally irrelevant, for band noise is so high that you could never use more sensitivity unless you wished to receive top band from a leaky dummy load! At no time did I note any RFIM problems on the front end, although the lab tests revealed some spurii.

In tuning across all the bands with a screened dummy load connected to the antenna socket, there were one or two sprogs at high signal strengths, the worst one being on 28.976MHz at S8.25. However, the same frequency can be tuned in by tuning below 29MHz on the 29MHz segment, and this is recommended in the instruction book. Other sprogs were noted on 28.487, 21.319 and 18.165MHz, all at S4.25. A few other very weak sprogs were noted but were of no consequence.

AGC

The AGC is of the hang type, and one's attitude to this is obviously highly personal, for I happen to dislike it considerably. When set to slow, the dynamic range of a voice is held extremely well with almost no AGC action for just over one second, and then very suddenly, full gain is restored. This therefore causes antenna and front end noise to pump like mad if you are

listening to someone who is constantly stopping for a breath for more than one and a half seconds.

With AGC on fast, it has the same characteristic but after only 0.2 seconds (see pen charts). This can be excellent for CW break-in, although almost impossible for SSB. The hang AGC is also very irritating if there is a sudden crack or spit, so frequently noted on LF bands, and this could be obviated if the noise blanker worked well, but alas, it doesn't.

The blanker seemed to cope with loud ignition interference on HF but was hopeless at LF, and Ten-Tec should do something about this. The product detector had a very clean performance and audio quality was superb, having very low inherent distortion and the internal speaker giving adequate volume for normal use, but relatively little in reserve.

Filters

The notch filter was excellent, although it required very fine adjustment to notch completely an annoying carrier. I was rather unhappy with the feel of the VFO. The first sample was very spongey and had a deal of backlash, and whilst the second sample was better, I still found it awkward to tune SSB in very accurately.

The importers explained to me that the VFO system essentially produced slight backlash because of its design, which has to give good mechanical stability when finally tuned. However, one could get over the problem of having to tune up and down tens or hundreds of Hz on an LF net, in which many operators seem to be incapable of netting properly, by using the offset control in its fine adjustment mode on transmit and receive.

Both the wide and narrow SSB filters were fabulous, the narrower one giving just about enough pass band to permit good copy whilst giving the maximum rejection of adjacent interference. The CW filter was also excellent, although I am surprised that its good shape at the top was not maintained down to very low levels, and also, noise did not seem to go down on CW when the filter was switched in. I noticed around 5dB loss through the sharp CW filter and this obviously counteracted what should have been an effective sensitivity improvement for CW.

The S-meter on the first sample was very well set up but on the second sample it was far too sensitive, although there are presets for adjusting this internally. The 750Hz audio beat oscillator for CW was extremely quiet, but again there is a preset provided for this which had been poorly adjusted by the manufacturer, and I did not have time to fiddle with it.

The frequency readout was easily visible but, for some odd reason, the hundreds of Hz are indicated with a different colour, and slightly displaced from the remainder of the digits, which is unusual. All the back panel facilities are very simple to use and are well described in the manual.

Having stated that the SSB reception quality from RF and AF aspects is so good, I should comment that the transmit side was also very easy to use. In checking the transmitted output into a dummy load with another receiver in the lab, I was particularly struck by the absence of the usual mic amp noise and even IF noise seemed to be far lower than usual.

Other stations tuning in to my transmissions reported that the transmitted quality was good, that IPs were held down reasonably, and that the transmission was cleaner than many, although the Ten-Tec mic supplied gave a rather coloured quality and lacked HF clarity. I would recommend, therefore, the use of an alternative mic such as a Heil, recently reviewed.

CW break-in

CW break-in keying was superb, the receiver coming live almost immediately after the key was released in the QSK fast mode. CW transmission is automatic when the key is held down and the mode is switched to CW, the normal PTT on the mic and on the back not having any effect here.

On SSB, the vox control worked extremely well, and the processor was generally liked, although on one occasion I did get some RF feedback on 10m which did not occur again when I later tried to repeat the problem. CW was clean, and undoubtedly the rig will suit first class operators very well indeed. RTTY can be accommodated, and the rig should work well with AMTOR.

Laboratory tests

The original rig supplied had very uneven RF sensitivities varying from 0.8μV on 24MHz to 0.3μV on 28MHz for 12dB sinad on the widest SSB filter. I suggest the first sample was a rogue, for the second was much better, being 0.22μV at best on 15 and 10m, degrading only slightly on other bands. The RF intercept point varied between 0dBm at worst, to +7.5dBm at best with RF preamp switched in, figures varying slightly depending upon the method of measurement.

At first glance these figures are just good and other rigs have given better measurements, but on further investigation we found that the Corsair retained these measurements even when the interfering carriers were only spaced 3 and 6KHz off channel! This performance is quite exceptional and contributes to the superb reception quality. The best measurements, incidentally, were obtained on 20m, whilst 10m gave the worst figures, which are good anyway.

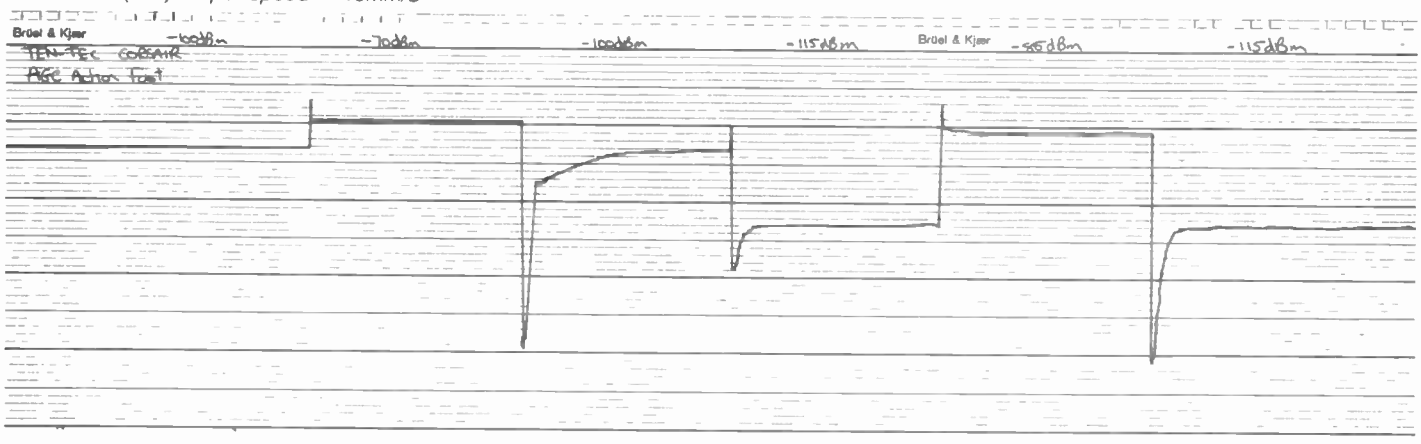
Now we come to some measurements which have shaken all of us in the lab. For measuring the reciprocal mixing performance, I do not normally put the disturbing carrier (the special muTek crystal control generator at 28.55MHz) closer than 20KHz spacing.

The figure obtained at 20KHz was so exceptional that I felt that there was justification enough for taking measurements closer in. There was only slight degradation at 10KHz, so we got closer and closer, ending up with an unbelievable 92dB ratio with the disturbing carrier only 2KHz LF of the received one, which was giving a 1KHz beat note. This is tantamount to saying that the side band rejection was around 92dB!

We went even further, and 1.5KHz LF still gave figures better than 80dB, which also speaks well for the IF selectivity. Not only did this show unbelievably low phase and amplitude noise on the first local oscillator, but it also showed the excellence of the IF section.

Looking at selectivity, it can be seen

AGC action (fast). Paper speed = 10mm/S⁻¹



Results across the bands	1.9MHz	3.7MHz	7.05MHz	10.12MHz	14.2MHz	18.11MHz	21.26MHz	24.92MHz	28.55MHz
RF sensitivity input EMF/2 for 12dB sinad dBm/μV	-117/0.32	-117/0.32	-117/0.32	-117/0.32	-119/0.25	-119/0.25	-120/0.22	-118/0.28	-120/0.22
RF intercept point (dBm) best figures quoted	+2.5	+3.5	+1.5	---	+7.5	---	+4.5	---	0 All with preamp in
RF input for S9, preamp in, dBm	-90	-92	-90	-90	-93	---	-93	---	-93
Tx Harmonics 2nd/3rd/ spurii, dB	-54/-61 slight	-50/-58 slight	-50/-56 clean	-50/-56 slight	-50/-53 slight	-50/-55 slight	-57/-57 -48	BNF/-60 -60	BNF/-53 -42

that both SSB filters were superb, while the CW narrow filter was excellent. The notch filter gave a 37dB notch at best, with rejection at 20Hz off notch at 29dB, 50Hz off at 19dB, and 100Hz at 11dB. This is quite a reasonable notch shape and in practice it was most useful.

S-meter

The S-meter was very even on all bands at S9, the sensitivity varying by only 3dB. This level though was far too sensitive at around 5μV, and it should have been around 20dB less sensitive! It had clearly been wrongly adjusted at the factory, for there was a standing reading just below S1. The law was not perfect but reasonably logarithmic.

The AGC pen charts showed that on 'slow', after a 30dB drop, a 7dB level was recovered in the first 1.25 seconds, followed by 15dB in the next minute fraction of a second, followed by the remaining recovery in several seconds. I found that the 15dB sudden recovery was very irritating. With AGC fast, it can be seen that recovery takes place in only 0.2 seconds.

The AGC charts had to be made on the first sample and were not repeated on the second. Product detector distortion was at a fairly low level at low frequencies, and rather better than that of most rigs, whilst for frequencies above 1KHz the distortion was lower than I have yet measured on an SSB product detector, thus contributing to the superb audio quality. There was no change in distortion when switching AGC from slow to fast. Available audio output power was adequate into 8ohms, but much more power was available into 4ohms.

When we were taking the RFIM measurements on 80m we kept getting very strange results, noting a double beat on some frequencies. We spent a lot of time investigating this, and by coincidence discovered a slight problem in that 80m frequencies one side of 3.75MHz mirrored an equivalent amount the other side at around 60dB lower. My only explanation for this is that breakthrough directly from the VFO from 5.0 to 5.5MHz was beating with 4.0 to 3.5MHz to give a 9MHz IF, this being superimposed beneath the normal local oscillator frequency.

It seems that better isolation of the VFO from the local oscillator injection would avoid the problem. We checked the IF passband ripple on the wide SSB filter, for on the first sample it was not too good, but the second sample was excellent showing only +/-0.5dB across the top. We confirmed that the narrowest CW filter lost around 5dB gain.

RF sensitivity on the narrowest filter on CW showed no improved sensitivity as compared with that of the SSB filters, when it should have been around 10dB better. This is the penalty introduced by this form of design, but it should not be a disadvantage below the 18MHz band.

No normal image problems were encountered, and in every other way the receiver seemed excellent.

The transmitter could give an output power variable from almost no output up to 105W out on all bands, both CW and PEP outputs peaking about the same. We were a little surprised that the output consistency was so good, showing excellent ALC control, the measurements being undertaken on the first sample. The second one was used for intermodulation product tests, the available outputs being around the same.

At 100W PEP output on 28.57MHz third order products were well down, but I felt that higher order products did not decrease as rapidly as I would have liked, suggesting that the standing current in the PA was set a little low.

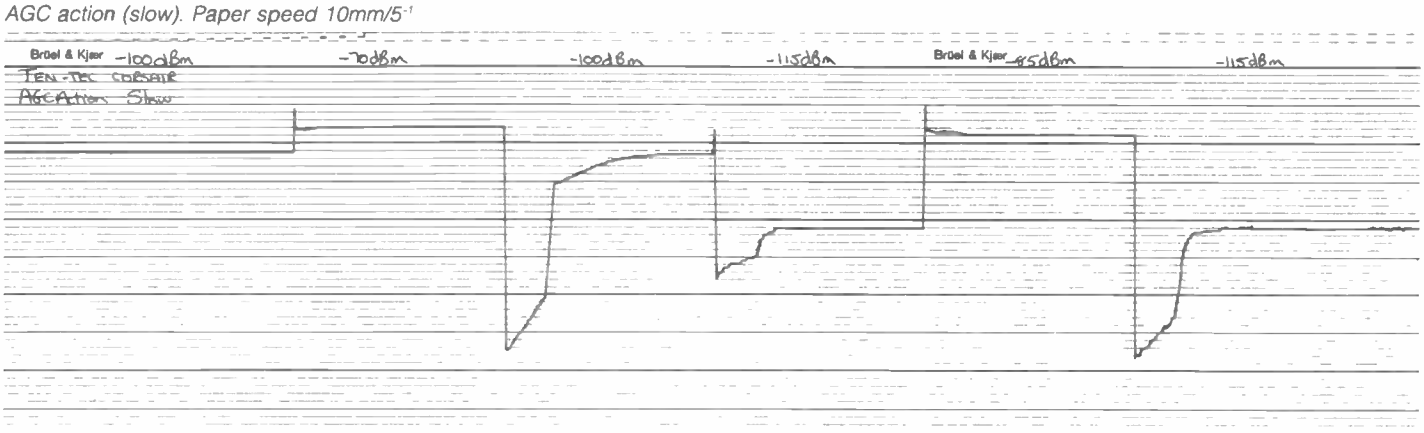
At 50W PEP, the third order products were remarkably low, but again the higher order products did not fall rapidly enough. We also noted that some products varied a little with time as the PA was warming up. Whilst the receiver frequency accuracy had been within 100Hz, the CW offset on Tx was 200Hz off, for it should have been 750Hz offset.

Harmonics

Harmonic outputs were generally reasonably well down, the worst measurements being 50/-53dB for 2nd and 3rd harmonics respectively on 20m. We did note though one particular set of spurii which did concern me a little. On 10m there was a constant spurious output at 27MHz (3 x the carrier generator frequency) at -44dB ref 100W, and another spurious which was spaced above the carrier by an amount which was always the difference between the carrier and 27MHz. This spurious measured at around 42dB and the problem was noted on both samples.

Unfortunately, if you transmit in the

AGC action (slow). Paper speed 10mm/5^{-1}



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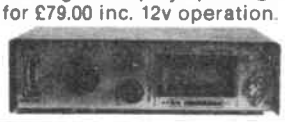

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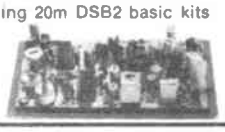

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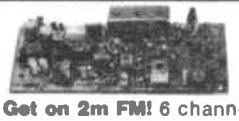

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CW portion on 10m at full output, you are in danger of transmitting a spurious CW signal which, incidentally, is right in the satellite portion of the band! We checked the audio passband from mic in socket to transmitted output, and this was almost a textbook desirable response, virtually flat from 400Hz to 2.7KHz, attenuating to -60dB at 3.52KHz, whilst 55Hz was -40dB.

Finest performance

We had a look at the total noise output of the transmitter ref full carrier when the mic input was short circuited, but with controls left in their normal positions for full output, with the spectrum analyser measuring with 10KHz bandwidth. We were stunned to see that the total energy, including that of the suppressed carrier, was only -75dB, surely the finest performance that I have noted on an SSB transmitter! Alternate sideband rejection was also phenomenal and literally down in the noise.

One or two other spurii were noted on various bands, the worst being a generation on 19.540MHz when 21.260MHz was transmitted, the spurious level being at -48dB. On other bands various spurii were below -60dB.

Almost no drift was noticeable on Tx, even when transmitting a continuous 50W carrier for a minute, any drift being less than 10Hz. The maximum current drawn on Tx should be around 18 amps when the rig is feeding a 50ohm load. Rx current, incidentally, is around 1 amp under normal conditions.

The range of the offset control was found to be from +/-970Hz on the minimum position, and from +/-3.5KHz on maximum. These ranges seemed ideal for normal purposes. The maximum vox hold time was around 1.5S variable down to almost instantaneous dropping out.

More than enough mic gain has been provided for medium and high impedance mics, and very strong compression is available if required, although I would not recommend more than around 12dB for normal use. The instructions are very specific about the position of the power/gain control for transmit and this was observed during tests. We found that there was stacks of gain available in reserve.

We used the rig with a professional power supply as the Ten-Tec one was not supplied, and if you do not use the latter, Ten-Tec can supply a magnetic operating cut out switch in the 13V input connection lead which will trigger out the supply if excessive current begins to be drawn: there are very helpful comments about this in the manual. The RF gain control, when pulled, switches the PSU on/off whilst the HF gain, when pulled, cuts out the RF preamp.

Conclusions

It soon became evident in the subjective tests that this rig was unusual in that several performance areas were obviously outstanding. For this reason, out of sheer fascination, my colleague, Jonathan Honeyball, and I spent many hours carrying out tests to investigate further some of the remarkable aspects.

I do not doubt that the received capability is one of the very finest I have ever encountered, and the transmitter seems to have got so many points right that competitive models get wrong. The exhaustive reciprocal mixing, selectivity and RFIM tests prove the rig's excellence.

In looking over all these aspects, I feel quite confident in recommending the rig for DX contest and very serious use by operators who do not want so many of the unnecessary facilities provided on the latest Japanese competition.

The rig excels at LF, and is very good at HF, and the received performance is matched by the excellent transmit side, although I was a little disappointed with the Rx and Tx spurii. You will probably get used to the VFO backlash which you might at first feel to be a disadvantage, but careful use of the offset control overcomes the problem quite reasonably.

The rig is very expensive for its facilities (at present £913 including VAT for the basic Corsair), but you are paying for its design excellence and concept, including simplicity in operation, with what must be virtually optimum performance in almost all areas.

Final areas of criticism are very personal, and I suppose the points that most annoyed me after trying the rig for quite a time, were the poor noise blanker and the AGC hang circuitry which I just cannot get used to, and which would actually stop me from purchasing the rig myself.

I feel sure though that many users would actually like it as it stands, and they might well dislike the more usual exponential type AGC recovery. The excellent manual includes complete specifications, circuits, very detailed alignment and servicing instructions and useful hints.

The rig measures 130 x 380 x 360mm and weighs 6.4kg. The power supply type 260 costs £179.40 incl VAT, and the auxiliary external VFO type 263 costs £175.95 incl VAT. The hand mic type 700C is £28.00 incl VAT, but is not recommended.

Optional filters include 1.8KHz type 288, 500Hz CW type 285 and 250Hz, CW type 282, each costing £45.50 incl VAT. The review sample also included an 8-pole 9MHz filter, type 220, costing an additional £22.76 incl VAT, which is strongly recommended.

I would like to thank KW Ten-Tec Ltd of Chatham, Kent, for the loan of the review samples and for their considerable assistance in helping me prepare this review, and also my colleague, Jonathan, for painstakingly assisting me with all the measurements.

A strong recommendation for purchase then if you are really fussy about performance, and are not concerned about the questionable kudos of having a rig that looks very technical externally and has umpteen bells and whistles.

Ten-Tec Corsair HF Trasceiver Laboratory Results

Reciprocal mixing ratio dB ref stated spacing	
100KHz	106dB
50KHz	106dB
20KHz	106dB
10KHz	102dB
5KHz	100dB
3KHz	95dB
2KHz	92dB
1.5KHz	81dB
(Interefering carrier low ref wanted, on 10m)	
Selectivity wide SSB	
6dB	2.3KHz
40dB	2.75KHz
60dB	2.95KHz
80dB	3.5KHz
Shape factor 1.3	
Selectivity: 1.8Hz SSB filter	
6dB	1.8KHz
40dB	2.4KHz
60dB	2.7KHz
Shape factor 1.5	
Selectivity: 250Hz CW filter	
6dB	220Hz
40dB	575Hz
60dB	865Hz
80dB	2.12KHz
Shape factor 3.9	
Audio distortion from strong RF carrier, 125mW/8ohms	
300Hz	1.4%
700Hz	1%
1KHz	0.8%
1.4KHz	0.4%
Audio power output for 10% THD	
2.4W into	8ohms
3.8W into	4ohms
Audio output constancy for RE input variations (1st sample)	
	-60dBm/0dB
	-70dBm/-0.9dB
	-80dBm/-1.7dB
	-90dBm/-2.6dB
	-100dBm/-3.9dB
	-110dBm/-7.8dB
	-120dBm/-16.5dB
S-meter calibration (second sample)	
S1	-120dBm
S3	-117dBm
S5	-113dBm
S7	-106dBm
S9	-93dBm
S9 + 20	-64dBm
S0 + 40	-38dBm
Pre-amp on/off gain difference for S9 reading	15dBm
Tx carrier and mic/IF noise ref 100W PEP output SSB	-75dBm
Transmitted audio pass band for 3dB points 400Hz to 2.7KHz (see text)	
Tx power output CW/SSB PEP 160 to 10m	105W
2 tone IPs 28.57MHz 100W PEP	
3rd	-32/-32dB
5th	-43/-47dB
7th	-46/-48dB
9th	-48/-48dB
	etc
2 tone IPs 28.57MHz, 50W output	
3rd	-42/-50dB
5th	-41/-47dB
7th	-43/-55dB
9th	-45/-47dB
	etc

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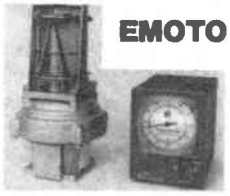

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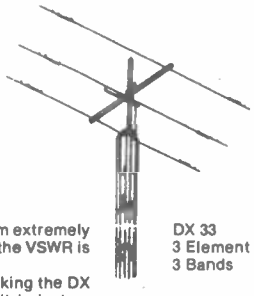

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1081	DX-31	Dipole 10/15/20m 2Kw p e p	93.95
1082	DX-32	2 elementb 10/15/20m 2kw p e p	128.80
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YAESU FT209R & FT209RH TWO METRE HANDHELDS

Since first writing for *Amateur Radio* I have reviewed many different models of walkie-talkie, the latest review being fairly recent, and I did not really intend to review yet another model so soon. However the new Yaesu FT209 is so very good in most parameters that I felt it was important to give this review considerable priority as it is now my own personal choice for the 2m band.

Although it resembles the earlier FT208, it also has more than a passing resemblance to the Icom IC02E, having very similar facilities. It incorporates just FM and can be switched to operate in 12.5 or 25KHz steps.

Front panel

Looking first at the front panel, the top part incorporates the speaker microphone and underneath it the liquid crystal display which indicates frequency, repeater minus or plus shift if selected, 'save' mode in use, and whether the unit is on air or has found a channel in use. Also under this panel is a crude S-meter which, at least, indicates the presence of a signal!

In the centre of the front panel is a 5 x 4 matrix of push buttons, most of which have dual functions. A frequency can be entered by pressing 4 or 5, followed by two more figures and then the 'd' key, which then causes the rig to go to the closest preferred channel.

If a 'function' button is pressed first, the 1 to 0 keys select alternative facilities as follows; 1 is repeater minus shift on Tx, 2 is return to simplex, 3 is repeater plus shift, 4 is 'save time', 5 is tone squelch *(not used in UK)*, 6 is tone squelch frequency *(not used in UK)*, 7 is 'save' mode on, 8 is tone squelch encoder activate *(not used in UK)*, 9 is beep on, * is 'save' off, 0 is tone squelch off and, finally, hash is beep off.

A tone squelch unit is an optional extra which could be useful for special purposes, in which case the appropriate buttons would be activated. Additional buttons provide single down and up steps or scanning, memory store, memory recall (ten memories included), reverse repeater Tx and Rx on/off, clear error, and the function select and frequency enter buttons.

All these latter buttons have second functions, including the provision of separate Tx and Rx frequencies, changing the basic repeater shifts to non-standard ones and back again, memory scan skip (this allows any combination of memories to be skipped during memory scan), clear, and step size in scanning mode.

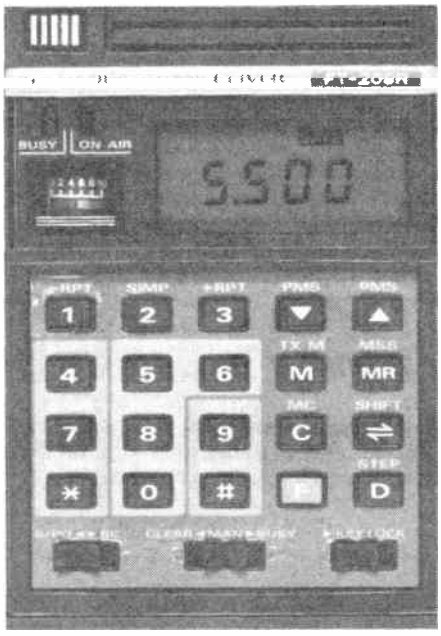
Priority operation is provided by calling up any memory as the priority channel, changing to dial mode by pressing 'd' and then pressing hash; a 'p' letter being displayed to show priority operation, which allows the memory channel to be checked every three seconds or so.

Finally, there is one particular function above almost all others which I must applaud, and that is the star function which allows immediate access of memory 0 into the dial mode. This is absolutely superb, for whatever the frequency remembered as last used by the rig, a predetermined calling frequency immediately comes up on depressing 'star'. This will be most useful for Raynet use.

Below the matrix pad are three slide switches selecting meter signal strength/power out or battery condition; scan for clear, busy or manual selector, and keyboard lock on/off. Several battery packs are available which slide on sideways along the bottom, a catch on the left side provided to lock them in.

The underneath of the rig to which the battery makes contact includes a 12.5/25KHz step switch which has to be activated by pushing a very thin screwdriver or pointer into it to change step. On the left side of the rig is a normal PTT spring-loaded switch and above it a 1750Hz toneburst button. On the right is another push switch which allows back lighting of the LCD display and S-meter.

The top panel is extremely well laid out and includes a firmly mounted 50ohm BNC socket for use either with a rubber duck or a ¼ wave whip, or connection with coaxial cable for other antennae. An easy to use push button selects high or low transmit power, whilst the on/off switch is incorporated into the Rx gain control, a variable squelch control complementing this.



Two more push buttons select vox on/off and vox sensitivity. A 3.5mm jack socket is provided for headphone connection, whilst a 2.5mm jack can be used for an external microphone. Yaesu can supply an optional single earpiece headset with attached boom microphone (£14.50 incl VAT), type YH-2 which worked extremely well with the FT209, vox operation working superbly and particularly useful for mobile 'no hands operation', etc. This headset is very well made with acceptable microphone sound quality. Vox does not work unless an external mic is in use.

On the back of the unit is an effective belt clip and also a small hole which provides access to a microprocessor reset switch, which clears all the memories and allows one to restart if the microprocessor has been corrupted.

Accessories

The set is supplied with a rubber duck antenna, a holding strap and a carrying pouch. There are two different models available: the FT209R (£239 incl VAT, rubber duck and case) being the normal version supplied with an FNB3 nicad battery pack giving 10.8V dc nominal; and the FT209RH, the high power model (£259 incl VAT, rubber duck and case), supplied with an FNB4 pack giving a nominal 12V dc.

The battery packs are interchangeable, although the rigs themselves are different. The PA stage for the FT209RH, for example, gives 6W output off the supplied battery! An alternative battery case is available which can take six AA type cells, giving around 9V for lower power operation off dry batteries.

Three chargers are available: the NC15 (49.95 incl VAT) being a quick charger/dc adaptor (this will charge both Nicad packs); the NC9C (£9.20 incl VAT) which is a compact, slower charger for the

FNB3; and the NC18C (£9.20 incl VAT) for the FNB4 Nicad packs. A dc car adaptor charger type PA3 supplies both trickle charge and external dc operation.

Underneath each battery are two holes for working the rig off external dc volts, and for trickle charge connections. Four separate indented lugs are provided for charging the battery from the NC15 fast charger. Up to 15V dc operation is permissible by interconnecting external dc volts into the appropriate socket, higher voltages permitting higher output powers, of course.

Subjective trials

I have used both rigs for some time on their rubber duck antennae, on a ¼ wave flexi-whip and on an outside antenna, my normal 2m 8/8. I have no doubt that the FT209RH is easily my top recommendation for a 2m handheld, for it has all the benefits of almost any other rig that I have ever used as a handheld in one box, with additional facilities as well.

I liked the IC02E, but its mysterious logic boobs upset me sufficiently to give it only a lukewarm review. The FT209, however, allows repeater shifts to be inserted into any memory without aggro, and if repeater shift is selected in dial mode it is retained whilst going up and down until it is cancelled, if one wants to hunt repeaters.

Perhaps the most amazing facility is the 'save' mode which permits the rig to fall asleep for between 300mS and 3S, the time being determined by pressing a number button followed by 'save T', and then awakened again for 300mS in order to monitor a chosen squelched channel. In the save mode, whilst dormant, the rig is taking only a minute current, for only the microprocessor is alive as far as the timing mechanism section is concerned, and the LCD still shows the frequency. A 'save' sign also appears to show the periods when the rig is dormant.

In this way a frequency can be monitored all day long and the rig will only come alive if someone comes on the frequency and the current then increases to normal. Save mode is resumed when the carrier ceases.

The FT209R (the lower power version) seemed to have an Rx frequency error, for I could still hear a strong station breaking through when selecting an adjacent 12.5KHz channel, but this fault is not present on the RH version supplied.

The Rx sensitivity was not fantastic, but acceptable, and on my 8/8 antenna there was slight RFIM if strong signals were present on the band.

Both transmitted and received audio were well above average in quality. There was sufficient audio power from the speaker for normal use, but insufficient for use in the car if there was high ambient noise.

All the facilities were extremely easy to use and the rig was clearly designed for the best possible ergonomics. I was very pleased to see that Yaesu accommodated 12.5KHz spacing, other versions being available to special order for 5 and 10KHz spacing if required. It was most useful to be able to listen on repeater output by depressing just one button, resetting the rig to normal by depressing it again .

The UK versions cannot receive or transmit out of band, even when an inappropriate repeater shift is selected. The rig has its own way of letting you know that you are making an error by giving beeps, with a flashing error sign appearing on the display.

High/low power

The unit is certainly not too heavy and the belt clip holds it quite securely. It was useful to have the high/low power switch, for low power operation is perfectly adequate for most QSOs. Many handhelds will not operate directly from a 13V car dc system, and the ability of the 209 to do so is yet another plus point.

The RH version, which gives 6W output from its battery, is just about the highest power I would like to see on an FM handheld rig, and Yaesu have clearly thought out the excessive walkie-talkie power problem very carefully. Higher powers are somewhat dangerous if a rubber duck delivering much more power is held close to the head.

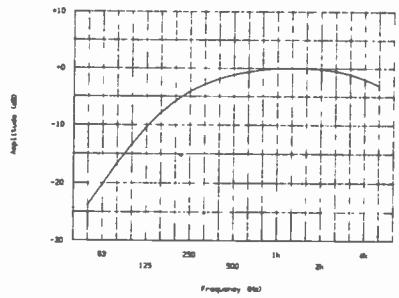
The convenience of inserting frequency with only four button pushes is fine, and I liked the up and down step buttons, which were so easy to use.

I took the 209RH version on holiday with me to GM at the beginning of September and it performed admirably under all circumstances. Even from hotel bedrooms I was able to make contacts relatively easily that might have been missed with lower power. When walking with it in the 'save' mode in Loch Garten Woods it opened up beautifully when I was called by my friend GM4LPG.

I had enormous fun working through GB3BI, the Black Isle repeater near Inverness, from the ski lift!

I have no doubt that the 209 is the easiest to use handheld that I have yet enjoyed! Charging up with the high speed charger was so quick and effective that I never ran out of battery power, but I must admit that I did *not* waffle too much!

Yaesu FT209RH FM received audio response (750uS pre-emphasis)



Laboratory tests

We took measurements on two separate units supplied from different sources and it was extremely interesting to note that there were some variations. Please note that in the tables the main results are shown for the FT209RH (high power), with results for the FT209R (low power) bracketed where applicable.

The results discussed here are for the RH version, unless otherwise specified. The RF input sensitivity was fairly good, but the Icom competition was better by 2dB. However, the 209R was 1dB worse than the RH when tested off channel for its best result, and on channel it was actually 3dB worse, as the internal crystal alignment caused the rig to be around 1.3KHz off channel. This problem affected the apparent sensitivity on channel, which can be seen on the table as only fair.

The IF selectivity was checked with two methods, and the white noise method showed the selectivity to be very good, even at 12.5KHz spacing. The FT209R had a very lopsided selectivity due to its crystal alignment problem, with considerable audible breakthrough from one adjacent channel, whilst the other side was excellent. The signal strength meter has a scale of 1 to 10, and between 1 and 9 the difference was only 18dB (16dB on the 209R), thus giving around 2dB per S point, which is extremely mean!

The RF intermodulation performance of the front end and mixer was not good, but no worse than most of the alternatives and, unfortunately, this is to be expected from a handi-talkie. Synthesiser noise, though, seemed to be at a fairly low level.

The distortion in the discriminator and audio output amplifier measured very well on the RH model, but the R version gave twice as much distortion, again due to the received frequency offset error. 800mW of maximum audio power should be quite sufficient, and is higher than that of some alternatives.

Capture ratio measured well and the rig effectively limited at well below the 12dB sinad point, which is good. The squelch operated well and no problem was noted.

We checked the received audio response from RF input to the external speaker output socket using a 750μS pre-emphasised signal, and the response chart shows this is almost ideal up to 3KHz, although the response did not fall off anywhere near fast enough above this frequency. However, I don't think this really matters too much on a handi-talkie.

This excessive audio bandwidth, however, may have contributed to the below average 12dB sinad sensitivity point. A very good transmission actually sounds superb on this little rig when received.

We noted quite a lot of quieting at the 12dB sinad sensitivity point, showing the effect of the IF selectivity on distortion of very low level signals. The ultimate signal-to-noise capability of the rig on a strong signal was most praiseworthy, showing virtually no synthesiser whine breakthrough.

Astonishing

The transmitter section measured very well indeed, a frequency error of -420Hz being perfectly tolerable. An astonishing 6W power output was noticed when operated with the 12V battery, which actually increased to nearly 7W on 13.8V dc external. This would be more than enough to feed a high power PA which would give around 90W output (eg the Microwave Modules' 10/100W model).

No spurii were noted at all above the noise level of the analyser, either close in, or far out, from the transmitted frequency, and RF harmonics were below -60dB on both models. Repeater shift accuracy was excellent, and the tone burst deviation and frequency were well optimised.

The average speech deviation peaked just below 5KHz, but when provoked under extreme conditions was only 1dB higher, which shows excellent limiting. We tried a frequency drift check, varying the external dc volts from 10 up to 13.8, and this resulted in less than a 10Hz frequency change over a period of a minute or so; the R version drifting no more than 20Hz.

The maximum current drawn was around 900mA on high power, which fell to 390mA on low power, which is reasonable as low power was much higher than average at around 0.75W. Unless you are an awful waffler, the save facility will reduce current consumption so much under average use that the batteries should last for at least a day's normal use for Raynet purposes.

The Nicads for the RH version have a claimed capacity of 500mA hours, which allows for half an hour of continuous waffle etc, etc! Note the remarkably low current consumption of 7.5mA whilst in the save mode, increasing to 38mA for 10% of the time.

Conclusions

The 209RH is just marginally heavier than the 209R, whilst the FNB4 is also heavier than the FNB3. The two rigs are the same size, but the FNB4 battery is about 2cm longer than the FNB3. The only slightly disappointing parameter is RF input sensitivity, but this is certainly not poor, although it is bettered, for example, by the IC02E. In practice, the difference would be only slightly noticeable on even weak signals, and it would only be an extremely weak signal which would show up differences.

I admire both versions very much indeed, and very strongly recommend both, although I am concerned about the slight receiver misalignment of the FT209R sample.

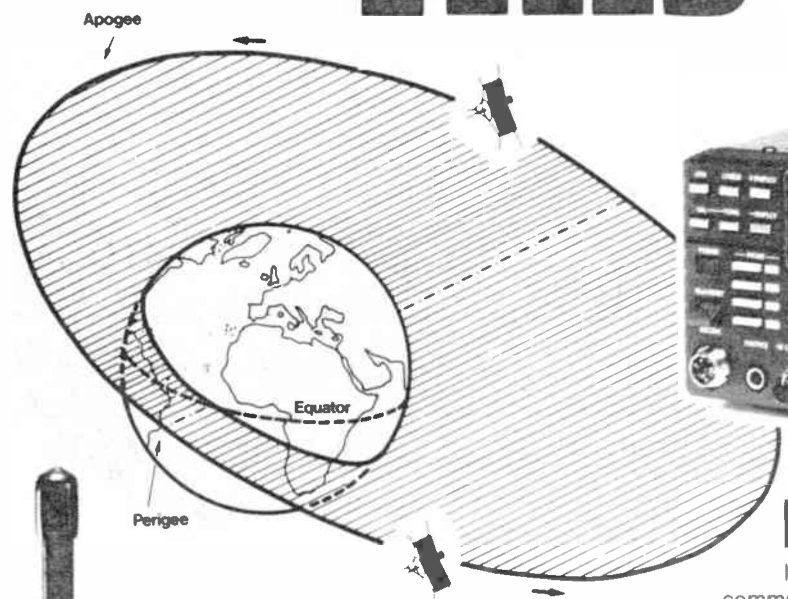
I very much enjoyed using the rig, and what more can I say other than that I will probably be purchasing one myself. I would like to thank SMC for loaning the FT209RH and Amcomm for loaning FT209R, both companies supplying various accessories. Yaesu certainly have a winner, and I expect this rig to become extremely popular.

I would also like to thank my colleague Jonathan Honeyball for helping with all the tests. Yes, I think the RH, in particular, is the Rolls Royce of hand-helds and will be difficult to beat.

YAESU FT209RH (R) – LABORATORY RESULTS

Sensitivity for 12dB sinad (1KHz modulation, 3KHz deviation)	
144.025MHz	122dBm (0.18μV) (R:-119.5dBm)
144.95MHz	-122dBm (0.18μV) (R: -119.5dBm)
145.975MHz	-122dBm (0.18μV) (R: -120dBm)
Selectivity	
blank carriers off channel to degrade sinad by 3dB (ref 12dB sinad)	
+/-12KHz spacing	51/42dB (R: +57/17dB)
+/-25KHz spacing	73/67dB (R: 72/66dB)
Selectivity second method	
carrier off channel modulated with filtered white noise (ref 12dB sinad)	
+/-12.5KHz spacing	30/20dB (R:34/6dB)
+/-25KHz spacing	74/69dB (R: 71/64dB)
RFIM performance	
carriers off channel for 12dB sinad product (ref 12dB sinad)	
50/100KHz spacing	67dB (R: 64dB)
100/200KHz spacing	67dB (R: 65dB)
Calculated RF intercept point	-21.5dBm (R:-23dBm)
S Meter RF levels required for the following readings	
S1	-110dBm (0.7μV)
S3	-102dBm (1.8μV)
S5	-98dBm (3μV)
S7	-95dBm (4μV)
S9	-92dBm (5.5μV)
Capture ratio	4.5dB
Audio quieting at 12dB sinad	16.5dB (R: 17dB)
3dB limiting point	-126.5dBm (R: -125dBm)
Maximum audio output (10% THD into 8ohms)	0.8W
Audio distortion 125mW into 8ohms)	
1KHz deviation	0.95% (R: 0.9%)
3KHz deviation	1.3% (R: 2.5%)
Best obtainable signal/noise ratio (approached at -77dBm (30μV) into rig)	61dB (R:60dB)
Current drawn on Rx, normal squelch on, 38mA, save on current	7.5mA
Current drawn unsquelched noise with vol at min	58mA
Transmitter Measurements	
Max RF output power at stated external dc volts	
FT209RH 13.8V 6.9W 144.5-145.8MHz	
FT209R 10.8V 3W	
RF output power from internal battery high/low	
FT209RH	6.1/0.75W
FT209R	3.8/0.35W
Carrier frequency accuracy	-420Hz (R:-22Hz)
Tx frequency drift over 1 minute max within 10Hz dc volts varied from 10 to 13.8	
Harmonic output ref fundamental 2nd/3rd	
FT209RH	-62/<-70dB
FT209R	<-60/-60dB
Normal/max provoked deviation	5/5.5KHz
Tone burst deviation	4KHz
Repeater shift accuracy	within 10Hz
Spurii,	<-70dB
Tx current, high/low power at rated external voltage	
FT209RH	910/390mA,
FT209R	630/250mA
Weights	
rig excluding battery	335gm (R: 300gm)
Nicads:	FNB4 235gm (R: FNB3 215gm)

ICOM IS OUT OF THIS WORLD.



IC-271 ,100W & 471 ,75Wr.f.

ICOM can introduce you to a whole new world via the world communications satellite OSCAR. Did you know that by making simple modifications, you can Tx to OSCAR on the 430-440MHz IC-471 and Rx on the 2m. IC-271.

Once these modifications have been made you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift.

The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON, E12 5EQ.

BUT, ON THE OTHER HAND...

IC-02E
IC-04E, (70cm).

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

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

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

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

ICOM PRICES ARE DOWN TO EARTH.

(Please contact us or your local Icom dealer for current prices)

IC-751

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. The IC-751 now has a remote push-button frequency selector pad

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.

The first IF is 70.045 MHz. Any XIT and RIT adjustment is shown on the display. The transmitter features high reliability 2SC2904 transistors in a low IMD (-32dB@ 100W) full 100% duty cycle. For more detailed information on this excellent set, please get in touch with us.

IC-R71E

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option).

Quadruple conversion superhet. IF frequencies 70MHz,9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

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

Agent: Gordon G3LEQ, or telephone Knutsford (0565) 4040.
Please telephone first, anytime between 0900 – 2200 hrs.

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BARCLAYCARD VISA

TIMESTEP ELECTRONICS LTD

FRG7 OWNERS ARE GOING — DIGITAL AND SIDEWAYS

And you can join them by using our custom designed DFC70 digital frequency counter. The DFC70 is specifically designed for the FRG7 and gives rock steady read out on all bands with 100Hz resolution. Signal frequency is computed and displayed unambiguously on a state of art LCD display specially made for us in Japan. It is not necessary to drill any holes and only one wire has to be connected to a well marked test point in the receiver.

DFC70 Kit £19.95 **Built and tested module £24.95**

Will also work with the Lowe SRX30 and Drake SSR/1.

With our new FM7 adaptor module, you will be able to receive sideways modulation (FM as it is otherwise known). Our superb state of art FM detector uses the very latest 3359 chip from Motorola, and has a built in IF filter and a variable squelch control for noise free monitoring. Although specially designed with the FRG7 in mind, it will happily work with other receivers or transceivers with a 455kHz IF amplifier. The FM7 will add a whole new dimension to your listening activities. You will of course be able to follow legal CB contacts but you will also hear the exciting DX being worked by amateurs on 10 metre FM. Used in conjunction with our DFC7 counter, you can accurately tune to a specific CB or amateur channel and so be sure that you will not miss whatever goes on.
Kit Price £9.95 **Tested Module £14.95** P&P £1.00 (VAT inc.)
For FM reception on receivers with any IF up to 50mHz, the FM 42 is the answer to all your problems. *Please state frequency required when ordering.*
Kit Price £14.00 **Tested Module £19.00** p&p £1.00 (VAT inc.)

TIMOTHY EDWARDS MK2 144 mHz PRE-AMP
HEAR IT LIKE YOU NEVER HEARD IT BEFORE

We are proud to announce that the well known RF consultant Timothy Edwards has given us the exclusive marketing rights to his new 2 metre pre-amp. Timothy Edwards RF designs are used by British Telecom amongst others and so you can be sure that this pre-amp will perform to perfection. It employs the incomparable BF981 which has a better noise figure at 2M than the often used 3SK88. Spec. Size (tiny) 34mm x 9mm x 15mm (same as Mk1) Noise figure 1.0db Gain 26db **Kit Price £4.95** (inc VAT & P&P).

TRANSISTOR BARGAINS

	mHz	PoutW	Pin W	Volts	Price	
2 N6456	30	60	1.25	13.8	£5 (inc)	Not 3SK88 but BF981 Better 2M noise figure -0.6db £1.40 (inc) ZTX 501 Gen. purpose PNP 0.5A, 20 for £1.25 (inc)

NEW LCD COUNTERS

At last a new range of 5 digit LCD counters that will cover up to 200mHz and give 1KHz resolution to 39MHz. Ideal for most short wave receivers using common IFs. Similar to the FC177 but cheaper! Supply voltage 5-15V dc. Will operate on 26 different IF offsets. If this counter range won't do what you want probably nothing will. Works with all of Tony Bailey G3WPO designs, ask for conversion data.

DFC40 0-4MHz £14.95 built **DFC41 0-32 MHz £18.50 kit** **DFC42 0-200MHz £21.95 kit**

LNA144. OUR ace RF designer Timothy Edwards has done it again! In line 144MHz RF switched pre amp which needs no modification to any rig. Just put it in the co-ax feed, supply 12V and your deaf rx will have ear ache. Uses the BF981 with a total of 4 tuned circuits for the best out of band rejection. The relays are 50ohm gas filled with earthed metal cans and are good to over 800MHz. This was originally designed for 'British Telecom Satellite Division' hence the provision for gold 14GHz SMC connectors. 1dB noise figure and 18dB gain is guaranteed to improve all standard rigs on 144-146MHz. Will fit in standard diecast box (not supplied). Try one in the car under a wing mounted aerial and be surprised. LNA144 kit £14.95. Built and tested module £24.95.

TONE BURST. Probably the smallest crystal controlled unit available. 1750Hz ± 0.1Hz. Supply 5-15V. Will fit in the tiniest of rigs or even microphones.

TBI Kit £6.50

70cm POWER AMPLIFIER At last a cheap and easy UHF power module by TRW the world leaders in RF modules. Only 150mW input for a full 15 watt output all the way from 430 to 440 MHz. Use with an attenuator for your handheld or build a simple TV Transmitter with the circuit provided. **TRW MX15 £12.75**

TOP BAND CONVERTER Listen to the other local nets and DX on 160m with any 2m SSB receiver. Does not need a large aerial and will comfortably out perform most commercial receivers.

UC160 Kit £9.95 **UC160 built and tested £16.50**

2M MONITOR RECEIVER. A superb design featuring crystal and ceramic filters coupled with the MC3359 and BF981 results in an almost bomb proof monitor. Single channel with squelch and 500mW audio amplifier. No coils to wind and little alignment required. Uses standard crystals from 'PM Electronics'. **MON2M Kit £19.95 Built and tested module £29.95.** For professional use on 18-200mHz built and tested module **£38.50** including crystal.

WHO IS TIMOTHY EDWARDS? He's 32, licenced for 14 years, was a senior design engineer at Pye Telecomm and now works full-time for Timestep. He's also responsible at Timestep for designing the synthesizers and down convertors for British Telecom used on the current ECS satellite system. He also specified and uses our new Spectrum analiser and signal generators costing over £40,000. Now you can see why our amateur modules always work properly and have full meaningful specifications..

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New Japanese 50 ohm low loss gas filled RF relay. Only 0.3dB loss at 430 MHz with 35 watts input. Ideal for switching pre-amps and the TRW MX15. BSWR 1.5:1 at 1gHz. 12 volt coil. **DR12V £4.75**

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Access

attract the interest of a Spanish amateur, I thought.

But fair's fair. Perhaps Juan – sorry, one – should QSY off 145.5MHz and leave the channel free for other users. So I called CQ DX on S22 and, sure enough, a CT station came back to me. But it was Carlos in Porto again and, with all the best will in the world, I'd become a little tired of working VA square! By now the entire mass of simplex and repeater input and output channels was occupied by Spanish and Portuguese amateurs, although I didn't hear one word of English from them.

I did notice, however, that my successful move from SSB to FM had been emulated by a number of other stations in Yorkshire, but whether any of them managed a DX contact – on S20 or otherwise – is anyone's guess. Sadly, all good things come to an end and, without warning, the E-vent died just a few moments later. 'Bring back the Portogeese', I was tempted to shout, but I didn't dare.

Friends tell me it's unusual for Sporadic-E to be so easily worked on 145MHz FM and that 2.5 watts into Portugal is a feat that many amateurs with much better equipment never manage to achieve. But, regardless of mode and method of propagation – tropospheric, Sporadic-E, Aurora or, dare I say it, bouncing signals off flying picket lines! – there was little skill attached to my all-too-brief QSO(s) with CT1BR. It was down to Lady Luck.

Casually!

But I didn't feel mean three days later when I happened, quite casually (!), to mention my Iberian DX at a meeting of the Goole Radio and Electronics Society in Yorkshire.

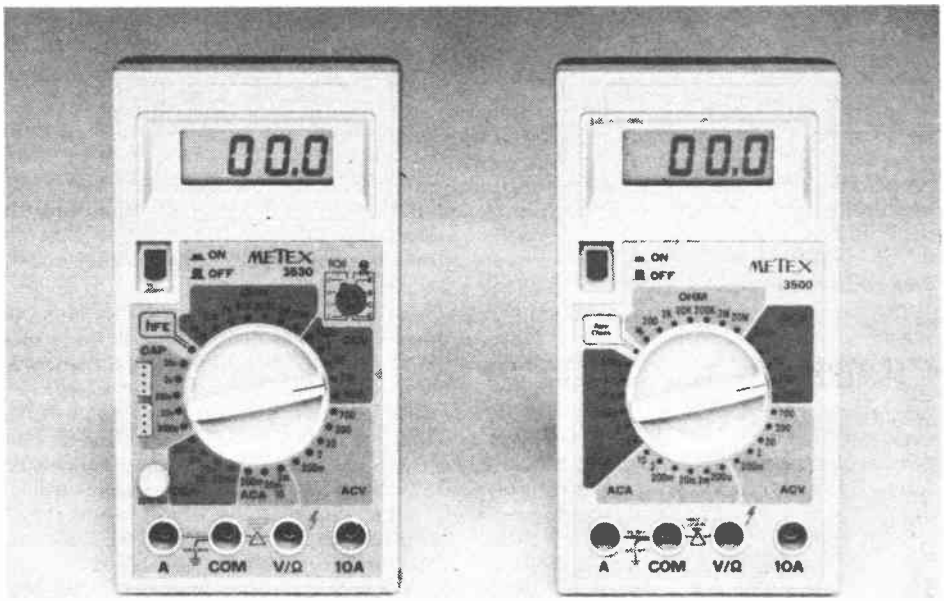
One particular (former?) friend, G8ERX (Geoff), pointed out that a telephone call at the time would have been appreciated. I was surprised to learn that, in all his dozen years on the air, Portugal was one of the countries he had not yet contacted. And Geoff, who boasts an excellent aerial system and power to match, had never experienced a Sporadic-E opening, not even on S20.

I promised faithfully I would ring him immediately when the next one occurred. But he's probably worked into Tunisia and Morocco already!

SPECIAL TEST FEATURE

KEN WILLIAMS:

TEST EQUIPMENT FOR THE AMATEUR



For any serious constructor, test equipment is essential, for not only must he be able to trouble-shoot, he must also be able to take quantitative measurements – for how else can he assess whether his latest masterpiece is better than the equipment it is to replace? How does he therefore set about acquiring the necessary equipment?

Professional modern test equipment is extremely expensive and it would be impossible for any amateur to equip a home laboratory with all-new equipment. Other avenues of supply must therefore be considered.

Points to consider

In equipping the home laboratory or workshop, several considerations arise:

1. How much space is available?
2. What types of measurement are required?
3. What accuracy of measurement is required?
4. How is the available finance to be used?

The first of these is obviously dependent on domestic circumstances. If all work has to be done on the kitchen table, then bulky or heavy items of equipment cannot be considered. If a spare room or garden shack is available, more bulky items may be purchased and the equipment may be left permanently in place.

The second consideration is for the type of measurements required. A hi-fi buff will, in all probability, never have need for any frequency above 50KHz but will be very interested in low audio level measurement. A radio amateur will almost certainly find signal generators up to 200MHz plus almost essential. Both will require basic equipment such as a multimeter, an oscilloscope, audio output meter, etc.

Next to be considered is the measurement accuracy required. Some parameters, such as voltage or frequency, must be to predetermined standards, for it would obviously be undesirable to put 7 or 8 volts on a 5 volt logic chip. Other measurements need only be consistent. Typical of these is the output level of a signal generator, for in general it is only necessary to determine whether a receiver has deteriorated since its last check, six months previously, or if the new receiver is better than the old, and by how much. It does not really matter whether the switched 1 microvolt output level is 0.5 or 1.5 microvolts provided that it remains constant over a long period.

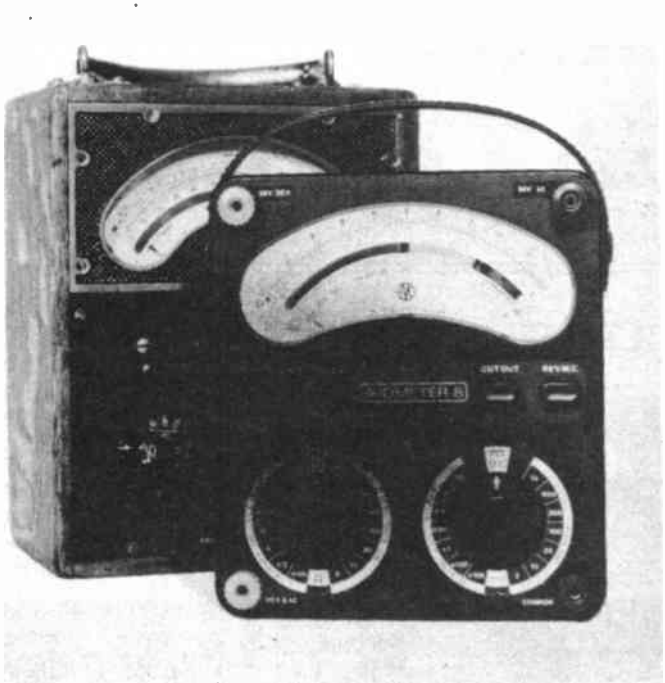
The realisation of which measurements need to be absolute and which are sufficient to be relative can lead to considerable economies in the home workshop.

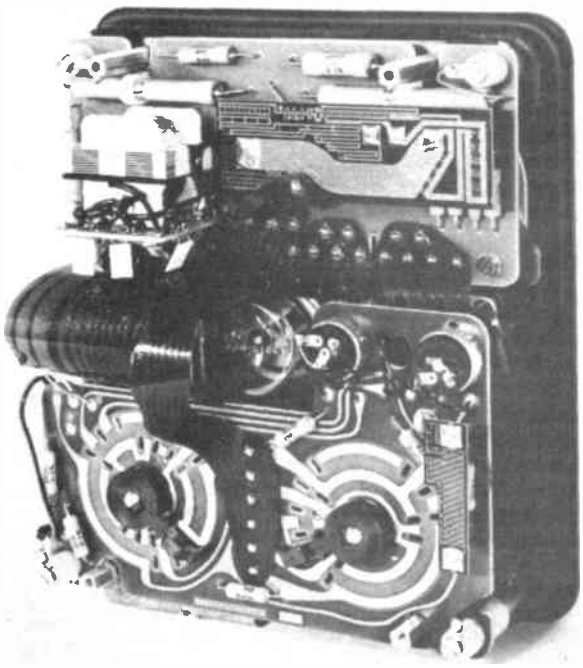
The final consideration is, of necessity, how is the available finance to be used? In this, priorities must be allocated in accordance with the intended work. However, certain basic items, such as multimeters, are common to all. Many other common items, such as AF output meters, although desirable, are by no means essential. An adequate substitute can be achieved by using a three or eight ohm resistor, as appropriate, as a load and measuring the output level with a multimeter switched to an ac voltage range.

Analogue or digital?

The modern tendency is to use a digital display meter and furthermore believe the indication implicitly. This assumption is unjustified, for digital equipment can be as prone to error as analogue. In the price range normally considered for multimeters by amateurs, 1% accuracy would be exceptional. If higher accuracy is required, it has to be paid for! As I write this, I have on my desk a catalogue of professional test equipment and in this, any digital multimeter of better than 1% accuracy costs in excess of £200.

Analogue meters are, in general, of somewhat lower accuracy – about 2% of full scale deflection being normal. These, however, have one big advantage. In the situation where the indication is varying, it is relatively easy to spot the trend, whereas with a digital display, this would be almost impossible.





A modern AVO 8 stands in front of the original Avometer. The interior of the latest model shows the 'ladder' design on the PC shunts which enables adjustment of the final valve by cutting the 'steps' (photo: Thorne-EMI Instruments)

Let us now cease talking in generalities and look at the types of instruments available for different purposes.

The multimeter

The multimeter is the most essential piece of equipment in the home workshop or amateur shack. It will certainly see more use than any other piece of test equipment, for its inherent versatility ensures that it will be 'first choice' for almost every purpose. In consequence it must be easy to operate, reasonably accurate and mechanically and electrically rugged.

Many inexpensive multimeters are available but for many years the first choice of the professional has been the AVO Model 8 and its variants. This is an analogue instrument which fully meets the above mentioned criteria and gives a good service life also (the author has had his since 1953).

These are expensive (about £150) but they are available on the secondhand market at about a third of that price. Also available secondhand is the Model 7 which is very similar in appearance but has a much lower input impedance and consequently imposes quite a heavy load on high impedance circuits.

To understand the effect which the input impedance of a multimeter can have, consider the measurement of the voltage across a device taking a constant 1mA fed from a 12 volt supply via a 6.8Kohm resistive load. In this circuit 6.8 volts will be dropped across the load, leaving 5.2 volts across the device. An AVO 8 would be switched to the 10 volt range for which the input impedance is 200,000ohms. This would effectively be parallel with the device whose impedance would be just over 5,000ohms, and in consequence the meter would read about 0.17 volts below the correct figure.

An AVO 7, however, has an input impedance of only 5000ohms and in consequence would load the circuit so heavily that it would only indicate about 3 volts.

The indication of any mechanical (as opposed to electronic) meter is energised by the circuit being measured. Consequently, the more sensitive the movement of the meter, the less power it will draw from the circuit under test. The AVO 8 uses a 37.5 microamp full scale deflection meter which is shunted to 50 microamps. On the 10 volt range, it will require a series resistor of 200,000ohms. The meter is therefore said to be 20,000ohms per volt. The AVO 7, on the other hand, was designed for electrical rather than electronic technicians and has a 1mA movement which is shunted to 2mA giving 500mA per volt.

Alternative

If the price of the AVO 8 is prohibitive, another meter well worth consideration is the AVO ATR (Analogue Toolbox Range), which is about the cost of a secondhand AVO 8. These have a relatively high impedance and, as their name implies, are extremely rugged.

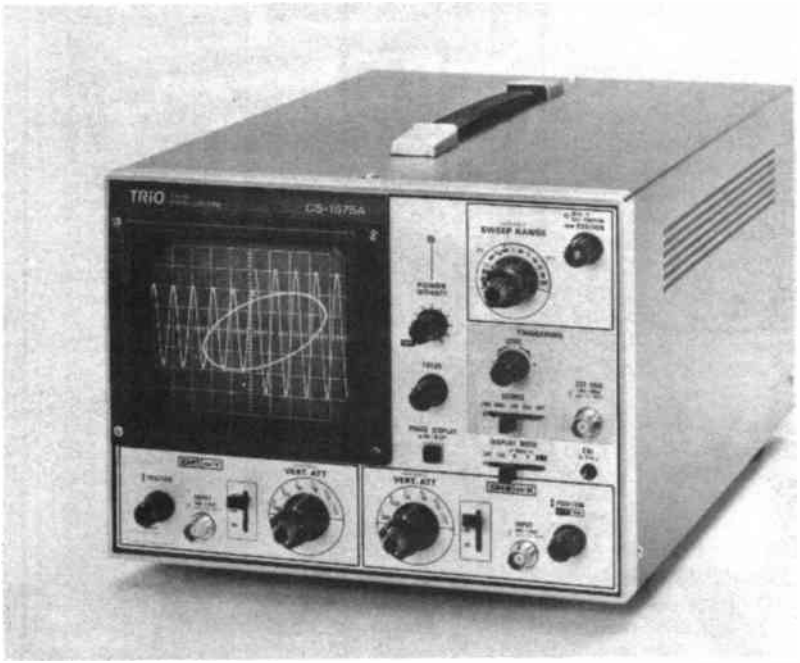
In general, however, any meter of 10,000ohms per volt or more, which is of reasonable quality, should prove perfectly satisfactory.

Through this discussion I have not mentioned digital meters. Suitable instruments can be purchased, but to obtain an instrument with similarly rugged qualities and of equivalent quality to those which I have mentioned, the cost will be high. In setting up a workshop, it would probably be advantageous to purchase a quality, lower cost analogue meter and use the money saved on other equipment. When finance permits, a second instrument, analogue or digital, can be purchased for it is often extremely convenient to be able to take simultaneous measurements.

Oscilloscopes

In the past, many people have considered an oscilloscope to be a luxury, but really it is a most basic piece of test equipment, for it is the only means by

The AVO 1001 ATR



which it is possible to actually see what is happening. With any other instrument it is only possible to deduce this from the indications given.

As an example of this, the author well remembers constructing an audio amplifier some years ago which just would not produce the expected power output. After many hours of investigation, an oscilloscope was borrowed – and the problem was immediately identified as a 28KHz spurious oscillation.

Buy new

In general, I would suggest that if possible, a new oscilloscope should be purchased. Although it is possible to obtain a much more comprehensive secondhand instrument, it is an unfortunate fact of life that many of these are almost impossible to maintain because many components, such as EHT transformers, were manufactured specifically for one or two models and are no longer in production. Furthermore, by the time that prices drop to *amateur* levels, they have long passed their useful service life.

Within the price range of £150 to £300 there is a wide choice of excellent oscilloscopes. In general with these you get what you pay for, but nevertheless there are a few points which should be considered.

The first of these is the size of the screen. As a personal preference, the author would always opt for the largest possible screen size, even at the expense of other features. Others may disagree, but measurements taken on a screen the size of a postage stamp are hardly likely to be accurate.

Bandwidth

The second consideration is the quoted bandwidth of the instrument. Many people believe that this is the highest frequency at which it can be used. This is not so. The frequency quoted is that at which the gain of the amplifiers is 3dB less than at low frequencies. It should be quite possible to view a 30MHz waveform on a 20MHz oscilloscope but, of course, the gain will be less.

Thirdly, should a single or dual beam oscilloscope be purchased? Although, wherever possible, the author would choose a dual beam instrument, much useful work may be done with a single beam and if, at a later date, dual beams are necessary, a beam splitter can be purchased or constructed.

RF signal generators

New RF signal generators of adequate quality for quantitative work are all very expensive. These, almost certainly, will have to be purchased secondhand, and it is therefore necessary to consider what is required of these instruments.

A signal generator is *not* a frequency meter, so absolute frequency calibration is not essential, although it should be within reasonable limits. The most important features of a signal generator are stability and the quality of the output attenuator. It is the latter which differentiates between the laboratory standard and servicemens' quality equipment.

The attenuator of the latter will almost certainly be a simple potentiometer, whilst a standard instrument will have means by which the output can be adjusted accurately in 1dB steps. In addition, the better quality instruments will have automatic or manual 'set level' controls. Although servicemens' instruments are adequate for simple tasks such as alignments, the higher quality instrument is essential for serious quantitative work.

To cover the spectrum from LF to VHF, two or more generators will usually be necessary, but if the station interest is HF or VHF only, one generator may well suffice.

Surplus

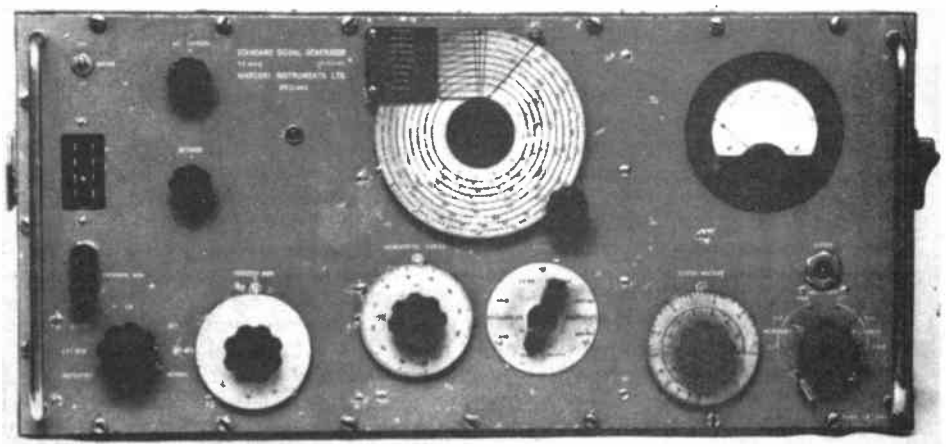
The most common generators available on the 'surplus' market are manufactured by Marconi, all of which have proved extremely dependable.

For LF and HF measurements, the TF144 series instruments cannot be bettered. They are rugged, stable and accurate, the only disadvantage being their size and weight, which is considerable. They were the industry standard generator for many years and can still give a good account of themselves. The calibrated frequency range is 85KHz to 25MHz, but in practice the upper frequency limit is beyond 30MHz so in effect, the complete HF range is covered.

TF144 series equipment can be obtained at quite reasonable prices and before purchase the only necessary checks are: that the instrument has not been modified, that the output and modulation levels are sufficiently high to reach the SET point on the meter, and that the attenuator is operative and not noisy.

At VHF similar considerations apply. The lower frequency limit of many VHF

The author's TF144G, still going strong from LF to 10m



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TG101 — Function generator; 0.02Hz to 200kHz; sine, square, triangle; 600 Ω output; variable DC offset; external sweep; TTL output.
TG102 — Function generator; 0.2Hz to 2MHz; sine, square, triangle; 50 Ω output; variable DC offset; external sweep; TTL output.
TG105 — Pulse generator; 5Hz to 5MHz; free-run, gated or triggered; square wave and complement; sync output; TTL output.

THERMOMETERS

TH301 — Hand-held; −50°C to 750°C; 1° resolution; K-type thermocouple connector.
TH302 — Hand-held; −40°C to 1100°C and −40°F to +2000°F; 0.1° and 1° resolution; K-type thermocouple connector.

OSCILLOSCOPE

SC110A — Bench portable; 10MHz; sensitivity 10mV/div; timebase 0.1μ secs/div to 0.5 secs div. in 21 ranges.

MULTIMETERS

TM351 — Bench portable, 3½ digit LCD; 0.1% basic accuracy; 29 ranges; battery life > 2000 hours.
TM355 — Bench portable; 3½ digit LED; 0.25% basic accuracy; 29 ranges; battery or mains.
TM356 — Bench portable, 3½ digit LCD; 0.25% basic accuracy; 29 ranges; battery life > 3000 hours.
TM354 — Hand-held; 3½ digit LCD, 0.75% basic accuracy; 14 ranges; battery life > 2000 hours.
TM451 — Bench portable, 4½ digit LCD; 0.03% basic accuracy; auto or manual ranging; sample hold and continuity buzzer.

COUNTERS

PFM200A — Hand-held; 8 digit LED, 20Hz to 200MHz; 0.1Hz resolution; 10mV sensitivity.
TF040 — Bench portable; 8 digit LCD, 10Hz to 40MHz; frequency, totalize and reset; 1Hz resolution.
TF200 — Bench portable; 8 digit LCD; 10Hz to 200MHz; frequency, time average period, totalize and reset; external clock facility; 1ppm resolution.
TP600 — 600MHz prescaler
TP1000 — 1000MHz prescaler

LOGIC ANALYSERS

TA2080 — 8 channels, 20MHz, timing and state. 252 byte data and reference memories. 23 bit triggering with trigger delay by events and/or clocks. Compare and search facilities. Composite video output. Microprocessor disassembly (Z80, 6800 and 6502) and RS232 option.
TA2160 — 16 channels, 20MHz, timing and state. 252 word data and reference memories. Can be configured as two independent or linked 8 channel analysers with separate clocks and independently set parameters. 34 bit triggering on two levels with trigger delay by events and/or clocks. Powerful compare and search facilities. RS232 interface, composite video output. Microprocessor disassembler options for Z80, 8085, 6809 and 6502.
TA232P — Serial data (RS232) pod for TA2080/TA2160

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THE LOGICAL CHOICE

generators is 5 or 10MHz, which will therefore often cover the IF of VHF receivers and obviate the need for a second instrument.

Frequency meters

This is one of the few instruments for which high accuracy is required.

In general, there are two types of frequency meter available: the digital frequency meter and the crystal hetrodyne wavemeter. I would suggest that within the amateur radio environment, both have their place, for whilst the digital meter is easy to use and has high accuracy, it is incapable of measuring the frequency of a weak incoming signal. The older crystal hetrodyne wavemeter, despite being less convenient to use, achieves this without difficulty.

Should you require only to measure locally generated signals, then the DFM is more than sufficient. Perfectly adequate instruments of this type can be purchased for under £100.

Should it be felt that a crystal hetrodyne wavemeter is needed then it may be constructed or purchased 'surplus'. The 'daddy of them all' is the BC221 but the British 'Class D' is adequate if less versatile.

An even cheaper alternative is to use a crystal calibrator in conjunction with a receiver. This can be readily constructed using a 100KHz or 1MHz crystal oscillator driving a series of dividers. The accuracy of the crystal can be checked by comparing a harmonic with a standard frequency transmission such as WWV or MSF.

Audio frequency oscillators

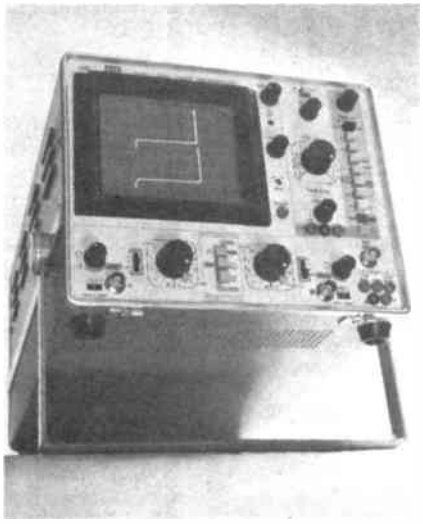
Although akin to RF signal generators, the requirements are not nearly so stringent. Provided that the waveform is good and the calibration reasonably accurate, they will perform their required task. Should the instrument not possess an output level meter and an accurate attenuator, a multimeter can be used to monitor the level, and an attenuator readily constructed at home.

AF signal generators can also make an interesting project for home construction and, when complete, can be calibrated with a DFM, or by comparison with a piano or electronic organ, or by using Lissajous figures on an oscilloscope to compare with mains frequency.

AF and RF power meters

For almost all applications, a dedicated AF output power meter is not really necessary. For most purposes, such as receiver alignment, only a relative measurement of power is required and this can easily be achieved by using an appropriate resistive load and measuring the voltage developed with a multimeter. To facilitate this, AVOs and some other instruments include a decibel scale which may be used in conjunction with any ac range.

If a dedicated output meter is desired, it is a simple matter to mount a suitable load resistor in a box and measure the



voltage developed with a rectifier-meter circuit. The instrument can be calibrated with a multimeter and the internal meter scale redrawn to suit.

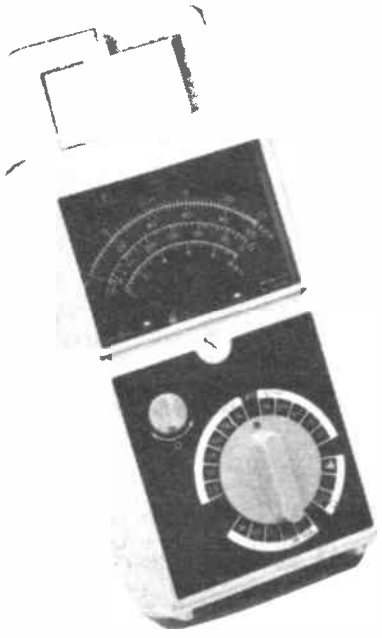
Inexpensive RF power meters are notoriously inaccurate, especially at VHF. The most commonly used instrument in industry is the Bird 'Thru-line' but these are very expensive and are rarely found on the surplus market.

Unusable

The small twin meter VSWR indicators costing about £10 to £15, although boasting a power scale, are so inaccurate as to be considered unusable in this application, although for VSWR measurements they are quite acceptable.

During recent months, Angus McKenzie G3OSS, has published a series of reviews of VSWR and RF power meters in ***Amateur Radio*** and I suggest that anyone needing such a meter should read these and make their selection accordingly.

The RF dummy load is an essential item when testing transmitters. For frequencies up to about 30MHz, these can be constructed at home, but at VHF the inductive and capacitive elements, which are always present, become significant and the load presented to the transmitter cannot be forecast. For such work a suitably rated load should be purchased. This, of course, can also be used on lower frequencies.



Standards

A noticeable feature of almost every piece of test equipment used in commercial laboratories and workshops is a small label giving the date on which the calibration of the equipment was last checked. It is recognised that equipment will deteriorate and in consequence, from time to time is withdrawn from service and compared with laboratory standard equipment. Often these standards can be traced back to those at the National Physical Laboratory.

To the amateur, this is not possible, but certain measures can be taken to ensure consistent results. It is obviously quite simple to compare two multimeters – but which one is correct? The mains supply voltage is one readily available standard, but even this may vary by 6%!

A reasonably inexpensive standard may be made up by feeding a constant current through a Zener diode. If the voltage across the diode can initially be measured by a new or recently calibrated meter, this can provide a standard voltage source for the future.

It is very difficult to measure RF voltage, especially at millivolt levels. Direct calibration of signal generators is therefore virtually impossible for the amateur. If both HF and VHF generators are used in the shack, however, it is not difficult to ensure that they are consistent, which is more than adequate for most purposes.

The lower frequency limit of most VHF generators is well within the upper frequency range of HF generators. If each is set to the same frequency, the relative outputs can be compared on a receiver with a signal strength meter. Any major discrepancy can be minimised by using a different 'SET RF' level on one or both of the generators. The result will not necessarily be accurate, but they will be consistent.

Using methods such as this, most test equipment can be cross compared, an exercise which will ensure that reasonably consistent results will be obtained when making quantitative assessments.

Never wasted

From this article it may seem that a vast amount of test equipment is necessary; however, as with good quality tools, money spent on good quality test equipment is never wasted.

By careful buying it should be possible to equip a workshop with a comprehensive set of test equipment for less than the purchase price of a modern multimode, and from it you will probably learn far more!

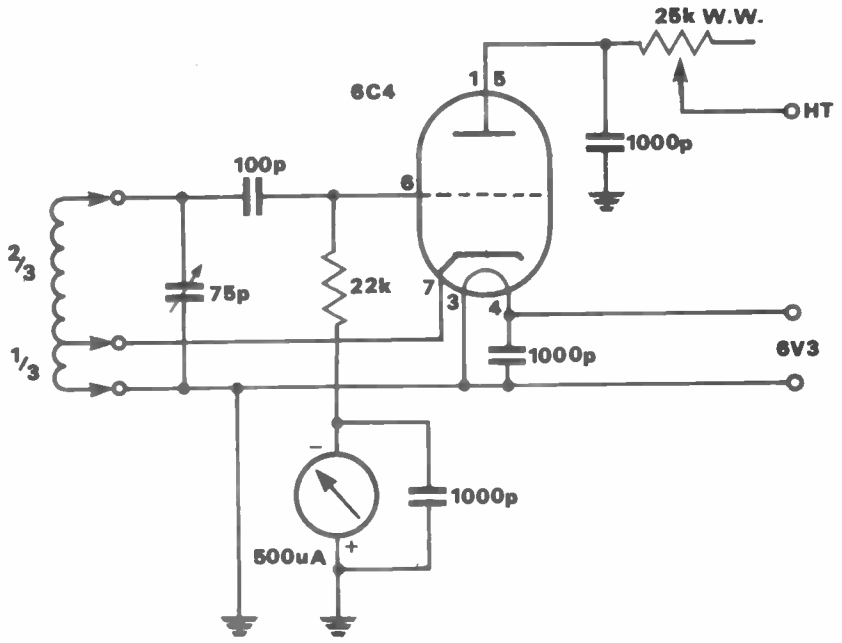
JOHN HEYS G3BDQ:

DIP OSCILLATORS AND THEIR MANY USES

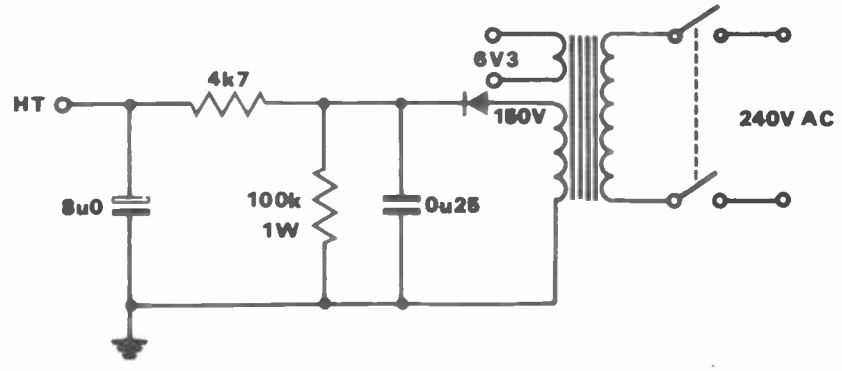
Dip oscillators, also known as grid dip oscillators (GDOs) or dip meters, are perhaps one of the most useful tools for *real* amateurs. The word real is maybe unkind, but it serves to distinguish between those who just purchase and operate 'black boxes' tacked on to ready-made antenna systems, and the rest of us who actually occasionally *do* make something, however humble or simple that item may be. Following hand tools, a soldering iron, and a multimeter, the dip oscillator comes next in the list of essentials for the chap who is or who aspires to be more than just a machine operator.

Dip oscillators (DOs) are still called GDOs by those of us who were weaned on valves before the mid-1960's and the term can still be used for a device using a FET as its oscillator: the word *gate* being substituted for *grid*. The dip oscillator seems to have been a post-war concept and circuits started to appear in the amateur journals around 1950. The writer was at one time a keen constructor of what were then 'state of the art' transmitters and receivers, many of which appeared in articles published between 1953 and 1967.

The simplest GDO using a 6C4 valve. This is the circuit of G3BDQ's original model together with its mains power pack. A similar power pack is suitable for most valve GDOs. The Hartley type oscillator needs 'three-terminal' coils



The GDO circuit



The power supply circuit

Trusty home-brew

A minimum of test gear and a kitchen table construction technique was used. Without his trusty home-brew GDO such work, which demanded a fairly accurate determination of the frequency of many tuned circuits to be built and aligned, would have been almost impossible. Even today this same GDO, which retains its original valve, often comes down from its shelf in the shack cupboard to help determine a resonant frequency, the inductance of a coil or perform one of the many other functions possible.

Many firms were formerly the makers of dip oscillators, but it is now becoming difficult to even discover advertisements for them. So far as is known there are now no valve versions advertised and a careful perusal of contemporary magazines has revealed only the Trio DM81 at £75 and the Altai Dip Meter priced at £49, as being currently available.

Both these instruments are solid-state designs and consequently suffer certain disadvantages. A personal experience, and also that of several of my friends and acquaintances, has shown that semi-conductor dip oscillators have an inherent weakness; they can be pulled out of oscillation when coupled to good high Q circuits. I never knew a valve GDO to have this fault.

Another problem associated with semi-conductor dip oscillators is the large variation in indicated current on their meters across each tuning range. Some even go out of oscillation at one end of the scale! This indicates that they are more sensitive to the changing Q of their own circuitry than valve oscillators.

Batteries

The modern solid-state types can of course be used with their internal batteries, whereas the older valved versions need a mains supply and a power pack which is heavy. The new battery powered jobs may be used easily out of doors for antenna adjustments etc, but I personally have rarely needed to use my GDO outside, and I wonder just how many battery operated DOs are left for long periods unused and suffer battery deterioration and even leakage?

Anyway, batteries are the most expensive kind of power supply and I prefer

mains operation whenever possible. A long mains lead (most folk have the drum-reeled extension cables for DIY etc) does not present much of a problem so long as sensible earthing precautions are taken. Some of the earlier valved GDOs only had twin mains leads with no provision for earthing, so take care.

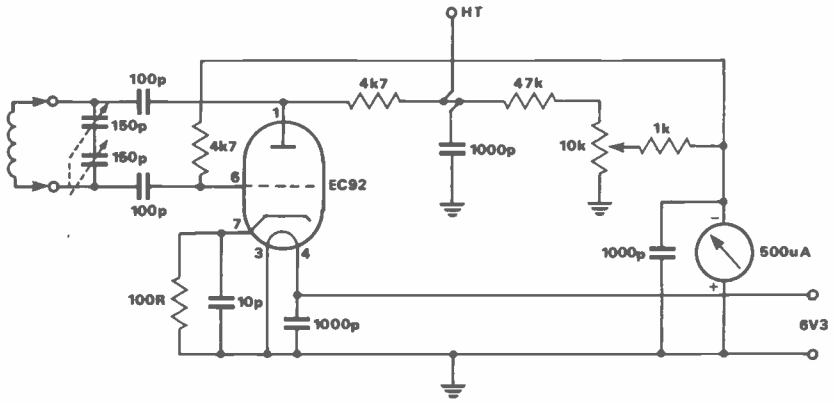
If the construction of a dip oscillator is being contemplated, I must recommend a valved version. Such an item will cost you nothing like the price being asked for factory built solid-state equipment, and it will be rugged and perform excellently!

Some 'roll-your-own' tips

I shall not give any detailed constructional advice to would be home-brewers, but instead offer a few sure-fire circuits culled from the past, together with one or two hints of advice which will hopefully illuminate or simplify things. A GDO is nothing more than a tunable oscillator which has a sensitive meter (usually around 500µA FSD) in its grid return circuit.

When oscillating there will be a healthy flow of negative grid current to earth through the meter, but if an external tuned circuit is coupled to the GDO oscillator coil, some of its RF energy will be sucked out to the external circuit and there will be a fall in the grid current. The tighter the coupling is, or the higher the Q or quality of the external circuit, the lower will be the grid current.

The GDO tuning capacitor has a calibrated dial and the frequency can be read off when the dip is observed. Unfortunately, external circuits *pull* the GDO oscillator considerably and this limits the accuracy of the dial markings. I always found it best to use my GDO in conjunction with a general coverage receiver which can pick up a strong signal (BFO on) from it, and so make it an easy matter to check the operating frequency even after *pulling*.

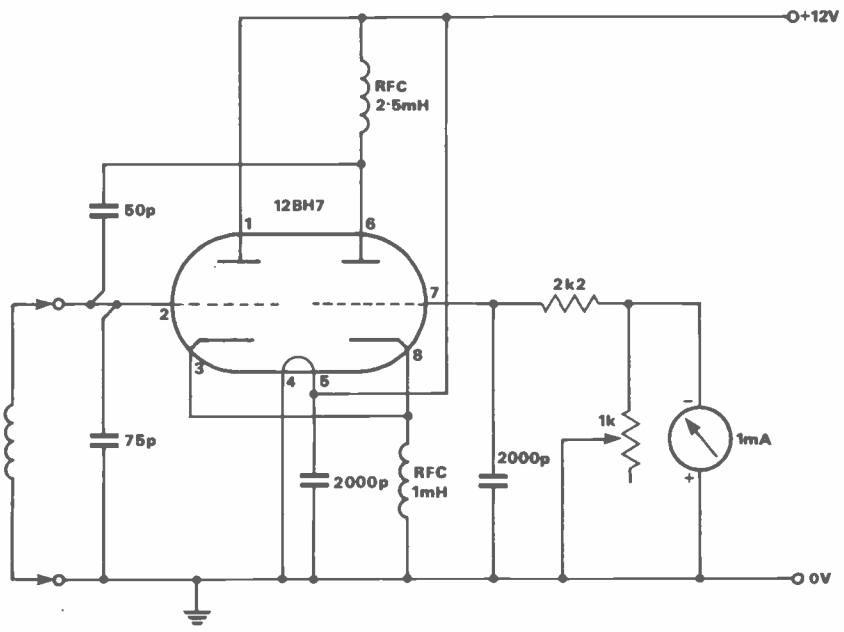


The basic RF circuit of the now obsolete Heathkit GDO model GD-1U. Its Colpitts circuit uses simple 'two-terminal' coils. A half section of a 12AT7 or ECC81 valve would be satisfactory in this circuit

Helpful technology

Modern technology has now come to our aid. Following the suggestion of a local amateur (G4FET), I put together an LCD digital frequency counter using the quite cheap RS frequency meter module and their 150MHz pre-scaler IC. These units have stock numbers 258-063 and 307-474 respectively. The finished unit is loosely coupled via a 5pF capacitor to the GDO tuned circuit (a pin on the coil socket) and it makes both the tuning dial and the external receiver redundant 'at a stroke'!

In ***Amateur Radio*** an advertisement can be found for the 'Time Step Electronics' LCD counters which are even cheaper. A ready built version which reads up to 4MHz is offered for under £15, and a kit to put together their DFC41 which will read to 32MHz is only £18.50. If valved versions of dip oscillators are used it is important to remember that they have quite a high RF output, and if tightly coupled to some transistor or IC circuitry they could cause damage. This is of course less likely with a solid-state DO which will run at quite low power levels.



Unusual GDO circuit which will work from just a 12 volt supply. The 12BH7 valve is still obtainable but is rather expensive. Some saving is acheived however by its use of a 1mA meter instead of the more sensitive µA meters needed for most circuits

Plug-in coils

Dip oscillators always use plug-in coils, for this makes it easier to couple them to external circuits. It is not always convenient to take the instrument really close to the circuit under test and I have found that a two turn link coil over the dip oscillator coil, connected to a length of thin coax (up to about 1 metre long), with a similar link coil at the far end will allow checks to be made on coils which would otherwise be inaccessible.

Making plug-in coils can be quite a challenge now that such items are no longer obtainable from component stockists. Some ingenuity is needed, and I have found that the 1¼in dia cylindrical camera film containers make good coil forms. By adapting the so called wander plugs and matching sockets, suitable connectors can be fabricated easily.

Some dip oscillator circuits use two-terminal coils and these are especially suitable for home constructors as they simplify the coils. VHF coils do not have a former but are in the form of a loop or hairpin made from thick wire or copper strip.

My first GDO tuned up to about 150MHz, and in 1951 it was quite a challenge to calibrate it. There were no locals with receivers covering the range

30 to 150MHz, and in the end I had to resort to first principles and build some Lecher Lines along a long wooden plank with a metric rule to measure the dip points as the shorting bar was moved along.

Without this early GDO I could not have made the many tuned circuits needed for my first 144MHz receiver and transmitter. Both used several multiplier stages from HF crystal oscillators which tuned to frequencies not available on the station receiver.

By the way, you can calibrate your MF coils by using an ordinary broadcast receiver tuned to known frequencies. This goes for IF frequencies too, for a little RF from the dip oscillator will get into the IF stages of most receivers.

No originality is claimed for the several circuits shown. They are derived from many sources and they all use valves. The valve types are obtainable quite cheaply from several advertisers (see Messrs P M Components Ltd) in ***Amateur Radio*** and elsewhere. The EC92 as used by Heathkit in their famous model GD-1U costs £1.25, and the little 6C4 triode is even cheaper. Valves are rugged and reliable and should last for many years in a dip oscillator which has only intermittent usage.

One may still discover suitable small power transformers to provide the valve heater supply (6 volts) and some HT. Not more than 100 volts HT is required and most circuits will perform perfectly on as little as 30 or 40 volts. The smoothing need not be elaborate either; just a simple RC filter is enough.

Dip oscillator uses

The first and perhaps the most important facility offered by a dip oscillator is as a means to measure the resonant frequency of external tuned circuits, either inductively or capacitively. Usually the circuit under test is arranged to be positioned with its coil in the same plane as the DO plug-in coil. The coupling at first can be quite tight to find the dip initially; then for a more accurate determination of frequency the coupling is reduced. This shallows the dip, and simultaneously the frequency can be checked on the station receiver.

A general coverage receiver is an asset if the circuit lies outside the amateur bands! Of course, even better and easier is to use a frequency counter as explained earlier. For capacitive coupling the external coil is positioned at right angles to the dip oscillator coil and brought up very close to it. The dip will not be anything like so pronounced using this technique and I am not too keen on it.

If the coil is hidden away at an odd angle it may be the only way to couple your DO. My preference, however, is to use a form of link coupling as outlined previously.

The output from a dip oscillator can also be used as a signal generator, and here the hum from its not too well smoothed HT supply will modulate the carrier produced and make its identification easy. In this way an IF strip may be quickly aligned without closely coupling the DO to the equipment.

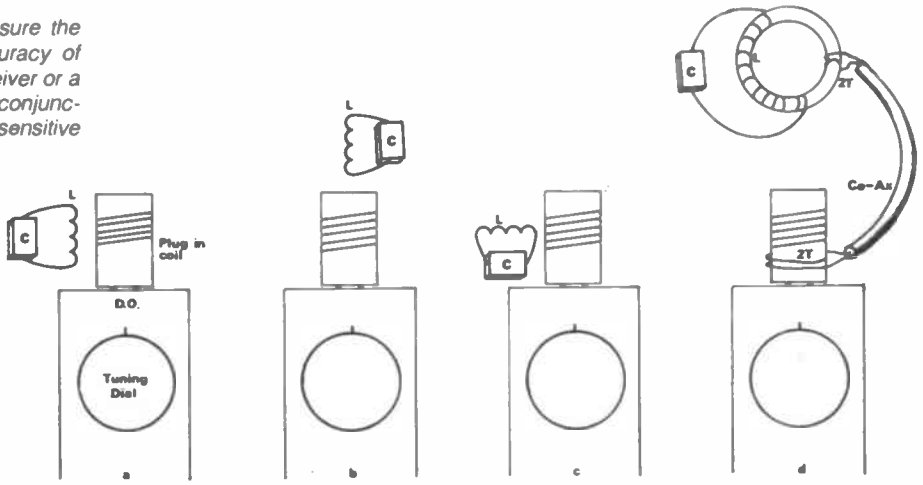
We now take it for granted that a modern quartz crystal is going to be good and will oscillate when wired into a suitable circuit. Some of the vintage *surplus* crystals are not always so reliable and a dip oscillator may be pressed into service to check such crystals for activity before their use is contemplated.

If a four turn coil is coupled to the DO, and its ends go to the crystal under test, a pronounced *dip* takes place when the crystal frequency matches that of the DO. The deeper the dip the more active is the crystal, and it will often take over the dip oscillator circuit over quite a range of its tuning. This is the old 'Goyder Lock' principle where the circuit with the highest Q (the crystal) takes over from its inferior competitor.

Handbooks

Most amateur radio handbooks (certainly the ARRL and the RSGB) include some graphs which plot frequency,

How a Dip Oscillator is used to measure the frequency of tuned circuits. For accuracy of measurement a general coverage receiver or a frequency counter should be used in conjunction with the 'DO'. Method 'c' is the least sensitive and will give a much shallower dip



inductance and capacitance in parallel tuned circuits. With this information, together with a dip oscillator, there is an easy way to measure the capacitance or inductance of unmarked components.

If an unknown inductance is put in parallel with say a 100pF silvered mica capacitor, the resonant frequency can be found using the DO, and a look at the chart will show the value of the inductance. Similarly, by using a known inductor and an unknown capacitor, the value of the capacitor may be found. There is no need to delve into mathematical formulae when the graphs are available. As the Yanks say, 'it's no sweat'!

Circuit Q

The quality or Q of tuned circuits may be measured with little trouble. A high impedance RF voltmeter (once known as a valve voltmeter!) is connected across the tuned circuit being examined, and this circuit is then loosely coupled to the dip oscillator, which is set to the frequency by looking for the dip. The DO is coupled so that a set reading of say 100 is on the RF voltmeter and the exact frequency is checked using a receiver or counter.

Without changing the coupling in any way, detune the DO up in frequency until the reading on the voltmeter reads about 70, at the same time noting this new frequency. Do the same thing with the DO tuned lower in frequency than that of the circuit being tested for another 70% voltage reading. Subtract the lower offset frequency from the higher offset frequency and divide the centre frequency by the difference. The result of this simple calculation will be the Q of the tuned circuit under test.

Although dip oscillators are often suggested as useful for making resonance measurements on antennae, the writer has never found such measurements to be easy. It is not possible to do anything at the shack end of a feed line and one must actually get out to the aerial!

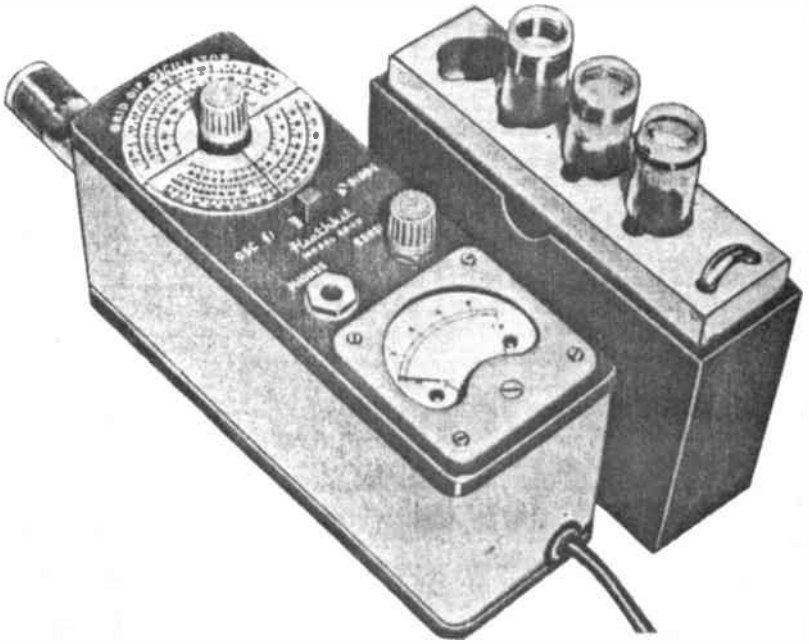
A capacitance coupling to the dip oscillator can be made from one end of your antenna (half wave) but this might involve a hazardous climb and will certainly not be an accurate measurement of resonant frequency, for actually taking the reading detunes the wire being tested! It is better to check at the centre of a dipole, driven element or parasitic element where there is the point of maximum current and where the impedance is low. The coupling will then have negligible effect upon the resonance.

No feeders should be attached and both halves of the element must be joined with a small single wire loop. This then couples to the dip oscillator and a frequency measurement may be made. The problems engendered in performing this are great. You must somehow reach the dipole centre so a climb is involved. You must also have a really accurate read-out from your dip oscillator (say plus or minus 50KHz), so a good receiver or a frequency counter must be outdoors with you.

For unbroken reflector or director elements a Delta match to a short length (inches only) of twin feeder coupled to the DO is a possibility, but has not been attempted by the writer.

Similarly, a vertical ¼ wave antenna may be checked for resonance. This time the small coupling loop is between the lower end of the radiator and the earth or radial connection point. A lot of what I must call 'cod's wallop' has been written about cutting antennae to exact resonance. Good dipoles should be relatively low Q devices with broad band characteristics, and when cut to length by the accepted formulae will work perfectly well. A few inches one way or the other, even on 28MHz, will have no effect upon the performance.

The sharp frequency conscious antennae often in use have high Q and are best avoided like the plague. Such antennae will give you enormous dips on the DO but as antennae they are lossy and have high SWRs when operated only tens of



The Heathkit GDO model GD-1U with plug-in coils

KHz from their resonant frequency. This type of antenna often has a loading coil or coils and/or a capacity hat loading arrangement.

Long wires do not need checking with dip oscillators. Their lengths are in no way critical, and indeed almost any length may be used and matched to the rig with an ATU (AMU?). Only an idiot or complete novice would want to trim a long wire to be exactly resonant for it would then have, at its shack end, either an extremely high or very low impedance, which would be nigh on impossible to match with any type of ATU!

Further uses for dip oscillators

Most of the commercially available dip oscillators have a switch which changes the circuit to make it an absorption wavemeter. When then coupled to a circuit which has RF power on board, the DO is tuned for maximum on the meter and the scale reading noted. This type of instrument, by the way, is a *compulsory* item for licensed amateurs in this country. In addition, an earphone socket is also provided which allows the monitoring of an amplitude modulated signal. These days, this is of little use!

Transmitter RF amplifier stages often have to be neutralised and this can be a tricky procedure. Using a dip oscillator coupled to the input (grid) circuit of a valve amplifier (all power OFF) and tuned to the same frequency, a deep dip will be found. If then the anode tuning capacitor is adjusted to resonance, an un-neutralised condition will make the indicated dip flicker.

The neutralisation control, normally a small capacitor, should be carefully adjusted to a point that allows the anode circuit to be tuned without any change in the grid circuit dip. When this is achieved the stage is properly neutralised. Always do this for the highest frequency band covered by the amplifier.

Unwanted resonances in RF chokes or circuit wiring may be discovered with a dip oscillator. Such resonances can cause parasitic oscillations or even burnt out chokes.

Toroidally wound coils are being increasingly used these days, and their enclosed fields mean that coupling them to a DO must be done with a small one-or two-turn link coil around the toroid core. Holding the DO plug-in coil near a toroid will not give the coupling necessary to give a dip.

Conclusion

For those unwilling to embark upon the construction of a DO, there is the Trio DM81. This is a solid-state instrument which tunes from 700KHz to 250MHz by using seven plug-in coils. It uses internal batteries, has a miniature earphone and a probe for use with capacitive coupling to tuned circuits. It weighs just 690g. The DM81 will perform all the functions outlined in this article and is one of the few types available in this country.

CW?

My old valve GDO with its 6C4 valve proved very useful one Sunday morning some 25 years ago. My AM Top Band TX was not working and I was unable to join the local net. I had some information for the late G2AON over in Eastbourne some 25 miles away, and in desperation decided to attempt a QSO using my GDO as a CW Tx!

How to key it was a problem, but it was solved by putting my key in series with the low impedance output lead from the ATU which was then link coupled to the GDO coil. A quick tune to the net frequency, a call to 'Will' in Eastbourne, when one of the more distant amateurs was transmitting, brought back an immediate response.

I was able to send the information satisfactorily and received a 569c report. The use of dip oscillators as emergency transmitters cannot be recommended, but this story illustrates the versatility of the breed. I find it difficult to envisage my own station without a dip oscillator, and I am sure that many others will discover that such a device is one of the most useful and important shack accessories. Good dipping!

REGULATORS

LM317T Plastic T0220 variable £1.00
LM317 Metal £2.20
7812 Metal 12v 1A £1.00
7805/12/15/24 plastic 50p
7905/12/15/24 plastic 50p
CA3085 T099 Variable regulator £1.00
LM723 14 dil 50p

EPROMS/MEMORIES

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2764 INTEL/FUJITSU 300ns £6.50, 250nS £7.00
2716 EX EQUIPMENT £2.00 ..... 10/£17.00
2732A-4 NEW £3.50 EX EQPT £2.50
2114 EX EQPT 80p 4116 EX EQPT 60p
4164-150nS £4 MC6810P £1.00

POWER TRANSISTORS

TIP141, 142, 147 £1 ea, TIP112, 125, 42B ..... 2/£1.00
TIP35B £1.30 TIP35C £1.50
SE9302 100V 10A DARL SIM TIP121 ..... 2/£1.00
2N3055 Motorola 50p ..... 5/£2.00
2N3055 Ex eqpt tested ..... 4/£1.00
MJE3055, MJE2955 equiv ..... ea 50p
2N5302 NPN 30A 60V SIM 2N3771 ..... 80p

DISPLAYS

Futaba 4 digit clock, fluorescent display FLT-02-8 also 5-LT 16 ..... £1.50
Futaba 8 digit calculator, fluorescent display 9CT-01-3L £1.50
LCD Clock display 0.7" digits £3.00
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STAINLESS STEEL HINGES 14.5" BY 1" OPEN £1.00 each ..... 10/£7.00

QUARTZ HALOGEN LAMPS

A1/216 24v 150w £2.25
H1 12v 55w (car spot) £1.25

WOUND POT CORES

With adjuster unused
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Stereo cass R/P head £2.50
Mono head £1, Erase head 50p
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TO220 Micas + bushes 10/50p ..... 100/£2.00
TO3 Micas + bushes 10/50p
RELAYS 240v AC coil PCB mounting 2 pole changeover £1 3 pole c/o £1.00
Varley 24v dc 4p c/o relay 80p
Fig. 8 mains cassette leads ..... 3/£1.00
KYNAR wire wrapping wire 2oz reel £1.00
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IEC CHASSIS PLUG/RFI FILTER 10A £3.50
Epoxy potting compound 500g £2.00
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Min. rotary sw. 4p c/o 1/8" shaft ..... 2/£1.00
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STICK-ON CABINET FEET ..... 20/£1.00
T03 TRANSISTOR COVERS ..... 10/£1.00
TRANSISTOR MOUNTING PADS T05/T018 £3/1K DIL
REED RELAY 2 POLE N/O CONTACTS £1.00

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12FR400 12A 400v small stud ..... 4/£1.50
BY127 1200V 1.2A ..... 10/£1.00
BY254 800v 3A ..... 8/£1.00
BY255 1300v 3A ..... 6/£1.00
1A 800v bridge rectifier ..... 4/£1.00
6A 100v bridge 50p
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PETER DODSON:

TEST CIRCUITS FOR THE AMATEUR

Unlike the motor car accessory market, which unloads a high percentage of goods of doubtful value on a largely naive and trusting clientele, by far the greater proportion of 'extras' sold by amateur radio dealers is *bona fide* merchandise, purchased by customers who know what's what; you don't see a lot of *'go faster'* stripes on Yaesu rigs! But having said that, there are still enough amateurs with a practical bent who can both fulfil their creative desires by building their own test gear – and save a few bob.

Basically, the test gear described below can be divided into two sections – that which is mandatory, and that which is for the convenience, if not the assistance, of the individual amateur. The circuits have been reproduced courtesy of the RSGB from whose publications they have been blatantly filched.

Of the 'mandatory' equipment, there are two circuits, one for a simple absorption meter, to check that harmonic radiation is not being transmitted outside amateur bands in general, and the other is a band-edge marker, to ensure that even the primary transmission is not going out beyond its particular amateur band.

It is within the terms of their licence that radio amateurs must not only know about such equipment, but also that they should know how to use it.

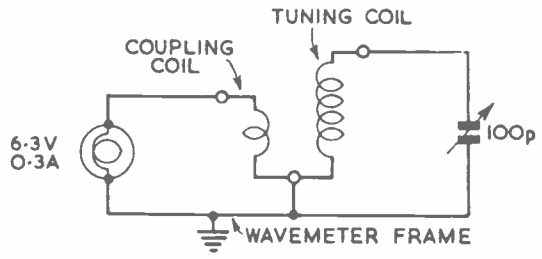
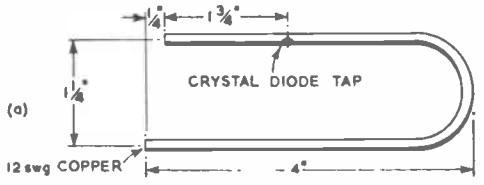


Fig 1 *Circuit for simple absorption meter (Courtesy RSGB)*

Range	Tuning Coil	Coupling Coil	Wire
1·5—4 Mc/s	80 turns	6 turns	32 s.w.g. enam.
4—12 Mc/s	29 turns	3 turns	22 s.w.g. enam.
12—30 Mc/s	6½ turns	2½ turns	22 s.w.g. enam.

Details of the inductance loop made of 12swg copper wire. The dimensions are important. Calibration relative to base. (anticlockwise):
230MHz-20°: 220MHz- 8°
200MHz-16°: 180MHz-20°
160MHz-25°: 140MHz-35°
120MHz-50°: 100MHz-73°
90MHz-90°: 80MHz-118°
70MHz-152°: 65MHz-180°



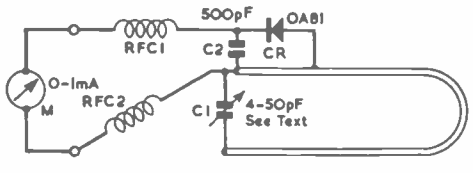


Fig 2 *The circuit diagram for a VHF wavemeter. RFC1 and RFC2 are wax dipped ½watt resistors of 1Kohm wound with 80 turns of 40swg wire (Courtesy RSGB)*

The absorption wavemeter featured here requires more engineering skill than electronic technology in its construction. It comprises simply a 20swg tin-plate box, 54 x 54 x 82mm, fronted by a 64 x 89mm panel which contains a coupling coil, a tuning coil and a variable tuning capacitor *(Figure 1)*.

Construction

The wavemeter frame is connected to one side of the tuning and coupling coil and the tuning capacitor, and a resonation indicator, in the form of a bulb, is fitted on flexible copper wire so that it can emerge above the box through a hole, to be clearly visible to the operator. Although a value of 6.3V 0.3A is quoted, it is possible to use a bulb of lower amperage to give higher sensitivity; on the other hand, using the value as shown ensures a reasonable tolerance against overload with adequate illumination at the resonance point.

The front panel-mounted tuning capacitor suspends an octal valve socket immediately behind it on two tapped aluminium pillars: into this valve socket can be plugged a choice of tuning coils. Coil formers can be made from octal valve bases, fitted into bakelized paper tubes of suitable size, and the entire unit cemented together on completion: the windings are as in the table.

Calibration of the unit is by way of an oscillator or a calibrated receiver. The latter method is achieved by tuning the receiver to the lower frequency end of the band to be calibrated. With a coupling coil of sufficient diameter to pass over the wavemeter tuning coil, connected in series with the aerial, the S-meter on the receiver should be watched carefully, whilst simultaneously tuning the wavemeter.

At one point it will be seen that the needle of the S-meter will drop out completely, indicating a total absorption of signal frequency energy. This point can then be marked on the wavemeter dial and the receiver tuned to the next signal up the band – a process to be repeated all the way up the band.

This device is adequate to cope with power outputs of half a watt or more. For anything lower – such as the local oscillator circuit of a receiver – a meter inserted in the grid-leak earth-return will dip as the wavemeter passes through the resonance point. Conversely, a milliameter inserted in the anode circuit of the LO valve will give an *increased* reading as the wavemeter is tuned. A VHF version is shown in *Figure 2*.

The second piece of equipment that is a *must* when it comes to mandatory gear, is a band-edge marker to ensure that the amateur stays within his legal frequency limits. A somewhat unusual IC crystal calibrator appeared on the scene in 1973, courtesy of Paul Franson, and made a change from the use of decade IC dividers and associated digital-type integrated circuits.

This one, believe it or not, originated in electronic organs, being capable of using high-value resistors of up to 20Kohms! This resulted in a very low power consumption of 14mA and an extremely long active life to a 9 volt battery. As can be seen from *Figure 3*, the 2 : 1 divider units need no external component when used simply as a crystal calibrator: the sine wave RF signal is simply put in at one end and an abundance of square waves at half frequency come out.

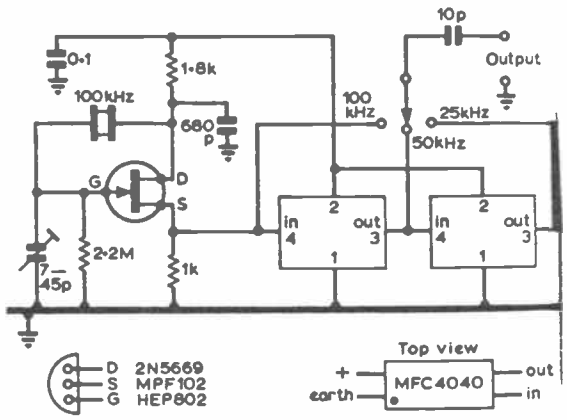


Fig 3 *Band-edge marker (Courtesy RSGB)*

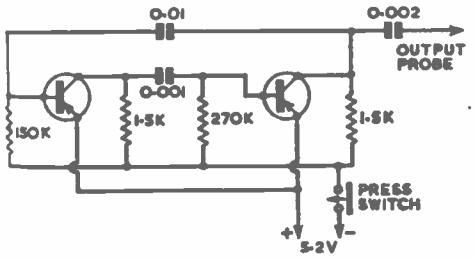


Fig 4 *Simple signal injector (Courtesy RSGB)*

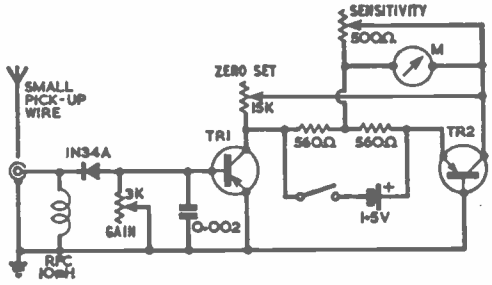


Fig 5 *High gain field-strength meter (Courtesy RSGB)*

Optional extras

So much for the *must have* variety of equipment, and on to the *would like* sort that can prove invaluable in fault-finding exercises. Most necessary of all, of course, is an AVO; that timeless piece of gear that nobody can remember coming onto the market. If you're lucky, you might pick up a secondhand one for about £30, but by and large, radio amateurs tend to hang on to their AVOs: if not as a back-up to their more sophisticated LED counterparts, out of sheer sentiment. There are other cheaper versions, but the principle is to have a device that will measure all three electrical components of volts, amps and ohms.

Having said that, there is not a lot of point in having a meter that measures units of electrical energy if there isn't any energy to measure, and a signal injector is a very useful tool, and an extension of that age-old ploy of placing a finger on the grid and listening to the resultant hum. In a word, employing a signal injector system is a bit like using a ferret, in that you shove it down a hole to see if it emerges, where it emerges, and for that matter, in what form it emerges!

Used extensively by maintenance engineers for fault-finding on all manner of electronic equipment from television sets to computers, these multivibrator-type generators can also be used in the construction of radio gear as a stage-by-stage check that everything is going according to plan. However, one advantage over the 'finger-on-grid' method is that a signal generator has the capacity to extend well into the realms of RF – far and beyond the detector stage of a receiver.

The size and shape of such a device is largely down to the ingenuity of the individual, as it is a piece of equipment that must, of necessity, be manoeuverable enough to be used in the most inaccessible of places. It is possible to make one from the jacket of a pen, using the ball-point as a probe. The version shown in *Figure 4* uses small mercury cells to power the transistors, being type 2N1265/5, or equivalent.

An American idea that has been taken up quite widely by many amateurs is for a high gain field-strength meter. It originates from a design put forward by WA4DXP and comprises an untuned unit, the sensitivity of which is achieved by using a transistor amplifier powered by a 1.5 volt cell. This is an alternative to what was formerly the accepted method of taking such measurements – with the use of a tuned circuit and plug-in (or switched) coils.

Originally constructed with a 500μA FSD meter, there is no reason why the unit should not be equally effective using a 1mA meter. It is suggested, however, that high-impedance headphones should be used in place of the meter if the equipment is to be used as an AM monitor (*Figure 5*)

This topic conveniently leads on to measurement of another kind, that of VSWR or, to give it the full title, 'voltage standing wave ratio': in a word, a final check of just how much energy is actually being transmitted. To a small extent, the popularity of SWR meters is down to CB enthusiasts: as, due to a lack of an alternative means of 'tweaking' their signals (or, for that matter, a lack of know-how), they were left with no option but to prune bits off their 'twigs' to attain peak transmission power.

Real purpose

For the benefit of newcomers to the realms of amateur radio, an SWR meter is used to balance the transmitted energy against the induced reflected wave; ideally a ratio of 1:1 should be (but never is) attained.

Commercial versions are readily available from around £7 upwards, the operation of which is to switch first to radiated power, adjust the meter needle to maximum deviation, then switch to reflected power and see what is going out.

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BLY49	25p
BPW41	25p
BRC116	25p
BRX43	15p
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BSS68	10p
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BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	25p
BC171	10p
BC172	10p
BC173	10p
BC174	10p
BC183	10p
BC184	10p
BC204	10p
BC207	10p
BC212	10p
BC213	10p
BC214	10p
BC237	10p
BC238	0p
BC239	10p
BC250	0p
BC251	10p
BC252	10p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
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MM5387	£1.00
MM5611	£1.00
MM5840	75p
N64100	£1.00
NE545B (Dolby)	75p
NE555P	60p
NE555	60p
IL-1	20p
OPT600	20p
OPT601	20p
SAA611	50p
SAA661	£1.75
SAA1020	£4.00
SAA1021	£4.00
SAA1024	£2.50
SAA1025	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1124	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£3.00
SAA1250	£3.00
SAA1251	£4.00

Filters

5-5MHz	15p
6MHz	30p
BFU455K	5p

Thyristors

TD3F800	£1.50
BT106 Plastic	30p
BT106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
G11 Thyristor	60p
Decca 80-100	60p
2N4444	£1.00

Thermistors

VA1104	50p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34 Degausing Thermistor (fits most sets)	20p
GEC Double Thermistor	75p
G8 Degausing	35p

SAA1272	£3.00
SAA1276	£3.00
SAA5000	£1.50
SAA5000A	£1.50
SAA5012A	£5.00
SAA5020	£3.50
SAA5030	£5.00
SAA5040	£3.50
SAA5040A	£4.40
SAA5050	£3.50
SAF1032p	£2.50
SAF1039	£2.00
SAS560	£2.00
SAS660	£1.00
SAS670	£1.00
SL901B	£5.00
SL918	£6.20
TA7122	£1.15
TAA320A	50p
TAA470	£1.50
TAA570	75p
TAA611B	£2.00
TAA621	£2.00
TAA661B	£1.00
TAA641	£1.50
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7607AP	40p
TA7609P	50p
TBA120A	40p
TBA120AS	50p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1441	£1.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA550Q	£1.75
TBA560CQ	£2.00
TBA570	£1.50
TBA625	50p
TBA641	£2.00
TBA651	£2.00
TBA673	£1.00
TBA720A	£1.50
TBA730	£1.50
TBA750Q	£1.50
TBA760	£1.50
TBA780	£1.50
TBA800	50p
TBA810AS	40p
TBA810S	60p
TBA820	60p
TBA830	£1.50
TBA890	£1.00
TBA900	£1.50
TBA920	£1.50
TBA920Q	£1.50
TBA950	£1.50
TBA990Q	£1.00
TMS1000NL	£4.00
TMS1943 (clockchip)	£1.00
TMS9980	£4.00
TMS9901	£1.00
TMS2716JL	£1.00
TMS3529	£1.00
TMS4014	70p
TX-012	£1.00
TMS9902	£1.20
ULN2216	75p
SN29848	50p
SN29770BN	£1.00
SN29771BN	£1.00
SN29772BN	£1.00
SN7402N	£1.00
SN7472N	£1.00
SN74107	£1.00
SN74167	70p
SN7472N	20p
SN75108AN	£1.00
SN76001	£1.00
SN76003	£1.00
SN76013ND	£1.50
SN76018	£1.00
SN76008	£1.00

BLY49	50p
I.C. Heat Sink	20 for £1.00
20xTO5 Heat Sink	£1.00
CVC 9 power supply board	£1.50
CVC 20/2 mains panel	£2.00
ITT Mains Filter .1/250v/CVC 20 to 45 chassis	50p
Pots 10 k with Switch	25p
Pots 47 k with Switch	25p
Mullard Surface Wave Filter RW 153P Colour TV Filter	40p
Mullard Surface Wave Filter RW 154 Colour TV Filter	40p
G11 Line Scan P.C.B.	£1.00
G11 Power Supply P.C.B.	£2.00

SN76023N	£1.50
SN76033	£1.50
SN76110N	£1.00
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	60p
SN76228N	£1.00
SN76270	£1.00
SN76532N	50p
SN76544N	£2.00
SN76545	£3.50
SN76546	£1.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76650	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1.00
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
UA783P3C	40p
BT100A/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA640	£1.00
TCA660	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£2.00
TCA830	£1.00
TCEP100	£2.25
TCE120CQ	£1.00
TDA440Q	£1.00
TDA1003A	£1.00
TDA1010	£1.00
TDA1060A	£1.50
TDA1072	£1.00
TDA1151	30p
TDA1170	£1.00
TDA1190	£1.00
TDA1327A	£1.00
TDA1412	50p
TDA2003	80p
TDA2004	£2.00
TDA2010	£1.00
TDA2140	£3.50
TDA2030	£2.00
TDA2525	£1.00
TDA2640	£2.00
TDA2522	£1.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2571AQ	£2.50
TDA2575A	£1.00
TDA2581	£2.50
TDA2590	£1.00
TDA2593	£1.00
TDA2560	50p
TDA2600	£5.00
TDA2611	£1.00
TDA2653	£1.00
TDA2002	£1.00
TDA2640	£2.00
TDA2680	£1.00
TDA2690	£1.00
TDA2593	£1.00
TDA3190	£1.00
TDA3560	£4.00
TDA3571Q	£1.50
TDA9403	£3.00
TDA3651AQ	£3.00
SN74LS 125AN	30p
SN74LS 248	50p
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
RGP30G	10p
MPSA14	10p
MPSA43	10p
MJ13005	30p
MJE51T	25p
MJE340	20p
MJE660	25p
MJE661	25p
MJE3055	£1.00

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4MHz
4.433-619
6MHz
8.867238

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Senikron Diode SKE2G2/04	30p

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A1223	15p
AC106	15p
AC121	15p
AC124	15p
AC128	15p
AC137	15p
AC151	15p
AC131	15p
AC138	15p
AC152	15p
AC153K	15p
AC142K	15p
AC169	15p
AC176	15p
AC176K	15p
AC178K	15p
AC179	15p
AC186	15p
AC187K	15p
AC188	15p
AC188K	15p
ACY21	25p
AD143	50p
AD149	50p
AD161/162	pair 40p
AF139	25p
AF181	£1.00
AF239	25p
AF367	25p
AL102	£1.75
BC161	30p
BD507	50p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p
BD646	50p
BD676A	30p
BD678	50p
BD681	25p
BD807	20p
BD826	50p
BD948	30p
BDX75	20p
BDX32	£1.25
BF115	20p
BF121	20p
BF127	20p
BF137	20p
BF157	20p
BF160	20p
BF161	20p
BF164	60p
BF179	30p
BF180	20p
BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	16p
BF244	40p
BF245b	20p
BF256	10p
BF257	20p
BF258	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF337	50p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF594	10p
BF597	10p
BF671	30p

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DIL – DIL		DIL – QIL	
40 Pin x 4	£1.00	16 Pin x 10	£1.00
42 Pin x 5	£1.00	18 Pin x 10	£1.00
28 Pin x 5	80p	28 Pin x 4	£1.00
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24 Pin x 5	75p	16 Pin G11	each 10p
14 Pin x 10	70p		
18 Pin x 10	80p		

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MS11-LB Unibus 128 kb Ram	£450.00
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Telephone 01-679 4414 Telex 27924

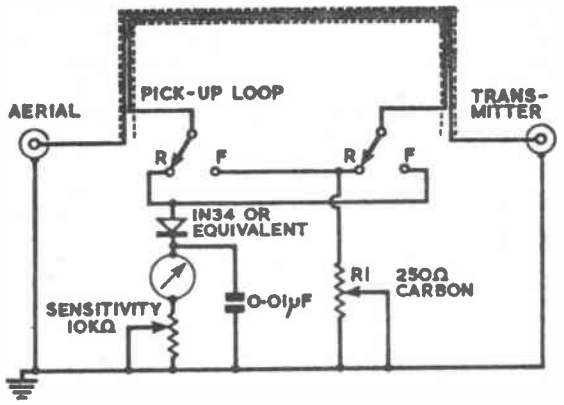

Fig 6 *'Mickey Match' SWR meter (Courtesy RSGB)*

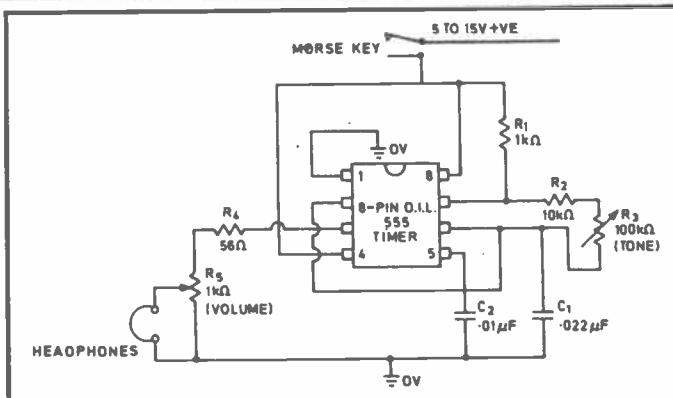

Fig 7 *A simple morse-practice oscillator (diagram courtesy of Ray Marston & Newnes Technical Books)*

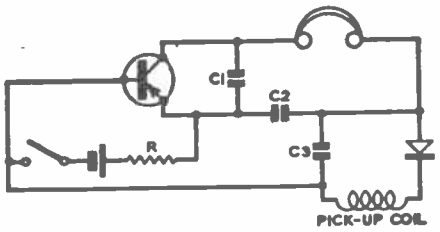

Fig 8 *CW monitor (Courtesy RSGB)*

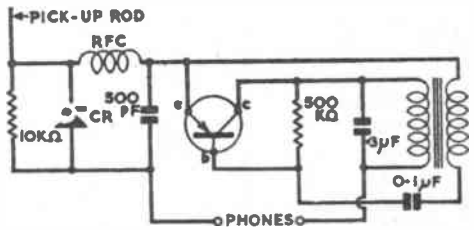

Fig 9 *'Der mini-monitor' CW monitor (Courtesy RSGB)*

For the creative amateur, another American, K6QHZ, produced a DIY version which might not be as compact or convenient as its commercial equivalent, but which has been tested on this side of the pond by G6RC. Originally christened the Mickey Match, the modified version called the Minimatch (see *Figure 6*), employed a 16 inch line section of standard co-ax cable, adapted for this particular purpose by running an insulated pick-up wire under the braiding by 'bunching' it.

This, it must be said, is a time consuming performance, but with a little patience and a lot of profanity, it can be achieved. The only problem, as far as G6RC was concerned, was in preventing the co-ax braiding from scratching the enamel insulating coating on the running wire, which would result in a short. Low-value carbon variable resistors might be a bit hard to find, but almost any cross-arm meter with an FSD of 60A should suffice.

CW oscillators

With the advent of a growing interest in the use of CW, oscillators for morse-practice and CW monitors for listening to outgoing transmissions are finding favour in the 'ancillary' departments of many amateur radio enthusiasts. Time was (and I certainly don't remember it!) when the early railway signallers used key-clicks (or sounders) as the only available audible means of reception: even First World War communications were conducted in similar fashion.

It might be of interest, incidentally, to know that Mr Morse might have been responsible for one form of telegraphic code, but not for the code in its present form. The revised version takes into consideration the fact that some letters are used more frequently than others, and were therefore allocated fewer dots and dashes.

Having imparted that relatively useless piece of historic unimportance, the fact remains that few, if any, radio amateurs can read key-clicks. They require an ICW to hear not only what they are sending, but also the quality with which they are sending it! Furthermore, the appearance of 'bug' keys and their electronic derivatives made the monitoring of outgoing signals imperative.

Machine-gun morse

Although the more recent electronic versions of the bug key regulate the duration-time of 'dashes' to match the speed of the 'dots', many users of original 'spring-type' bug keys fall into the inevitable trap. In an attempt to con fellow amateurs (and possibly themselves!) into believing that they are bug-key wizards, they screw the 'dot'-rate up to a far too high level, with the result that their morse-sending resembles a volley of machine-gun fire interspersed with elongated 'dahs' – presumably during reloading!

A Morse practice oscillator, therefore (along with an independent quality assessor) is definitely a 'must' before projecting yourself on an unsuspecting audience, most of whom would be too well-mannered to say 'QSD', but who will merely turn the dial to find somebody they *can* read! The simplest method of constructing a practice oscillator is shown in *Figure 7* – a device which requires the minimum of components, making use of the ubiquitous 555 IC and which provides separate tone and volume controls.

But having achieved the necessary competence on the practice gear, a monitor is still necessary for live operations. Such a unit is shown in *Figure 8* – a useful circuit which has 'done the rounds' of radio magazines and thus proved itself. It is, in fact, a dual-purpose machine which will not only provide a sidetone for CW monitoring, but will also check on the transmitter function. Dubbed the 'Der Mini-Monitor' by WB2AAI, the transistor forms an AF oscillator with its frequency determined by C1, C2 and the high impedance headphones.

Whilst it is possible to use the device entirely by rectified RF pick-up, the degree of coupling to the transmitter aerial tuning unit can be reduced by the use of the assisting battery. An alternative, shown in *Figure 9* allows the amateur a certain licence in that virtually any transistor can be used. You *must* make sure that the crystal diode does not create harmonics: a problem easily rectified by the absorption wavemeter you've just made from *Figure 1*.

Assortment

So that is it – an assortment of test circuits which may give pleasure in the construction, and assistance in the operation of radio gear. There are many, many other devices of a similarly helpful nature.

One thing about amateur radio enthusiasts is that they are willing, and even eager, to share their individual discoveries with their fellow amateurs. Whether or not this generous (not to say unselfish) attitude is prompted by a desire to further the development of radio techniques, or just to show off, I wouldn't know; maybe it is a little bit of both, but, either way, we all win!

News from Glen Ross G8MWR

The new schedule

The new schedule comes into effect on 10th November this year and contains some points of specific interest to the metrewave operator. Let us take the bands individually, starting with 50MHz. There is nothing allocated generally at this frequency, although 50 special permits have been issued and another 60 are being negotiated. The long term future for amateurs on this band seem to be fairly bright with a strong possibility of an allocation at 50 to 52MHz.

The RSGB are at present negotiating on the basis of the band being available to both class A and B operators, although whether this will come to fruition is anyone's guess at the moment. The band is at present only available outside normal TV hours, but apart from that the facilities available to those who do have a permit are broadly the same as on the other bands.

On 70MHz the position is unchanged and of course the band is only available to class A operators. There is no prospect of any change to this arrangement, because the band is not recognised internationally and is issued to UK amateurs via one of the 'Footnotes' in the rulebook.

The primary user of the band is the Ministry of Defence and there is a clause in the schedule which states that 'the use of any frequency shall cease on the demand of a Government official'.

The band of interest to most class B and many class A operators is two metres, and here the situation is the same as before in respect of frequencies and power. We are, however, the prime user of this band both in our normal and amateur satellite service. The satellite service is given separate recognition in the schedule and so counts as a service in its own right.

The permitted modes are Morse, telephony in its various guises, RTTY, data, FAX and slow scan TV. The maximum power permitted is 26dBW, measured at the aerial.

As an aside, the Americans have an allocation at 220MHz which is not available to us. However, due to this band having very little use, it now looks as though it will be withdrawn and handed over to the mobile service.

This is surely a good demonstration of the 'use or lose' syndrome which could happen here, and nearly did happen in Belgium a year or so ago with respect to the next band on our list.

Seventy centimetres provides a lot of problems for us. Firstly the amateur service has secondary status on this band, the primary users being the Ministry of Defence and various radiolocation services, the most notorious being the 'Syledis' system. This effectively pushes the amateur down into the third layer of precedence on this band.

Most of the national societies in Region 1 feel that this is not the right place for this type of location service, and pressure is being brought to bear on the national governments of the countries using them to attempt to get them moved.

Inefficient

It has also been claimed that they are inefficient in their use of spectrum space and that satellite based systems are not only more accurate but could also be cheaper. The only snag is that the users have already bought Syledis and they are hardly likely to want to change in a hurry.

Another user of the band is the MOD's 'Mould' system. This is a communication system which is 'interleaved' between the amateur repeater system, and carries traffic using military procedures and also data; most of the time they seem to send plain carrier.

These frequencies must be avoided at all times. There are also geographical and power limitations in the 430 to 432MHz area of the band which apply in the London and North Yorkshire areas. It is fortunate that these restrictions do not apply to the section of the band (432 to 433MHz) which carries most of the amateur traffic.

In addition to the modes listed for two metres, this band, and those higher in frequency, are also available for fast scan TV operation. On 23cms the band is from 1240 to 1325MHz, the most commonly used segment being from 1296 to 1298MHz.

On this band the amateur service is again the secondary user and the amateur satellite service is listed for earth to space transmission only. This is an attempt to get some sense into the present system, where people trying to listen to the Oscar 10 downlink on two metres also get a fair ration of those using the same frequencies to transmit up to the Russian satellites. This, as you can imagine, causes a certain amount of confusion.

On 13cms the band is from 2310 to 2450MHz (this is one area where we are certainly not short of space and the bands get even wider as we go higher). The amateur again 'enjoys' secondary status and the satellite service is allocated 2400 to 2450MHz. A note tells us that we 'must accept interference from the industrial, scientific and medical allocations that also exist on this band'.

The next band up is 9cms where we have an allocation from 3400 to 3475MHz on a secondary basis with no amateur satellite allocation. The allocations at 6 and 3cms are on the same basis and remember that special permission is required before you use the band from 24050 to 24250MHz.

On the bands at 47, 75, 142 and 250GHz we are the primary users. These allocations are probably based on the pre war idea of giving 200 metres and down to the amateurs because these wavelengths were of no use and would at least keep them quiet. We proved them wrong then, and I suspect we will do so again.

The power is still to be measured at the aerial, which means that you can take into account the loss of the feeder when generating the RF. This is probably not of any real consequence on two metres, but becomes very useful as the frequency of operation increases.

Another point is that when using RTTY, data or TV transmission you must include your callsign, by voice or CW, at intervals not exceeding 15 minutes and on the same frequency. This would seem to put an end to sending pictures on RTTY that could take more than half an hour to complete.

It has always been required that you send your callsign in this manner on any mode if the transmission time exceeds 15 minutes, but this requirement has been rather ignored in the past.

The sting is buried in footnote 'H' where it says that 'where the amateur service holds a band on a *primary* basis, this is on the understanding that they cannot claim protection from interference from *any* other authorised service'. Could someone please explain to me how you can be a primary user of a band *and* have to put up with interference from secondary users?

Things in space

The Get Away Special seems to have become contaminated by its British Rail namesake! The shuttle flight that should have left the platform on the 1st October ran several days late (too late for this edition in fact) and therefore we can bring you no news of the Marshall experiment. Details for QSLing etc, were given in last month's edition.

On UoSAT 2, or Oscar 11 if you prefer, the news is that the clock has been reset to the correct time. Is there no end to the achievements possible on this machine!

Users of Oscar 10 will find that the operation schedule has changed a little. Modes 'L' and 'B' are now both available on each orbit. Related to Mean Anomaly, the schedule is now: 0 to 90 Mode B; 90 to

107 Mode L; 107 to 208 Mode B; 218 to 235 OFF; 235 to 256 Mode B.

There have also been some changes on the General beacon on 145.810MHz. The new system is still based on a 30 minute schedule and is intended to give users more information on the status of the satellite. The new schedule starting from the hour will be: 0 to 5 minutes CW; 5-15 minutes PSK; 15 to 20 minutes RTTY; 20 to 30 minutes PSK.

The schedule then repeats for the next thirty minute period. It is hoped that the information carried will be updated every week. Future satellites include the German Phase 3C unit, which will be similar to Oscar 10, and the Swedish SWASAT unit, which is in a very early phase of planning. Looking even further ahead is the idea of a Phase 4 unit which would be the start of a geostationary system.

Odds and ends

Last month we mentioned the 432MHz contact between GW8VHI and EA8XS. More details have arrived from Reg who gives some information on the equipment used and queries the distance, which he claims as 2787Kms.

Reg was running 50 watts to a 19 element Tonna. EA8XS has 50 watts output to a pair of 16 element Tonnas on two metres, and on 432MHz runs 50 watts to an array of eight 21 element Tonnas. He is also active on 23cms with 7 watts to a 1 metre dish and to top it off he has 800 milliwatts on 2.3GHz. If you feel conditions are good enough to give it a try he can be contacted by phone on 010 928 640184.

The RSGB 50MHz beacon, GB3HQ, is well received in most parts of the country and GB3ANG on 70MHz is now operational again, putting a good signal into the Midlands when conditions are up a little.

A possible first on 50MHz was a contact between G3NOX and W6JKV who was operating stroke 'P' in Greenland. ZB2VHE, the Gibraltar beacon, has been putting good signals into the UK and giving a taste of what is to come when we get the band.

Now on to some repeater news. GB3PI has recently had a new feeder system fitted which has made some improvement to the coverage. In the Midlands GB3YJ at Leamington has changed callsign to GB3WK, but the proposed site change has not gone through yet. The 70cms repeater at the same site is now back on the air.

GB3GD, the Leicester data repeater, has also changed callsign to GB3RY. This was to clear the callsign for the Isle of Man repeater. GB3SH in Devon has had a lot of work done to it and now sports two new J beam four stacked dipole arrays, this in conjunction with a GaAsFET pre amp and a 25 watt linear has really put this into the 'good thing' class.

Things to do

For those of you involved at the higher end of the scale there is the Microwave Roundtable which is held at the Dept of Electrical Engineering, Mappin St, Sheffield, on November 17th. Plenty of test gear and so forth will be available (more details from G8AGN, who is QTHr).

For those of you in the North, the Microwave Society are giving a talk and demonstration at the Bolton club on November 1st. Talk-in will be in operation and details are available from G8MWR (also QTHr).

Contests coming up are the 70MHz fixed on 28th October, the 1296MHz cumulatives on November 2nd and 18th and the 144MHz CW contest over the weekend of the 3rd and 4th of the month. The 432MHz cumulatives take place on the 10th and 26th, and looking forward we have the 144MHz fixed station event on 2nd December. That should be enough to satisfy anyone.

There always seems to be more to fit in than we have space for, but that is one of the good things about this hobby; there is something for everyone. I wonder if you had any luck on those moonbounce tests? There are some big stations around and maybe you were lucky, so please let us know. All information to me at 81 Ringwood Highway, Coventry.

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ECH83	0.78
ECH84	0.69
ECH2000	1.50
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ECL86	0.80
ECL805	0.69
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EF50	2.50
EF55	4.95
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EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.50
EF85	0.50
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EF91	1.50
EF92	2.15
EF93	0.95
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EF95	1.50
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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
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PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN25	2.00
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PEN45DD	3.00
PEN46	2.00
PFL200	0.95
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	1.75
PL509	4.85
PL519	4.95
PL802	5.95
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PL820	2.95
PL5557	29.50
PY32	0.60
PY33	0.50
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QQV03-10	5.50

QQVO3-20A	18.50
QQVO3-20B	32.00
QQVO6-40A	23.95
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
QV2-250C	45.00
QVO8-100	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	35.00
RK2K25	62.50
RG4-1000	10.00
RK-20A	12.00
RL18	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	33.50
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
SC1/1100	6.00
SC1/1200	5.00
SC1/1300	6.00
SC1/2000	9.00
SD6000M	45.00
SP2	1.50
SP4B	4.95
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2 5/300	85.00
TB2-300	45.00
TB3/2000	395.00
TBL-2-300	275.00
TD1-100A	25.00
TD03-10F	35.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TT21	34.95
TT22	34.95
TT100	57.00
TTR-31MR	65.00
TY2-125A	85.00
TY4-400	70.00
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	2.95
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	2.50
UCH42	2.50
UCH81	0.65
UCL82	1.75
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.50
UL44	3.50
UL84	0.85
UU5	3.50
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
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
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y65	6.95
Y503	25.00
Y602	12.00
YD1100	75.00
YJ1060	265.00
YL1020	29.00
YL1071	135.00
YL1290	65.00
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
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1A3	4.50
1AC6	1.20
1B3GT	1.95
1B22	10.00
1B24	14.95
1B35A	29.50
1BC2A	2.50
1C1	2.50
1C5GT	2.50
1D5	2.50
1FD1	2.50
1G3GT	2.50
1K3GT	2.50
1L4	0.60
1LA6	1.00
1N1	4.50
1N2	4.50
1P28	25.00
1N5GT	2.50
1P28	25.00
1S2	0.55
1S5	0.70
1T4	0.70
1U5	1.00
1X2B	1.40
1Z2	8.95
2B22	69.50

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
2K25 Ray	75.00
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	3.36
3B2	3.00
3B4	7.00
3B7	4.50
3B24	10.00
3B26	24.00
3B28	12.00
3BZ6	1.50
3C4	1.00
3C45	24.00
3CB6	1.50
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3E22	49.50
3EH7	1.95
3EJ7	1.95
3W4GT	2.50
4B32	19.50
4B551B	115.00
4BQ7A	1.75
4BZ6	1.95
4-65A	59.00
4-250A	65.00
4C27	25.00
4C28	25.00
4CB6	1.95
4CX250B ITT	37.50
4CX250B EIMAC	49.00
4CX250B surplus ex-government	12.50
4CX250B tested ex-equipment	6.00
4CX250BM EIMAC	75.00
4CX250K EIMAC	95.00
4CX350A	71.50
4D26	75.00
4GS7	2.25
4GV7	2.25
4JC6A	2.95
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4X150A	25.00
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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
5B8	2.50
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	69.00
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
6A7	4.95
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	2.65
6AN8A	2.65
6AQ5	1.50
6AQ8	0.85
6AR8	3.95
6AS5	1.50
6AS6	1.50
6AS7G	4.50
6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
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	2.35
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
6BZ6	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	3.50
6CA7	3.50
6CB5	3.95
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CH6	6.95
6CL3	3.95
6CL6	3.25
6CL8A	2.00
6CM5	1.60
6CM7	2.95
6CS6	0.75
6CW4	6.50
6CY5	1.00
6CY7	2.50
6DC6	2.95
6DK6	1.15
6DQ5	3.35
6DQ6B	2.50
6DW4	2.15
6EA4	4.95
6EA7	2.50
6EA8	2.50
6EB8	1.75
6EM5	2.50
6EM7	2.50
6EU7	£1.95
6EU8	1.75
6EV7	2.95
6EW7	4.50
6EW6	1.50
6F1	2.00
6F5	4.95
6F7	5.50
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F22	0.70
6F23	0.50
6F24	1.26
6F25	1.26
6F28	1.26
6F32	1.26

6F33	17.00
6FG5	1.95
6G6G	5.50
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GS7	2.15
6GV7	2.50
6GW6	2.50
6H1	9.50
6H3N	1.10
6H6	1.95
6H6GT	1.95
6HS6	4.95
6J4	1.10
6J4WA	3.15
6J5	2.50
6J6	0.65
6JB6A	3.95
6JE6C	4.95
6JS6C	4.95
6JU8	2.50
6J7	2.50
6K7G	1.35
6K8Y	3.95
6KD6	5.50
6KM8	2.50
6KT8	2.95
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC(GE)	3.95
6L6GT	1.15
6LD20	0.60
6LF6	4.50
6LJ8	2.50
6LQ6	4.95
6L15	3.15
6N7	2.50
6N7GT	2.50
6P15	1.50
6P25	4.00
6P26	4.00
6P28	2.00
6Q7	1.20
6Q7GT	1.20
6R7G	3.15
6S4A	1.50
6S7	1.10
6SA7GT	1.35
6SC7	1.50
6SG7	1.35
6SH7	1.35
6SJ7GT	1.35
6SK7	1.35
6SK7GT	1.35
6SL7GT	0.85
6SN7GT	1.35
6SQ7	1.35
6SS7	1.95
6U4GT	1.75
6U8	1.15
6U8A	1.50
6V6GT	0.85
6X2N	1.00
6X4	1.50
6X5GT	1.00
6X5GTY	1.00
6X8A	2.25
7A6	4.50
7A7	2.00
7AD7	1.75
7AU7	1.50
7B7	2.50
7C6	2.50
7E7	2.50
7J7	5.50
7V7	4.15
7Y4	2.50
8B10	2.50
8BQ5	1.95
8D8	2.50
8EQ7	1.95
85A8	1.50
10D2	1.25
10DE7	2.50
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD11	1.00
10LD12	0.65
11E3	55.00
12A6	3.95
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	0.95
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	1.95
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12R76	4.95

12CA5	1.95
12CX6	1.20
12DQ6B	3.50
12DW4A	3.50
12DW7	2.50
12E1	17.95
12E14	28.00
12GN7	4.50
12HG7A	4.50
12J7GT	3.50
12K5	1.00
12K7GT	0.60
12K8	1.10
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
13D7	2.50
13D9	3.20
13DR7	2.95
13EM7	3.50
14S7	1.00
17EW8	0.95
17JZ8	2.78
18D3	1.60
19AU4GT	2.50
19G3	17.00
19H4	23.95
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
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
31JS6A	5.50
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
42	6.95
47	6.00
60B5	1.60
50A5	1.50
50C5	0.95
50CD6G	1.15
50EH5	1.50
53CG	15.00
60JY6	2.96
52KU	2.00
61SPT	4.50
75B1	2.50
75C1	2.50
83	8.50
84	3.00
85A1	6.50
85A2	1.50
90AV	10.00
92AG	19.50
92AV	12.50
95A1	6.50
108C1	1.50
150B2	6.95
150C2	1.50
150C4	2.15
155UG	26.00
274A	15.00
1858T	1.50
307	5.00
328A	15.00
388A	17.50
404A	10.95
425A5	8.00
431U	2.00
5636	5.50
5678	7.50
572B	35.00
5847	10.95
5879	8.50
5886	13.95
6058	2.50

6064	2.95
6158	3.20
6205	6.95
6688	6.50
6870	11.50
6887	9.50
6973	4.50
705A	8.00
708A	8.00
715A	6.00
715C	45.00
7167	3.95
7189A	2.95
7199	4.95
7233	7.95
7239	17.50
725A	275.00
7462	15.00
7475	5.00
7486	75.00
7551	5.45
7558	9.45
7586	15.00
7587	26.95
7591A	4.95
7609	40.00
7788	18.50
7733	5.50
7868	3.95
803	14.95
805	39.00
807	1.60
810	45.00
811A	12.95
813	18.50
813 USA	45.00
829B	14.50
832A	14.50
833A	60.00
866A	4.50
872A	25.00
873	60.00
884	5.50
927	18.00
930	9.95
931A	13.95
954	1.00
955	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
1927	25.00
2050W	4.50
2050	3.95
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
5687	4.50
5692	3.50
5696	2.75
5704	3.50
5718	6.15
5725	2.50
5726	1.50
5727	1.95
5749	2.50
5750	1.85
5751	2.95
5763	4.95
5814A	3.25
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5847	10.95
5879	8.50
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5963	1.75
5965	2.25
6005	1.85
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5965	2.25
6005	1.85
6012	16.00
6021	3.65
[illegible]57	2.50
6058	3.95
6060	2.25
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6064	3.25
6067	1.95
6072	4.20
6080	4.75
6080WA	8.50
6096	2.85
6132	10.00
6136	2.50
6146B	7.95
6157	2.50
6201	6.45
6211	2.50
6267	2.25
6350	2.00
7189	2.95
7247	2.95
7360	8.95
7475	5.00
7587	26.95
7591A	4.95
7609	47.00
8417	5.95
18042	10.00
18045	10.00
18045	10.00

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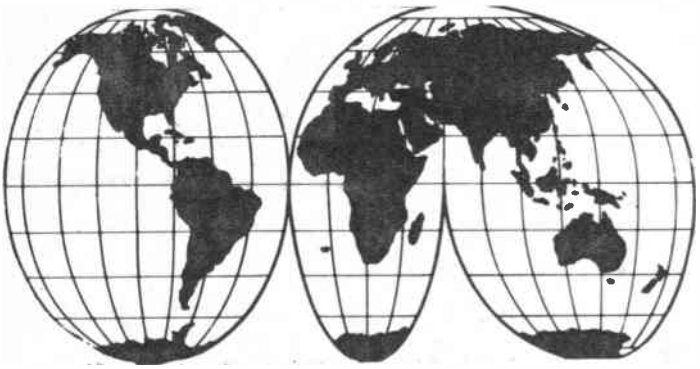

DX 'countries' and calls never stop changing. Special events, expeditions and political changes are just three reasons why callsigns and prefixes never stand still!

Nigel Cawthorne G3TXF

Special event callsigns

Hardly a week passes on the HF bands without some new set of special event or commemorative callsigns showing up. Special calls may last from just a few hours to a year in duration. Some countries make more use of special callsigns than others.

The Canadians seem to celebrate anything and everything with a special prefix! VE3's have used CH3, VY3, XJ3, XK3, XL3, XO3, 3C3 and many other prefixes on different occasions over the past few years.

Special prefixes in the UK are much rarer and are that much more sought after when they do appear. The Silver Jubilee in 1977 was celebrated by UK stations with the special prefix GE. Two years later in 1979, Isle of Man stations celebrated 1000 years of their parliament with the special GT prefix. The IARU Region 1 meeting in Brighton in 1981 was the backdrop to the then special prefix GB1. The most recent example of a special prefix in the UK was the GK0JFK operation in August 1984, which was a special call issued for use on the Kennedy Memorial at Runnymede.

USA

The number of different prefixes in use in the USA has grown so much over past years that it is no longer possible to tell the difference between a special call and a normal call! The USA started to go bananas on prefixes in 1976, with their Bicentennial celebrations. For one year the then normal prefixes of W, WA, WB and K were transformed into AC, AA, AB and AD.

The next callsign upheaval was caused by a complete restructuring of the callsign system in order to computerise it. New USA callsign allocation blocks (A and N) were released, which generated several new series of prefixes.

The result is that today US prefixes are almost countless in number. Any serious prefix hunter has a fulltime job trying to keep up with the US prefixes! The mainland US callsigns AF4A, KF4A, NF4A and WF4A are examples of how the prefix can seem to vary more times than the suffix!

African callsign changes

The wind of change that blew through Africa in the 1960's and 70's has changed many amateur prefixes. The old prefixes have passed into the history of amateur radio and are now to be found only on dusty QSL cards.

VQ	5H1	Zanzibar	FA	7X	Algeria
VQ2	9J2	Zambia	FD	5V	Togo
VQ3	5H3	Tanzania	FE8	TJ	Cameroun
VQ4	5Z4	Kenya	FF4	TU	Ivory Coast
VQ5	5X5	Uganda	FF7	5T	Mauritania
VQ6	6O	Somaliland	FF8	TY	Benin
VQ8	3B8	Mauritius	FF8	5U	Niger
VQ9	S79	Seychelles	FF8	XT	Upper Volta
ZD1	9L1	Sierra Leone	FF8	6W	Senegal
ZD2	5N	Nigeria	FQ8	TL8	Central African Rep
ZD3	C5	Gambia	FQ8	TT8	Chad
ZD4	9G1	Ghana	FQ8	TN8	Congo
ZD5	3D6	Swaziland	FQ8	TR8	Gabon
ZD6	7Q7	Malawi	FT4	3V8	Tunisia
ZS8	7P8	Lesotho	CR6	D2	Angola
ZS9	A2	Botswana	CR7	C9	Mozambique

DXpedition callsigns

DXpeditions often generate special callsigns or prefixes. One-time prefixes such as SY1 (Mount Athos), YV0 (Aves Island) or OJ0 (Market Reef) will only be heard during DXpedition operations. Some rarer area prefixes (eg GJ6 or FS7) will often only be available during DXpedition operations. Missing one of these operations might mean waiting several years before the same prefix is used again.

Political changes

It is changes of political status, usually meaning the gaining of independence, that have brought about the greatest number of prefix changes. One of the first administrative functions of any newly independent state is to apply to the ITU for their own callsign block allocation. It is from this block of prefixes that the amateur callsigns are determined.

The table shows some Afri-

Old North African QSLs

can prefixes that have changed over the past three decades as countries have achieved independence. Many of the colonial prefixes are now to be found only on dusty QSL cards in attics!

Post-war callsigns

In the early years after WWII, occupation forces operated with temporary callsigns that were to disappear just as soon as the occupying forces returned home. Our picture shows cards from MD1 (Benghazi, Libya), MD2 (Tripoli, Libya), MD5 (Egypt) and MB9 (Austria). These were just some of the prefixes allocated to British forces amateur radio stations in the immediate post-war days.

Post-war occupation prefixes (above) and French colonial prefixes (below)

China

China has been the sleeping giant in amateur radio for over thirty years. The recent re-emergence of amateur radio activity, even though still on a relatively limited scale, marks the end of a long period of an amateur radio silence that began in 1949. In pre-war days, as well as in the immediate post-war years, Chinese stations could be regularly contacted on the amateur bands. Early Chinese amateur stations used the prefixes XU and C, as shown in the picture. Today's Chinese amateur stations use the BY prefix, eg BY1PK, BY1QH and BY1AA.

Any collection of old Chinese QSL cards is always of great interest and curiosity value to the younger DXer who was not around in the days when China was last on the air. The display of exotic Chinese QSLs, as well as all the other old-time QSLs used to illustrate this article, come from the QSL collection of the late G6BQ.

G6BQ – DXer

Very active on the DX bands for many years from the Gravesend area was the late Jack Box, G6BQ who amassed a huge collection of DX QSLs from all over the world. His QSLs span forty years of DX activity.

Both G6BQ's valuable QSLs and his logbooks are being carefully looked after. They represent a unique historical record of DXing. The G6BQ QSLs are being kept by Dennis G3MXJ, to whom I am grateful for the loan of the cards for the preparation of this article. Jack's logbooks are being looked after by Dave G4BUO.

QSLs as history

Prefixes come and prefixes go. What is common and easily workable on the air today may, in a few years' time, be very rare or no longer available at all. It is QSL cards that keep the memory of long gone prefixes and callsigns alive.

QSL cards are a unique record of history. They may be stuffed into shoe boxes or stowed away in dusty attics, but in years to come they provide fascinating reading as well as an indelible record of the history of amateur radio DXing.

So get going now and don't miss out on those QSLs. Don't wait, because DX is always on the move.

DX just doesn't stand still.

More historic amateur prefixes

Some pre-1949 Chinese QSLs

MARCO TRADING

BRIDGES

1½A 50V	[illegible]
100V	0.28
200V	0.32
400V	0.40
600V	0.50
800V	0.58
2A 100V	0.52
200V	0.55
400V	0.61
600V	0.67
800V	0.70
6A 100V	0.66
200V	0.68
400V	0.74
600V	0.80
800V	0.86
10A 50V	2.20
100V	2.24
200V	2.35
400V	2.50
600V	3.50
25A 50V	2.05
100V	2.25
200V	2.40
400V	3.20
600V	3.95

ZENER DIODES

400mW Plastic 3V-75V [illegible]
1.3W Plastic 3V-200V 15p each 10/£1.40
1.5W Flange 4.7-47V £1.26 each
2.5W Plastic 7.5-75V 87p each
20W Stud 7.5-75V £1.31 each

INTEGRATED CIRCUITS (£) EACH

AN240P	3.42	SN76530P	[illegible]
AN214OQ	3.88	SN76533N	1.60
AN715O	2.90	SN76650N	1.05
CA3065	1.75	SN76660N	0.75
CA4031P	2.88	SN76666N	0.80
CA4102	3.30	STK015	6.50
CA4250	3.50	TA7108P	3.20
CA4400	2.98	TA7120P	3.20
CA4422	3.07	TA7129AP	3.65
LC7120	5.33	TA7130P	1.65
LC7130	5.26	TA7172	1.80
LC7137	5.16	TA7193	5.50
LM380N	0.80	TA7172P	1.80
LM1303N	2.52	TA7176	2.50
HA1151P	3.12	TA7202P	4.18
MC1307P	1.65	TA7204P	1.86
MC1310P	1.85	TA7205AP	1.50
MC1312P	2.25	TA7208P	3.27
MC1327P	1.25	TA7210P	6.50
MC1330P	0.83	TA7222P	1.68
MC1349P	1.85	TA7223P	3.68
MC1350P	1.20	TA7227P	5.60
MC1351P	2.50	TA7310A	1.80
MC1352P	1.50	TA7609P	4.28
MC1357P	2.88	TA7611AP	2.88
MC1358P	1.30	TAA263	2.48
MC1496P	1.15	TAA310A	2.68
ML231B	2.10	TAA550	0.50
ML232B	2.10	TAA570	1.99
ML237B	2.30	TAA611A12	3.50
NE555	0.25	TAA611B12	2.85
C-mos 555	0.88	TAA630S	3.90
NE556	0.80	TAA661B	1.70
SAA1024	5.35	TAA700	2.80
SAA1025	8.40	TAA840	3.38
SAS560A	2.50	TAD100	2.80
SAS560S	1.85	FM FILTER	1.20
SAS570S	1.85	TBA120A	1.00
SAS580	2.85	AS.S.SA.SB	1.20
SAS590	2.82	Q.T.U.UQ	1.32
SC9503P	1.10	TBA120B	1.30
SL432A	4.00	TBA231	1.45
SL901B	8.20	TBA281	2.65
SL917B	6.25	TBA395	1.20
SL1327Q	1.10	TBA480Q	1.50
SN76003N	2.44	TBA400	2.30
SN76013	1.90	TBA510	2.60
SN76023ND	2.90	TBA510Q	2.60
SN76033N	2.45	TBA520/Q	1.60
SN76110N	1.12	TBA530/Q	1.30
SN76115N	2.00	TBA540/Q	1.40
SN76131N	1.65	TBA550/Q	1.52
SN76226ND	1.80	TBA560C	1.70
SN76227N	1.10	TBA560CQ	1.40

TBA570	1.50
TBA641BX1	4.50
TBA673	2.40
TBA700	2.85
TBA750	2.80
TBA800	1.60
TBA810P	1.10
TBA810S	1.20
TBA820	1.60
TBA890	3.88
TBA920/Q	3.00
TBA940/2A	3.05
TBA970	4.05
TBA990	1.88
TCA160C	3.90
TCA270S	4.00
TCA270SA	4.02
TCA800	3.10
TCA940	1.90
TDA440	3.80
TDA1002	1.90
TDA1003A	5.50
TDA1004A	2.90
TDA1006A	2.40
TDA1035S	4.50
TDA1044	4.30
TDA1170S	3.00
TDA1190	3.50
TDA1200	2.98
TDA1270Q	3.70
TDA1327A	1.66
TDA1352A/B	1.56
TDA1412	1.20
TDA2002	2.60
TDA2020	4.60
TDA2030	2.78
TDA2140	5.90
TDA2521	4.10
TDA2523	3.50
TDA2530	2.70
TDA2540	3.60
TDA2541	3.60
TDA2560	3.50
TDA2571A	2.50
TDA2581	3.20
TDA2590	3.20
TDA2591	2.98
TDA2593	2.98
TDA2610	3.20
TDA2611A	1.94
TDA2640	2.90
TDA2680	3.40
TDA2690	3.50
TDA3950A/B	2.80
UPC554C	1.32
UPC557H	0.90
UPC566H	2.95
UP575C2	3.20
UPC1018C	1.10
UPC1025H	2.90
UPC1032H	0.90
UPC1156H	4.20
UPC1158H	0.76
UPC1163H	0.98
UPC1181H	1.60
UPC185H2	3.76
UPC1212C	1.30
UPC1230H	3.90
UPC1350C	3.90
UPC1367C	3.40
UPC1378H	4.40
UPC2002H	2.80

Type	Price (£)
2SC1507	0.63
2SC1678	1.06
2SC1758	0.68
2SC1909	1.20
2SC1923	0.30
2SC1945	2.88
2SC1953	0.74
2SC1957	0.76
2SC1969	2.88
2SC2028	0.73
2SC2029	1.00
2SC2078	1.05
2SC2091	0.73
2SC2098	2.90
2SC2122A	3.20
2SC2166	1.20
2SC2314	0.80
2SC2335	1.50
2SC2749	2.70
2SC2752	0.60
2SD234	0.64
2SD348	3.30
2SD986	0.62
2SK134	3.80
2SK135	1.90
3N126	1.90
3N211	2.52
3SK45	0.76

ROTARY POTS

0.25W CARBON
LOG 4K7 — 2M2
LIN 1K — 2M2
32p ea. 10 for £3
Any 100 for £27.50

VEROBOARD 0.1m

2½ x 3¾	68p
2½ x 5	£1.00
2½x17	£3.07
3¾ x 17	£1.05
3¾ x 5	£1.18
3¾ x 17	£4.10
4¾ x 17¾	£4.98
Pkt of 100 pins	50p
Spot face cutter	£1.48
Pin insertion tool	£3.50
Vero Wiring Pen & Spool	£3.80
DIP board	£3.65
Vero Strip	£1.25

IC SOCKETS Dil to Dil

8 pin	0.08	0.70/10
14 pin	0.10	0.95/10
16 pin	0.11	1.00/10
18 pin	0.14	1.60/10
22 pin	0.21	1.95/10
24 pin	0.25	2.28/10
28 pin	0.30	2.76/10
40 pin	0.34	3.10/10

BNC 50R Plug £1.10
PL259 - Male Plug 45p

VALVES

Type	Price (£)
DY802	0.88
DY86/87	0.75
ECC81	0.95
ECC82	0.65
ECC83	0.75
ECC84	0.66
ECC85	0.90
ECC88	0.95
ECF80	0.95
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.98
EF80	0.65
EF86	1.60
EF183	0.75
EF184	0.75
EH90	0.94
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.95
PCF801	1.45
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.98
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	5.95
PY88	1.80
PY500A	2.40
U26	1.90
UCH81	0.90
UCL82	1.70
6J5GT	1.75
6SJ7	2.20
30FL12	1.60

TRANSISTORS + DIODES

Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
AC127	0.30	BC108	0.10	BC302	0.32	BD244A	0.65
AC128	0.30	A,B or C	0.12	BC303	0.32	BD375	0.32
AC128K	0.34	BC113	0.14	BC307	0.10	BD410	0.76
AC132	0.55	BC114	0.12	BC308A	0.10	BD434	0.68
AC141	0.26	BC115	0.12	BC323	0.99	BD436	0.68
AC141K	0.40	BC116	0.15	BC327	0.14	BD437	0.76
AC142	0.26	BC117	0.22	BC328	0.14	BD438	0.75
AC142K	0.48	BC118	0.17	BC337	0.12	BD439	0.68
AC151	0.45	BC119	0.30	BC338	0.12	BD507	0.48
AC152	0.45	BC125	0.12	BC350	0.14	BD508	0.53
AC176	0.28	BC140	0.28	BC440	0.30	BD509	0.54
AC176K	0.46	BC141	0.42	BC441	0.32	BD510	0.48
AC187	0.26	BC142	0.30	BC461	0.32	BD517	0.56
AC187K	0.40	BC143	0.30	BC547	0.12	BD520	0.66
AC188	0.28	BC147	0.08	BC548	0.12	BD699	1.25
AC188K	0.40	A or B	0.10	BC549	0.12	BD707	0.88
ACY40	0.88	BC148	0.08	BC550	0.18	BDX18	2.35
AD142	1.10	A or B	0.10	BC550C	0.18	BDX32	2.10
AD143	1.10	BC149	0.09	BC557	0.12	BF115	0.32
AD149	0.96	BC157	0.10	BC558	0.12	BF117	0.54
AD161	0.42	BC158	0.10	BCX34	0.27	BF119	0.82
AD162	0.42	BC159	0.10	BCY70	0.15	BF120	0.38
AD161/AD162	0.96	BC160	0.30	BCY71	0.17	BF123	0.40
AF106	0.48	BC161	0.30	BCY72	0.18	BF125	0.42
AF114	2.10	BC168B	0.12	BCZ10	1.68	BF127	0.38
AF115	2.10	BC169C	0.10	BCZ11	1.45	BF152	0.16
AF116	2.10	BC170	0.14	BD124P	0.80	BF154	0.23
AF117	2.10	BC170B	0.12	BC130Y	0.68	BF157	0.40
AF118	0.85	BC171	0.10	BD131	0.34	BF158	0.22
AF121	0.62	BC171	0.10	BD132	0.34	BF159	0.24
AF124	0.48	A or B	0.08	BD131/BD132	0.95	BF160	0.23
AF125	0.48	BC172	0.08	BD135	0.32	BF167	0.30
AF126	0.48	A or B	0.12	BD136	0.36	BF173	0.25
AF127	0.48	BC177	0.20	BD137	0.36	BF177	0.42
AF139	0.68	BC178A	0.22	BD138	0.38	BF178	0.30
AF178	0.68	BC182	0.09	BD139	0.38	BF179	0.32
AF239	0.68	A,B or C	0.09	BD140	0.38	BF180	0.35
AF279S	0.75	BC182L	0.09	BD144	1.60	BF181	0.35
AL100	2.50	A,B or C	0.09	BD145	1.82	BF182	0.32
AL102	1.88	BC183	0.09	BD150A	0.51	BF183	0.32
AL113	2.20	A,B or C	0.10	BD159	0.65	BF184	0.32
ASY80	1.75	BC183L	0.08	BD160	1.65	BF185	0.32
AU110	1.40	A,B or C	0.12	BD165	0.45	BF194	0.08
AY102	4.32	BC184L	0.10	BD175	0.60	BF195	0.10
BA102	0.34	A,B or C	0.10	BD182	1.00	BF196	0.10
BA110	0.67	BC207	0.15	BD183	1.10	BF197	0.10
BA121	0.40	BC208	0.16	BD184	1.20	BF198	0.14
BA129	0.38	BC212	0.09	BD201	0.72	BF199	0.16
BA148	0.16	A,B or C	0.10	BD202	0.87	BF200	0.26
BA154	0.08	BC212L	0.08	BD204	0.80	BF222	0.48
BA155	0.10	A,B or C	0.10	BD222	0.80	BF224	0.20
BA156	0.08	BC213	0.09	BD225	0.86	BF224J	0.16
BA157	0.28	A or B	0.10	BD232	0.45	BF240	0.20
BA164	0.14	BC213L	0.10	BD233	0.60	BF241	0.20
BB104B	0.52	A or B	0.10	BD234	0.62	BF244	0.26
BB105B	0.30	BC237	0.11	BD235	0.63	BF244A	0.28
BB105G	0.48	BC238	0.12	BD236	0.63	BF244C	0.24
BB110B	0.42	BC239C	0.14	BD237	0.65	BF245A	0.28
BC107	0.10	BC251	0.12	BD238	0.56	BF254	0.15
A or B	0.12	A,B or C	0.14	BD241	0.60	BF256	0.40
		BC301	0.30	BD243A	0.80	BF257	0.32

Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
BF258	0.30	BT101/300	1.15	BYX36/150	0.22	TIP32	0.40
BF259	0.32	BT101/500	1.25	BYX36/600	0.28	TIP32C	0.60
BF262	0.30	BT102/300	1.35	BYX48/300	0.72	TIP33A	0.63
BF263	0.30	BT102/500	1.65	BYX49/300	0.47	TIP34A	0.72
BF270	0.30	BT106	1.50	BYX55/350	0.29	TIP41C	0.46
BF271	0.26	BT108	1.30	BYX55/600	0.33	TIP42A	0.52
BF273	0.18	BT109	1.18	BYX71/600	1.18	TIP47	0.60
BF274	0.32	BT116	1.25	BYZ12	0.42	TIP110	0.88
BF323	0.92	BT119	3.62	C106D	0.80	TIP2955	0.60
BF336	0.26	BT120	3.60	E1222	0.40	TIP3055	0.60
BF337	0.26	BT121	3.02	E5024	0.30	TIS43	0.32
BF338	0.26	BT138/600	1.30	GET872	0.48	TIS88	0.40
BF355	0.42	BT151/560R	0.90	ITT44	0.04	TIS90	0.25
BF363	0.82	BT151/300R	1.15	ITT2002	0.11	TIS91	0.28
BF367	0.24	BTY79/400R	2.80	ME0402	0.20	ZTX108	0.12
BF371	0.27	BU100A	2.30	ME0404/2	[illegible]	ZTX109	0.12
BF422	0.38	BU104	2.00	MEU21	0.60	ZTX212	0.28
BF450	0.38	BU105	1.20	MJ400	1.25	IN4001	0.05
BF457	0.33	BU105/02	1.56	MJ2955	0.90	IN4003	0.05
BF458	0.36	BU108	1.80	MJ3000	1.98	IN4004	0.06
BF459	0.44	BU124	1.75	MJE240	0.60	IN4006	0.07
BFR39	0.22	BU126	1.25	MJE340	0.54	IN4007	0.07
BFR40	0.22	BU133	1.80	MJE370	0.68	IN4148	0.05
BFR41	0.22	BU204	1.35	MJE520	0.48	IN5400	0.12
BFR51	0.30	BU205	1.30	MJE2955	0.99	IN5402	0.15
BFR61	0.32	BU206	1.70	MJE3055	0.70	IN5405	0.16
BFR62	0.28	BU208	1.55	MPSL01	0.28	IN5406	0.18
BFR88	0.34	BU208A	1.63	OA47	0.10	IN5408	0.20
BFR90	1.72	BU208/02	2.05	OA90	0.08	IS920	0.08
BFT41	0.38	BU326S	1.75	OA91	0.06	2N697	0.55
BFT43	0.38	BU407	1.65	OA95	0.18	2N706A	0.33
BFW10	0.79	BU407D	1.80	OA200	0.06	2N2904	0.28
BFW44	0.76	BUX80	3.70	OA202	0.15	2N2906	0.24
BFX29	0.28	BUY20	1.75	OC25	2.10	2N2926G	0.10
BFX30	0.30	BUY69A	2.60	OC26	1.70	2N3053	0.22
BFX80	3.56	BUY69B	1.98	OC28	1.50	2N3054	0.56
BFX84	0.24	BY101	0.48	OC29	2.47	2N3055	0.45
BFX85	0.26	BY118	1.10	OC35	1.75	2N3702	0.10
BFX86	0.26	BY122	0.68	OC36	1.75	2N3704	0.10
BFX87	0.26	BY126	0.12	OC42	0.72	2N3708	0.10
BFX89	0.65	BY127	0.10	OC42K	1.40	2N3772	1.90
BFY50	0.21	BY133	0.16	OC44	0.72	2N3773	2.70
BFY51	0.21	BY135	0.25	OC45	0.58	2N3904	0.16
BFY52	0.21	BY164	0.44	OC71	0.50	2N3906	0.16
BFY57	0.40	BY179	0.66	OC72	0.52	2N5294	0.48
BFY90	0.90	BY182	0.87	OC81	0.68	2N6107	0.71
BFY90S	1.34	BY184	0.40	OC200	2.46	2N6126	0.68
BR100	0.20	BY187	0.72	OC202	2.20	2SB337	1.60
BR101	0.44	BY189	4.75	ORP12	0.85	2SC1172Y	2.90
BR103	0.58	BY198	0.44	R2008B	1.50	2SC1173Y	0.82
BRC4443	1.76	BY199	0.47	R2010B	1.52	2SC1302	1.40
BRY39	0.38	BY206	0.24	SHG1 5	0.40	2SC1226	0.84
BRY56	0.42	BY207	0.24	TAG1/100	1.40	2SC1279	0.50
BRY61	0.86	BY210/400	0.25	TAG3/400	1.78	2SC1306	0.92
BSS17	0.56	BY210/600	0.26	TIC44	0.40	2SC1307	1.40
BSS27	0.92	BY210/800	0.30	TIC45	0.45	2SC1413A	2.70
BSX19	0.34	BY223	1.20	TIC46	0.46	2SC1444	1.45
BSX20	0.34	BY227	0.26	TIC47	0.70	2AC1449	0.63
BSX59	0.62	BY229	0.30	TIC106A	0.70		
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½W pack 5 each value E12 — 2R2 to 2M2 365 pieces	3.00
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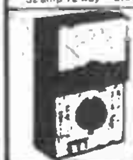

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AERIALS AND PROPAGATION

PART 2

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Radio frequency electromagnetic waves have equivalent properties to light waves. They can be refracted, diffracted, reflected, absorbed, curved and operate in a similar manner to visible light. The two basic methods of usage of light waves in everyday life are either by direct transmission or reflection.

Direct transmission can be considered as the radiation from a naked light bulb, in which radiation takes place from a point source and is evenly distributed all around this central source. This source of illumination is called an isotropic source. By installing a reflector, as in a car headlamp, the light is concentrated into a beam, the effect of this concentration being to intensify the strength of the light in one direction only. The total strength of the forward beam now depends upon: *a)* the efficiency of the reflector, *b)* the angle or cross sectional area of the beam.

The efficiency of the reflector is determined by the amount of light absorbed in the reflecting medium, and the angle of radiation of the beam determines the aperture illuminated.

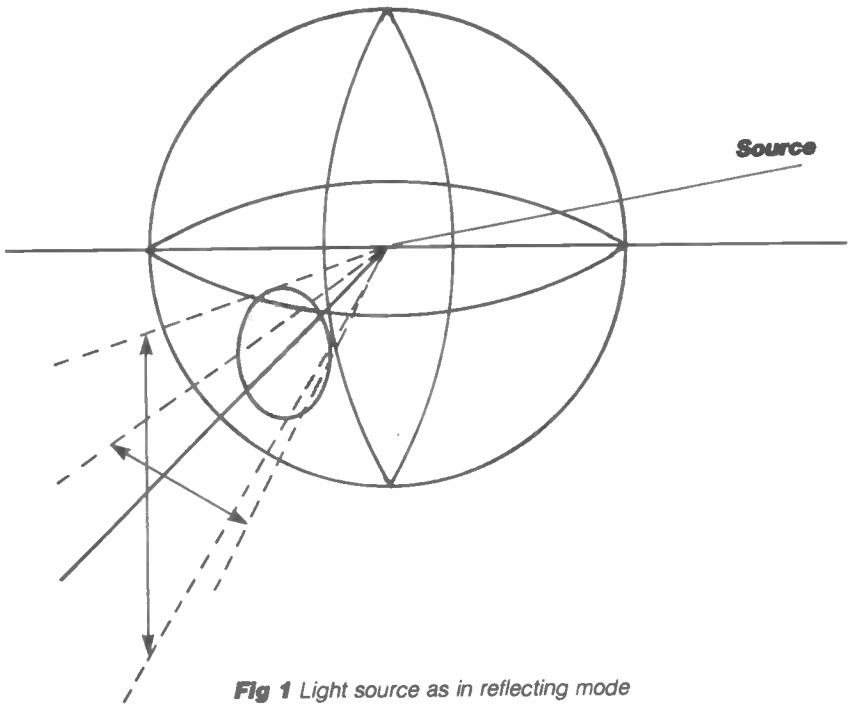

Fig 1 *Light source as in reflecting mode*

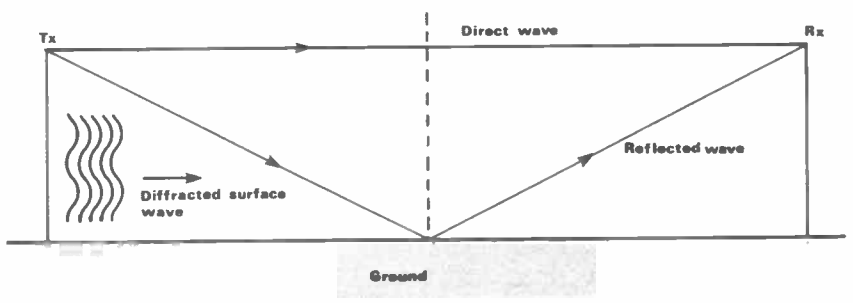

Fig 2 *The arrival at the receiver of the direct and ground waves which have travelled by alternative paths*

From *Figure 1* you can see that if the centre of the circle is a light source illuminating the inside of the sphere evenly, the source is the said isotropic point.

If we introduce a reflector behind the source as shown, the light is now intensified only in the area controlled by the angle of the reflected wave, and a smaller area of the sphere interior is now illuminated but at a much higher level of intensity. The intensity of the light in the new area, compared with the strength prior to the installation of the reflector, is an indication of the gain and is shown as dB gain over an isotropic source.

Reference to these points will be made in later discussion, and the purpose of their introduction at this stage is to establish the possibility of electromagnetic waves being propagated in a controlled manner.

Aerial waves

In the case of waves being radiated from a transmitting aerial we can separate the propagation into two phases:

1) Those waves remaining in close proximity to the ground, normally called space waves.

2) Those waves projected into space and meeting no further obstructions, normally grouped as sky waves.

The actual effect of (1) is to give a space wave consisting of ground reflected waves and direct waves only *(Figure 2)*. If the transmitting and receiving aerials were at a low height on level ground and just at the limits at which they can see each other, ie horizon limits, the direct wave would be the only link.

By elevating the aerial a situation is created whereby the ground reflected wave and the direct wave add vectorially. This means that the receiver may get a wave sum of two waves in phase or phase addition and may alternately receive the waves in phase subtraction, the resultant wave being the sum of the two received waves.

Direct and ground waves

Figure 2 shows the effect of the arrival at the receiver of the direct and ground wave when the ground wave has travelled by an alternative path. It also indicates the effect of the receiving aerial's height in relation to the phase difference between the two incoming waves.

Molecular density variation in the lower regions of the atmosphere affects the radio horizon distance in different ways. Methods of calculating optical horizon distances will be discussed in a

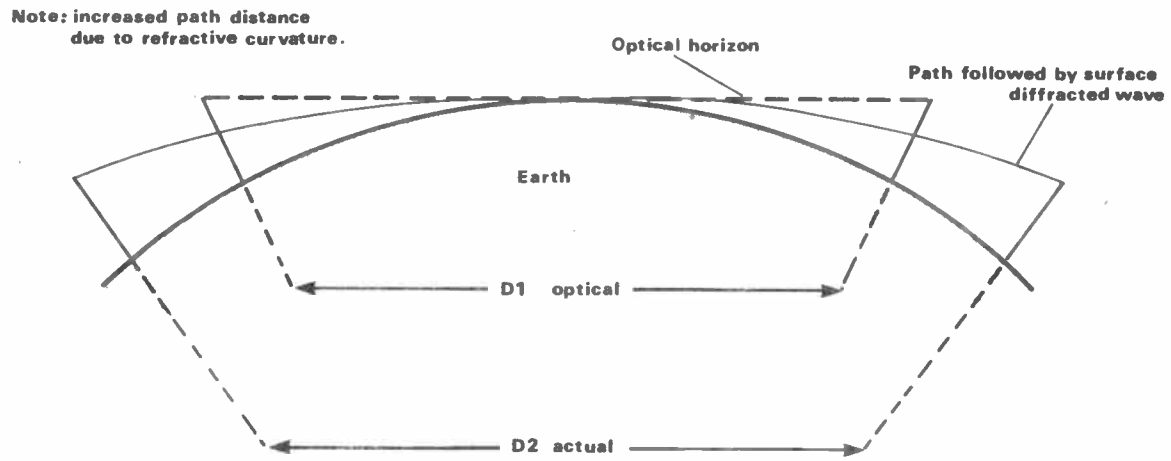

Fig3 *The effect of the rate of direction of the wave, created by the variation in the refractive index when related to the curvature of the earth, on the radio horizon*

later article. The illustration shows the effect of curvature of the radio wave at ground incidence due to local atmospheric variations. These cause a gradual change to the atmosphere's refractive index, thus causing a slow bending or rate of curvature of the propagated radio wave.

Refractive Index

The rate of change of direction of the wave created by this variation in index, when related to the curvature of the earth, means that under average conditions the radio horizon is some 20% greater in distance than the optical horizon (see *Figure 3*).

The variation in the refractive index is caused by gradual temperature and pressure reductions with altitude, creating a situation where the maximum or saturated moisture content of the air is exceeded or highly concentrated, thus causing a variation in the refractive index of the media through which the wave is passing. Note that this condition exists for both ends of the path, so the horizon grazing point is as follows: d1 = 1.4H for transmitting aerials, + d2 = 1.4H for receiving aerials, where d is in miles and H is in feet above sea level.

Moisture

If the moisture content does not vary uniformly and bands of highly loaded moisture containing areas appear as altitude increases, the effect is to refract the VHF waves to a greater or lesser degree depending on the moisture content and temperature gradient. This effect is often brought about by warm weather fronts being mixed with cold

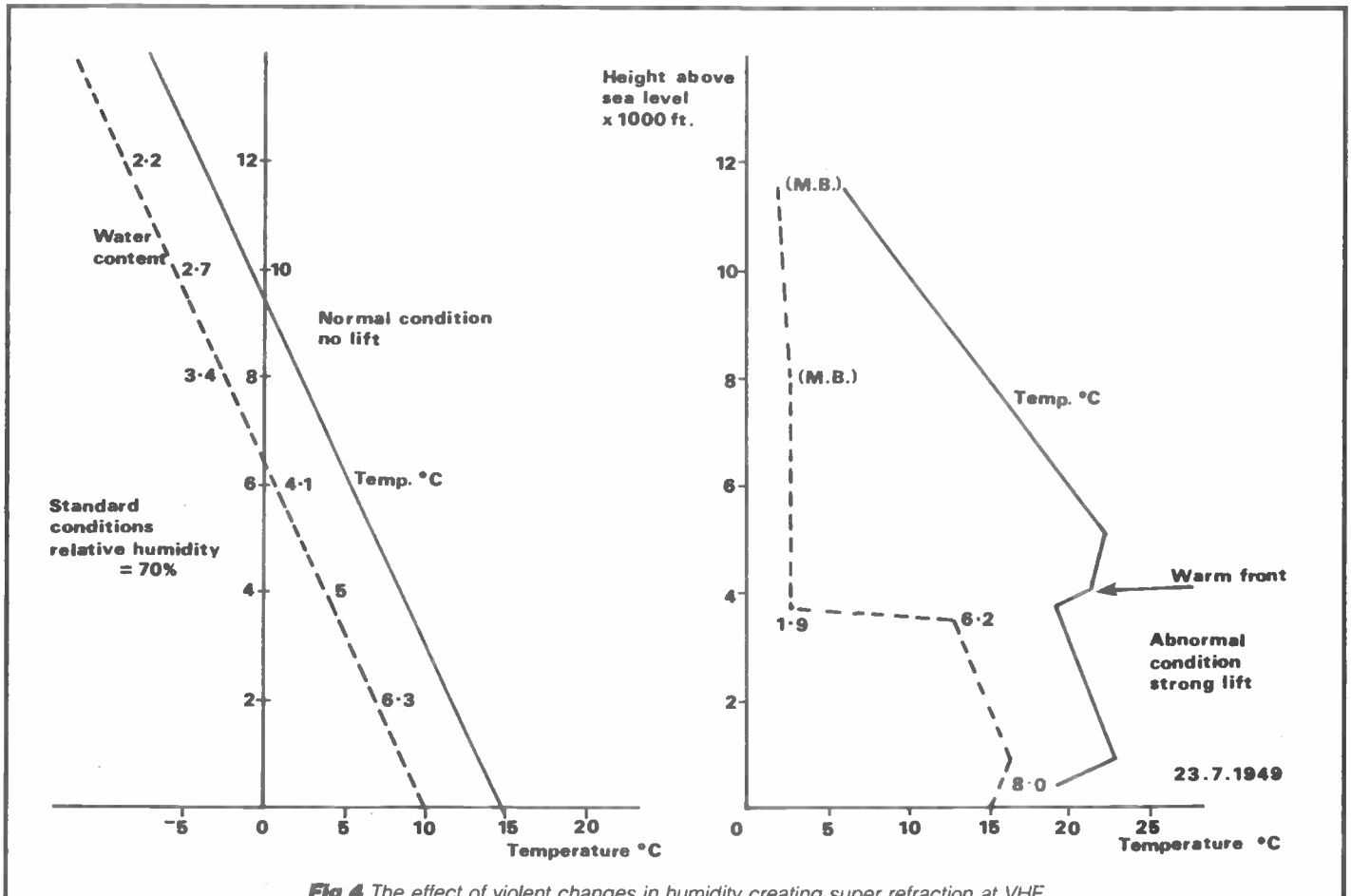

Fig 4 *The effect of violent changes in humidity creating super refraction at VHF*

fronts, either by riding above the cold front and losing moisture at the interface, or by a cold front riding between two warm fronts. These conditions can frequently be forecast by keeping an eye on the weather maps shown before the 6.00pm news on BBC1.

A close pattern of isotherms at a high pressure area (a rapid pressure gradient) often indicates an opening on VHF, and under such circumstances 2 metre DX is available. A warm sunny day after rain followed by cold nights may bring about similar conditions. This is why May and September are usually the best months for VHF DX.

Calculated values for variations in temperature and humidity which create these conditions are discussed in a future article. *Figure 4* illustrates the variation in atmospheric conditions, showing the effect of violent changes in humidity creating super refraction at VHF.

Sky waves

The second part of the original wave, which was designated as the sky wave, is directed upwards towards outer space.

Due to the action of radiation from the sun on the limits of the earth's atmosphere, the rarified air at these limits is affected in various ways. The main effect is for intense ultra violet radiation to discharge its energy content into separating electrons from the mother atoms, consequently leaving a fairly thickish layer of highly ionised air: that is air in which electrons and atoms minus electrons (ions) are in coexistence.

This layer has a marked effect on the approaching sky wave, and when the advancing wave front reaches the ionosphere (as the layer is termed), it applies an alternating field to the free charges of ionised gas (electrons have a negative charge and protons or ions a positive charge).

Any electric charge in an electric field will have a force exerted on it, tending to move it along the field-lines. The protons have a much greater mass than the electrons, so the absorbed energy charge creates a more sluggish movement of the positively charged particles in the varying voltage field of the oncoming wave front. The energy imparted into the electrons creates negatively charged particles which are excited more freely by the arriving wave front and oscillate with greater velocity.

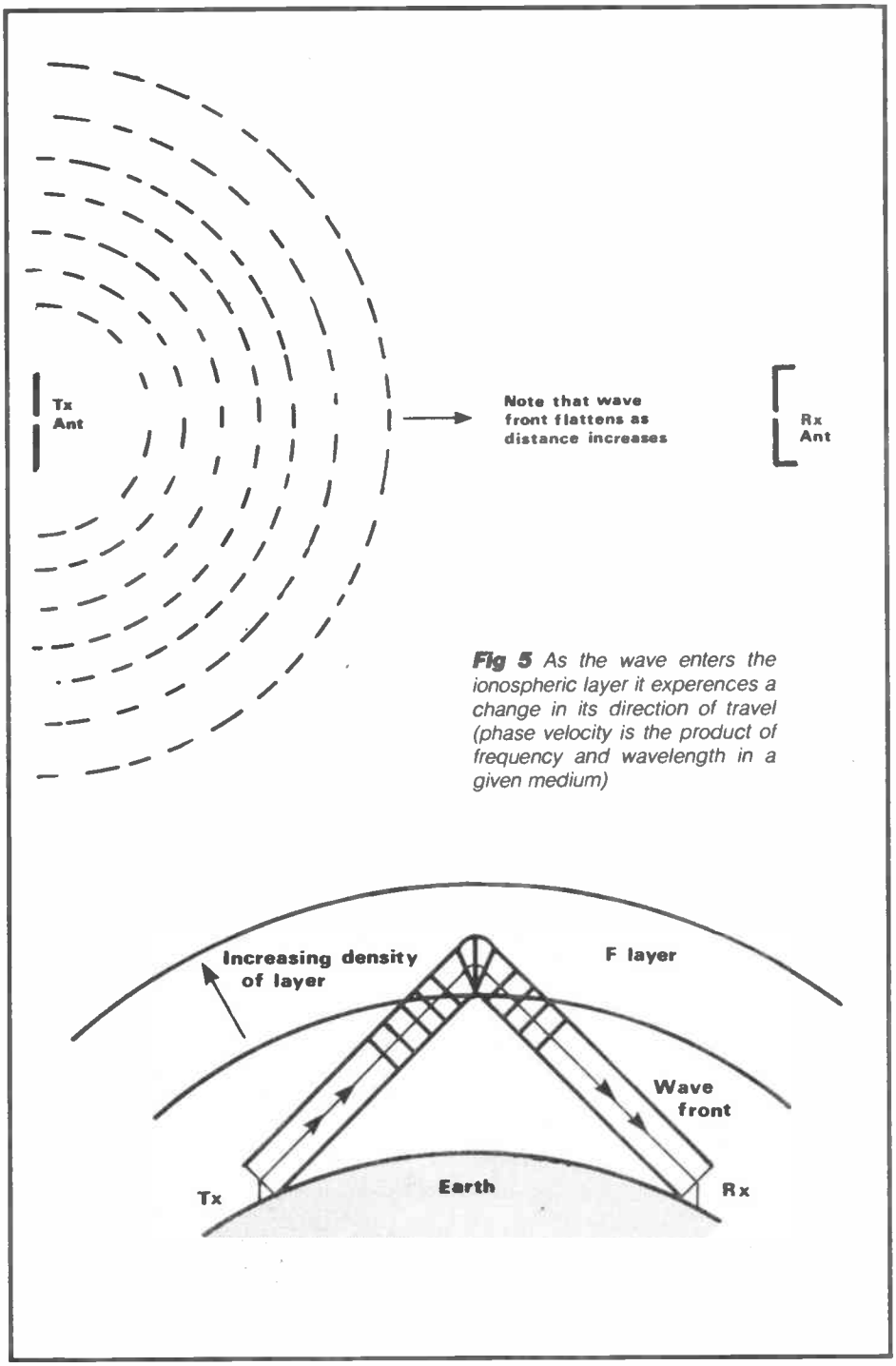

Fig 5 *As the wave enters the ionospheric layer it experences a change in its direction of travel (phase velocity is the product of frequency and wavelength in a given medium)*

Energy loss

This situation in the rarified atmosphere creates some heat loss, and a certain amount of power is extracted from the wave front by the effect of this action. The general effect is for the wave to lose energy in the layer and suffer attenuation. The total loss depends on the probability of collisions occuring between charged particles and increases in proportion to the number of particles available.

It follows that the degree of ionisation of the layer can influence the absorption. Indeed, in cases of intense solar activity and a high incidence of ultra violet radiation, absorption can be 100% at all frequencies. This is the effect known as 'fade out.'

If the wavelength is increased, the possibility of an electron/proton collision occuring is improved, since a lower frequency of oscillation will allow time for the voltage field to permit a longer path of electrical oscillation, thereby increasing the tendency to collide. The general effect is for the attenuation to be greater at lower frequencies than at higher frequencies.

As the wave front enters the ionospheric layer it experiences a change in its direction of travel, since the top of the wave front suffers a change in its phase velocity (phase velocity is the product of frequency and wavelength in a given medium. See *Figure 5*). The sharpness of the change in direction is related to the density of the ionisation and its relationship to frequency. Consequently a higher frequency wave will penetrate further into the layer than a lower frequency one, and will not be subject to the same rate of bending.

Next month

Next month I'll be looking at the effects of the sun's radiation, and the solar cycle, on propagation. I'll also be examining the different layers that exist within the Earth's atmosphere, their properties and the effects they have on radio waves of different frequencies.

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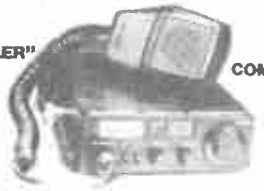

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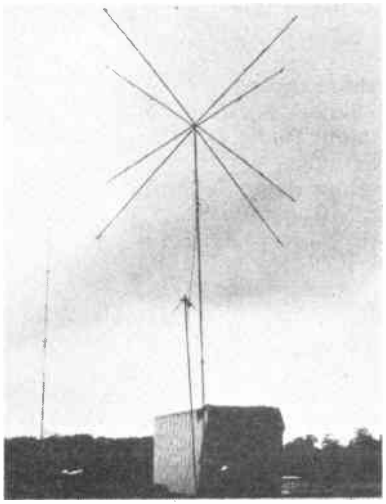
BACK TO BASICS



Bill Mantovani gets his new series for beginners under way by looking at

THE RAE AND THE AMATEUR LICENCE

As with any RAE course, in this first 'lesson' we don't propose to dive straight into the technical side of amateur radio and put some of you off before we even start. Instead, we will take a look at what the hobby is all about, which should answer many of the initial questions that a lot of people who have only ever had a passing acquaintance with amateur radio would ask, and so put you on the road to becoming a radio amateur.

Expanding a little on last month's article, before any transmitting station can be set up and used, it is first necessary to obtain the appropriate licence. For establishing an amateur radio station, you must obtain from the Secretary of State for Trade & Industry an amateur licence A or B, which contains the conditions under which the amateur station may be used. Full details of conditions, types of licences, applying for a licence and an application form are contained in the publication *'How to Become a Radio Amateur'*, which is available free of charge, and with the compliments of the Secretary of State for Trade and Industry, from the Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, Derbyshire S49 1PF.

A summary of becoming a radio amateur is that you will need to be over 14 years of age, have passed the City & Guilds Radio Amateurs' Examination and have paid the appropriate fee (renewable annually and currently standing at £12) to the PO Headquarters at the above address. People who hold foreign passports but who reside in the UK may also take the UK examination.

Types of amateur licences

There are two types of licences at present in this country, the principal one being the amateur licence A. To obtain this, you must have also passed the Post Office Morse test, which is not as difficult as it sounds. The Morse test consists of sending and receiving words and figures at a speed of about 12 words per minute and a full list of test centres, plus a Morse test application form and fuller details of the test (which only takes a few minutes), are included in *'How to Become a Radio Amateur'*. The Morse test fee is presently £15 and it is normal to first pass the RAE before tackling the Morse test, because you must have passed the test not more than 12 months before applying for a licence.

There has been quite a lot said to question the necessity of having a Morse test in order to obtain a 'full' Amateur licence. It is a fact though that telegraphy is still the prime mode of communication for a number of non-amateur services and in the amateur field itself there are still many operators who continue to use Morse code. It is a most reliable method of communication and much of the rare DX (long distance stations) will usually have been worked using Morse code in conditions where speech would have been indistinguishable.

This magazine regularly contains advertisements for Morse code tapes and home courses, whilst the Radio Society of Great Britain (the RSGB), produces a very useful booklet entitled *'The Morse Code for Radio Amateurs'*. Whilst 12wpm may sound fast to some, with patience and practice, it is possible for the average person to far exceed even this speed.

The amateur licence A allows you to transmit on all the amateur frequencies available in this country, from 160 metres upwards (see panel), but there is also the amateur licence B, whose conditions are broadly the same as for licence A, but which does not authorise the use of frequencies below 144MHz, nor Morse telegraphy. For this reason, you are not required to have passed the Morse test to apply for an amateur licence B.

Many amateurs today do in fact apply for the B licence once they have passed the RAE, gaining experience of the airwaves on the VHF and UHF bands whilst they study for the Morse test. Communication distances possible on these higher frequencies are somewhat limited compared to those obtainable on the bands below 144MHz though, so the biggest benefit of the A licence is that it literally opens up the whole world to the amateur, something well worth sitting the Morse test for.

Callsigns

Once an amateur licence has been issued, it will have on it your callsign – the means of identifying your station when on the air. The callsign begins with an international prefix to indicate which country it belongs to, and for England, callsigns start with the letter G. The panel shows a list of amateur callsign prefixes for Great Britain. A full list of international prefixes can usually be

Frequency Allocation

The schedule of basic HF, VHF and UHF frequency bands for Great Britain. Full details of power allowed, classes of emission and other limitations can be found in both the RSGBs 'Radio Amateurs Examination Manual' and the free publication from the Radio Amateur Licensing unit 'How to Become a Radio Amateur'.

(It is worthwhile remembering the band limits for the RAE).

Frequency band in MHz			
1.810	-	2.000	
3.500	-	3.800	
7.000	-	7.100	
10.100	-	10.150	Amateur
14.000	-	14.350	Licence
18.068	-	18.168	A only
21.000	-	21.450	
24.890	-	24.990	
28.000	-	29.700	
70.025	-	70.500	
144.000	-	146.000	Amateur Licence
430.000	-	440.000	A & B

Amateur Callsign Prefixes for Great Britain

Prefix	Country
G	England
GD	Isle of Man
GI	Northern Ireland
GJ	Jersey
GM	Scotland
GU	Guernsey
GW	Wales
GB	- used for Special Event Stations, exhibitions, repeaters, beacons etc.

found in various books on amateur radio. They are worth remembering as there is often a question in the RAE on prefixes for Great Britain.

That was just a brief outline of the amateur licence. Fuller details, including how much power you are allowed to use, what modes of communication are acceptable, ie phone, single sideband, frequency modulation or Morse (CW), and on which bands, can be found in *'How to Become a Radio Amateur'*. These will be covered in more depth later, as licensing conditions are in fact part of the RAE syllabus.

The RAE

Speaking of the RAE, or the Radio Amateurs' Examination, let us enlighten you as to what it is all about.

We mentioned last month that the examination is conducted three times a year, usually in March, May and December. The dates once again for 1984/85 are Monday 3 December 1984, Monday 18 March 1985 and Monday 13 May 1985.

The exam can usually be taken at local colleges, or they can tell you where the nearest examination centre is, but plenty of time should be allowed when applying to sit the exam so that the necessary arrangements can be made for you. To sit the exam in May, for example, you should think of applying around the beginning of February or possibly earlier.

The Radio Amateurs' Examination is set by the City & Guilds of London Institute, whose address is *Electrical & Telecommunications Branch, 76 Portland Place, London W1N 4AA*. The regulations, objectives and syllabus for the RAE (No 765) can be obtained from the C&G at the same address, usually for a small fee. The exam itself lasts three hours, is split into two papers with a fifteen minute break in between, and consists of a number of multiple choice questions on a variety of subjects (see panel). Multiple choice means that together with the appropriate question there will be listed four answers, only one of which must be ticked as the correct answer. Sample exam papers are also available from the C&G and we will be looking at one at a later date.

Both papers must be taken at one sitting, but it is possible to gain a pass in one and a fail in the other. In this case, it is possible to sit the failed paper on the next examination date. There is a charge for sitting the exam but this varies across the country, so information should be obtained when applying to your local college or centre.

Details of where you can take the RAE, or enrol on a RAE course, can be found in various radio journals, such as ***Amateur Radio*** or from the Radio Society of Great Britain (the RSGB). Similarly, local newspapers invariably list all the various courses on offer at local colleges before the start of the main term but failing that, a telephone call to the nearest college should reveal the necessary information.

A club for the radio amateur

With most hobbies, you will always find a club to support it, and amateur radio is no exception. There are many clubs throughout the country, but perhaps the best way to find out what is going on in the world of amateur radio is to join the RSGB, which we mentioned earlier, or at the very least, make use of some of its publications. These go a long way to fully explaining what amateur radio is all about (we have far too few pages in this magazine), and one of its publications, the *'Radio Amateurs' Examination Manual'* has long been standard reading for any RAE candidate. This book, together with full details of the RSGB and its other publications and activities may be obtained from the *Radio Society of Great Britain, Cranborne Road, Potters Bar, Herts EN6 3JN.*

As this course is basically centred around the RAE Manual, it would certainly help those of you who intend to go through the next few months with us and follow the series to buy, or even borrow, a copy. You can then read each chapter as the months progress, and through these articles, we will try and explain the topics that we think you may have trouble with or which are important points to note.

Well, we hope that this has been a gentle introduction to amateur radio and that you are all keen to progress further. Next month we start on electrical theory and calculations, but nothing too hard. If you can get your copies of the RAE Manual before then and start reading up then at least it shouldn't make our task of writing these articles too difficult!

Recommended reading

'How to Become a Radio Amateur' - Radio Amateur Licensing Unit
'The Radio Amateurs' Examination Manual' - RSGB

Further reading

'A Guide to Amateur Radio' - RSGB
'Amateur Radio Operating Manual' - RSGB
'Amateur Radio Techniques' - RSGB
'Radio Communication Handbook' - RSGB

Useful addresses

Radio Society of Great Britain, Cranborne Road, Potters Bar, Herts EN6 3JN
The City & Guilds of London Institute, Electrical & Telecommunications Branch, 76 Portland Place, London W1N 4AA
Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, Derbyshire S49 1PF

Acknowledgement

RSGB
City & Guilds of London Institute
Office for Trade & Industry/Radio Amateur Licensing Unit

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Examination Pattern

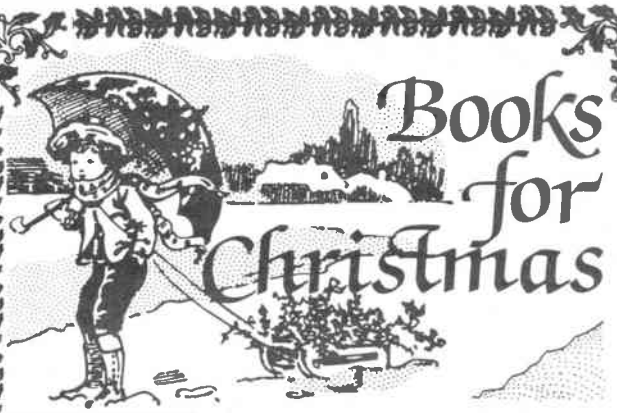
The examination for 765 Radio Amateurs consists of two separate papers, 765-1-01 Licensing Conditions and Transmitter Interference and 765-1-02 Operating Practices, Procedures and Theory. 765-0-01 contains 35 multiple choice questions and 765-1-02 contains 60 multiple choice questions. Questions are allocated to the syllabus sections as indicated below:

765-1-01 Licensing Conditions and Transmitter Interference (1 hour)

Syllabus	Questions
1 Licensing Conditions	23
2 Transmitter Interference	12
	35

There will be a break of 15 minutes between the two papers. 765-1-02 Operating Practices, Procedures and Theory (1¾ hours)

Syllabus	Questions
1 Operating Practices and Procedures	5
2 Electrical Theory	11
3 Solid State Devices	9
4 Radio Receivers	9
5 Transmitters	9
6 Propagation and Aerials	10
7 Measurement	7
	60



RSGB PUBLICATIONS

A Guide to Amateur Radio (*19th edition*)	£3.91
Amateur Radio Awards (*2nd edition*)	£3.68
Amateur Radio Call Book (*1984 edn*)	£7.14
Amateur Radio Operating Manual (*2nd edn*)	£5.33
HF Antennas for All Locations	£7.35
How to Pass the Radio Amateurs' Examination	£3.42
Microwave Newsletter Technical Collection	£6.83
Morse Code for Radio Amateurs	£1.64
Radio Amateurs' Examination Manual	£3.84
Radio Communication Handbook (*paperback*)	£11.79
RAYNET Manual (*1984 edition*)	£2.78
Teleprinter Handbook (*2nd edn*)	£12.72
Television Interference Manual	£2.31
Test Equipment for the Radio Amateur	£6.00
World at their Fingertips	£7.75
VHF/UHF Manual (*4th edn*)	£10.58
Meteor Scatter Data	£3.51
Logbooks	
Amateur Radio Logbook	£2.77
Mobile Logbook	£1.41
Receiving Station Logbook	£2.87
Maps	
Great Circle DX Map (*wall*)	£2.23
NEW! Locator Map of Europe (*Maidenhead*)	£1.75
World Prefix Map in full colour (*wall*)	£2.33

OTHER PUBLICATIONS

Active Filter Cookbook (*Sams*)	£12.71
All About Cubical Quad Antennas (*RPI*)	£5.83
Amateur Single Sideband (*Ham Radio*)	£5.46
Antenna Anthology (*ARRL*)	£6.00
Antenna Handbook (*RPI*)	£6.88
ARRL Antenna Book (*Hardback for p/b price while stocks last*)	£8.78
ARRL Electronics Data Book	£4.47
Beam Antenna Handbook (*RPI*)	£6.83
Better Short Wave Reception (*RPI*)	£5.83
Care and Feeding of Power Grid Tubes (*Varian*)	£6.99
CMOS Cookbook (*Sams*)	£13.07
Complete Shortwave Listener's Handbook (*Tab*)	£12.34
Design of VMOS Circuits with Experiments (*Sams*)	£8.50
FET Principles, Experiments and Projects (*Sams*)	£8.04
FM and Repeaters for the Radio Amateur (*ARRL*)	£4.30
G-QRP Club Circuit Handbook	£4.52
Hints and Kinks for the Radio Amateur (*ARRL*)	£4.47
How To Troubleshoot and Repair A.R. Equipment	£10.47
IC Op-amp Cookbook (*Sams*)	£11.76
International VHF FM Guide	£2.45
Newcomer's Guide to Simplex and Repeaters on 2M	£1.06
Radio Frequency Interference (*ARRL*)	£4.18
RTTY Today (*Universal Elec*)	£7.19
Satellite Experimenters Handbook (*ARRL*)	£10.11
Satellite Tracking Software for the Radio Amateur (*AMAST-UK*)	£4.47
Secrets of Ham Radio DXing (*Tab*)	£7.92
Semiconductor Data Book (*Newnes*)	£7.97
Shortwave Listener's Antenna Handbook (*Tab*)	£10.10
Shortwave Propagation Handbook (*Cowan*)	£7.79
Simple Low Cost Wire Antennas (*RPI*)	£6.83
Solid State Design for Radio Amateur (*ARRL*)	£7.87
Television for Amateurs (*BATC*)	£2.23
The Radio Amateurs' Handbook 1984 Edn. (*ARRL*)	**Special Price** £6.98
The Complete DXer (*Locher*)	£7.77
The Power Supply Handbook (Editors of 73 Mag) (*Tab*)	£10.99
Towers' International MOS Power and other FET Selector	£10.95
Towers' International Transistor Selector (*New Edition*)	£13.95
Towers' Op Amp Linear IC Selector	£9.50
Understanding Amateur Radio (*ARRL*)	£4.73
Understanding and Using the Oscilloscope (*Tab*)	£10.10
VHF Propagation Handbook (*Nampa*)	£3.75
Weekend Projects for the Radio Amateur (*ARRL*)	£4.95
World Atlas (*RACI*)	£3.35
99 Test Equipment Projects You Can Build (*Tab*)	£8.00

OTHER ITEMS

Morse cassette stage 1 (*to 5wpm*)	£4.54
DX Edge (*HF propagation prediction aid*)	£14.09

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To ensure delivery of books in time for Christmas your order should arrive by December 3rd.

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SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Before we get on to this month's topic, I would like to thank readers for their letters.

I try to help those with problems, providing I have had the experience. If not, I either search round for the answer or pass the letter to a more capable person.

I have been a short wave listener myself for many years, beginning with a simple broadcast receiver and progressing through the usual stages of listening until passing the RAE.

Over the years I have experimented with and built antennae of all shapes and sizes, made antenna tuners, filters and test equipment – with some successes and some failures – but it's all good experience.

I have worked prefix lists, nets, special event stations and many other award schemes etc.

Currently, I am working HF using 10 watts or less with 90% CW, experimenting, along with other members of the local Swansea Radio Amateur Constructors Club, on data transmission and with wire aerials. In my spare time I teach Morse on 2 metres to B licensees.

Consequently, I think I can honestly describe myself as an experienced listener and I try to pass some of this experience on to newcomers through these columns.

As for the building of receivers and the design or modification of circuits, I leave that to those who have far more knowledge and experience than I.

Despite my licence, I am still a short wave listener and will continue to encourage and assist those wishing to enter the hobby.

Computers and SWLing

A while ago I had some enquiries regarding the use of computers in connection with short wave listening.

Having had no experience with computers I did not feel that I could write on the subject. However, the point had been raised and I eventually purchased a 48K Spectrum, probably one of the best known home computers.

Using a home computer is, in itself, a hobby and has its own devotees (apart from the games players), and there are hundreds of ready made programs available on many subjects from bank account records to designing circuits.

Consequently there are a variety of ways in which the home computer can be put to good use by the short wave listener, budding amateur and even the full class A licensee.

Software

Probably the simplest use of the computer is the log book or record, for which there are a number of programs available from advertisers in this magazine. They have various methods of creating the record but, to take one example (Vu-File), the computer program presents a 'page' on screen which you can design to suit your own specific needs and requirements.

Your 'page' may consist of a simple name, callsign, date of contact etc, or may be more complicated with details of equipment, propagation conditions, area and zone codes and so on.

The page itself is limited by size but otherwise you can let your imagination run riot. The number of pages available is dependent on how much you put on each page, as the more information you require the more bytes you use. With 'Vu-File' the number of bytes available can be displayed if you wish. The display also gives the number of records in use at any time.

I found this program very useful and have adapted it in a number of ways to cater for WAB records, award records and even my club membership records.

There are other programs with the same theme and some are better than others, so it's up to you to try one or two and find out what suits your needs.

Morse code reception seems to be one of the popular uses of the home computer and I obtained a couple of these programs to see what they could do, bearing in mind my previous review of specialised Morse readers.

Purists may state that this is cheating and that one should make an effort to learn the code even if only a listener. Well, as someone who uses Morse more than SSB, I must admit that I have found the programs very useful when a station is transmitting faster than my receiving ability and I want to get all the details. This often happens near the end of a QSO when the operator only wants a quick contact with no frills, and so rattles off the last part of the contact at high speed. Not good operating procedure, but it happens.

The first program I received was by Pinehurst Studios and was extremely quick to load, taking only 30 seconds. The program is for receiving Morse only, having no other facilities, and is accompanied by a leaflet explaining the program. The instructions are easy to follow and no problems were encountered.

The on-screen display consisted simply of the 'Pinehurst Data' logo and the program was ready for use.

Details of the connections to the receiver are given later. The chosen signal was tuned as finely as possible and any interference filtered out.

First attempt

The resulting first attempt proved that a little practice would not go amiss as a large number of EEE's and 555's were coming up on screen. This is covered in the leaflet and meant that the incoming signal was too strong. This was corrected and it was pleasing to see a fairly constant read-out of translated Morse appearing on screen.

Not surprising was the effect QSB had on the signal translation and lots more dot characters appeared.

The speed range accepted by the program is variable over three ranges selected by pressing the F or S keys on the computer. There are no quoted limits but I found that even extremely fast machine-generated Morse was accurately translated.

There are ten screens of memory and these can be recalled in sequence. The ten complete screens are always in memory and the addition of more information results in an additional line being screened, at the loss of the original first line.

Background noise

A simple means of reducing background noise is given in the text. As when loading a program into the computer, the volume fed in is fairly critical so a certain amount of adjustment is necessary, but this is soon mastered. This was a very useful program to the listener and I found it worked as well as was claimed.

The second program to arrive was the 'Morse Terminal' program by P Anderson of Shepton Mallet, Somerset. This is a much more comprehensive program and can be used for transmitting Morse as well as receiving. It also has a very useful Morse training section, which can be used to build up your receiving speed if you already know the code, or start you from scratch.

Loading the cassette in the usual manner, the first thing seen on screen is the start of the 'Instruction' section. This consists of a series of 'pages' of information accessible by pressing 'any key'. The instructions are clear and easily followed and include connection details (see later) and details of fault finding in the program.

Side 2 of the cassette contains the main program and starts with the main 'menu' or list of available options. The Morse training program allows you to select your own speed and transmits groups of five characters until the screen is loaded, whereupon the Morse sent is displayed allowing you to check your progress.

Curiously, the Morse program selection transmits punctuation marks as well as plain language when the code '38' is keyed in, but if you key '26' just the plain alphabet is sent.

By trying different numbers from one, I found that the number relates to the position of the letter in the alphabet, with 27 to 38 being the punctuation marks and numbers. This is not clear from the instructions but is a point worth consideration, as the first four letters could be learned, then four more added and so on until you had learned the alphabet.

Mock test

The next part of the program is a mock test with a test passage at twelve words per minute and groups of numbers.

The main program, for transceive, opens up with the selection of transmit speed in which you feed between 1 and 99 words per minute. The receive speed is automatically tracked and no adjustment is necessary. Once the speed is selected the computer presents the receive mode. It is then just a matter of tuning the required signal in the usual way.

One point to note is that no gaps are present on the readout. This can be confusing if you take your eyes off the screen during reception.

The selection of the transmit mode is made by keying 'enter'. You can then key in your message as fast as you wish and the computer will send out the code at the preselected speed. There is a 'buffer' of 1500 characters so there is plenty of available space for most purposes.

I liked this program very much and it is a pity that the transmit speed is so low or it could be useful for meteor scatter transmissions where, I am told, speeds of 200wpm are common. Funnily enough, although the quoted maximum receive speed is only 25wpm, I never had any trouble copying any Morse transmitted on air, although I am sure some of it was faster than 25wpm.

It was hard to choose between the two programs as far as reception was concerned. The Pinehurst program had word spacing, which was a definite bonus, whereas the Armstrong program had automatic speed tracking, which I found much easier to use than the manual type.

Interface

The matter of connecting your computer to the receiver is left to you in both cases and a bit of experimenting is necessary, but myself and a group of interested parties soon had the problem licked and I offer our solution. Certainly a lot cheaper than a ready made interface even if brand new parts are used.

The design of this unit came about during experiments between amateurs in Swansea and has proven very successful in handling both data and Morse.

Although built as a transmit and receive unit, it can be simplified for listening only but the cost is very little so it hardly seems worth it. You could need all the facilities one day.

This particular 'interface' was the third designed and is fitted inside a neat plastic box with a switched 9V supply for the Spectrum to avoid having to remove the supply plug from the computer (necessary to clear the computer memory).

The connections on the switch marked 'B' denote the braid of the screened leads used. I should mention that we found the volume control on the extension speaker was necessary due to the high volume of signal required by the computer.

The Pinehurst recommendation for a noise filter is as simple as you can get!

Using a computer in connection with your listening can increase your enjoyment quite extensively.

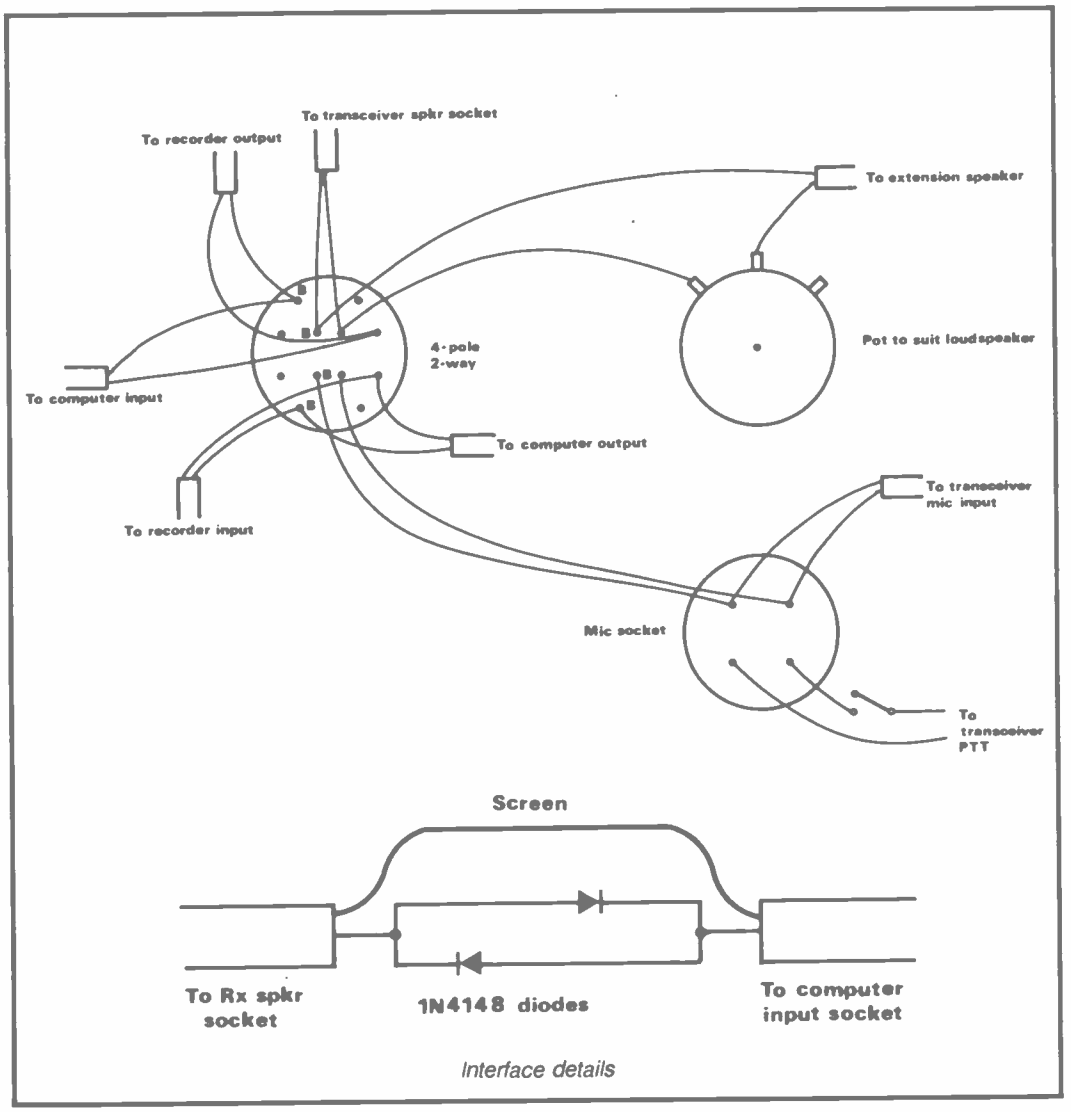
This was my first venture into computers. Although I haven't the time to write my own programs, anyone with a *lot* of spare time could make more use of the amazing facilities. As it is, I am enjoying a new side to both my listening and transmitting activity.

Just using ready made programs can still be extremely interesting and *very* time absorbing. Do not be put off by the funny language used by computer 'buffs' as the instruction manual, combined with the excellent demonstration tape supplied with your new 'toy', will soon have you searching avidly for more.

Experiment

As stated earlier, a few friends and I have been experimenting with programs on data transmission in which whole pages of text are transmitted in seconds. Trouble is there are not many stations abroad with compatible equipment that are active in this field. But if you should get the bug and hear our group on two metres or HF, please send us a card. . .we're getting a bit bored with reports from the same six stations!

Meanwhile, have a good month listening.



Interface details

TEN METRE AERIALS:

how to radiate a good signal

by John Petters G3YPZ

For the ten metre operator there is one simple rule to follow if a good signal is sought after. That is: forget HF techniques and think VHF. There are two areas which are of equal importance here, otherwise the results achieved will be very disappointing. These are the antenna and the receiver.

In this article I will deal with the antenna as this is the most common reason for poor results, leading to the attitude that the band is a dead loss. It is a complete waste of time to expect to be able to use such antennae as G5RV's, long wires, mini beams, lumps of wet string or the proverbial six inch nail.

Curse

That modern day curse, the multi-band trapped vertical, which embraces the HF5, 12AVQ, 18AVQ, 18AVT, C5 etc, without prejudice to any one manufacturer, has also become the source of the weak signal on ten metres.

How many people have you heard on the VHF bands using a trapped vertical for four metres, two metres and seventy centimetres? The notion is sheer folly, yet daily I hear stations struggling to propagate weak signals over pathetic distances on ten metres with such inefficient systems, and then complaining that the band is no good.

The polarization is of paramount importance on ten metres, with as much as a 20dB loss between horizontal and vertical antennae. Either system will perform admirably to its soul mate at the other end. Beam aerials obviously outperform ground planes by many dBs, but horizontal beam to mobile whip will result in a very weak and fluttery signal, and severely limited range.

For good all round local coverage the standard ½ wave end-fed CB vertical is more than adequate, and can only be outranked by a proper ⅝ wave ground plane or the unusual ¾ wave Sigma 4. The use of the centre fed ½ wave dipole is not a good bet, unless it is mounted at least ½ wave above ground, with the feeder taken away at 90 degrees to the vertical.

Of course it is also ridiculous to mount such an antenna with a stand-off from a metal mast, unless this too is ½ wave or more long. When using the ½ wave end-fed type antenna it is important to note that these are essentially free space antennae, as indeed is the ½ wave dipole, and should thus be mounted away from any objects, and at least ½ wave above the ground. Placing such an antenna closer to the ground will result in the radiation angle being tilted skywards.

Space wave

When considering the 'space wave' mode of propagation, we are primarily concerned with obtaining a low angle of radiation. The ½ wave centre-fed in free space radiates at 90 degrees to the vertical. However the lobe is rather fat, meaning that energy is wasted in the skyward direction. The end-fed half wave gives the same pattern, only raised by a few degrees.

With the ⅝ wave ground plane, the angle of radiation is 15 degrees from the radials, but the lobe is much more concentrated and hence gives an apparent gain at the horizon. The standard ¼ wave ground plane gives an angle of 45 degrees, hence is down in gain on the ½ wave dipole.

The availability of many different CB aerials at very reasonable prices gives the amateur the opportunity to acquire an efficient radiating system for the band.

Care should be taken in the selection of the aerial with regard to the physical construction and indeed the ease with which it will match. Any end-fed ½ wave is going to be of high impedance at its resonant frequency.

To match into 50ohms some L/C network is necessary. In some cases just reducing the physical length of the elements is all that is necessary (radials included if there are any); however, it is likely that the tuned circuit may need reducing in size, or a tapping point altered, to get a good VSWR.

In certain antennae the tuned circuit is enclosed within the rivetted base, and this will have to be removed in order for access to be gained. It is important when this is done to ensure that adequate weather proofing is provided. Any radials that exist on these aerials are provided for matching rather than as a contributory radiating factor.

The ⅝ wave ground plane will be familiar to many two metre operators. Its ten metre counterpart is the same beast only much bigger. Again there are a variety of different types of these, some having a full length vertical element, some having a capacity hat on top. Either should have a minimum of three ¼ wavelength radials.

In some cases these will be sloping down at a slight angle, which should offer a lower radiation angle than those with horizontal radials. The ⅝ ground plane is not a free space aerial, and will therefore work at lower heights, and even at ground level.

There are some ⅝ wave antennae currently available that must be avoided at all costs. These claim to be optimised for high gain and low angle radiation. More correctly the blurb should read high angle – low gain.

Such aerials as the GAP ⅝ vertical are radial-less and certainly do not perform with any degree of satisfaction.

The mast at G3YPZ is a 14 storey tower block, on which one of these antennae was erected as a good alternative to a proper ground plane. Having had good results with both ½ and ⅝ wave aerials at modest heights in the past, great things were expected of the new high installation. The results were more than disappointing. I needed 80 watts to reach Newmarket, a distance of merely 35 miles, with the GAP 27.

Staggering

On a cold, wet December evening I braved the elements and replaced this aerial with a proper ⅝ GP. The difference was staggering. My signal with G3IAG in Newmarket had increased by 11dB and contact could be made on 10 watts.

Matching ⅝ wave ground planes can usually be done merely by shortening the length of the elements by something in the order of 6%. Most types are also fairly broad banded and should be usable across the whole band with a reasonable VSWR.

Unless you are prepared to phase a group of verticals or can put up some form of vertical beam, then the ⅝ wave will give optimum results. Going to ¾ wave will be a disaster as the angle of radiation goes up drastically, and gives less gain than even a ¼ wave GP.

There is one exception to this, that being the Sigma 4 antenna. This is a ¾

wave vertical but with an inverted cone which shrouds the bottom ⅛ wave. This cancels out any radiation from the bottom of the antenna, leaving the top ⅝ to do the job. This type of antenna is certainly worth using, as its results are comparable, and possibly better, than the ⅝ GP.

Tests

A test with G4VYC in Sanderstead, Surrey, some months back found a 2 S-point increase on the Sigma 4 over his ½wave end-fed vertical. The Sigma 4 was only 10ft high, while the other antenna was ½ wave above the ground.

The HF5 is a ¾ wave antenna on ten metres, and behaves very badly for both DX and local traffic. A test with G4PHV in Ware, Herts found that the HF5 ground-mounted was many dB down on a ¼wave loaded whip on a car in the same location. In fact, the HF5 needed 40 watts to give the same S reading as the mobile whip with only 4 watts.

Convinced by this, G4PHV erected a helically loaded whip (⅝ wave) on the gutter of his house with several radials and immediately found his ten metre range was drastically increased.

Another test with G4HXH in Bishops Stortford, using 40 watts to a ground mounted 18AVT, and G3ZEV/M running 10 watts to a helical whip in the same location, again proved that the mobile antenna was better by far than the trapped vertical.

The sceptic might say, *'but the base aerials were ground mounted, what about putting them up higher?.'* This has been done by several stations, but still the results have been far better with the proper aerial.

The popular ⅞ wave antenna could be tried by ten metre operators and would give a marked increase in performance over the ⅝ wave, but practically it would be difficult to mount. Some Stateside stations have been worked who have been using collinears, but for most practical purposes the ½ or ⅝ wave aerials will be most suitable to the majority of stations.

Matching the antenna

There exists in amateur radio a number of hoary old chestnuts that seem to be revered and treated as dogma without due regard for common sense. One of the most common of these is the almost obligatory use of the ATU on any HF antenna system. An ATU should *never, never* be used in a coaxially fed aerial line. If your CB vertical, beam dipole or WHY has a high VSWR, it is a complete waste of time to try to correct this at the shack end with an almighty supermatch.

The mismatch occurs between the feeder and the antenna itself, and any matching must be done at this point. Inserting an ATU or Z match at the shack end will result in the feeder becoming part of the aerial, which at best can alter the polar diagram of the antenna, and at worst can cause TVI. The only time an ATU should be used is with high impedance lines or long wires etc.

Good quality

The feeder itself should be of good quality. RG8, RG213 or UR67 should be used. The thinner types of cable will be lossy, even at 30MHz. Using a run of 50 metres of RG8 at my base station resulted in a loss of three watts in ten.

If matching the antenna appears to be difficult it is worth measuring the length of the feeder, because an odd ¼ wave can cause the VSWR to be very high. The best bet is to terminate the feeder into a good dummy load before you start, and check for a 1:1 SWR.

An important consideration with the CB verticals is to ensure that water does not get into the matching network, as this will wreak havoc with the system. Some variation in VSWR is to be expected during rainy weather, and should be no cause for alarm unless the status quo does not return.

In the next part of this series, I will discuss the problems encountered with mobile operation on ten metres, dealing with installation, suppression and mobile aerials.

SECONDHAND EQUIPMENT GUIDE

NOT A BAD DAY FOR ONCE

by Hugh Allison G3XSE

It's a sad reflection on modern day living, but recently many amateurs have taken to buying old, secondhand rigs to put in the car rather than use the all-mode, all-bells-and-whistles gear normally residing in the shack. The reason, of course, is theft.

Despite 'all risks' insurance, after your second or third claim (I speak from experience), the average amateur often decides to either call it a day and give up mobile operation or buy an old clunker. Incidentally, if theft has never happened to you, don't think that insurance will cover everything. Even if you get the full cost of the rig back, nine times out of ten the damage done to the car by the thief cannot realistically be claimed back on your car insurance, due to the subsequent loss of your no claims bonus. Although I don't always agree with the fuzz, it really is good advice to lock valuables out of sight – put the rig in the boot or under the seat and don't forget the aerial. If I had a pound note for every mag mount I've had stolen, I could buy myself a big bottle of scotch to console myself.

I digress, however. It thus came to pass that yours truly was running around the bring-and-buy at Woburn like a one armed wallpaper hanger, with strict instructions not to return without a cheap 2metre FM rig for a friend. Well, a Heathkit HW202 at £2 certainly seemed to fit the bill, and the guy selling it couldn't have been more honest. I'll leave out the rude words, but basically he had bought the kit ten years ago and had never got it going. The receiver was really deaf and the transmitter took off (ie numerous spurious emissions). He was fed up with it (my words!) and had given up.

Honest

Also being honest at Woburn was SMC. They had a corner of their display devoted to non-working rigs. A Kyokuto FM144 – 1OSXRII was realistically described as 'very non-working' and priced at £10. These rigs were early synthesised 2m FM devices, fairly middle-of-the-road with regards sensitivity etc, but it was the salesman who talked me into it. 'You'll never get that working again'. A challenge! As I reached for my wallet a non-working 2 metre monitor at £5 caught my eye, so £15 changed hands (he wouldn't haggle) and more junk went into the nearly full boot of the car.

Another bargain was an AOR240 synthesised hand portable, again non-working, at £15. It was almost a criminal offence for me to buy it at such a low price since, by the seller's description of the fault (channel change selects the wrong channels) I knew what the fault was. Incidentally, these rigs never cease to amaze me, they really are sensitive.

Back on the bench

Fancying a quick and easy repair, it was the AOR240 that was first to receive attention. These rigs have two printed circuit boards inside, with wires between each other and/or the front panel. Herein lies the problem. A fairly generous length of ribbon cable runs between the divide-by-n part of the synthesizer and the thumbwheel switches. The insulation on the ribbon tends to shrink over the years and adjacent wires can short each other, due to a twist in the cable.

Although I have come across shorts at both ends, sods law normally decrees that it is the synthesizer end (the hardest one to work on) that goes. To prevent a re-occurence I normally fit a new ribbon, but a cut and rework with the old cable will often last for years. Anyway, fault exactly as diagnosed.

Next on the bench was the SMC 2metre monitor with no audio output coupling capacitor. By the way, the earphone lead doubles as the antenna (when in use) on a lot of little monitors, so don't get confused by RF chokes and small value capacitors of the order of 0.001 to 0.01μF, which separate the RF from the audio.

Connecting the AVO to the other side of the output coupling capacitor – no volts. This point should, nearly always, be at half rail. If it isn't, then no volts normally means the bottom transistor is a short (sometimes the top open, but rarer). Full rail means the top transistor is a short or the bottom open. In this case the bottom one was a dead short, because a 2N2369 was fitted as it was handy and it worked.

The HW 202

Feeling in a good mood by now, it was the turn of the £2 Heathkit to receive attention. I tossed a coin and it came down heads, so the transmitter was to be done first. There was a short interruption whilst a phono plug was located – Heathkit used to use these as aerial connectors (at 144 MHz???) – then via an attenuator to a spectrum analyser. Although I am prepared to admit that an analyser is not the most often-found piece of kit in your average shack, in this case a tune around 2 metres with a general coverage receiver would have confirmed the seller's statement that the transmitter was indeed taking off.

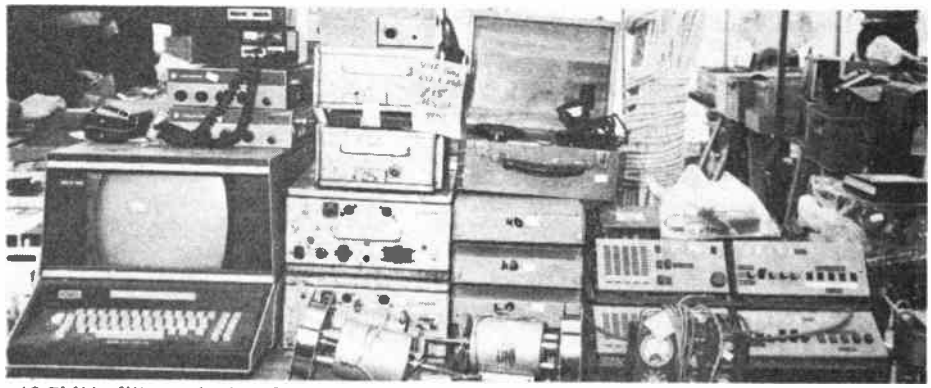
RF instability is often caused by faulty decoupling. A good trick is to look at the supply to each stage with an oscilloscope and see what 'crap' you have superimposed on the rail. Don't fall into

the trap of thinking that, because the rig is running at 144MHz, you need a 150MHz+ oscilloscope.

By way of example, suppose (as in this case) that your 144MHz carrier is generating spurious outputs every 80KHz, then the rail to the offending stage will have a massive helping of 80KHz on it. Be suspicious of any rail with over half a volt of rubbish on it.

This really was my lucky day, however. I clipped the earth of the oscilloscope to a grounded lead from a capacitor and looked at the supply to the driver stage. No dc was indicated on the oscilloscope. I checked that the oscilloscope was on dc coupling, and it was. Touching the tip of the probe to +12 volt supply into the rig (front panel was illuminated, so the supply was OK), did not register any dc on the oscilloscope. Solution? The 'earthed' lead from the capacitor that I had connected to the oscilloscope was dry jointed to the printed circuit board. Reflowing the joint (which looked absolutely perfect) cured the instability and out of the rig came a good clean 7 watts. It's a gift really . . .

Now it was the receiver's turn. It took 1 volt EMF up the aerial socket to get 10dB of quietning, a reasonable definition of a deaf receiver. Re-alignment got the sensitivity down to 10μV (for 10dB) and I was thinking about fitting a pre-amp when I happened to notice that there was



a 10.7MHz filter missing from the board. In with a ceramic one removed from a CB set and 18dB quietning for 1μV resulted. Not excellent, but usable. What do you want for £2 anyway.

The Kyokuto

By now, full of confidence, it was the turn of my last *bargain* to receive attention. The synthesizer in the rig is contained in a screened box which someone had removed by cutting all the wires. How do you connect up 20+ wires to 20+ pins when you have no circuit diagram? Simple. Open up the box and admire the 20+ colour coded wires inside, all of which had colour coded 'friends' hanging loose outside .

As I said, my lucky day. After rewiring the synthesizer it didn't work (probably the original fault). I shall not dwell too long on my one mistake of the day, involving a chip with only 4044 printed on it. I thought it was a CMOS 4044 but it was a Motorola MC 4044 phase detector. I hate to admit it, no laughter please, but I wasted a quarter of an hour with the CMOS book in my hand until it dawned that the book said 16 pins and my chip only had 14. Twit!.

Anyway, VCO working, mixer working, divide-by-n working and reference oscillator/divider running. Why didn't it work then? There was no link between the output of the divide-by-n and the phase detector. I'll bet a half of best bitter that there never had been.

So, four working rigs after three hours work (without circuit diagrams) for a total cost of £32. Not a bad rally, Woburn!

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■ Trio TS130V as new. Used once. All new warc bands 3.5-30MHz SSB/CW £325. Robson, 101 Ellis Gardens, Hemlington, M'bro, Cleveland T58 9EX. Tel: M'bro 595351.

■ Trio TR2300 T/CVR plus VB2300 lin-amp, MB2 mobile mounting packer A145 ATU ME x 55 boom mic C/W gear stick switch and mic gain control, A2DEM AS006 speaker valor magmount £200 prefer not to split demis G8NKU. Tel: King's Lynn 674015 QTHR.

■ Grundig satellite 3000, 21 band comm receiver, digital frequency display, field strength meter, built in SSB unit, 24 LCD quartz clock, superb 7.5W audio output. Used only in lounge £140. Two PYE Cambridges unmodified £20 each. Tel: 0642 (Stockton) 583572.

■ HW8 QRP HF Tx/Rx with RIT modification and complete with HWA-7-1 PSU £100. Alan Williams, G3KSU (QTHR). Tel: Ryde 0983 65551.

■ Realistic DX200 receiver good condition with instruction manual 0-15 to 30MHz AM SSB CW CB £65 ono. Ex USA army VHF receiver 27-140 MHz Halicrafter R44 ARR5 for disposal as spares required attention £10. Buyer collects. Hudson, 49 Radstock Road, Stretford, Manchester MS2 0AJ. Tel: 061 865 6987.

■ Yaesu FRG7 good condition. Must sell, gone VHF, £80 with manual. Tel: Whitstable, Kent 264815 anytime.

■ For sale: Icom IC745 transceiver as new complete with SSBN filter, marker, FM board few weeks old. Boxed, absolutely unmarked, cost £966 accept £735. Phone 01-998 4936 evenings or write 181 Argye Road, Ealing, London W13.

■ Kenpro KR400 rotator and controller, 440 LBS load rating, VGC. 8 element X-YAGI, offers. G4HHR. A Hyner, 20 Dene Tye, Pound Hill, Crawley, Sussex RH10 4TS. Tel: Crawley 885137.

■ TS530 HF transceiver, less than 10 hours use £395. Datong D75 Speech Processor almost unused £30 ono. Diawa Infra-red Mobile Mic unused £20, all in mint condition, ring Ken Dunstable (0582) 606983.

■ PYE motafone £40. PYE Bantum with case and Mic £40. Storno Fone 500 £15. FDK Hand Monitor 140MHz to 180MHz £100. Jaybeem PMR home base Paerial £70. PYE Westminster W15 £60. PYE Cambridge/Sharp CB £20. A 150 range of other PYE units. H Graham, No 16 Fordell CP, Lander Rd, Dalkeith, Scotland. Tel: 0875 320 642.

■ Datong model PC1 converts any good two metre SSB receiver or transceiver into a superb general coverage communications receiver. Coverage is 0-30MHz in thirty synthesised bands of 1MHz and no receiver mods are required £90 ono and get SEM ezitune free! Tel: 01 247 6097 (day).

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■ Global AT 1000 ATU with instruction cost over £40. Will sell for £30. Post paid. Reason for selling have trap dipole for BC work. Covers freq 10KHz thru 30MGs. Ideal for serious BCL. W Lee, 8 Bron Heulog, Budffordd, Isle of Anglesey.

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■ FT707 with FM £390, FP707 PSU £90, FC707 ATU £75. All vgc and boxed with manuals. FV707DM VFO £90. All ono or £575 the lot. Datong ASP speech processor £50 ono. Would consider FT757 for the lot. Tel: Tim, Reading (0734) 866122.

■ Edinburgh:- Signal generators one manual the other manual/sweep both 0-20KHz. Measuring set 20-20KHz. Hammarlund HQ180 HF receiver 150KHz to 30MHz. Ex marine VHF trans/rec with spare output value (QQU03-20) mains transformer 0-550volts other values 5U4G, 12AT7, 6BH6, 5763 EL85 EF95 6AK5. Tel: Alex after 6pm 0875 20775.

■ Realistic DX200 receiver 0.4-30MHz. Good condition. Boxed with handbook £60 ono or swap 144MHz linear/pre amp suitable FT290R mobile antenna or WHU. Ring Alan, G1IWQ Kings Lynn 829075.

■ Yaesu FRG7700 £295. FRT7700 £30. Also Bearcat 20/20 40 channel uncrystalised scanner £175 and Discone 65-520MHz Rx antenna £15. Buyer collects London NW10. Tel: 01-965 6677.

■ Welz CP-5 trapped vertical antenna complete with radials. 80-10m (non warc) £70 ono consider part exchange for HW-8 CW rig or WS-128, WS-122, A-16 or similar Spyset. Prefer buyer to collect or carriage extra. G4TMO, 4 Meadow Road, Watchfield, Swindon, Wilts. Tel: 0793 783461.

■ Complete dark room including envoy enlarger with 35mm colour box. Also 2¼x 3¼lamp house electronic exposure timer. Stacks of paper, dozens of extras, would exchange for TR9130 or FT290R. R D Hargreaves, 212 Gwendolen Road, off East Park Road, Leicester LE5 5FH. Tel: 0533 738377.

■ Racal RA17, nice condition, recently overhauled £125. Icom SM5 mic, new £20. Daiwa all mode active filter, type AF 606F £34. G8ZWW, Tel: 0322 63968 (Kent).

■ Trio Kenwood TS520 SE, excellent condition, recently serviced by Lowe Electronics £280 ono. Yaesu FT480R as above £300 ono. Overseas move forces sale. E Hocking, G4LKV. Tel: 02372 5637.

■ Kenwood (Trio) R1000 receiver. Good condition general coverage communications receiver £175. Also, 'realistic' patrolman scanning receiver which scans between 10 crystal channels. 14 crystals for 2 metre band included £40. Datong DC144/28 2m converter. Brand new £35. All in good condition, and complete with instruction manuals etc. Will sell separately or £240 the lot. Martin Vasey, 35 Nash Road, Romford, Essex RM6 5JL. Tel: 01 590 5490.

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■ Daiwa CNW518 antenna tuner, 2.5KW PEP, cross needle meter, 2 inputs. Mint condition, boxed £135. Adonis AM503 compressor microphone, base model, compression levels 10dB, 30dB, 45dB £25. Phone How Caple 205 evenings.

■ Sony ICF-2001 digital keypad entry receiver 150KHz-30MHz with power supply. Nearly new, perfect £90. Tel: Bury St Edmunds (0284) 704152 after 5.30pm.

■ For sale Trio R2000 communications receiver with MM 2m converter 8 months old still 3 months guarantee left £325 ono. Tel: Ipswich 830468.

■ Trio 9R59 general coverage receiver very good condition with manual £65 ono. Tel: 01361 1666 after 7pm.

■ Yaesu FR101 all mode HF receiver with 6m and 2m fitted has 160m to 10m and all broadcast bands with option for more £195 ono. Buyer collects. Ideal for beginner. Tel: Stephen Walters 794-1984 after 7pm West Hampstead.

■ Signal generator. AM/CW marconi type TF144H/4. Offers G4UNM (0983) 402273.

■ AVO. Valve characteristic meter type VCM 163 complete with original manuals. Offers G4UNM (0983) 402273.

■ Radio direction finder Fujiun makers packing unused. Model F1000C marine bands 144MHz AM FM LW beacons S1+ volt cost £120 offers. Also SMC Hand held receiver 11 marine crystals fitted. Mint £40. Phone (0274) 676556 after 6pm.

■ Yaesu FT207R 2m trancvr; NC3 deluxe charger/AC adaptor; small charger; helical and¼λwhip ant; external mike/speaker. All as new. Used very little and then mainly on RX. Bargain at £159 ono. Icom IC740, filted with internal power supply. As new. One year old. Little used and mostly on Rx. Going QRP Homebrew. Cost £900 will sell for £675 ono. Miss Jane Mullany, 83 Cole Valley Rd, Hall Green, Birmingham, West Midlands, B28 0DE.

WANTED

■ FT707 with FP707 and FC707 must be crystalled for 11 metres and in good condition, willing to pay around £400. Contact Dave Tel: Lincoln 43642

■ 2m rig for newly licenced GM1. Have nikon FE camera body, three months old will exchange for suitable rig with cash adjustment if req'd by you. FT290R, TR2300, TR7800 or WHY write to Graeme Brown, 36 Wellshot Drive, Cambuslang, Glasgow or Tel:(041) 641 1489 (Evenings)

■ Design details/circuits for audio mixers (especially monitoring); and handbook/service information for B41 (57141B) to borrow/buy. Also require several valves and spares for B40/B41 including knobs etc; (scrap set perhaps?) Chris Wheeler 21 Albion Road, Reigate, Surrey RH2 7JY (07372) 41510

■ Ham int jumbo legal stamped and freq counter needs attn. Exch for Icom R71E with remote if poss or similar. Abbey, 21 Moat Close, Bramley, Hants RG26 5AD. Tel: B Stok 882 825

■ 2m trans, and receiver, good price paid or will exchange some of the following. Eumig S936 automix super 8mm sound projector as new or ZX81 computer and recorder and 16K RAM pack ace as new, also Philips cassette recorder and case/mike, offers in writing, Lee Mannerings, 135A Watling Street, Gillingham, Kent

■ HF receiver. Will swap TRS80 LEV II computer 48K and loads of software, including machine code Morse send prog anything considered, in good working order. P F Scott, 19 Ashcombe Drive, Radcliffe, Manchester, M26 0NH. Tel: 061 723 3250

■ Manual for converter single sideband add on unit for B400 Rx, can photo copy all cost paid or buy, John Markey, 4 Harrison Way, Lydney, Glos GL15 5BN

■ Eddystone EC10 MK2, details, price, Tel: Reigate Surrey 48812

■ Urgently require alignment details, circuit diagrams or anything at all Trio Rx JR60(u). This Rx includes FM and 2m. The convertor is in built and Rx covers .55 to 30m and also 142 – 144MHz. Please help, your price or any costs by return or to copy. Also want any convertors to buy. Also 3 Henry Choke suitable for KW2000A PSU. This is also urgent. Sorry no phone, Parks, 1 Silk Stone View, Platts Common, Barnsley, South Yorks

■ IC 290E or FT480R 2m multi mode transceiver. Have multi 700AX 25 watt FM transceiver 144-148 MHz also MMT 144/28 2m down to 10m transverter still under guarantee, would exchange all for above item tel:- Terry G4OXD (0462) 35248 after 6pm

■ RAE course ICS or other, for ex naval sparker 1931 – 1946 vintage Morse no problem theory rusty, Wardle Tel: 0559 370085

■ Swop stereo system cost £750 for transceiver or good receiver. Also swop radio controller for model boats planes etc WHY. Phone Ernest G1KBD 051 489 2668

■ Wanted digital VFO to fit Yaesu FT101B, A Wilson 39 Kenneth Place, Smithton, IV1 2LX 791 954 Inverness Scotland

FREE CLASSIFIED AD 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

Amateur RADIO SMALL ADS

DW ELECTRONICS G3 XCF

Amateur Radio Supplies
71 Victoria Rd, Widnes
Tel: 051-420 2559
Open Mon-Sat 9.30-6 (closed 1.00pm Thurs)
We supply Yaesu, ICOM, Tonna, Jaybeam, Microwave Modules, Datongs etc

MORSE CODE PREPARATION
Cassette A: 1-12 wpm for amateur.
Cassette B: 12-25 wpm for professional examination preparation.
Each cassette is type C90.
Price of each cassette (including booklets) **£4.75.**
Morse key with separate battery (PP3) — driven solid-state oscillator and sound transducer produces clear tone for sending practice. Price of key with electronic unit **£8.50.**
Price includes postage etc. Europe only
MH ELECTRONICS (Dept AR)
12 Longshore Way, Milton, Portsmouth PO4 8LS

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

G W MORSE KEYS

4 Owen Close, Rhyl, Clwyd
Wales LL18 2LQ

THE GW MORSE KEY
A joy to use and to look at, this key is made from solid brass polished and mounted on a slate base, here in GW land (not JA) Mounting the key on slate stops all movement of the key when in use. £34.50 pp £2.00 ea.

24 HR LCD CLOCK
Clear ½" high lcd readout repeat alarm clock, battery powered (2 AA pencells). No R/F problems known. Complete with batteries £9.50 pp £0.50 ea.

GWHP PRODUCTS
The full range of Gwhips always in stock for quick and prompt delivery or collection.

NEW — NEW BASE STATION ANTENNA FROM — NEW
NEW — GWHP PRODUCTS — NEW
NEW — AVAILABLE SOON — NEW

For full information and price list please send SAE

BRASS CALL PLATE
Your callsign engraved on a brass plate for fixing to the GW morse key or any of your radio equipment. £1.00 only.

NO POST & PACKING CHARGE FOR ORDERS OVER £50.00

'Hacked any good systems lately? Computer journalist would like to hear from you. Anonymity guaranteed.' Please Quote Box No AR101 Amateur Radio, Sovereign House, Brentwood, Essex. CM14 4SE.

SAVE THIS CHRISTMAS ON YOUR COMPUTER

Commodore 64	£189	**Save £12**
Spectrum 48K	£119	**Save £10**
Acorn Electron 32K	£189	**Save £10**
BBC Model B 32K	£378	**Save £20**

All software for all computers
MR J SEAWARD
7 Olaf's Road, Stratton
Nr Bude, Cornwall Tel: 0288 4179

Eastern Communications

31 Cattle Market Street
NORWICH
(0603) 667189
MAIL ORDER
MON-FRI 9.30-5.30
SAT 9.30-5.00
ICOM
ACCESS/BARCLAYCARD

Telephone the advertising department on: 0277 219876 for details

MORSE READER PROGRAMME for Spectrum, Dragon, CBM, 64, Any Vic 20, BBC B. Self tracks approximately 8/30 WPM Spectrum needs no interface, others use simple 1 transistor interface. Circuit and full instructions with cassette £6.00. **J E Price, 4 Housman Walk, Kidderminster, Worcs.**

G3EKX S. S. B. PRODUCTS G3EKX

2 off Rascal – RA117E. Like new. 1-30MHz
Century. Digital Receiver..... **NEW** – .5 to 30 MHz..... £199
RCA. AR88D. Excellent condition with Spkr ..... RX
RCA. AR88LF with Speaker and Manual ..... RX
Yaesu FRG7. Mint condition ..... £140 RX
AOR-Scanner. NEW. AR2001. 25-550MHz £330
RS2000. NEW Scanner. 60-519MHz. 70 Mem..... £260
Rhode & Schwarz – Sig-Gen. 30-303MHz £125
Audiotine 348. Boxed **NEW** CB Base Station £99
Discone VHF/UHF. **Aerial. NEW** £25
2 metre Slim Jim NEW £8.50
Large stock of receivers, B40, Eddystone, Marconi, etc. Sig-Generators, Co-Ax, Plugs, Aerials, 3-Element Beams 10m £46. Rotators, Crystals (10,000), Part Exchanges, Generous Allowances. Established 1952 (Ex Derby).

Ring Norman Birkett (Dept AR)
Truro – (0872) 862575

QSL Cards
Printed on white or colour gloss cards, printed to your own design.
Please send SAE for sample to:
Caswell Press
21 Homethorpe Ave, Redhill, Surrey
Tel: (Redhill) 71023

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

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

ABC membership approved pending first audit Jan-Dec 1985

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	⅛ page	£86.00	£82.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ 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

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£560.00	£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 proof ad	mono no proof & small ad	mono artwork	on sale thurs
Dec 84	25 Oct 84	31 Oct 84	2 Nov 84	22 Nov 84
Jan 85	22 Nov 84*	28 Nov 84*	30 Nov 84*	27 Dec 84
Feb 85	17 Dec 84*	2 Jan 85	4 Jan 85	24 Jan 85
Mar 85	31 Jan 85	6 Feb 85	6 Feb 85	28 Feb 85

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.

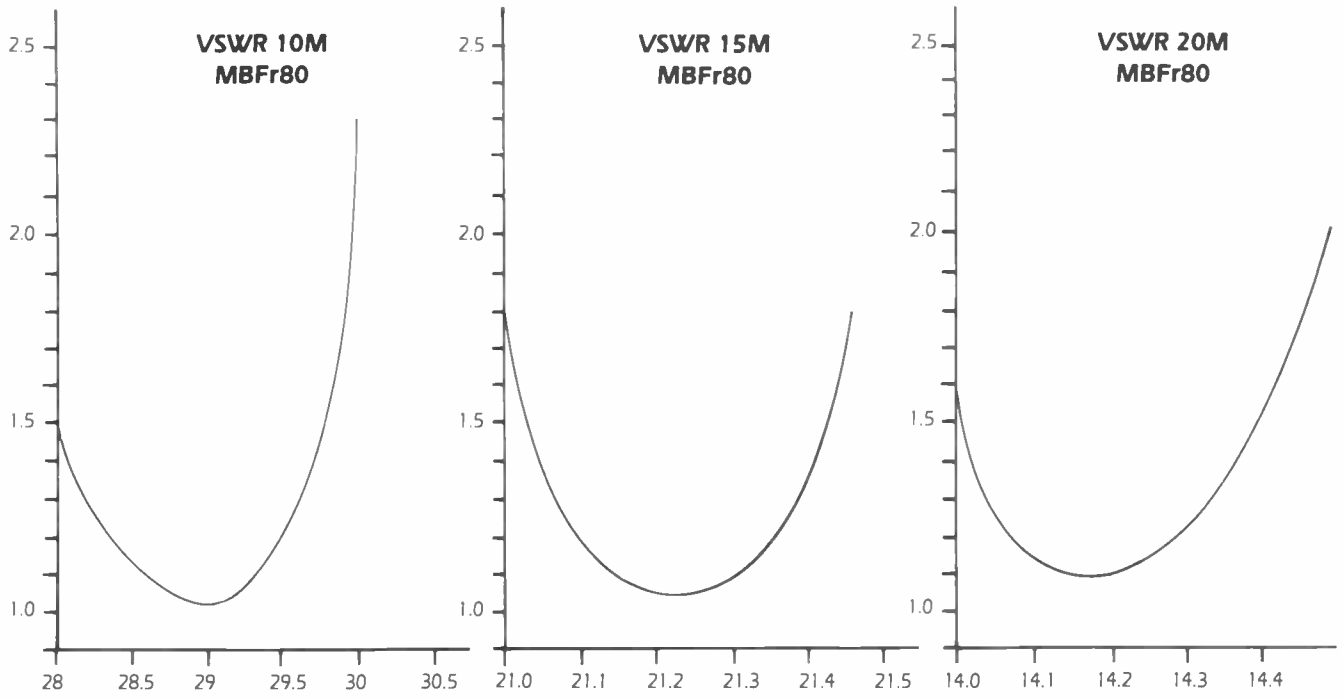
PAYMENT
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by the publication date.
Overseas payments by International 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.

HI-SPEC FROM HIGHTECH



MBFr80 breaks new barriers in antenna design

Have you ever been in the situation of working rare DX when a short skip signal comes in on the back of your beam and wipes out your QSO? Most beam antennae commonly available today rarely better an F:B ratio of 30dBd. With the **MBFr80** an F:B ratio of 43dBd is easily attainable. **MBFr80** is not a traditional parasitic array but uses absorption techniques to achieve this 'quantum leap' in performance. Over 3 years of research work has been put into development of this type of antenna and extensive proving trials have shown us that in many cases the quoted specifications will be exceeded.

MBFr80 presents an input impedance of 50Ω (unbalanced) yet does not require a conventional balun due to methods of capacitive coupling used within the driven elements.

Due to the use of linear frequency decoupling conventional traps (i.e. coil and capacitor) are not required, hence reducing losses to a very low level. This means that **MBFr80** can sustain a maximum power input of 2kW (100% duty cycle) and 5kW peak at reduced duty cycles.

Unlike conventional 'trapped' antennae, this array has a much greater bandwidth. The plots above speak for themselves — solid state transmitters do not normally require an ATU with **MBFr80**. A conventional three element tri-band beam often has as many as 12 separate traps, leading to excessive losses, narrow bandwidth and limited power handling capabilities.

Using aircraft grade (fatigue tested) aluminium and high quality poltruded GRP, our antennae exhibit extreme durability, corrosion resistance and strength.

The **MBFr80** is exceptional value for money at £189.95 inc. VAT and P&P and is expandable through upgrade kits which will shortly become available for 2M (interlace) and HF (extra parasitic element). For users who demand maximum performance on a restricted budget, **MBFr80** only requires a lightweight mount and with careful siting may be used on a chimney mount without significant degradation in performance.

TECHNICAL SPECIFICATIONS

Input impedance	50Ω (unbalanced)
Max. power input	2kW (100% duty cycle) 5kW peak (reduced duty)
Forward gain	Better than 4.5dBd
F:B ratio	Better than 43dBd
Max. boom length	4m
Max. element length	2.3m
Boom diameter	40mm
Turning circle	3m
Net weight	8kg
Max. wind survival velocity	100mph

H I G H T E C H

Antennae (Scotland) Ltd

To: HTA (Scotland) Ltd., 24 Gremista Ind. Est., Lerwick, Shetland Is. ZE2 0PX

Please Supply .. .. **MBFr80** Antenna(e)

@ **£189.95** incl VAT & P & P

Name (please print) .. ..

Address (please print) ....

..... Postcode .....

AM2

I enclose a cheque/PO payable to HTA (Scotland) Ltd value £ .....

or debit my Access Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Cardholder Signature .....

Credit Card Hotline 0595 - 5949 Please allow 28 days for delivery Offer valid UK only

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 . . .

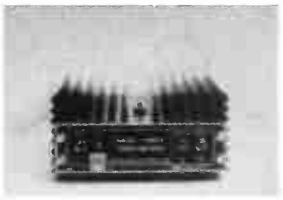
Every product in our range is designed and manufactured in the UK by our own employees, and wherever possible British Components are utilised.

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.

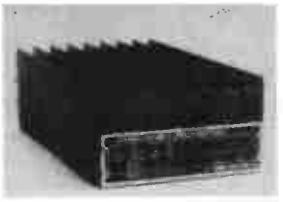
OUR RANGE OF LINEAR AMPLIFIERS . . .

MML144/30-LS



MML144/50-S

MML144/100-LS



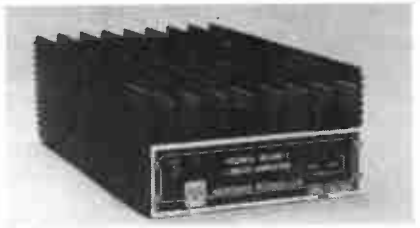
MML144/200-S

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, FM, AM, CW,	12dB	<**1.5dB**	13.8V @ 4A	\	£75 (p&p inc £3)
MML144/50-S	10W	50W				13.8V @ 6A	\	£92 (p&p £3)
MML144/100-S	10W	100W				13.8V @ 12A	\	£149.95 (p&p £3.50)
MML144/100-HS	25W	100W				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				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 FM ATV CW.	12dB	2dB	13.8V @ 6A	\	£139.95 (p&p £3.50)
MML432/50	10W	50W		12dB	2dB	13.8V @ 8A	\	£129.95 (p&p £3.50)
MML432/100	10W	100W		—	—	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.