

Amateur

RADIO

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Starting on 10GHz**



**A User Review:
The Cirkit TM5375 Digital Multimeter**

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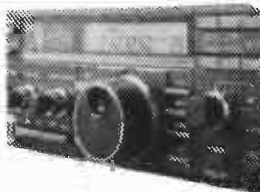
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FT-470	£389.00
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Broadband mag-mount antenna	£14.95
Total regular price	£466.74
Raycom package price	£425.00

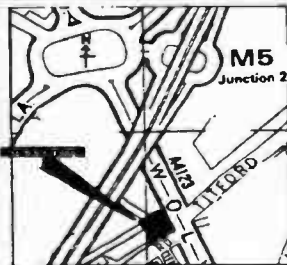
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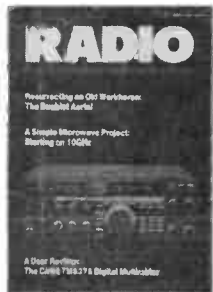
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The Icom IC-765 HF All
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LEVEL

ON THE COVER

On the front cover this month is the Icom IC-765 HF all band transceiver.

This rig caters for the serious DX enthusiast and is equipped with Icom's exclusive DDS (Direct Digital Synthesiser) system, a fully automatic antenna tuner, an electronic keyer with iambic operation and a full break-in function, among others. The IC-765 costs £2,499 including VAT.

For further information contact *Icom (UK) Ltd, Unit 9, Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 363859.*

TOROIDAL TRANSFORMERS

Toroid Technology Ltd have introduced their extensive range of high-quality, light-weight toroidal transformers, which are designed to be used in areas where space is limited.

This range has a standard selection of power ratings from 15VA to 1000VA, whilst incorporating primaries of 120V in parallel or 240V in series.

The frequency setting is 50/60Hz, with a maximum operating temperature of 55°C.

Several sizes are available from: 60mm x 31mm to 164mm x 84mm, and weighing from 0.38kg to 8kg.

Variations to the standard products of this range can be manufactured to customer requirements, including alternative voltage and current ratings and, if specified, a copper foil screen between windings.

For further information contact *Toroid Technology Ltd, 175a Brigstock Road, Thornton Heath, Surrey CR4 7JP. Tel: 01-689 8002.*

VARIABLE CAPACITOR

Nevada have announced a new addition to their existing range of ATU components, the 750pF high power variable capacitor – the model TC750.

The TC750 is particularly

suitable for use in the output stages of high power amplifiers and certain ATU circuits.

The capacity of the TC750 is 2-750pF and it weighs 600gms. The capacitor measures 14.5mm x 10mm x 10.5mm (WHD) and costs £28.00.

For further information contact *Nevada, 189 London Road, North End, Portsmouth, Hampshire PO2 9AE. Tel: (0705) 662145.*

CLUB NEWS

The Coventry Amateur Radio Society's programme for December includes an illustrated talk on The History of QRP on 1 December, a Night on the Air and Morse tuition on the 10th and a Christmas Fun and Novelty Competition on the 15th.

CARS meets every Friday at 8.00pm at Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Visitors are always welcome.

For further details contact *the club secretary, Jonathan Ward G4HHT, tel: (0203) 610408.*

The Norfolk Amateur Radio Club meets every Wednesday at 7.30pm for an 8.00pm start at the **Norfolk Dumpling**, the Livestock Market, Harford, Norwich.

On 13 December Alan Wright G0KRU will be giving a talk on Beyond Packet – the Computer Works! On 19 December (a Tuesday) there will be a Christmas party – there will be a charge of £1.25 for non-members.

For more information contact *the club secretary Steve Sewell G4VCE QTHR, tel: (0508) 78258.*

The Horndean & District Amateur Radio Club meets on the first Thursday in each month at 7.30pm at Merchistoun Hall, London Road, Horndean, Portsmouth. All visitors are welcome.

A club net takes place each Sunday on 28.320MHz at 0900 (CW) and 0930 (SSB), both local time.

The club also operates an

award programme. Each contact with a club member is worth one point; contact with the club station G4FBS is worth two.

The HF Award requires ten points, the VHF Award, fifteen.

For further details of the awards contact *George G0IVW*, for more information about club meetings contact *Stuart Swain G0FYX.*

The Rugby Amateur Transmitting Society provides a meeting point for all radio amateurs and short wave listeners in the Rugby area.

The society meets every Tuesday at 7.30pm at the Cricket Pavilion outside Rugby Radio Station. Visitors and new members are welcome.

Most meetings are informal natter nights when people can meet and exchange news, get advice on problems etc. However, there is also a programme of talks, slide shows and videos on topics of interest to radio amateurs. The club also arranges a number of excursions including some to distant radio rallies.

The society enters a number of contests, the highlight being the 144MHz Affiliated Societies Contest.

For further information contact *the secretary, Kevin G8TWH, tel: (0203) 441590.*

SWAPMEET

The eighth Aerial Christmas Vintage Wireless Stall Sale and Swapmeet will be held at Clarence House near Bristol on Sunday, 3 December.

A special feature will be a working display of vintage television sets. There will also be the usual Christmas fayre and refreshments. Everybody interested in vintage wireless is welcome.

Entrance is only by advance ticket. Booking forms are available from *Mrs D Roe, 7 Ashdown Road, Portishead, Bristol BS20 8DP. Enclose an sae.*

PROJECT BOOK

by Martin Williams

This month, we continue our investigation into power supply requirements by taking a look at rectifier diodes and electrolytic capacitors.

Rectifiers

These come in many shapes and sizes from the single diode unit, which is typified by the 1N4000 series, to the very heavy-duty stud-mounted types and 'four in a package' bridge rectifiers. The stud-mounted types are available in versions where the mounted stud may be either the anode or the cathode of the diode. It is, therefore, very important to make sure you get the right type for your mounting requirements.

Probably the best answer is to make it a rule always to use insulating, heat conducting, mounting kits when using these types. That way you can be sure of keeping out of trouble.

Inverse volts

One thing you must consider when choosing rectifiers, of whatever physical type, is the peak inverse voltage rating of the diodes. The main point of concern is whether the rectifiers will be used in a bridge or full-wave configuration (Figs 1 and 2 show the two types of circuit). If the diodes are used in a bridge circuit, then they only need to have a peak inverse rating of one and a half times the RMS input voltage to the rectifier. If they are used in a full-wave circuit, however, they need to have a PIV rating of three times the RMS input volts.

Safety margins

The reason for this is that the diodes 'see' the peak input voltage plus the off load charge on the reservoir capacitor, which is equal to the peak input voltage. In the bridge rectifier circuit there are always two diodes conducting at any one time, so the individual diodes only see half of this combined voltage.

Remember that it is always wise to use diodes which have a much higher rating than is really needed. This is because sudden pulses on the incoming mains line can cause very much higher voltage spikes than you may expect. The extra cost is a matter of pence, but the reliability factor increases dramatically.

Selecting

Bargain bags of unmarked diodes are often available at rallies and these can provide all you need, as long as you know how to select them! Unless you are sure that you can sort them out, do not take chances. Brand new units are not

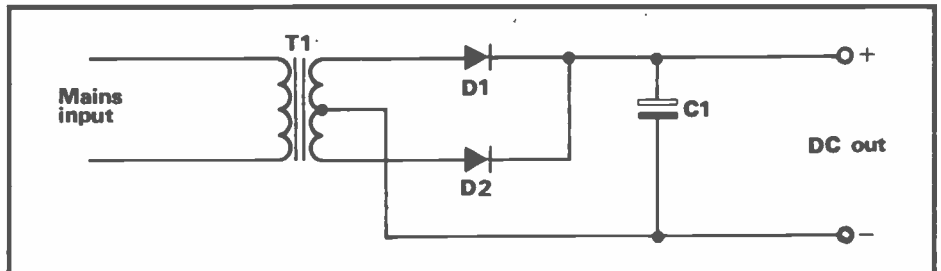


Fig 1: Full wave rectifier circuit

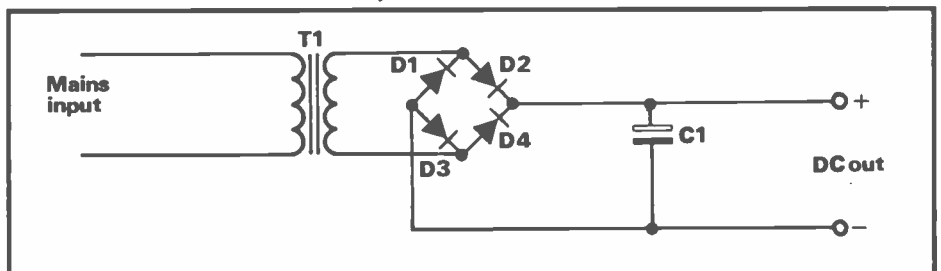


Fig 2: Bridge rectifier circuit

expensive and provide peace of mind. Remember that if a badly chosen diode blows on you it could destroy an awful lot of expensive equipment, unless you have taken steps to prevent this happening.

Testing

All you need to test a diode is a simple ohmmeter. Set the meter to a medium range ohms scale and connect the meter leads to the diode to be tested. Now make a note of the meter reading. The next step is to reverse the connections from the meter to the diode and take a second reading. One of these readings should be considerably higher than the other to indicate a good diode. If the readings in both directions are very low, it probably indicates that the diode has short circuited, whilst an infinity reading

indicates an open circuit and, hence, a blown rectifier.

Polarity

Testing for polarity is also done using an ohmmeter. Connect the two leads so as to get the lower of the two possible readings. The lead from the negative terminal of the meter is now connected to the anode of the diode, and the positive meter lead goes to the cathode. This is the reverse of what you would expect, but is explained by the fact that on an analogue meter set to read ohms the normally negative lead is actually connected to the positive side of the internal battery. This may not be so if you use a digital meter. In this case check the polarity of the leads, by referring to the circuit diagram of the meter or by checking it out with a second voltmeter.

In next month's thrilling instalment we explain how to select the various capacitors you need, and also offer some advice on sorting out the required heatsinking arrangements. In later articles, we move on to stabilisers and over voltage and over current protection. Stay with us and learn all the black arts!

CIRKIT TM5375 DIGITAL MULTIMETER REVIEW

by Ian Poole G3YWX

There are always new meters being launched on to the market. Cirkit have recently launched a new range of DMMs from around £20.00 which makes digital multimeters an economically viable proposition for most amateur shacks.

Analogue vs digital

There is much debate as to the advantages or otherwise of digital meters, and whether they are better than their analogue counterparts which until recently have dominated the market. The fact is both digital and analogue meters have their pros and cons.

Analogue meters are ideal for many tasks. They indicate trends very well and are ideal for checking whether a reading is in the right region. To give an example of this, a meter may be used to check something like a voltage rail. In most cases, it is only necessary to know if the right voltage is present. Although an analogue meter will give a quick indication of this, its accuracy will be limited. A good analogue meter, such as an AVO, will have an overall accuracy of about 1%, and new AVOs cost over £200.00.

On the other hand, digital meters can be made inherently more accurate. In order to make a display read to more places it has only to be extended. This means that the accuracy of the instrument is really limited by the measurement circuitry. In fact, it is possible to buy digital multimeters which read to fractions of a percent for less than the cost of an AVO. Another advantage of digital meters is the ease in which their displays can be read.

An analogue meter will have several different scales. This will entail a certain amount of working out to determine the real value once the reading has been taken. Whilst this is usually a simple task for voltage and current readings, it is more complicated for resistance measurements. In any case, it creates another opportunity for making mistakes. On the other hand digital meters will have their decimal point in the correct place, thus allowing for a more direct reading.

With these factors in mind, it is worth looking at what is generally needed in an amateur shack. An accuracy of around 1% is more than adequate for most measurements, although sometimes the extra accuracy of a digital meter can be an advantage.

Cirkit's range of meters

The new range of DMMs from Cirkit offers a wide range of facilities. Obviously the basic range of amps, volts and ohms is standard on all of the meters.

However, there is a number of other measurements which can also be made. For example, it is possible to measure the HFE or current gain of transistors. This measurement gives a faster, better indication of the health of a transistor than the simple indications of the transistor junctions which can be made with an ordinary meter. It is also possible to perform a diode and LED check.

Some meters are supplied with a logic indication, while others give measurements such as capacitance, frequency and temperature. Obviously not all these facilities are available on any one meter. A summary of the specifications and facilities is shown in the Table.

In addition, each meter is housed in a strong ABS case. They are also protected against overloads and come with a full year's guarantee.

The LCD display gives a three and a half digit indication and auto zeros. The battery life is in excess of 150 hours and there is a battery low indication.

Finally all the meters come complete with test leads, battery and instruction manual.

The TM5375

The case for the TM5375 is made of ABS, and is coloured yellow on the front

panel and black on the rear panel. There is a hinged stand on the back of the case which is normally recessed but it can also be hinged out to enable the meter to be canted at a 45° angle. This makes the meter much easier to read under some circumstances.

Front panel

At the top of the front panel is the LCD display. The figures of which are half an inch high and quite clear to read, even in relatively poor light. The main range switch is free of obstructions and has a nice positive action. In addition to this switch are two small slide switches which select ac/dc and the trigger level for the frequency meter.

Below the main range switch are four sockets provided for the test probes: the first one is the common socket, the second measures volts and ohms, the third is for current and the fourth is for the 10A current range; these sockets accept standard 4mm plugs. A groove is cut around the outside, with an equivalent 'ring' on the test probes to give complete protection from the possibility of touching any exposed metal on the sockets. One final socket provides four connections and is used for testing the HFE of the transistors.

Electrical performance

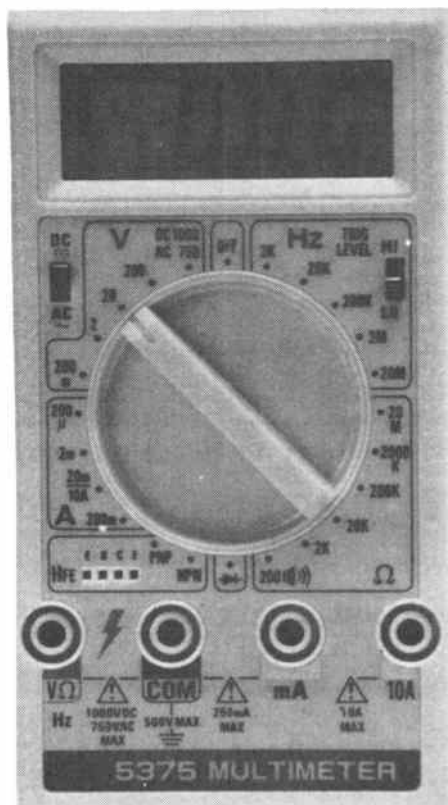
As expected, the meter is very easy to use. It is also well within the manufacturers specification for accuracy.

For dc voltage the specification is $\pm 0.5\%$ plus one digit; for ac voltage $\pm 1.0\%$ plus four digits, and 1.5% for the 750V range; dc current, $\pm 1.0\%$ plus one digit, and $\pm 2.0\%$ plus three digits for the 10A range; ac current $\pm 1.2\%$ plus four digits, and 2.0% plus four digits on the 10A range.

The instruction manual does not include a specification for the ohms range, although the sales data quotes $\pm 1\%$ plus three digits for the 200 ohms range; $\pm 0.8\%$ plus one digit for the 2k to 2M range; and $\pm 3\%$ plus one digit for the 20M range.

These measurements show that the meter performs within 0.5% for the worst case, and that most readings are within 0.2% of specification. Although it is possible to buy more accurate instruments, it is unlikely that their improved accuracy would ever be used in amateur electronics.

One useful feature of the ohms range is the continuity test. At 200 ohms a small buzzer sounds for values below 80 ohms. This feature can be very useful when tracing circuits through, as it avoids having to keep looking up when your



The front panel of the TM5375

head is buried in a piece of equipment.

The frequency meter is another useful feature. Although it is not intended to be an accurate counter it is well within specification. The tolerance for this range is 1.0% plus one digit for the 'low' trigger position and 1.5% plus one digit for the 'high' trigger position.

The frequency ranges are useful for

checking a number of things. For example, ensuring that various types of oscillators are running at around the right frequency.

Although the accuracy of the HFE test was not tested, several transistors, PNP and NPN, working and not working were tried. Using this range the meter quickly tests a transistor's dc characteristics.

Apart from the transistor test there is also a diode test, which measures the voltage drop across the diode. The reverse direction gives an over range indication, whilst forward direction gives the voltage drop across it. This enables the type of diode to be determined, as silicon ones have a drop of around 0.6V and germanium ones have around 0.2 to 0.3V.

Finally, the overload protection varies from range to range. It is such that the meter should survive most cases of carelessness. For all the current ranges, apart from the 10A ranges, a 0.8A fuse forms part of the protection. A spare fuse is provided with the meter.

Inside

To open the meter a single screw is removed, allowing the case to be popped open. This reveals two neat circuit boards, mounted one on top of the other. In fact, the standard of construction is higher than I had expected.

Calibration of the unit is fairly easy. It simply requires adjusting two potentiometers: one to set the dc meter section and the other to adjust the frequency meter. Both potentiometers are quite accessible using a small screwdriver.

Instruction manual

The meter comes complete with a small instruction manual, which starts off by outlining a few safety precautions. The next section gives a complete specification for the unit. The meter is described in sufficient detail for almost anyone to be able to operate it without difficulty. Finally, there is a section on maintenance which covers instructions on battery replacement and gives details about calibrating the meter.

Final thoughts

The meter is very easy to use and there are no real problems using it. Although it is at the bottom of the price range for digital meters it is sufficiently accurate for virtually every amateur shack. As such, this range offers good value for money.

My thanks to Cirkit for their help in preparing this review.

Meter Ranges and Basic Specifications

TM5315B

Dc volts	200mV - 1kV
Ac volts	200V, 750V
Dc current	200µA - 10A
Resistance	200 ohms - 20 Mohms
Continuity and diode test	
Basic dc accuracy	±0.8%

TM5375

Dc volts	200mV - 1kV
Ac volts	200mV - 750V
Dc current	200µA - 10A
Ac current	200µA - 10A
Resistance	200 ohms - 20 Mohms
Frequency	2kHz - 20MHz
Continuity, diode and HFE test	
Basic dc accuracy	±0.5%

TM5365

Dc volts	200mV - 1kV
Ac volts	200mV - 750V
Dc current	200µA - 10A
Ac current	200µA - 10A
Resistance	200 ohms - 2000 Mohms
Frequency	2kHz - 200kHz
Capacitance	2nF - 20µF
Logic, continuity, diode and HFE test	

TM115

Dc volts	200mV - 1kV
Ac volts	200mV - 750V
Dc current	200µA - 10A
Resistance	200 ohms - 2000 Mohms
Continuity, diode and HFE test	
Basic dc accuracy	±0.5%

TM135

Dc volts	200mV - 1kV
Ac volts	200mV - 750V
Dc current	200µA - 10A
Ac current	200µA - 10A
Resistance	200 ohms - 2000 Mohms
Temperature	200C, 750C
Capacitance	2nF - 20µF
Continuity, diode and HFE test	

TM175

Dc volts	200mV - 1kV
Ac volts	200mV - 750V
Dc current	200µA - 10A
Ac current	200µA - 10A
Resistance	200 ohms - 2000 Mohms
Capacitance	2nF - 20µF
Frequency	2kHz - 10MHz
Continuity, diode, HFE, LED and logic test	

Price List

Type	Stock Number	Price
TM5315B	(56-05315)	£20.89
TM5375	(56-05375)	£37.65
TM5365	(56-05365)	£38.80
TM115	(56-00115)	£34.57
TM135	(56-00135)	£46.85
TM175	(56-00175)	£58.38

Available from: Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111.
All prices include VAT and P&P

Cirkit NEWS

DECEMBER 1989



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Cirkit

Cirkit's new range of Digital Multimeters offer a quite unbeatable combination of features and value:



- Ranges include: frequency, capacitance and temperature
- Housed in strong ABS cases
- Overload protection on all ranges
- Full one year warranty
- 3½ digit, auto zero, auto polarity LCD, plus low batt indication
- 200 hour battery life
- All meters supplied with test leads, battery and manual

TM5315B

- Remarkable value
- 18 ranges
- 10A dc current

Price **£19.99**

dc volts: 200mV-1kV
ac volts: 200V, 750V
dc current: 200uA-10A
resistance: 200Ω-20MΩ

Continuity and diode test
Basic dc accuracy: ±0.8%
Size: 128 x 72 x 33mm

TM5375

- Frequency measurement to 20MHz
- ac/dc current to 10A
- 24 ranges

Price **£36.75**

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A
ac current: 200uA-10A

Resistance: 200Ω-20MΩ
Frequency: 2kHz-20MHz
Continuity, diode and HFE test
Basic dc accuracy ±0.5%

TM5365

- 30 ranges
- Frequency and capacitance measurement
- Compact size

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ac current: 200uA-10A

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Capacitance: 2nF-20uF
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ac volts: 200mV-750V
dc current: 200uA-10A

Resistance: 200Ω-2000MΩ
Continuity, diode and HFE test
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STARTING ON 10GHz

by Glen Ross G8MWR

Many operators are becoming jaded with the idea of continual 'black box' operating and are looking for something that would, perhaps, get them back into the spirit of amateur radio as it used to be. One area where this can be achieved is on the upper microwave bands. Before you start thinking that this is all starting to sound like top technology stuff involving lots of money, a laboratory full of gear and a well equipped mechanical workshop, let us see what can be achieved with simple equipment and what the cost is likely to be.

Expensive?

First of all it must be obvious that, as with any other hobby, as far as expense goes the sky is the limit. Buying the latest all singing, all dancing, camera equipment can cost an arm and a leg; but don't forget you can still take good pictures with an old box camera! This will be our approach to microwaving. Owing to the availability of surplus equipment, we will concentrate on the 3cm band.

Information

The amount of space available is from 10,000-10,500MHz. This is equivalent to a band extending from dc to above 70cm, so there is no lack of space. In this band you are allowed to use any mode and power that you could use on, say, the HF bands. 400W of SSB would be nice, but very expensive.

In practice the modes normally used are wideband (300kHz deviation) FM at power levels around 10mW and SSB, with power levels of less than 1mW. Before you write this off as unworkable QRP which will give ranges not worth thinking about, let me point out that the world record using 10mW of FM at both ends of the path is just under 1500km – and that record was set with both stations at sea level!

Distance

That is certainly a lot more than most people will ever manage under normal conditions, but what can we reasonably expect to do? Using 10mW of FM and a reasonable site, ranges of 150 to 200km are normal using moderate gear. 'I thought you could only work line of sight,' you say. The answer to this is that your line of sight can be a lot further than you think and also includes about a 30% increase for bending effects under normal conditions. Obviously a high site or very flat country is a great advantage, and portable operation is the usual way.

However, many people are now working from home using ATV and data links

to friends a few miles away. This is an ideal way to use the band, because it gives a private and interference-free link. What you can achieve from your QTH you will have to discover for yourself but, for example, I have a 10mW system with a horn aerial giving 10dB gain (ERP 100mW) on a 30ft high tower. My QTH is in Coventry (only 200ft ASL) and there are higher hills in all directions at a range of about five miles. Many contacts have been made and the best is a 5' and 9 report from near Cheltenham, forty miles away.

Getting started

Provided you don't want to set the world on fire, you will be pleased to hear that you can get going for around £15.00 for the complete transceiver.

The key to this project is to make use of one of the many microwave burglar alarm units that are now available. The simplest unit to start with is known as the 'side by side' type and is available from several suppliers at a cost from about £7.00. This unit comprises a 10mW Gunn diode in the transmit cavity, a low noise mixer diode in the receive cavity, and a small horn aerial – all mounted as a complete unit.

Transmit

How do we use it? First let us look at the transmit circuit requirements. The Gunn diode produces microwave power when a small dc voltage is applied to it, normally somewhere around 8V. It is a *negative* resistance device and so draws *more* current as the voltage is *decreased*. Because of this *never* operate the diode with less than 4V, otherwise you will destroy it. (The second part of this article will describe a circuit which makes it impossible to operate at less than 5V). The frequency produced by the diode is voltage sensitive, so if you superimpose some audio on the supply you will get a frequency modulated transmission. The amount of audio required to give 300kHz deviation is around 50mV RMS, depending on the individual diode.

Receive

On receive the incoming signal is applied to the mixer diode, together with a small amount of the Gunn diode signal (this now acts as the local oscillator). The Gunn diode should be set so that the mixer operates to produce the required intermediate frequency, which is commonly at 10MHz or sometimes around 100MHz, depending on the main IF strip used.

In its original use the mixer relied on a

reflected signal from the burglar to provide the focal oscillator injection which, hopefully, will no longer be available. Because of this a slight modification to the head is required.

Duplex

One of the interesting aspects of this type of microwave operating is that there is no Tx/Rx switching, the unit does both at the same time. This makes it possible to hold full duplex telephone-style conversations, but this is only possible if both stations are using the same IF.

Let us look at some figures to see how this is possible. For this example let's assume an IF of 100MHz. Station 'A' Tx's to station 'B' on 10.1GHz, and to receive this 'B' has to set his Gunn oscillator to 10.2GHz so as to get 100MHz IF. But since there is no way in which 'B' can stop the oscillator radiating (after all, it is his Tx), a signal on 10.2GHz goes towards 'A'. As his oscillator is already on 10.1GHz he also gets 100MHz IF and both stations can hear each other, hence obtaining full duplex operation. If 'A' now speaks into the mic while listening to 'B' he will not only hear 'B' in his loudspeaker but also his own modulation, so providing full sidetone facilities.

Fixed link

The choice of 100MHz IF for a fixed link means that the receive strip can be made by simply feeding the output from the mixer into a cheap broadcast portable tuned to around 100MHz on the FM range. The second head should then be adjusted using the tuning screws until contact is obtained.

Network

If you intend to work to a variety of stations rather than a dedicated link, then it is far better to go for a 10MHz IF, which is the one most commonly used. This makes it possible to use just the electrical tuning, because most people using this system will have centred the mechanical tuning at about 10.4GHz, which is the part of the band normally used. The receive board could then consist of a low noise preamp, possibly a CA3089, as the IF chip and the ubiquitous LM380 will look after the audio requirements.

What next?

In this short article we have only managed to give you a glimpse of microwave operating. Next month's concluding article shows the very simple circuits you need to get started and explains how to put it all together.

The World of D | A | T | A BY DON FIELD G3XTT

Over the past few months I have devoted a lot of space to major topics related to packet, RTTY and AMTOR operation. I hope it has given many of you both the urge and the background information to try these various modes. Each of them has its own fascination.

Packet radio is developing fast with new ideas and features coming along at a rate of knots. RTTY, though long-established, is enjoying something of a revival, and activity is high. In the recent CQWW RTTY Contest, for example, a number of participants made well over 1,000 RTTY contacts in the one weekend.

AMTOR is also increasing in popularity as people realise the benefits it gives for data transmission on the crowded HF bands. The AMTOR demonstration put on by G3PLX at the RSGB HF Convention in September attracted a high level of interest.

This month I have a pot pourri of items which I have been holding back. I hope you find something of interest.

Licence changes

Firstly, from G3XDV at Potters Bar comes news of some licensing changes affecting packet operation. Both changes come into effect on 1 January.

The first is rather esoteric, and is to the effect that Unattended Digital Operations are now allowed to any UK amateur in the 1299 to 1300MHz range. The benefit to packet users should come as trunk network links are set up in this frequency band.

The second change is that frequencies in the 70MHz band, plus 432.675MHz, will be dealt with in future under the Mailbox Notice of Variation system already used for 2m and 6m, where applications are dealt with by the RSGB on behalf of the DTI. This should significantly speed up the processing of mailbox applications relating to these frequencies.

In case you didn't know, up until now applications for frequencies on 70 and 432MHz have had to go via the DTI. In the case of 432MHz the DTI has then consulted the MOD with whom we share a number of frequencies on 70cm. The whole process has taken months, which is why congestion on 2m has remained at such a high level.

All being well, we should now begin to see some easing of the situation. The moral seems to be that you should encourage your local mailbox operator to apply for a port on 70cm, and then make sure that you use this one in future to get a better service.

Curling interference

Earlier this year G1YDY put out on the packet network some useful tips on how to reduce the pick-up of radiation from a computer (which can affect operation of the radio and TNC). This is a common problem, depending of course on how well shielded your computer happens to be, so I thought I would reproduce his advice here.

Firstly, ensure that you use shielded cable for all connections into and out of the TNC, paying particular attention to the power supply leads. Secondly, solder the braided shields of the antenna coax, rather than just crimping them or securing them with a screw thread. Thirdly, wrap leads such as speaker leads around ferrite rings. Fourthly, reposition cables to minimise the interference. Finally, ensure that all equipment is well earthed.

I would add to the above that it is essential to ensure that the computer itself is well screened – those in a metal case start off at an advantage. And bear in mind that radiation falls off by the square of the distance, so keep your computer and your radio as far apart as practically possible. Hope this does the trick! From my own experience, 6m seems to be the band that suffers most from computer-produced 'hash', so if you can cure it on that band you'll probably have the trouble well under control.

Although G1YDY doesn't mention it specifically, you may find that much of the interference is finding its way to the TNC and hence to the radio via the RS232 cable and, in extreme cases, I believe an opto-isolator in line with the RS232 should effect a cure.

Graphics via packet

For many years now RTTY enthusiasts have been making up pictures, using the standard RTTY character set, and sending them to each other around the

world. However, there are obviously limitations to the quality and definition of what can be sent.

Packet radio offers scope for sending anything that can be handled by a computer, which could include high-definition colour graphics of various sorts. The only constraint is that the sender and recipient must have compatible equipment, and graphics is one area in the world of personal computing where compatibility is hard to find. In the IBM PC environment alone we have CGA, EGA, Hercules graphics etc.

Last year it was reported that N1CH was distributing some software for handling the transmission of graphics between IBM lookalike PCs, and G1WYN also put out a message to the effect that he had been working in this area. By now I would imagine that others are getting involved.

I should like to hear from anyone experimenting in this area, which offers scope to extend packet beyond the simple text messages found on bulletin boards to, maybe, sending colour QSLs around the system, pictures of your shack, graphs of sunspot numbers, or whatever. The scope is endless.

The address field

One topic that has been given an airing at recent SYSOP meetings has been that of addressing. A number of options are becoming available. For example, those of us who live in the Thames Valley can use the address @TV to put a bulletin on those four mailboxes which are part of the Thames Valley forwarding system.

We can expect to see many similar examples cropping up, all of which will help to cut down the number of bulletins addressed simply to ALL and having to be forwarded the length and breadth of the country. Of course, there will always be those who believe their particular bulletin is of great interest to ALL. Whether ALL would agree is another matter entirely!

The other issue is whether it makes sense to send a bulletin to addresses such as SIX or NEWS. The first field is, after all, supposed to indicate an individual or group of individuals. Therefore, shouldn't a 6m bulletin be sent to

ALL @SIX rather than to SIX @GB. The problem, of course, is that the former doesn't give scope to indicate whether the message should go nationwide, Europe-wide or whatever.

I suppose we actually need a new field which includes key words giving a clue as to message content (as frequently used in commercial messaging systems), and on which the TNC could search. Thus a message header might contain something like ALL @GB (SIX, DX, PROPAGATION), with the implication that people interested in any one of those three broad topics might want to read it.

Personal mailboxes

Many TNCs are now appearing with so-called personal mailbox capability. The theory is that they can be left on all the time and messages left for the operator. Some operators ask their local SYSOP to download mailbox traffic to their personal mailbox.

Frankly I find all this rather puzzling because I can see no advantage in it when there is a perfectly good mailbox network. Why not check your local mailbox at your convenience and read your mail at the same time as looking to see whether any of the bulletins to ALL are of interest?

If any readers feel that personal mailboxes are advantageous in any way, I would be interested to hear why.

Packet awards?

The very nature of packet radio is that it brings to amateurs the benefits of a reliable network, not dependent on power, propagation, or even the availability of the distant station given that messages can be left in his local mailbox. Being able to raise somebody on packet is almost as guaranteed as being able to raise them on the telephone. Not much reason, then, to think in terms of packet contests or packet operating awards.

Having said this, I notice that at least one US amateur has already been awarded a Worked All States certificate endorsed for packet operation, so I suppose we might see more of this happening. A pity really. It's rather like getting awards for working DX via FM repeaters.

Of course, there are some very worthwhile awards for RTTY and AMTOR operation as I have mentioned before, and many other operating awards can be endorsed for operation on these modes if you ask at the time of application. BARTG publish a small book called, appropriately enough, **RTTY Awards** which goes into more detail.

Kantronics RF modem

The ARRL newsletter Gateway recently reported that Kantronics is expected to introduce an inexpensive 2m 9600-baud transceiver and TNC

combo shortly. Dubbed the DVR-2, the unit combines a 2W, two-channel, crystal-controlled 2m transceiver with a TNC and a 9600-baud modem. This won't be a lot of use in the UK as it stands, because we have much less spectrum available on 2m, but is interesting as a sign of things to come.

The major difficulty many amateurs have had with the G3RUH 9600-baud modem has been in modifying the radio to handle the interface (the audio response needs to be tailored to suit the modem tones, so the modem cannot simply be connected via the microphone jack). Such problems would be solved if radios came with an integral modem. Let's hope there is soon similar hardware to the Kantronics' available for 70 and 23cm.

9600bps update

While on the subject of 9600 baud, G1NTX sent out a bulletin in early October reporting on progress with his modem design. At that time the cards were almost at first prototype stage, so should be up and running by the time you read this.

Among other features, the latest version has had a 'voice mode' added to it. This allows sampling of an audio channel at 9600Hz and the storage of 8-bit data. After this, the data can be replayed at the same rate (or different rates).

This will allow the addition of voice mailbox features or messaging to the proposed packet card. There is also DTMF (touch-tone telephone keypad) receive capability, which opens up the possibility of some interesting interactive applications.

TNC download

G6NBO reports that he has recently finished writing a program that will download a file containing parameters and the current time and date from an IBM computer to a TNC. The program will work with any COM port and at any baud rate, parity etc. (Everything is controlled from the command line allowing the file to be added to an autoexec file.)

Copies of the software are available from Howard by sending a disc plus return postage to: H A Banks, 13 Eastgrove Avenue, Sharples, Bolton, Greater Manchester BL1 7EZ.

The Converse Node

K4ABT, writing a couple of months back in **CQ Magazine**, described a feature available in conjunction with the **NORD<>LINK** networking software which I found of interest. This is 'The Converse Node' which allows a multiway connection between stations connected to the same node so that they can have what I suppose you might call a net or a round-table QSO.

Unlike Packet Cluster, no computer is

required to run The Converse Node. It all happens in the TNC at the node station. Sounds interesting. I do know that G1PLT has something similar up and running in the High Wycombe area, though I believe his is resident as software in his PC.

Who looks after you?

In case you didn't know, one of the main guiding hands behind the development of packet radio in the UK is the RSGB's Packet Working Group. Like any voluntary body, the PWG has a thankless task, never being able to please everyone all of the time. However, the PWG handles mailbox licensing, tries to set out guidelines for the development of the network, co-ordinates frequency allocations with the RSGB HF, VHF and Microwave committees, and generally tries to encourage innovation in packet radio while maintaining a level of co-ordination.

The PWG is chaired by G3XDV, who nowadays is also a staff member of the RSGB, and the other members include GM4AUP (Minutes Secretary), G0/K8KA, G3VPF, G4MTP (Mailbox Co-ordinator), G8IMB, G8KHV, G8LWY (Editor of CI), and G4WRW (Site Clearance Co-ordinator). There is also a number of *ex-officio* members, plus corresponding members including yours truly who keeps an eye on HF-related topics. So now you know who to blame!

I'm afraid that's it for another month and, indeed, for this year. A Very Happy Christmas to all of you. Perhaps now is as good a time as any to ask for feedback on this column. The first World of Data appeared in March and I have covered a lot of the basics as well as some of the more leading-edge aspects of amateur datacomms.

It's always hard to know just what to cover in a column like this, and at what level to pitch it, so any comments, suggestions or criticisms are always welcome. Write to me via the editorial office, direct to my Callbook address or send a packet message to me at GB7WOK.

Next month, among other topics, I want to have a look at log keeping in the age of PCs, and at emission codes relating to data traffic, a topic that seems to cause nothing but confusion!



SECOND-HAND

by HUGH ALLISON G3XSE

Japanese PMR rigs

There are a few bargains to be had at the moment with 'made for the home market' Japanese PMR rigs. I must admit to a certain curiosity as to how two or three-year-old rigs, covered in Japanese symbols (both printed on and stuck on with Dymo tape) have come to be available on the second-hand market in the United Kingdom.

Both types mentioned below are 12V powered. One type bears the famous Yaesu name, though model numbers vary. These are approximately A5 sized and are hot little ships – 20+W out and a very decent receiver. They are crystal controlled and, all in all, are desirable boxes.

I'm sure dedicated bargain hunters don't need me to tell them that, at £10.00 to £25.00 each, they are mega-bargains – snap them up! They seem reliable too, no-one has yet reported a non-worker.

The second type leaves me feeling a bit embarrassed, I don't know who makes them or what they are called; there is nothing on them but Japanese symbols and I can't make head or tail of them. The best description I can give is that they are Liner 2 sized and the front panel, like the Liner 2, has two heavy-duty aluminium knobs on it (on/off volume and squelch). The aerial connector is on the back and is 'N' type. The rigs all appear to be single channel.

Transmit and receive crystals are both X27, which is unusual, but beware, I've come across 10.7 and 21.4MHz IF variants. The best bet here is to wave a signal generator in the general direction of the mixer, and see which frequency will provoke it into squawking.

One oddity is that lots of these have come with telephone-type handsets yet only the mike is wired up. There is no internal speaker in the set and the audio comes out only on a 3.5mm jack socket on the back. The handset has an earpiece in it and the wires exist, so modification is simple if you wish. I must admit I fully expected the earpiece to work when I encountered my first example of these and had to check back when I couldn't get any audio action.

The receiver ain't too bad, say 18dB for the microvolt. The only slight disappointment is the transmitter at 5W out, which is a little bit lacking. This isn't due to poor alignment or lack of efficiency when used on 70cm, I looked up the output transistor and it's only a 5W rated device. Most examples that have come my way have been on 420 or 460MHz and have set up on 70cm with no problem.

You must admit, it's not often you read a review of a rig in the amateur press where the writer doesn't know the name,

make or model number of the unit he's testing. Before anyone writes in complaining, remember I could have failed to alert you to them by simply ignoring them.

If you see a Liner 2-looking kit with a white plastic handset, an 'N' connector and lots of weird symbols on it you could be looking at one of the above. At £5.00 to £10.00 I think they are good buys for, say, a local repeater natter box.

BARTG Sandown Park

The trade area was a bit of a let down for me. I bought one item, a small TV monitor for a fiver. I was promised it worked, it didn't. Only 470µF on a zenered line gone open circuit. It entailed just half an hour's work, but it was a bit annoying.

The flea market saved the day. There were some grumbles from car boot sellers who had arrived about 9.00am (to try for a good pitch) and weren't let in until 10.30, but to be fair that was the stated opening time. I also understand that they wouldn't have been covered by public liability insurance until then, so I have some sympathy with the organisers; at least there was a good reason and no-one was being bloody-minded.

The car boot area attracted only about twenty-five cars, but it was definitely quality rather than quantity. One outstanding bargain was a 2m in, 6m out 'Spectrum' transverter for a tenner. Fully working and very sensitive, I'm well pleased with it.

All in all I bought about thirty items, and I look forward to next year.

Huntingdon Junk Sale

Mention junk or rubbish and I'm in there like a rat up a drainpipe. This bash was the first the Huntingdon club had organised and it shows great promise. There were trade stands, bring and buy, flea market/car boot area and an auction. Only the latter was a failure, as not enough gear was entered. The car boot area attracted only a dozen or so brave souls yet they came up with a Cortina bootful of toys for me to play with.

One notable item was a Yaesu FT560 HF transceiver for £15.00, minus mains transformer which had burnt out. I've bought several in this state over the years and am beginning to think this is a weak point of these rigs, as it is on FL50s. This should make an excellent long-term winter resurrection project; particularly since the seller chucked in an FT570, in the same condition, for free.

Signposts

The only moans I heard at the Huntingdon sale were about poor sign-

posting which made it difficult for people to find the venue. This is a very common fault at a lot of rallies. Sure, an amateur radio rally has a big advantage over, say, a craft fair, in as much as people on their way to the event can be contacted and talked in via the magic speaking wireless. However, this doesn't help those listeners or licensed amateurs who don't bring their rig because of fears of getting it stolen. Also, the talk-in often doesn't start until, say, 10.00am, which is of no help to the trader who is trying to find the place at 8.00am.

I appreciate that rally organisers have a difficult job to do, and that their efforts usually go unrecognised, but spare a thought for your dedicated amateur who may have got up at five or six in the morning, driven a couple of hundred miles to a town he has never visited before and then had to waste half-an-hour going round in circles.

Telford Rally

Brilliant. For those who have never visited, there are two halls, each about the size of a football pitch. One has mainly traders, the other a very generous flea market area plus catering. When you visit as many rallies as I do you begin to recognise the trade stands by their stock, but at Telford both the trade and junk areas produced the goods.

Please, oh please Mr Telford Rally organiser, don't let this rally 'clash with any of the other major rallies, as it has done in the past – Harlow or Old Warden for instance. The enormous covered area, good selection of goodies and easy access make this an excellent rally.

Old Warden

Wow. How do the organisers do it? Another record-smashing event. Over 250 car booters, a couple of thousand buyers and a great time had by nearly all. Nearly? A friend of mine bought a stack of non-working Spectrum computer boards, set up his bench to repair them (logic analysers and the like) and they worked!

Everybody had fun, from the six-year-old who was proudly showing off a hundred marbles he had bought for 25p, to the old-age-pensioner who was looking forward to reliving his youth with an ancient Eddystone 'all wave two' he had bought for the bargain price of £20.00 – I've seen people turn down £250.00 for them.

I took along a load of rubbish, didn't open up shop till 12 noon since I was running round buying other people's stuff, and sold out an hour later. I had to fight off people trying to buy stuff from me that I'd just bought for myself!

One seller had mainly wartime gear. Big glass insulators, ARP wardens' hats, Lancaster bomber DF loop control boxes, all 10p or 20p an item. Roller coasters, 30p; transmit quality variable capacitors, 25p; the list of bargains was endless. I also saw Icom IC2 hand-helds selling at £60.00, very cheap indeed.

Honestly, Old Warden is the radio event of the year. Why else would Danish, German and French amateurs travel over to snap up the bargains?

Peterborough

It's not often you get rained on indoors, but we managed it at the Peterborough Rally. Apparently the building in which the event took place is shortly to be demolished – look out for a new venue next year – and lack of maintenance had resulted in rather a lot of leaks.

Apart from that, well, I bought three things. An IC2E for £40.00, an FT290R for £100.00 and a rotator for £2.00 – all three were excellent value for money. The Peterborough rally is always like this, each year I buy only a few bits but am always well pleased with them. It's a small rally really, but friendly – put it in the 'worth a visit' category.

Harlow Rally

Held in a massive sports hall, plus one other room. The organisers had cleverly made the 'other' room the bring and buy, thus relieving the usual crush where trade stands meet bring and buy. There

was plenty of parking, a popular bar, loads of bargains and lots of room.

I noticed the organiser smiling at 11.00am – an unusual sight if ever I saw one. 'What's the joke', I asked. 'No complaints yet', he replied.

First class do, go to it next year if you can.

Kenpro KT200EE

In comes one of the above for repair. It's a VHF 2m FM synthesised hand-held. No synth action. It had obviously been got at by a man with a blowlamp and a crowbar at a guess, and would only lock at 140MHz dead. I wound in another address, 140.01MHz, and the carrier went for a bounce about. 140MHz equalled a count of all noughts, anything else resulted in *all* address pins going about half rail. Just occasionally it would lock up and work, all address pins nice hard noughts or ones.

Wasted an hour, I did. Even said one or two naughty words. Wanted to tweak the VFO core so I held it tightly in my hands, 'ping', it locked up. There weren't any screws holding the front to the back. Popped one in; perfect. The moral is, fit all the screws.

Satellite TV . . . again

A few months ago I wrote a few pearls of wisdom on second-hand satellite TV in this learned column. I took the proverbial out of two amateurs who had discussed the idea of mounting a dish up their

aerial pole, my point being that after a multithousand mile trip from ground station to satellite to receiver, 20ft or so of aerial pole ain't going to make a lot of difference.

In came a letter from a puzzled reader, he *had* mounted his dish up his (amateur) pole, the idea being to be able to steer his dish from one satellite to another. He could still get only the Astra stuff, the same as a near neighbour with a more conventional wall-mounted dish. He couldn't work it out. Well, here's why.

1. The dish and outdoor receiver gubbins will only be sensitive enough to receive high-power satellites, viz Astra, not the low-power distribution ones he was hoping to get.

2. A conventional aerial rotator only steers the aerial round in the horizontal plane. A genuine steerable satellite system rotates and alters the vertical angle of inclination at the same time. This is called a sidereal mount, to be technical. If you give it a bit of thought, geostationary orbits all have to be over the equator, so from the UK a satellite to the far east (or west) of us will require a lower inclination than one on 0° east/west. If you lived on the equator you would only have to change the angle of inclination – now there's a thought!

Believe me, the only advantage of putting an Astra satellite dish up your amateur pole is that it will clear any obstruction in its line of sight.

Might look flash though!

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ERA Ltd. is a manufacturing facility and as such has no showroom. We do however accept personal callers who may like to find out more about the Microreader or try one on their own equipment without obligation. Due to limited parking during the week we must restrict this to Saturdays only, but please do ring us first.

TODAY'S TECHNOLOGY

by Ian Poole G3YWX

There are still many new developments hitting the headlines which affect amateur radio. However, this month's column begins with a technology which is a little more established but finds a lot of use. Then there will be other topics covered which are at the forefront of technology or show what developments and design work have been going on.

VMOS

VMOS devices have been with us for some years now. They have many applications throughout the field of electronics. But to the radio amateur their presence has been felt most of all by the QRP constructor, who can readily use them as PA devices. VMOS devices are not restricted only to QRP because they have many uses in RF amplifiers, either as preamplifiers or output devices. The lower power devices handling up to 5W only cost a pound or so, and even the larger devices which are more expensive are still very economical.

VMOS is basically a form of FET technology, which overcomes many of the problems that prevent the more standard forms of FET from handling high powers. VMOS does this by using a different type of structure. Instead of the current flowing horizontally between the source and drain, as in the standard MOSFET shown in Fig 1, it flows vertically. The VMOS structure shown in Fig 2 provides two channels and allows much higher current densities to be used. It also retains the oxide layer between the gate and channel, thus ensuring that it retains the very high input resistance which is a characteristic of MOS technology.

Fig 2 also shows that the source has two connections, one at either side of the V-groove, enabling it to control the channel current. The channel is comparatively short and is in the p region sandwiched between the two n regions. Finally, the drain is connected to the lower n region.

Although the structure of VMOS FETs is more complicated than that of standard MOSFETs, VMOS devices offer several advantages. As well as their improved power handling capability over other FET devices, they feature both very low internal capacitances and particularly gate drain feedback capacitance. This makes the devices very tame and unlikely to burst into oscillation when used at HF or VHF. In turn this means that little or no stabilisation is needed leading to higher efficiency.

VMOS devices are robust and have a very high drain source breakdown level.

This means that they can be run with fairly high voltage rails and withstand high levels of VSWR. Furthermore, several VMOS FETs can be run in parallel without difficulty. Because heat causes their current consumption to fall, they will tend to share the current and not run into problems with thermal runaway.

If this was not enough, impedance matching is easy. VMOS devices present a constant input load, regardless of the output. So, once the input has been set up the output circuit can be adjusted without having to readjust the output.

Radio modules

For those people interested in building their own UHF equipment, Taki has released a series of modules to be used as building blocks within receivers and transceivers.

The series includes small high performance front-end modules pretuned for a specific band which contain an RF input circuit, oscillator amplifier and mixer.

One of the modules is a synthesiser for use on different bands: 400-420MHz, 450-470MHz, 470-490MHz and 490-512MHz.

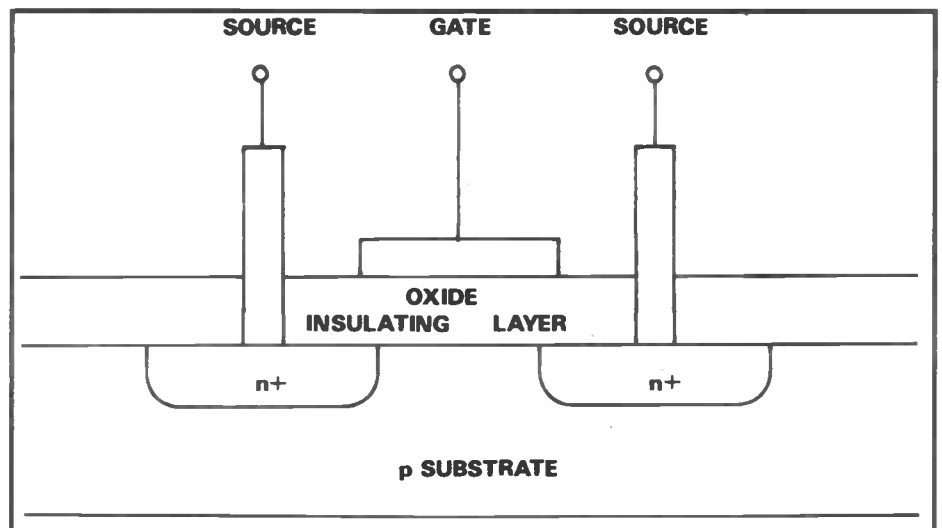


Fig 1: Cross-section through a standard MOSFET

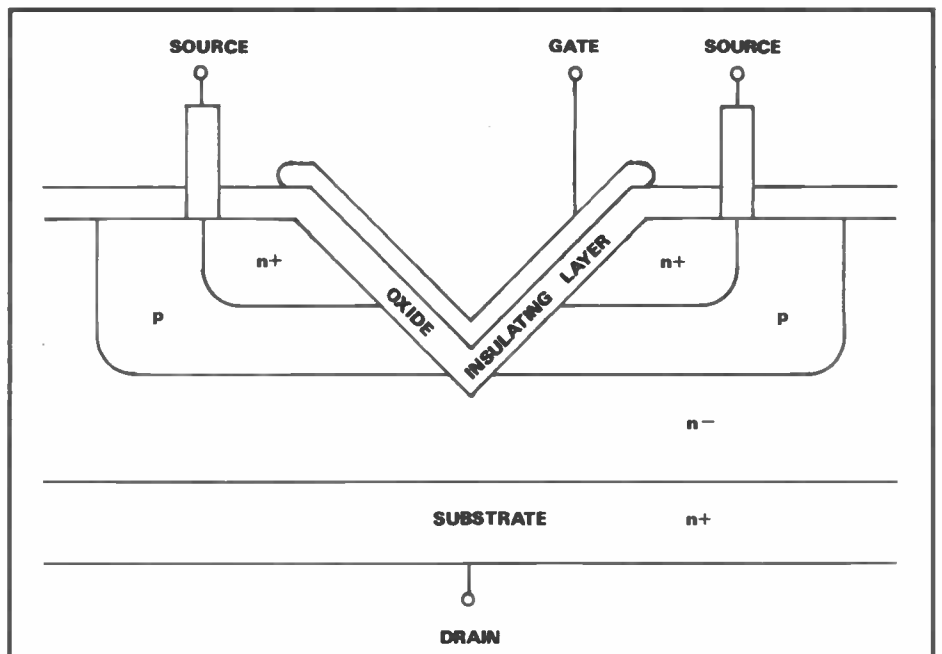


Fig 2: A VMOS FET cross-section

The synthesisers use a dual modulus prescaler, are more than sufficiently stable and measure just $12 \times 17 \times 14$ mm.

Finally, there is an IF amplifier module which includes two IF amplifiers, a detector and squelch circuit. All of these modules are available from Cirkit Distribution.

Superconductors again

Apart from the antennas which have already been mentioned it is just possible that superconductors may be seen in microwave resonators.

If a cavity is connected to a source of RF it will be seen to resonate, and the frequency at which it resonates will be determined by its geometry.

One of the all important characteristics of any tuned circuit, cavity or otherwise is its Q, the value of which is determined by the losses. Since a cavity constructed from a superconductor would suffer no ohmic losses its Q is very high.

A cavity like this has many uses. For example, it could be used on the output of a high power transmitter. As its ohmic losses would be small, little heat would be dissipated and it could be made small (apart from the cooling equipment to keep it in the superconducting region). Alternatively, it could be used in a receiving application purely for its high Q.

The design of these cavities is critical if the high Qs are to be fully realised. However, Q factors of 150,000 have been

realised; a factor of thirty higher than the best conventional cavities made with gold. This makes their performance comparable to that of quartz crystals. Anyone for a microwave crystal?

Modern relays

Today relays are often thought of as 'old hat' and rather out of date. This is far from true because even with the many new technologies and semiconductor devices available now, they still offer a viable solution to many problems. For instance, there are very few technologies which give an ON resistance of less than 0.1 ohm, and what devices give complete isolation between the actuating and switched circuits? These and other advantages make the relay a cornerstone in switching for today's electronics industry.

In order to retain their place, relays have had to undergo a tremendous amount of development. This has led to some very impressive improvements in performance. The old telephone relay has been replaced by a technology which can give power savings of over 90%; the expected operational life of a relay has increased over ten times and has been coupled with a hundred-fold increase in contact reliability. In addition, size and heat generation have also been reduced.

To achieve these new levels of performance, many new ideas have been used. Power consumption has been reduced not only by the use of better magnetic materials but also by the use of

semiconductors. Circuitry which gives the relay an accurately timed pulse of current for switching, followed by a reduced hold in current is one approach.

New contact materials have been developed, since it is not sufficient to use merely a contact material which is a good conductor. A material is required which will withstand many switching cycles and then still offer a low resistance. Ideally, this should be possible with a minimum contact pressure. In order to do this many contacts use several layers of different types of material. These contacts can be as thin as 0.005mm, although they will often be thicker. Some are used to provide good electrical conduction, whilst others are used to improve heat conduction, provide long life or bond different layers together. This all means that the science used to make these contacts is very advanced.

In spite of all these improvements, it has been possible to keep the costs down. Relays now represent excellent value for money and often provide the most cost effective approach to switching problems.

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DX DIARY

News for HF operators compiled by Don Field G3XTT

Once again HF amateur radio has proved its worth, allowing traffic to be passed on the bands following Hurricane Hugo when much of the telecommunication infrastructure of the various Caribbean islands was knocked for six. Often it is the slick operating procedures learned in the heat of DX and contest activities that help to speed up the flow of traffic in such emergencies. Mind you, some of the stations checking into the emergency nets on 20m seemed to be doing so out of curiosity rather than with genuine ability to offer any sort of assistance.

In future more and more emergency traffic is likely to be carried by the data modes, especially AMTOR. The IARN, international equivalent of our own RAYNET, is setting up an international data network to cope with emergency traffic (G4SCA is the UK co-ordinator), which will link with national organisations such as RAYNET in the UK.

Hurricane Hugo also had a major impact on many amateur radio installations in the Caribbean. The massive KP2A hilltop station in the US Virgin Islands was completely destroyed, as was the VP2MU contest station in Montserrat. A big blow, of course, for the owners of these stations, which also left some notable gaps on the bands during the recent major contests.

Around the bands

The bands became rather more lively during October, with excellent conditions on 10m for days on end, with DX such as KH8, KL7 and KH6 being worked regularly. Ron ZL1AMO showed up as ZK1CQ from the North Cook Islands, and was worked easily on 10m from the UK at mid-evening our time.

While all this was happening the LF bands were also lively. For example, KX6DC was workable both morning and evening on 40m, and even top band produced some rare DX such as JT (Mongolia) and VQ9 (Diego Garcia).

Bouvet Island

Plans for this one continue apace. I have received a copy of the twenty-seven-page press release from the American group hoping to operate as 3Y0B. This certainly looks like being a big one, with hopefully six stations manned round the clock, three on SSB and three on CW, with particular emphasis on the LF bands. The WARC bands will also be

included, and there may be some RTTY activity. Most operation will be split-frequency, and the plan is to make regular announcements of the bands and modes of the other stations to pre-empt the inevitable questions which would slow down the operation.

Restrict your QSO to an exchange of signal reports to give as many people as possible the chance of a contact. 'Insurance' contacts are acceptable, but not on the same band and mode until at least forty-eight hours into the operation.

QSLing will be handled by WA9VGY, and a full colour phototype award will be available to anyone working 3Y0B on three or more bands.

Latest news, incidentally, is that Martti Laine OH2BH will be going along as one of the operators.

DXCC news

The September issue of **QST** carried the call signs of several UK amateurs who have achieved DXCC status. G4HK, G4SUJ and G4WKH gained Mixed Mode certificates; GW3CDP gained a Phone certificate with 314 countries credited (nice one Denzill!); G4WKH also picked up a CW certificate; G4WVX gained the 10m award; while G2GM, G3LNS and G3AXI were all awarded 5-band DXCC. It's encouraging to see this level of achievement by G stations.

ARRL have announced that contacts on 10MHz will count towards the various DXCC awards, so all nine HF bands now count. 10MHz has been relatively quiet of late; perhaps this announcement will help restore activity levels.

One of the strangest applications to date for DXCC country status must be that submitted for the Puyallup Tacoma Indian Reservation near Tacoma in Washington State. An operation took place in mid-October under the call sign K7SS/PTI. There were big pile-ups, but somehow I can't see the ARRL DX Advisory Committee going along with this one.

Operator behaviour

From time to time I have mentioned the need to maintain discipline on the bands. The appalling behaviour of European DXers is often singled out for comment by DXpedition operators in contrast with the high standards of operating exhibited by amateurs in some other parts of the world, especially Japan. However, I

recently received an interesting letter from Paul Godolphin G4XTA, which puts a rather different slant on the discussion.

Paul argues that many DXpedition operators go on these trips as much to satisfy their own egos as to give contacts to the masses, and quite enjoy laying in to the waiting multitude with their demands for co-operation with their own peculiar style of operating and their comments about 'Stupid, stupid Europeans' and the like.

I suspect Paul has a point because I too have come across these prima donnas of the airwaves who seem to enjoy the fame of being rare DX and being able to tell everybody else what to do. Any comments from the rest of you?

Forthcoming DX

Between 1 and 12 December look out for the special prefix CT500 which will be used by Portuguese stations.

According to DX News Sheet, UB5EAZ will operate as either R0Q/UB5EAZ or UA0/UB5EAZ from the Stolbovoy Island group (AS29 for IOTA) some time during December.

ZL2VS hopes to operate from Chatham Island as ZM7VS from 15-29 January. And, while we are looking at January, F6EEM and F6EYP have given early warning that they will be operational from the Maldiv Islands for two weeks in late January.

Before that, I4ALU will also operate from the Maldives, as 8Q7BX, from 29 December until 7 January, on all bands, CW only. QSL to his home call.

Finally, of course, if the Norwegians actually pull off their operation from Bouvet Island (as opposed to the US expedition discussed earlier), this is due to start on Christmas Eve.

4U1WB

The call sign 4U1WB has been allocated to the World Bank Amateur Radio Club in Washington DC. However, for DXCC purposes this will simply count as USA.

Incidentally, another interesting station in Washington which you may hear from time to time is NN3SI as the Smithsonian Institution. And W3USS is the call sign of the radio club at the US Senate on Capitol Hill.

QSL manager list

John Pitty G4PEO, of the Chiltern DX Club, has compiled a summary of all QSL information which has appeared in DX

DX DIARY

News Sheet during the first six months of 1989. This includes full addresses where these are available. The list costs £2.50 from John, whose address is in the Callbook.

CQ World-wide

For the first time in years there was a significant change to the rules of the CQ World-wide Contests, but unfortunately the rules arrived too late for me to publish a correction. In fact it probably won't affect UK amateurs this year, though it may well do in the future.

What has happened is that a new class of entry has been introduced: Single Operator Unlimited. This new category, unlike the traditional Single Operator category, allows the use of DX spotting nets or any other form of DX alerting assistance.

This is to take account of the rapid growth in the use of Packet Cluster DX alerting systems, especially in conjunction with the K1EA contest logging software which allows a direct interface to Packet Cluster and to popular HF radios. Although such a system is being set up in the UK it will be some months before it becomes effective.

Don't forget, as I mentioned in July, that the Chiltern DX Club is sponsoring trophies for the leading UK stations in both legs of the CQWW Contests, so do make sure you send off your contest entry to **CQ Magazine**.

The single-op multi-band category must be the biggest contesting challenge available, demanding stamina, operating skill, an effective station and a good knowledge of propagation in order to know when to change bands.

As well as the results of the 1988 Phone and CW Contests which produced some extremely high scores (I have extracted the UK results which appear in the tables), **CQ Magazine** recently carried an interesting analysis of contest participation and achievements over the years. To take the Phone leg of the contest, the number of logs submitted has increased from just a couple of hundred in 1948 to about 1,500 during the 1970s to between 2,500 and 3,000 in recent years.

The higher levels of activity have led, of course, to much increased scores. PY2AC, the world single-op winner in 1948, scored 124,068 points. By 1966 VQ9AA/D was able to double the previous record to 3,624,942 points, but even this looks modest compared to the 12,743,190 points amassed last year by OH2BH operating as CT9BZ.

1988 CQ WORLD-WIDE PHONE CONTEST – UK RESULTS

Category	Call sign	Score	QSOs	Zones	Countries
Single-op all-band	GW4BLE	5,235,428	3936	127	357
	G3SNN	2,891,184	2426	122	342
	G4OBK	2,639,249	2584	111	310
	GW0ARK	2,137,148	2575	95	274
	G3XTT	1,773,708	1663	114	360
	G3OZF	1,636,728	1755	100	276
	GW4RHW	1,227,290	1408	93	277
	GM4VJV	848,922	1550	85	217
	GM3BCL	813,100	1307	68	167
	G14BBV	607,624	710	64	238
	GM4WEW	317,958	707	54	143
	GM0DBW	156,558	601	48	146
	G4ZXC	134,706	450	45	112
	G4NXG/M	50,830	156	43	87
	GM4CUX	20,280	114	28	50
	G0IAT	15,615	117	11	34
	28MHz	G3FXB	1,494,048	3338	37
G3LNS		1,264,848	2895	37	119
G4OJH		500,820	1839	32	70
GW5NF		192,654	741	30	69
GW3NYY		185,768	772	25	63
GM0HJV		113,288	593	22	46
GB75USA		94,815	662	14	35
G6QQ		52,059	318	20	47
GM4CHX		51,525	315	21	54
GM3CFS		26,340	212	16	44
21MHz		G4CNY	990,344	2390	38
	GW4VHO	21,861	170	20	43
	GM0AXY	15,957	77	27	54
7MHz	G0KBB	160,272	789	27	81
	28MHz QRP	GW0ESU	8,904	80	16
Multi-Single		G3CWL/A	1,320	32	7
	G3NAS	4,406,754	3495	130	376
	GB75CQ	3,553,440	3680	116	324
	G4PKP	2,412,000	2616	108	292
	GM0IZS	145,281	799	24	55
	G3CSR	12,599	120	17	26

Notes:

The Chiltern DX Club team (VK9YG by G4JVG, GW4BLE, G3XTT, G4OBK, G3OZF) was third in the Team Contesting category with 14,956,371 points
GW4BLE was fourth in Europe, G3FXB second in Europe, G3LNS third in Europe, and G4CNY sixth in Europe in their respective categories

1988 CQ WORLD-WIDE CW CONTEST – UK RESULTS

Category	Callsign	Score	QSOs	Zones	Countries	
Single-op all-band	GW4BLE	2,788,668	2592	117	336	
	G3MXJ	2,513,302	2122	135	371	
	G4BUO	2,348,919	2141	129	344	
	G3NKS	1,001,700	1402	85	233	
	GD4UOL/A	615,600	1431	74	226	
	G4DRS	602,975	1070	79	192	
	G3ESF	572,790	887	79	234	
	GI4BBV	350,208	562	71	217	
	G3GGS	250,008	418	71	193	
	G4ZFE	200,655	550	56	139	
	G4XTM	81,048	614	36	96	
	G6NK	12,882	141	17	21	
	G4ZME	11,283	183	36	66	
	28MHz	G3LNS	375,777	1303	35	94
		G0CKP	91,512	329	34	89
		G4UZN	79,540	319	27	70
		G6QQ	48,585	259	24	55
G4OBK		11,280	183	36	66	
21MHz	G4CNY	361,800	1175	37	98	
	G3SXW	360,720	1106	37	107	
	GM4CXM	244,577	973	36	95	
	GM3CFS	52,870	336	21	64	
14MHz	G0CGV	42,476	295	20	54	
	G3FXB	708,724	1836	39	124	
	G3TXF	422,408	1332	40	112	
7MHz	G3KDB	196,440	846	32	88	
	G3IGW	130,074	631	28	86	
	G4ODV	121,220	596	28	82	
3.5MHz	G4ARI	18,864	285	9	39	
1.8MHz	GW3GWX	4,551	101	7	34	
All-band QRP	G4ELZ	466,272	790	67	221	
	GD3HDL	3,666	78	7	32	
	G3DOP	2,046	85	14	30	
28MHz QRP	G3VMY	23,055	193	19	34	
	G3CWL	8,855	107	14	21	
Multi-Single	GW8GT	3,044,352	3172	135	377	
Multi-Multi	ZB2/GW3NYY	344,682	1354	49	185	

Notes:

GWBLE (operated by G3WVG), G3MXJ and G4BUO were fourth, sixth and ninth respectively in Europe in the single-op all-band category

G3LNS was sixth in Europe on 28MHz, G3FXB first in Europe and third world-wide on 14MHz, G3TXF sixth in Europe on 14MHz, and G4ELZ fourth in Europe and ninth world-wide on QRP (5W input)

All this has meant a change of strategy for the high scorers. No longer do they have to hunt around the bands for contacts. Where 100 QSOs per hour was once a contestant's dream, rates of 250 per hour are now relatively commonplace for the 'big guns'.

Interestingly, though not surprisingly, no European station has won top world honours in the single-op category since F8PI in 1958. South American stations have taken this slot in twelve of the last fourteen years, the only exception being EA8AK in 1980 and CT9BZ in 1988.

Turning to the CW leg of the contest, the single-operator section has only twice been won by European stations. These were GI6TK in 1948 (the first year the contest was run) with 452,454 points, and PA0UN in 1949. South American

stations have won in eight of the last nine years. The 1988 winner, OH2MM operating as FY5YE, achieved a new record score of 9,574,096 points with an astounding 5,548 contacts, an average of 116 per hour!

By the way, although his score doesn't appear in the table, G4JVG amassed 3,671,258 points in last year's Phone Contest operating as VK9YG from Cocos-Keeling Island, and comes away with the Single-Operator Expedition Trophy. Congratulations Steve.

Contests

All this talk of contests brings me on to the events for December. The ARRL 10m Phone Contest is likely to generate the most interest. This is a dual-mode event and takes place over 9-10 December,

running for a full forty-eight hours. Should be fun if propagation smiles on us.

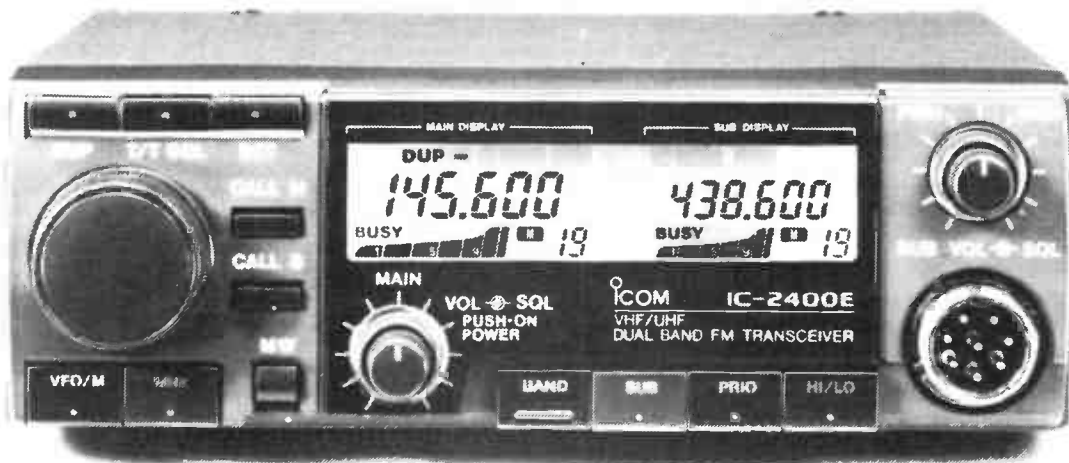
I want to make a special mention of the TOPS Activity Contest on 2-3 December, from 1800 to 1800. This is an annual event on 3.5MHz CW (3500-3585kHz), run by the TOPS CW Club, a UK-based organisation which exists to promote good CW operation.

Contestants should exchange RST+Serial Number, and their TOPS membership number if they have one. Single operators must take at least seven hours of rest in one or two break periods. The logs go to OE1TKW and all entrants will receive a copy of the results.

That wraps it up for this month except, of course, to wish you all a Very Happy Christmas.

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

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THE DOUBLET AERIAL

by Ken Williams

With all the problems associated with radiating an effective signal on nine HF wavebands, it is surprising that little, if any consideration has been given to an aerial system which has been known for sixty years, is capable of operating on any frequency where its top is more than a quarter of a wavelength long and can be completely home-made. I refer to the untuned Doublet aerial.

The Doublet aerial

The Doublet is a wire aerial of random length, centre fed with open wire feeders. As it need not be resonant on any band the VSWR on the feeder may be very high, while the impedance presented to the transmitter could be almost anything. However, provided that the AMU (Aerial Matching Unit) can match the transmitter output impedance to that of the aerial and feeder, an effective radiating system will result.

As very high VSWRs can be expected, the feeder must be of very low loss, which calls for balanced open wire feeders. These can easily be made at home.

Therefore, the only problem remains in matching the feeder to the transmitter. If a dedicated AMU is constructed, this can both match the feeder and act as a balance to unbalanced transformer, but if a commercial unit is used it may have neither the impedance range nor the balance to unbalanced facility.

This dilemma can be solved 'at a stroke' by inserting either a 1:1 or a 4:1 balun between the AMU and the feeder. Most commercial AMUs will match VSWRs up to 4 or 5:1, which corresponds to an impedance of about 250 ohms. With a 4:1 balun impedances up to 1000 ohms can be catered for, which should effectively deal with most situations. Should this prove insufficient, other measures can be taken.

Construction

Although the length of a Doublet aerial is not critical, the longer it is the more effectively it will radiate at lower frequencies. Even though it may not be necessarily resonant, this does not mean that it shouldn't, although under such circumstances it would more likely be referred to as a centre fed Zepp aerial.

If space is restricted the ends of the aerial can be turned down to give a little extra length, although, as for other aerials, it is wise to keep the ends at least 10ft above the ground to prevent people or animals from receiving an electric shock, as a high voltage is present during transmissions.

The feeder

The construction of the feeder should present no great difficulties. It is made from two lengths of fourteen to twenty gauge soft-drawn copper wire, kept a few

inches apart by plastic or ceramic spacers at 2-3ft intervals. Provided the wires are kept apart the distance between the spacers is immaterial, in fact, the greater the distance the more efficient the feeder will be.

The material for the spacers is not critical. However, stranded wire should not be used as it is far too flexible and will twist in the wind, whilst hard-drawn copper will tangle itself up if it is not under tension.

If you do not wish to make your own feeder, you will find that 300 ohm slotted ribbon is reasonably effective. To minimise feeder unbalance, it should be led away as far as possible at right angles from the aerial. It should drop from the aerial down to a few feet from the ground and be led away to the shack.

To prevent the feeder swinging excessively in the wind, it is a good idea to anchor one or more spacers to a stake in

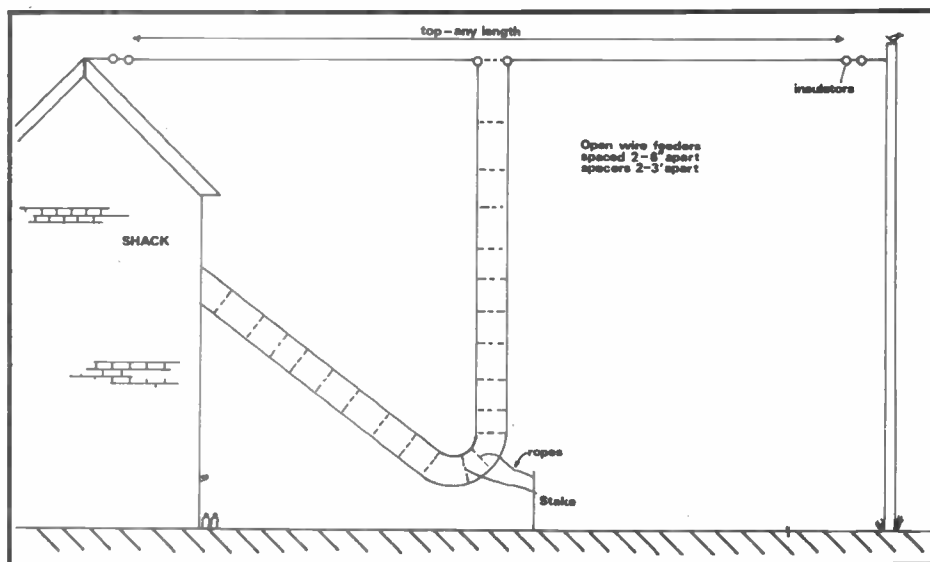


Fig 1: Layout of the Doublet aerial

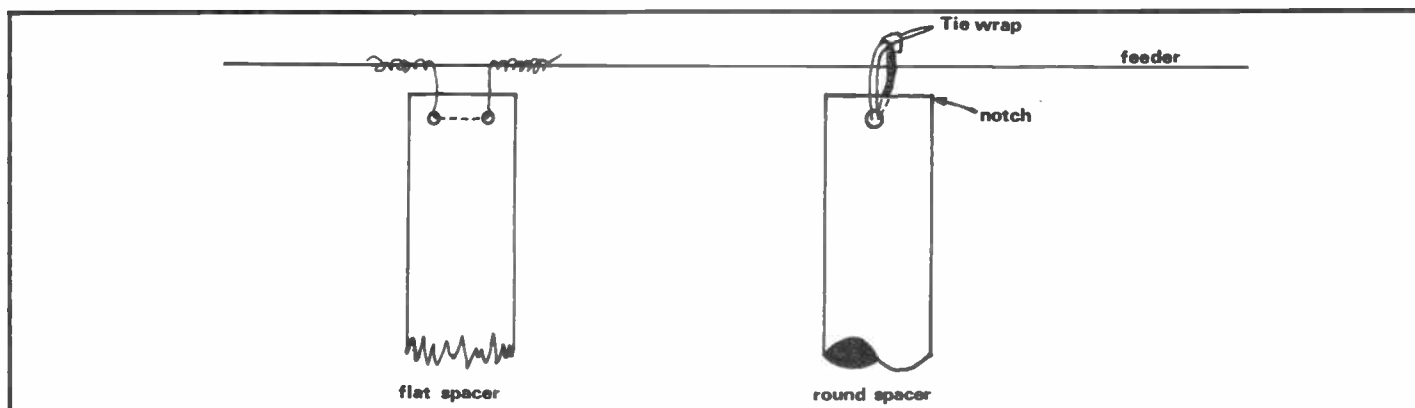


Fig 2: Two methods of attaching the feeder wire to the spacers, which should ideally be made of plastic

the ground, or any other convenient object, with rope or string. Finally, the feeder should be 10-15ft longer than is necessary for direct connection.

Matching the feeder

It was suggested earlier that either a home-constructed AMU or a commercial unit could be used in conjunction with a balun. Several designs for home construction will be given later in this article but for the moment, let's assume that the second option is used and that the commercial AMU does not have a balanced output facility.

It is not necessary for the balun to be located next to the AMU for, even if the VSWR on the coaxial cable between that and the balun is high, the losses on a few feet of coaxial cable are likely to be negligible. Therefore, it is most convenient to mount the balun next to where the feeder enters the shack.

For an initial trial, run up the transmitter at low power on each band and see if the system can be matched; note on which band the aerial presents the highest impedance. If a 1:1 balun is used it may be found that all bands have a very high impedance, in which case, it should be exchanged for a 4:1 balun.

If the impedance is still too high on some bands, it will be necessary to alter the length of the balanced feeder. If the offending band is 80m, then try shortening the feeder by 10-15ft to effect an improvement. But if it does not, resolder the length which was removed from the balanced feeder (this will not cause any losses) and extend it by the same amount and discard the rest. If the same trouble occurs on higher frequency bands, then lengthen or shorten the balanced feeder by proportionately less. It may even be found that a 4:1 balun is required on some bands and 1:1 on others, but varying the length of the feeder will effect a compromise which enables all bands to be used.

In every case, the impedance presented at the bottom of the balanced feeder is as a result of a combination of the feeder and aerial length and will therefore be different for each installation.

In order to minimise matching problems, the initial length of the feeder plus half of the aerial should not approximate to a multiple of half-wavelengths at the lowest frequency of operation.

Constructing AMUs

AMUs are possibly the simplest constructional task in amateur radio, because they are very simple in design, do not require a PCB and contain no active components. Two of the units described comprise simply an inductor tuned by a capacitor, which is inductively coupled to the transmitter by a link winding. The only difference between each design is the method used to

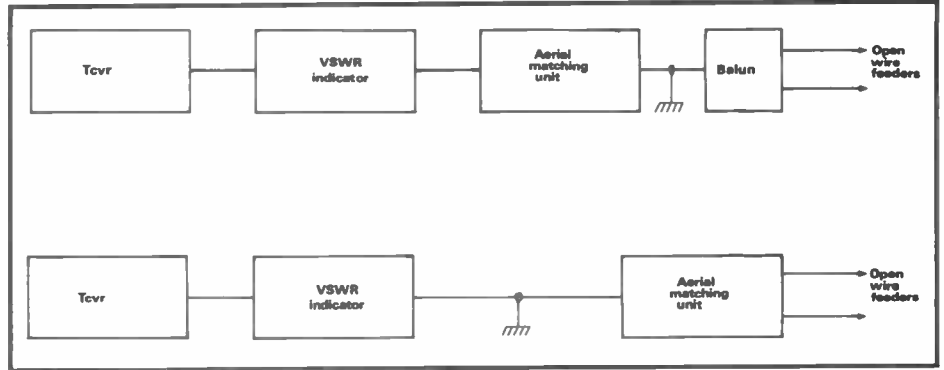


Fig 3 (top): Layout for the transceiver, commercial ATU and balun. **(Bottom):** transceiver and AMU incorporating the balun

couple the open wire feeders. Owing to their extreme simplicity, no precise constructional details are given.

Three versions

The first AMU comprises a tuned circuit L1/C1, which is resonant to the frequency in use; L1 is centre-tapped to earth. This is link-coupled to the transmitter by L2, which is wound loosely around the centre of L1. The feeder is connected by two crocodile clips to L1 at equidistant points from the centre tap.

C1 should be of about 150 to 300pF capacity and may be either a simple variable capacitor or split stator. If it is not split stator, the spindle and frame will be at high RF potential and should be insulated from the AMU chassis with an insulated coupler fitted to the spindle.

For tuning, an RF indicator (a torch bulb in series will suffice) should be connected to the feeder, then the

transmitter is switched on at low power and C1 tuned to resonance. The position of the taps on L1 are then adjusted for a compromise of maximum RF output and minimum VSWR between the transceiver and AMU. If necessary, the number of turns on L2 may be altered to achieve this. For similar reasons it may be advantageous to include C2 in series with L2, although this is not always necessary. This should be a 500pF variable capacitor, a receiving-type component will have an adequate voltage rating.

The second version of the AMU is similar, except that L1 is split into two halves. The centre connections of the coil are then connected to the stator plates of C3, a 500-0-500pF split stator capacitor, and the feeder is attached to the same place. C3 can conveniently be a twin gang 500pF tuning capacitor removed from an antique radio receiver.

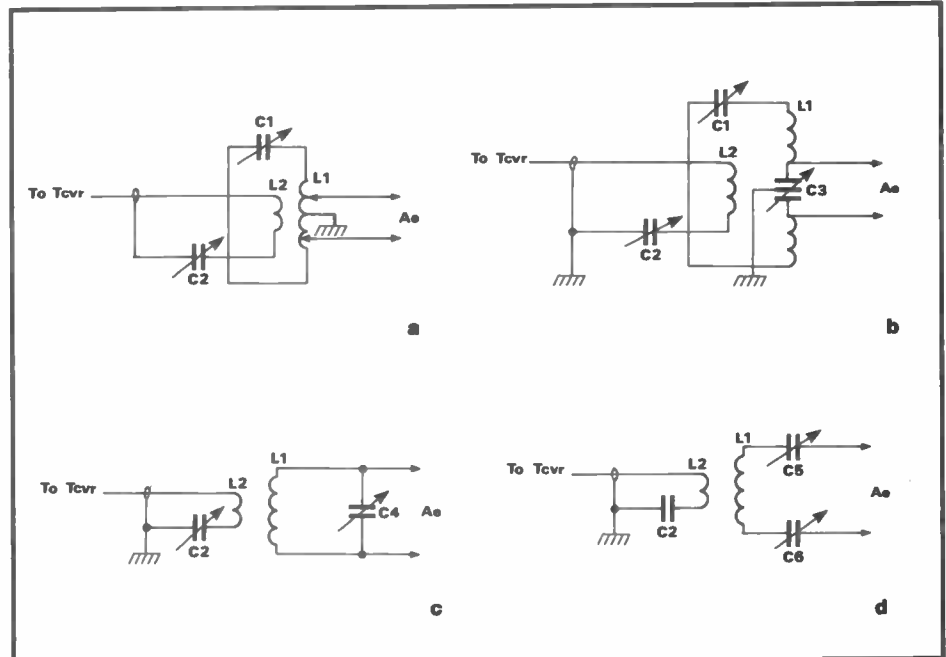


Fig 4: AMUs for open wire feeders. By using plug-in coils or switching, **a** and **b** can be used on all bands. **c** and **d** are different configurations of the same unit which can be achieved by banana plugs and sockets or switching. Component values C1, C5 and C6: 150-200pF transmitting variables C3, two gang 500pF receiving type, C2, 500pF variable receiving type. L1, L2 to suit the frequency in use.

THE DOUBLET AERIAL

Tuning the second version of the AMU is exactly similar to the first with the exception that, instead of moving the position of the crocodile clips on L1, the value of C3 is varied.

The third AMU is drawn from the far distant past and comprises tuning the feeders directly. This AMU requires an RF current indicator in each leg of the feeder and consists of an inductor connected directly across the feeder, which is tuned by either a parallel or two capacitors in series with the legs of the feeder. The inductor is link-coupled to the transceiver.

In order to tune this arrangement, first use the parallel configuration, and tune C4 to obtain optimum loading on the transmitter, then adjust the number of turns on the link for minimum indicated VSWR. If resonance cannot be gained, change to the series capacitor configuration and adjust capacitors C5 and C6 in unison until maximum output is obtained and similar current is flowing in both feeder legs. Finally, adjust the number of turns on the link-coupling for minimum indicated VSWR. Improved VSWR may be achieved by adding C2 in series with the link.

It should be borne in mind that with both of these configurations, both sides

of the variable capacitors are at RF potential and should consequently be insulated from earth, and that the spindles should be connected via insulated couplers.

The configuration which must be used depends entirely on the combination of the lengths (in terms of wavelengths) of the feeder and aerial. It is probable, therefore, that parallel tuning must be used on some bands and series on others. With a little ingenuity there should be no difficulty in arranging switching from one configuration to the other.

Whenever you experiment with a new AMU, it is essential that the lowest possible transmitter power should be used until the resonant points have been established. This is because high VSWRs may initially be present on the transmitter output, which could damage some valve equipment using sweep valves and most equipment using solid-state linears if full power tune up is attempted.

Why use a Doublet?

There are three main reasons why the Doublet is an excellent multiband aerial. Firstly, as it can be of any length, it uses all of the available aerial space. Secondly, it will operate on any fre-

quency where its top is at least a quarter of a wavelength long.

On any waveband where the length approaches or exceeds half a wavelength, it will radiate just as effectively as a resonant aerial on that band, though the horizontal polar diagram may not be quite the same. Similarly, if it is longer than two half-wavelengths, it will prove as effective as any multiband aerial which is of similar length.

The Doublet can also be used on frequencies that are much lower than its resonant length with reduced efficiency. For example, if an aerial from about 60-70ft in length is used on the 80m band, it will radiate from about 4-6dB below that from a half-wave dipole. This may sound a lot but, in practice, it is only about one 'S' point, which means that the aerial can still radiate a useful signal. Therefore, it is an extremely useful aerial for amateurs who have a small garden.

Thirdly, the feeder is lightweight, so, consequently, the height at the centre will be noticeably higher than that of aerials using relatively heavy coaxial feeder, traps and/or baluns.

The Doublet was very popular in the 1930s and is still used in many commercial installations. Perhaps it is now due for a new lease of life in amateur radio?

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SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

Nearly the end of another year. We cannot complain much about conditions in 1989, either propagation-wise or weather-wise, with a superb summer behind us.

Expectations are for a fairly good year ahead after a reasonably mild winter, so perhaps the good DX conditions will prevail.

October, when this piece was written, was a very good month for listeners of the higher frequencies of the amateur bands, with 21 and 28MHz being the featured bands in the RSGB contest calendar.

The 8th was alive with at least three contests in progress, the RSGB 21/28 Phone, the California QSO Party and a VK/ZL affair arousing a lot of interest and offering plenty of prefixes, US counties and states and other countries to listeners. Many new prefixes were also available to those interested in that field.

The RSGB 28MHz Cumulative Contests on 9, 17 and 28 October and continued on 2 and 10 November, together with the Club Calls Contest on the 11th, also kept those bands very active. The CQWW DX SSB Contest on 28 and 29 October brought the month to an exciting end with a lot of good stuff heard.

Award hunters

Of course, the lads to take full advantage of these contests are our award hunters who always appear to find time to be at the receiving end when those calls us mere mortals only dream of suddenly appear out of the ether.

Martyn Whyte of Edinburgh sent in claims this month for the North America Continental Award for 20m only coupled with one for the 80m band. General listening has resulted in EK2RR, CY0DXX, 9K3C, CX1EC, J73JM/KP2, 9V1UJ, A41JR, 8J1RL, C31SK, 3A/HB9DCQ, C6ADC, ED5TIA, JY8RK and CN8ST all being logged as well as the

usual run of the mill stuff. Although in a poor location, Martyn still manages to fill his logs regularly. Well done!

Ewald Bartunek of Vienna has added to his score again with the Oceania Continental Award. Some nice calls amongst this lot including A35KB, AX2LEE, V85NR, FK0CS, NH6T, a whole string of Indonesians and all the Australian call areas. Ewald comments on the excellent conditions on 21/28MHz that have helped no end. With eighty-plus loggings for both South America and Africa, those will be the next two on the award list for him.

Oleg Liskra of Prague sent in his claim for the Bronze Prefix Award for 250 prefixes logged. Some nice ones here including AB4FC, AD5Q, A25/G3HCT, CO2SO, EW2CFZ, FV9NDX, JW0A, J3/K8CV, OD5PL, P40V, S90AS, XM1ASJ, 3C0A and HL0Y. Well done!

Mike Ribton of Gillingham also got in his Silver Prefix Award for 500 prefixes with A71BK, AB4CB, AX5AGM, BV2FA, C53FN, CR0CIR, CZ8CM, D44BC, F89/FD1LYM (special prefix for Bastille celebrations), GV75/HA8BI, HH2Z, HV3SJ, J39CM, JX7DFA, KP2A/KP5, P29VMS, RT8U/UJ8JQC, TGFRA-CAP(!), V29A, V85HG, XF4L, ZS8AO and a whole bunch of others. 'There really are some weird calls to be heard nowadays', says Mike! As long as you log 'em, mate, that's the thing but I'd love to see the 'FRACAP' QSL card!

Getting involved

As you see, we have a keen bunch of award hunters and their logs make interesting reading. It's not everyone's cup of tea but getting involved in even the simplest form of award hunting, such as the Continental Awards (for logging just 100 stations in one continent) can add a great deal of enjoyment to listening. There are no time limits to these awards so you

don't have to spend long hours at it, just log stations as you hear them and keep a watch on your score as you go.

I well remember my first award after obtaining my licence. It was a simple enough affair offered by the G-QRP Club for working a number of stations on Morse during the first year of transmitting. The first few were difficult until I got my nerves under control, then it came easy, and with the last few for the award in sight, I couldn't get them quickly enough! I was right chuffed when that piece of paper came through the post.

Award hunting or contesting is like that. It's a bit of a chore at times, especially when you are aiming for something like the Gold Prefix Award (1,000 prefixes) that takes perhaps a couple of years to obtain. However, when you see the end in sight and that engraved plaque comes in the mail, you can relish that feeling of achievement.

Of course, you learn an awful lot too. You learn when to listen for that exotic DX station; to scour the pages of magazines for news of DXpeditions for rarities; how to winkle that tiny signal out of the noise or that elusive call buried under the QRM caused by hundreds trying to work him; you learn a lot about propagation conditions; and you really get to know your equipment – the best aerial to use, how to use filters and the limitations of whatever you have and how to get the best from it.

It doesn't matter if you are interested in broadcast stations, amateurs or even aircraft, logging for a purpose gives you the edge over the casual listener and helps you fill the logbook with those interesting stations that others miss.

Take another look at the log extracts and see how many you have logged.

ILA promotion

There are a few awards available to readers of this column which are promoted through the International Listeners Association.

The Prefix Awards are the most popular, and are available for logging 250, 500, 1,000 and 2,000 amateur radio prefixes. The prefix is the first part of a callsign (G1, GW4, DL3, 4X4, 3W1 etc) which denotes the location of the station and allocation. Each prefix is only allowed *once* in any claim. Claims can be submitted for mixed bands/modes or single.

The Continental Awards are for logging stations rather than prefixes and are available to broadcast listeners as well as amateur. They are also available for mixed bands or modes.

The Medium Wave DX Award is presented for logging 100 broadcast stations on medium wave only.

The Broadcast Listeners Award is for logging just 100 broadcast stations in any band (nice and easy for the beginner).

So, as you see some are easier than others but none of them is out of reach of the average enthusiastic listener.

All you need to claim is a log presented in the standard date/time/frequency/mode form and details of the award you are claiming. There are no fees for these awards as they are presented in the interests of listening, not profit, but a first class stamp for the certificate is essential!

Send claims to ILA, 1 Jersey Street, Hafod, Swansea SA1 2HF.

Why not have a go in 1990. You can only improve your listening skills!

Christmas presents

It's not long now until we settle down on Christmas Eve to await the visit of Santa Claus. To attempt sleep when all the while we are just itching to peek inside those intriguing boxes under the

SHORT WAVE LISTENER

Christmas tree. What has Santa brought us this year, we wonder.

I suppose this month's column is written as much for the long-suffering XYL as for the listener. For the mum and dad who are so pleased that Johnny took up radio when so many youngsters get their kicks in less desirable ways. Or, more rarely, for the OM whose wife spends more time at the rig than at the bridge club.

Buying a present for a keen radio enthusiast is often difficult. He usually has most of the essentials for the hobby so it's hard to find something he needs but doesn't have. So, here are some items that could be useful for the listener (and, being an equal opportunities kind of chap, they are suitable for boys or girls!).

Books

Always a good stand-by as a main present or a stocking filler.

£14.00 would buy a copy of the Klingenfuss **Air and Meteo Code Manual**. Essential reading for the fax enthusiast.

The **Shortwave Radio Listeners' Handbook** by Arthur Miller is a good buy at £6.99.

Phil Darrington's **Guide to Broadcasting Stations** is excellent in that field at £9.95.

The **Shortwave Listeners' Confidential Frequency List** is ideal for the cloak and dagger types at £7.95.

WRTVH, the broadcast listener's 'bible' is always a good bet and annually updated at £17.95.

For the budding ham, the **Amateur Radio Operating Manual** will put him/her on the right track.

For the tree or stocking, how about **Q&A on Amateur Radio** by FC Judd for £3.95, **Dial Search** by George Wilcox at £3.25, **Introduction to Radio DXing** by RA Penfold for £1.95, or **Aerial Projects** at £2.50.

All the books are available from RSGB Sales, Lambda House, Cranbourne Way, Pottery Bar EN6 3JE.

Accessories

These should be chosen with care. Perhaps one of the recipient's pals would know what is needed.

An aerial tuner is always useful and can be used with almost all receivers, broadcast or amateur (up to 30MHz). The Global AT1000 is a good one at £69.00 (Waters and Stanton, 18-20 Main Road, Hockley, Essex SS5 4QS). The MFJ 1601 at £42.00 (Stephens James, 47 Warrington Road, Leigh WN7 3EA), or the Hamgear PMX combined ATU and preamp at £69.00 (Hamgear, 125 Wroxham Road, Norwich NR7 8RD) would fit the bill.

If the listener is into airband or scanners, perhaps an antenna would be welcome. Various models are available for reasonable prices, including the Revcone at £35.95 (Garex, Harrow House, Ake-man Street, Tring HP23 6AA), the Nevada PA15 collinear at £49.95 (Nevada, 189 London Road, Portsmouth PO2 9AE) or the Diamond CLP5130-2 beam for £89.00 (Waters & Stanton).

HF band listeners usually go for endfed wires or similar, but if the neighbours are getting fussy or your laundry keeps getting wrapped up in the wire, perhaps the Sony AN-1 active antenna will solve the problem for £49.00 (Waters & Stanton). Headphones are always a useful buy and need not cost the earth. Try the Saisho HF40 at only £8.95 (any Dixons branch).

What about a nice world clock for the shack? A digital World Time by Casio costs £12.95 or a regular style Hansen 24-hour clock is only £7.95 (both available from local stores).

Receivers

A new listener may only have an ancient receiver or maybe the old boy needs a portable.

The Grundig Yacht Boy 225 comes gift-wrapped at only £59.95 with nine short wave bands, while the Tatung TMR7602 features SSB/CW

reception too at £99.99 (Johnson's Radio, 43 Friar Street, Worcester WR1 2NA).

Subscriptions

Subs to magazines are always welcome and remembered for a year!

Association subs are also good such as RSGB membership at £20.50 (only £10.45 if a student of eighteen to twenty-five).

Computer programs

These are most welcome and many are very cheap such as the Triple S programs for Spectrum featuring airband listings at only £8.49 for three (98B Baker Road, Newthorpe, Nottingham NG16 2DP). Check out the Technical Software RX4 for RTTY/S-STV/Morse reception from £25.00 depending on computer (Fron, Upper Llandwrog, Caernarfon LL54 7RF); the JEP Spectrum Fax program for £33.00 including interface (Unit 5, Meadowhill Estate, Kidderminster DY11 1HH); or the G4TYF Logbook (ideal for the award hunter) at £1,764 (Gurney Valley, Bishop Auckland DL14 8RW).

Albums

A place to store QSL cards is always useful and those flip-over photograph albums are ideal. Available in boxes of four albums at only £5.99 (holding over 200 cards) (Woolworths).

Well, there you are, a few ideas for presents that any listener would be pleased with. I hope Santa is kind to you this year!

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May I take this opportunity to thank all those readers who have written into the column and congratulate those who have gained awards this year. I hope 1990 is as successful. Cheers and Beers all!



MEDIUM WAVE DXING

by Steve Whitt G8KDL

In early October I went to the north of Scotland in search of super-DX. I have been on DXpeditions to Scotland before, but I was sure that my previous trips there had not exhausted the potential of the location. In the past luck has had it that I've gone on expeditions and encountered medium wave DX conditions that have been anything but favourable. Nevertheless, there were plenty of interesting and rare signals to be heard for four good reasons:

1. Excellent Beverage aerials were employed offering good directivity and low noise.
2. An electrically quiet location was chosen with no interference from TVs, street lights and car ignitions etc.

3. The location on the coast took advantage of sea gain in an arc from south-west through west, to north.

4. The location was far enough away from continental Europe to reduce broadcast interference, particularly after European dawn.

This DXpedition was scheduled to last two weeks but one DXer, Mark Hattam, manned the site alone for the first week with just one aerial beamed to the Caribbean. Nevertheless he caught some of the best North American DX heard in the UK for years.

When Clive Rooms and I eventually arrived in Scotland, all that was left was an amazing set of cassette recordings. The second week suffered from the

affects of solar storms and did not yield much beyond east coast transatlantic DX. However, this didn't stop some interesting stations being logged. For example:

Date: 24 September till 8 October 1989.
Location: Sheigra, Scotland (5° 06' x 30' west, 58° 29' x 45' north).

EARS: Mark Hattam used a Drake R7A, Clive Rooms used a Drake R7 and I used a modified Sony ICF2001D.

Antennas: Four Beverages ranging from 300 to 400m in length were erected, radiating like spokes on a wheel from the farmhouse that was to become the DX nerve centre.

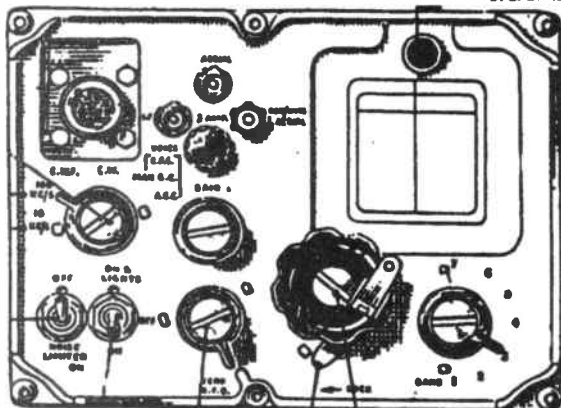
DX window: High power Asian stations became audible around 1500hrs UTC,

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MEDIUM WAVE DXING

followed by Africa at 1900hrs and Newfoundland stations and Brazil at 2100hrs. Morning dawn-induced fade-out occurred around 0830hrs, although signals were still in at 0930hrs on the best days, some two hours after sunrise.

Despite logging over a dozen UK-firsts on this trip the real prize catch was KNX Los Angeles, which hasn't been heard in the UK since the mid-1960s!

DX highlights

The Table shows a selection of the 185 non-European medium wave stations (from thirty-four countries) positively identified during the two week DXpedition. Probable UK-firsts are marked in bold type.

Do it yourself

The DX shown in the Table is typical of what you can hear on a well organised medium wave DXpedition. And it may come as a surprise to learn that if the location is correctly chosen and good aerials are put up, then the DX will roll in (solar activity permitting).

However, you don't have to plan a full-scale DXpedition to try out a Beverage-type aerial and if you are fortunate enough to live in or near open countryside, then experimenting with this sort of aerial should be relatively easy.

For a Beverage to be reasonably effective it needs to be between one and ten wavelengths long, which, on the medium wave band, implies a length of between 200 and 500m. The longer it is relative to the wavelength of interest, the more directional the aerial becomes. Remember that a Beverage has its maximum signal pick-up along its length and that the aerial should point along the great circle path towards the desired reception area. The following is what you need to put one together ready for use.

Wire: Hard-drawn copper wire is best for a permanent aerial since it won't break, but it is not cheap and is quite heavy. I use 7/0.2mm multistranded insulated wire for temporary DXpedition-type aerials. A continuous barbed-wire fence (galvanised steel) is OK, as long as it's not too rusty, to make good electrical connections.

Supports: Bamboo canes (4-6ft tall) are cheap and ideal for the job. Just cut a slit at one end with a penknife or junior hacksaw to hold the wire. Lightweight wire (eg, 7/0.2mm) needs a support every 15m, so if a straight hedgerow or fence runs in the desired direction, you can dispense with the bamboo canes. It is also possible to support wire in trees, as long as a reasonably constant height above ground is maintained.

Earth stake and terminating resistor: If a Beverage is operated as a long wire aerial its performance will be directional and it will pick up signals from both ends of the wire. However, if the end of the wire furthest from the receiver and

Frequency	Station	Details	Time (UTC)
500	CKY Winnipeg MB	Oldies music	
0680	CJOB Winnipeg	Sports news	
700	JBC Montego Bay, Jamaica	Reggae competition	
750	CJWW Saskatoon SK	Pop music	
800	VOWR St Johns NF	'Music of relaxation', classical mx	
830	R Taino/R Moscow, Cuba	English and Spanish programme (1040kHz)	
850	HJ?? R Recuerdos, Bogota, Colombia	Latin music	
860	HILR R Clarin, Santo Domingo	Local music, Spanish	
920	ZP1 R Na'l, Asunción, Paraguay	Motor rally	
930	CX20 R Monte Carlo, Uruguay	Talk programme	
950	CFAM Altona MB	Local sport, classical music	
960	CFAC Calgary AB	Music, station promos	
980	CKRM Regina SK	News, radio news, sports	
1000	CFLP Rimouski PQ	'Radio Mille' French	
1010	V of Vietnam, Hanoi	English news and commentary	1615-1630hrs
1040	WHO Des Moines IA	Talknet	
1070	KNX Los Angeles CA	CBS and KNX nx	
	RFO Cayenne, French Guyana	Relay of France inter 162kHz LW	
1080	CKSA Lloydminster AB	Broadcast news, oldies music	
1130	WDGY Minneapolis MN	Larry King, mutual news	
1143	VOA Philippines relay	Chinese and English ID	1500-1600hrs
1190	CFSL Weyburn SK	Sport and weather	
1200	CHMG St Albert AB	'MG1200', Wolfman Jack, Thursday	psychedelic
1230	CFGN Port aux Basques NF	CFCB satellite news relay	
	WJOY Burlington VT	ID only	
1240	WBAB Freeport NY	Sports and weather for New York	
	ZYH?? R San Francisco, Canidé	Music, full ID and information	
1290	CIFX Winnipeg MB	'12-90FOX' hits from '60s, '70s and '80s	
	WPBG Palm Beach FL	Oldies music	
1300	PJD-2 Phillipsburg, Saint Maarten	Talk	0558hrs s/off
	CJME Regina SK	C and W music	
1375	RFO St Pierre et Miquelon	Pop music, French	
1380	WFCL Clintonville WI	Oldies music	
	KGLD Saint Louis MO	Oldies 'K-GOLD' slogan	
1390	WRIG Schofield WI	R'n'R oldies 'where Wausau's rock and roll began'	
	CJCY Medicine Hat AB	C and W music	
	WPLM Plymouth MA	Big band/swing music, UPI news	
	WGCI Chicago IL	Gospel music	
	WFBL Syracuse NY	Music of your Life, CNN news	
1394	RTT Togo	French talk 5046.6kHz	
1400	PJB-2	Voice of Bonaire	
	WIRA Fort Pierce FL	Talknet	
1420	CJVR Melfort SK	C and W music, Star Country Network	
	WOC Davenport IA	'WOC-14' NBC news	
	SCN Fort Davis Panama	Pop, PSAs (Panama Coup!)	
	CKDY Digby NS	'AVR' network, 'AVN' news, C and W	
1430	CJXX Grande Prairie AB	'Power Country'	
1450	VSB1 Hamilton Bermuda	'VSB1 14-50 and 106FM C and W	
1480	WMAX Kentwood MI	US radio news, baseball talk	
	WTDY Madison WI	Talknet, NBC news, sport	
1490	WPEX Hampton VA	Nostalgia, local ads	
1502	EP de Benguela Angola	Portuguese talk and local songs	
1510	HD210A Guayaquil Ecuador	Time signal	57600hrs
1540	ZNS1 Nassau Bahamas	EZL music, local religion	
1570	CKMW Winkler MB	C and W Star Country network	
	R E1 Spectacular? QTH?	US pop mx, Spanish talk	
1575	VOA Bangkok Thailand	EE and Bengali	1555-1701hrs s/off
1600	WLuz Puerto Rico	Music, Spanish and English	0400hrs s/off

nearest the target reception area is terminated in a non-inductive (eg, car-

bon) resistor, which is equal in value to the aerial's characteristic impedance

(usually about 500-600 ohms), then the aerial becomes omnidirectional. To obtain the best results it's a good idea to experiment with the resistor value, but even a fixed resistor of, say 560 ohms, which is connected between the aerial and the ground stake will do the job. Do not forget that an earth stake at the receiver is also needed.

Receiver: If you aren't planning a full-scale DXpedition from, for example, a farmhouse, you'll need portable equipment.

Portable DX

A portable receiver which performs very well with Beverage aerials on the medium wave band is the Sony ICF2001D, provided it is used with an ATU. This radio can run off its internal batteries or alternatively, a short/medium wave communications receiver running off 12V can be used instead. Just imagine the simplicity of driving up to your aerial, parking in a lay-by and then passing the aerial wire through the car window, connecting it to the receiver and you are ready to go! With a bit of ingenuity and a few simple bits and pieces you could be DXing with your very own Beverage aerial; you certainly don't need to own several acres of land.

Newsdesk

Offshore: As you'll have read in the press and seen on television, Radio Caroline was raided in late August by Dutch and British government officials, who closed the station down by confiscating and destroying equipment. Despite this action, however, the station managed to reappear on the air on 1 October with a daytime schedule on 558kHz.

Ireland: The radio scene in Ireland has been fairly quiet for some time now. This is because most of the unlicensed stations were closed down to make way for a licensed independent radio service. Just a couple of pirates remain on 846kHz and 981kHz, but in early October unidentified tests were heard on 1143 and 1404kHz (presumed to be originating from the new station, Century Communications).

Another significant development was the arrival on 1 September on 254kHz of the new 600kW pop giant, Atlantic 252. It was amusing to see the British government complaining about radio signals crossing territorial boundaries from Ireland into the UK. Perhaps someone forgot to remind them about the World Service transmitters on 198, 648 and 1296kHz?

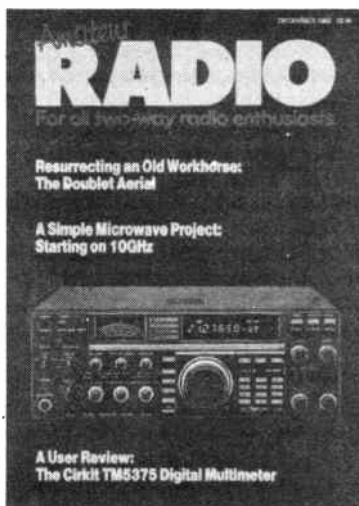
DX file

The only problem with DXpeditions is that one is spoilt for DX. Usually when I return home, DXing from the shack is a bit of an anti-climax. Somehow I managed to motivate myself to set all the gear up and have a tune around the band in mid October; fortunately, excellent DX conditions did not let me down.

On one night unusual propagation conditions focussed reception on the Canadian city of Toronto – so much so, that co-channel signals from New York and the Eastern seaboard were almost inaudible. Most of the stations operating in Toronto were audible at such a great strength that they could almost be mistaken for locals!

That just about wraps it up for another month. Any queries, comments or your personal medium wave loggings will be very welcome care of the editorial office.

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News and comment from Glen Ross G8MWR

This month, we start with news of several new world record distances being worked on the microwave bands. The first report comes from our American reporter, Marty Barrack, and concerns efforts on the 5.7GHz band. The new record for the band now stands at 613 miles and was set by XE2GXQ and N6CA, with several other stations getting in on the act. The record was set on 23 July at 0200hrs UTC.

Details

N6CA was located to the west of Santa Barbara, in California, and XE2GXQ set up shop south of Guereiro Negro, which is in Baja California, Mexico. If you want to check the distances the locator squares are DL37CK to CM94XM. The Mexican end of the path was only 150ft above sea level, but there was an advantage at the Californian end where the station was located at 1,600ft. The equipment used for the attempt was supplied by N6CA and was mainly home-brewed with a few surplus items thrown in. Both stations used 4ft diameter dishes with transmitters running 4W of single sideband. The receivers were pretty nifty, weighing in with noise figures running around the 1.5dB mark. The end results of all this were signals about 30dB above noise.

Enthusiasm

Transporting the gear was no joke either. XE2GXQ drove for fourteen hours over some atrocious roads to reach the site from where the first tests were made. He then drove a further six hours to get to the final site. Talk-back was also a problem with the 2m signals being just above noise. In the end they set up a 220MHz FM link from N6CA to W6UZL, a distance of 280 miles. W6UZL then used a 28MHz link to KH6HME in Hawaii, who then relayed the messages to XE2GXQ.

More bands

Contact was also made on 3.4GHz for a new USA ducting record, but an attempt

on 1.2GHz produced signals only just above the noise level. Proving, as I have said before, that conditions are often much better as you go higher in frequency, contrary to what you might expect to happen. Incidentally, the contacts on 3.4 and 5.7GHz were also first contacts between the USA and Mexico.

Just in case you think that this attempt will keep N6CA happy for a while, I have to tell you that he has already shipped gear for 3.4, 5.7 and 10GHz to Hawaii for some really serious long-distance attempts!

More records

News just coming in reports that our Mexican friend, XE2GXQ, has set new records on the 144, 220, 432 and 2300MHz bands. XE2GXQ was located at Mauna Loa, with contacts from the other end being provided by KH6HME on Hawaii. The locators are BK29 and DL28.

The new 144MHz record stands at 2,659 miles and was established on 13 July. KH6HME was running 80W to a pair of seven-element yagis, and XE2GXQ used 160W to a single eighteen-element Cushcraft Boomer. This equipment allowed reports of 5 and 2 to be passed on single sideband.

Higher bands

The 430MHz record was established the following day at 1547hrs, with a slightly shorter distance of 2,573 miles. Later that day at 1754hrs the new record for 2.3GHz was set over the same distance. The new record was achieved with the KH6 station running only 10W to a set of four loop yagis stacked in a vertical line. I think you will agree that, by American standards, this is *real* QRP operating. Two days later, on 15 July at 0755hrs, they completed the job by setting a new record distance on 220MHz, a band that is not available to us in this country.

XE2GXQ must hold more distance records and first contacts between countries than any other amateur. A

remarkable achievement deserving our congratulations.

Still more

Working long-distance terrestrial stuff is hard enough, but how do you fancy setting new records via the moon and on 10GHz? The two stations involved are WA7CJO and WB5LUA. The actual ground distance covered is 888 miles but the round trip distance is obviously a lot more. WA7CJO used 80W to a 16ft diameter dish, with WB5LUA running only 25W into a 9.5ft diameter dish. It is worth thinking about the effort these contacts involved.

QST

After all that Stateside VHF and microwave activity comes news that the ARRL have decided to drop the 'New frontiers' microwave column from their magazine **QST**, as from the November issue. Apparently, rather like the RSGB, the ARRL have decided to cut costs, and each page of **QST** sets them back about \$1,000. The odd thing is that they have only cut the microwave column from the magazine. The one thing that encourages activity is reports of individual achievement, as can be seen in the USA of late, where there have been some very interesting developments. It seems a shame that there will now be no more publicity to keep the fires burning.

Problems

Bouncing signals off the moon sounds easy when it is said quickly, but the problems are enormous. First of all there are the problems of generating enough radiated power and building super low noise receivers to overcome the tremendous path losses involved. Remember that, owing to the beamwidth of any practical aerial system, most of the power that you transmit will go straight past the moon to start with. This is because the surface of the moon is a very poor reflector and will absorb most of the transmitted power. And since the surface of the moon is convex most of what is reradiated goes in any direction other than back to Earth. Think in terms of a reflecting mirror ball at a disco and you will get the idea.

Return trip

To cap it all, what does return to Earth has to survive the losses resulting from a quarter million mile journey before it reaches your receiver aerial system. Amazing that it works at all, isn't it? Now take into account the problems of getting signals on 10GHz stable enough to sit in a tight receiver bandwidth. As a final point, you then have to keep up with the Doppler shift, owing to the relative motion of the Earth and the moon. How do you fancy your chances?

RTTY

There are not many amateur teleprinter signals about these days, since more people are moving on to the packet network. Those who are left are getting a little irritated by the people who still

insist on operating FM on 145.3MHz. This is listed in all the bandplans as the RTTY calling frequency and it will certainly be appreciated if you keep clear of this frequency, allowing them to continue enjoying their particular interest in the hobby.

Beacons

News from OY9JD is that the Faroes 2m beacon OY6VHF is on the air again from its site in IP62NA. The beacon runs 25W and, if all has gone according to plan, will now be firing into two four-element yagi aerials, one pointing south-east and the other north-east. You will be right to think that there is little to the north-east of the Faroes, since that aerial is for auroral working.

Awards

Things have been slow on the award scene lately but here are some awards to catch up with. Steve G1WYC, from Spalding, claims a 144MHz Bronze award. His best contact was with OK1KEI at a distance of 1102km. He asked for the certificate to be endorsed 'running 10W or less' and this has been done.

A 144MHz Silver award is claimed by Stan G6NUO, from Birmingham. His best DX was to IW0BTS at a distance of 1611km. His is very much a home-brew station as far as the aerial system goes, built at minimal cost.

The next claim is from G7BIM, from Chingford, who claims a Bronze award

on 144MHz. His best claimed contact was with GM1EHK at a distance of 592 kilometres.

The last award was issued to G6UDW, of Coventry, and comes in our special class for a contact in excess of 100 miles made on 10GHz while running just 3mW of FM. Nice one, Colin.

Repeaters

The Sussex coast 2m repeater is back on the air from its new site near Brighton. G4HSY would welcome your reports on this one.

Moving across to the other side of the country the Bristol packet repeater GB3FC now has a 4m port up and running. Further information on this new facility is available from G4WRW. At Bracknell, the UHF repeater GB3BN came back on the air on 30 September after repairs to the transmitter had been completed.

Repeater abuse

The repeater abuse in the North of England continues with no sign of anything being done about it by the licence holders, the RSGB. This is in spite of the fact that a meeting between the complaining parties and RSGB took place some time ago. The whole thing has now reached the point where the alleged offenders have been threatened with legal action if the problems are not resolved. Meanwhile, a group of amateurs from the Midlands provided evidence to the RIS, which resulted in

the RIS visiting certain premises and removing a quantity of equipment.

Stupidity

The point of all this is that if a few local amateurs can get results on a private basis, why can't the RSGB achieve the same? Just to show you the sort of idiots who are involved, try this for size. In the GB3MH service area a person suffering from diabetes went missing and after a search he was found in a coma. Help was called for on the repeater and while attempts were made to pass information as to how the person should be treated medically, some idiot continued to jam the repeater with music and odd sound effects. This continued even after the person was made aware of the emergency.

Cheer up

Let us go out with a smile. **Talkback** the newsletter of the Western FM Group contains the following gem heard on the local repeater. One G7 to another, 'There must have been a lot of passes in the last exam, George. I worked a G8 last night, have you heard one yet?' Just to put the record straight, some G8 plus 3 call-holders have had their tickets for the best part of twenty-five years.

Close-down

That's it for now. Please send your news to me at: 81 Ringwood Highway, Coventry, or on packet via GB7NUN.

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DESIGN AND USE OF DIP METERS

In the second part of his series Joe Pritchard looks at building and testing a simple dip meter

When I decided to build a dip meter, I wanted a unit that would be fairly fool-proof and simple both to build and use. The metering system would need to work with a multimeter as well as, if desired, a built-in meter. And the frequency coverage would have to range from a couple of megahertz to a hundred or so megahertz. Plug-in coils would also be required. Finally, I wanted to build the unit as cheaply as possible.

The circuit I used is a FET Colpitts design, as shown in Fig 1. I selected a FET circuit because its high input impedance gives dips that are clearer to see than those from a circuit based upon bipolar transistors. In addition, it's fairly straightforward to meter the output from the circuit without additional amplification or needing even a diode. Finally, the frequency range is easily changed by plugging in a new coil. No additional capacitor or tapped inductors are required.

How it works

Feedback in this circuit is via two 100pF capacitors; the RF choke acts as a load and isolates the oscillator from the power supply at RF. The 0.1µF capacitor across the power supply adds to the decoupling and increases the reliability of the circuit. I tried omitting this component, but the results given were nowhere near as good as those when the circuit included the bypass capacitor.

The tuned circuit of the oscillator is formed by L1 and the two gangs of VC1. Note that these two gangs are in series across the coil; this arrangement gives a 50pF capacitance (maximum) across the coil (two 100pF variables in series). The meter and resistor in series also bias the FET into an operational state, and the capacitor across the meter simply decouples the meter as far as RF is concerned.

Construction of the meter

Building a GDO can be frustrating when it comes to getting a good performance over a range of frequencies. A possible layout is shown in Fig 2. With dip oscillator construction, like all RF circuit construction, the main point to note is that all interconnections around the FET and tuned circuit should be as short as possible and present the lowest possible RF impedance by avoiding inductances in leads, stray capacitance etc.

The possibilities for stray feedback must also be taken into account. For example, this can be caused by running connections from different parts of the circuit close to one another, or insufficient decoupling of power supplies etc. The connections between the coil and capacitor must be as short as possible, otherwise the upper frequency range will be restricted.

I built the circuit into a metal box, with the RF oscillator strung between the tags

on the variable capacitor. Note that the case will be connected to 0V if it's built in, so care is needed to avoid short circuits.

Owing to the sharpness of the dips made possible with this circuit, a slow-motion drive is a good idea; the 6:1 reduction drive I used was perfect for this job, but good results are still possible with a 3:1 drive.

The shaft of the variable capacitor is linked to the drive via a plastic shaft extender; this reduces hand capacitance

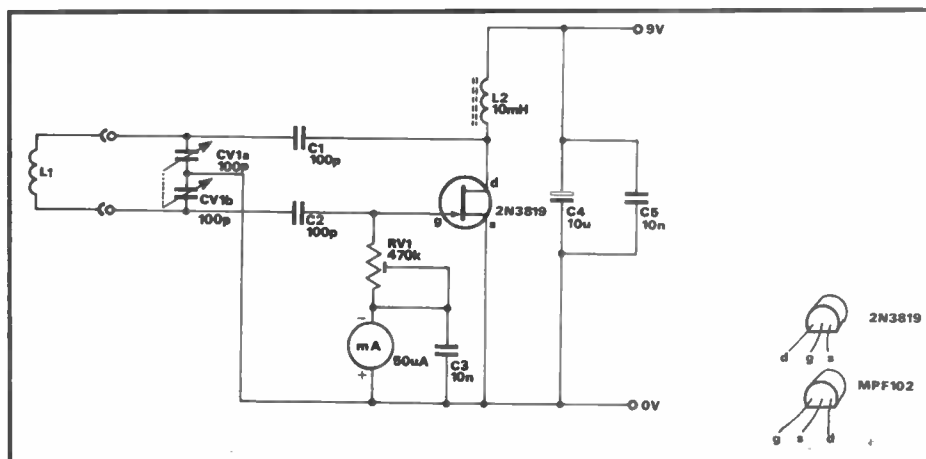
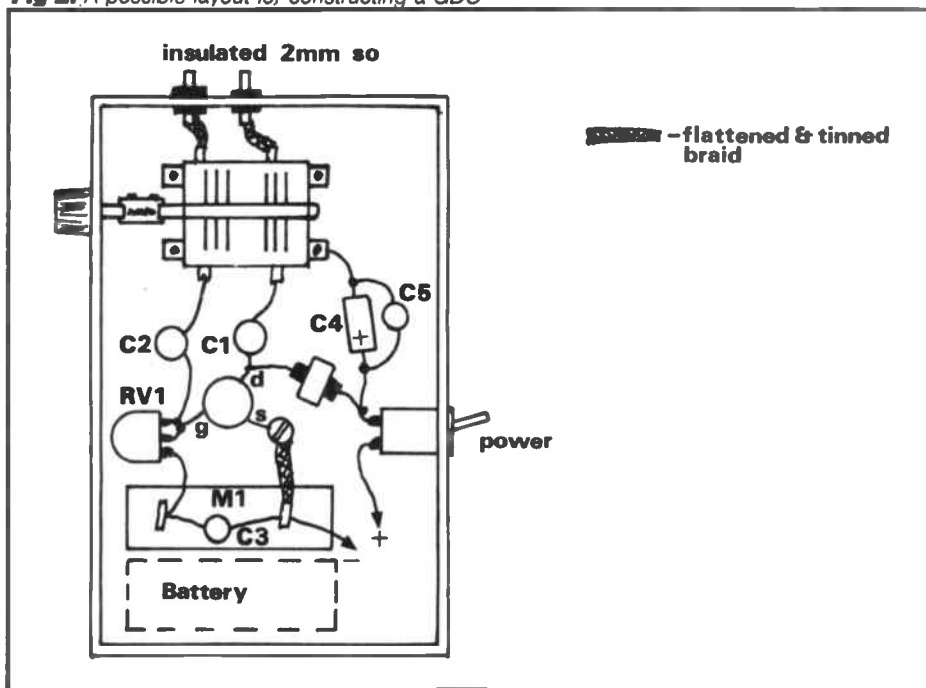


Fig 1: A FET Colpitts circuit

Fig 2: A possible layout for constructing a GDO



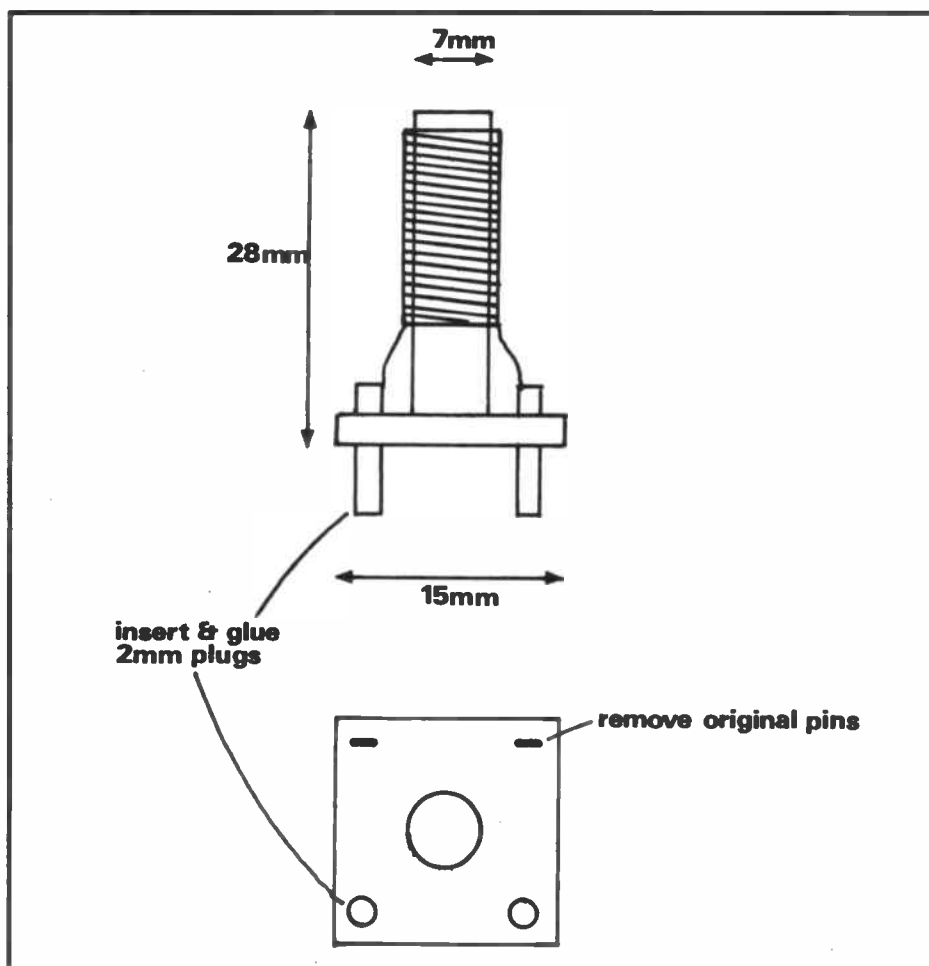


Fig 3: Modified coil formers

Table 1

L1	L2
<p>L1 70-200MHz Self-supporting thick wire</p>	<p>L2 28-80MHz Self-supporting thick wire. Eight turns spaced over 14mm</p>
<p>L3 13-24MHz fifteen turns close wound 28swg on top of former</p>	
<p>L4 6-15MHz Forty turns close wound 28swg on top of former</p>	
<p>L5 3.5-6.2MHz Seventy-five turns close wound 28swg on top of former</p>	

effects which may detune the oscillator when the operator's hand is moved away from the tuning control.

In the prototype, the coil connection is made from 2mm screw terminals, but any type of connector can be used, providing that it won't be 'lossy' at high frequencies.

The meter used in the prototype was designed for use as a VU meter, and is quite a small unit for which a slot can be cut in the case. Alternatively, a jack socket can be fitted in place of the meter to allow a multimeter to be plugged in, if that's more convenient.

For the links between the tuning capacitor and coil sockets, I used flattened and tinned braid from coaxial cable. This makes a low inductance connection. I also used this material to provide the 'ground bus'.

I tried three types of FET: a 2N3819, an MPF102 and a 2N3823 device - they all worked well in the circuit. There are, however, differences in the performance of individual FETs of the same type in circuits like this, especially at high frequencies. So if you have a few FETs in your junk box, you can try them until you find one that gives the best results.

The coils

The coils are the vital components in this circuit, and they have to be home wound. The main difficulty is in selecting the former on which to wind the coils. For long-term reliability and stability, the former needs to be rigid and resistant to humidity in the atmosphere. In addition, metal formers cannot be used owing to the losses incurred. This usually leads us to some form of plastic former, and a variety of rigid plastic coil formers can be purchased from companies, such as Electromail. I used coil formers from this company, modified as shown in Fig 3, but any plastic tube of similar diameter can be used. Of course, there's nothing to stop you experimenting by using formers of any other diameter, but the coils will have to be wound on a 'trial and error' basis. Details for the coils are shown in Table 1. The exact frequency coverage offered by the coils depends to some degree upon the construction of the oscillator, especially at the high frequency range, but it will not differ too much from the range given.

The meter

The circuit shows a 50µA meter connected as the indicating instrument. Fig 4 shows how the circuit can be modified to drive a multimeter set to a 0.25V range.

Testing the oscillator

Wind the coils and plug in one of them. Turn on the power and adjust the tuning control. You should see a decent indication on the meter; the size is immaterial, as long as it's about 50% full

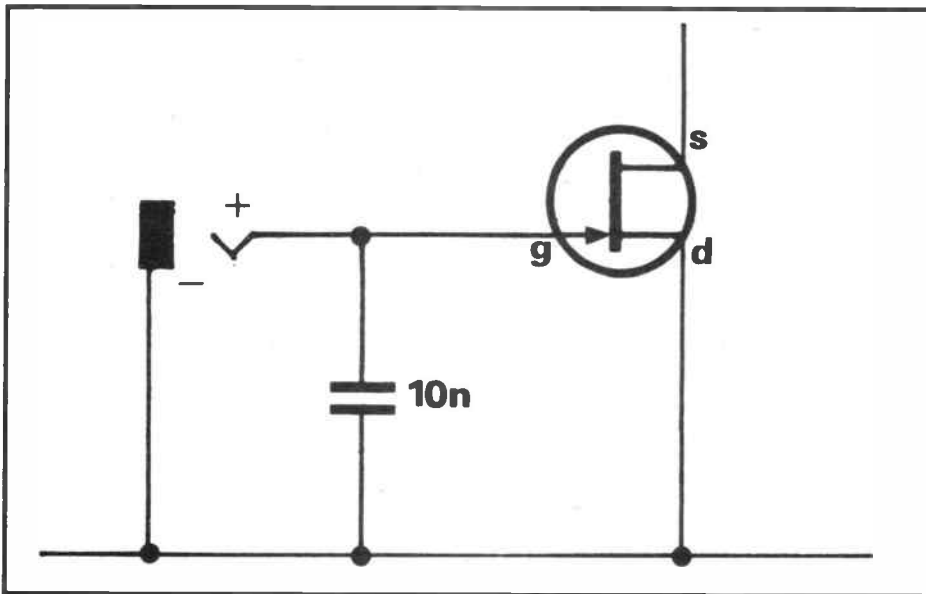


Fig 4: The circuit will oscillate only when the meter is plugged in

scale. If it's too small, however, you won't be able to see the dip when it occurs. The meter reading indicates that oscillation is taking place. You can confirm this by tuning a radio receiver to the oscillator frequency. Check for oscillation on all frequency ranges and if you have problems, then check the following points.

Battery Low

FET: The FET may be giving low activity. Try a new one.

Check the decoupling capacitor.

Check for short circuits between variable capacitor plates.

As a final check on the oscillator, select a coil and wind an identical coil, then connect it in parallel with a 25pF

capacitor. While holding the open end of the coil next to the tuned circuit, you should be able to tune the oscillator and see a dip when the resonant frequency of the tuned circuit is passed through.

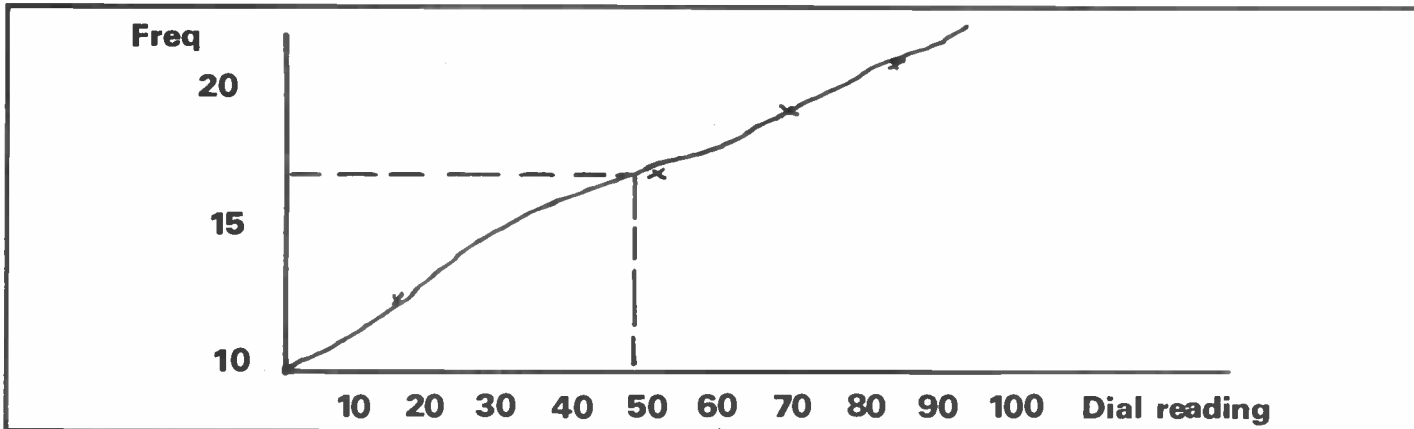
Calibration

Some ranges of the oscillator will be calibrated by tuning the oscillator signal on a receiver, especially if you have a short wave receiver. If you have a band II FM receiver - 88MHz to 108MHz, then the harmonic of signals in the 44-54MHz range can be resolved as well as the fundamental signals, thus allowing you to calibrate two parts of the oscillator range. Of course, if you've access to a dip oscillator which has already been calibrated, then you can use the existing meter as a calibration tool!

A series of graphs can then be drawn for the meter to show the reading of the slow-motion drive across the bottom of the graph. The frequency can then be tuned up the side. Measuring the frequency of a dip is then simply a matter of reading off the slow-motion drive and using a ruler to read the frequency off of the graph (see Fig 5).

That concludes the construction of the dip meter. Next month, I'll start showing you how to get the best out of your meter, whether it's a home-brew or commercial unit.

Fig 5: Measuring the frequency dip



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■ Help to identify signal generator made by Marconi with Ekco instruments. Eight ranges fitted and of similar appearance to model TF144G but earlier vintage, possibly pre-1939. Contains valves type AC/P (3); and $\mu 4$ with tuning dial calibrated from zero to 180. Handbook, circuit or other info required, also RF coaxial output plug appreciated. Postage refunded. Write to: G Mott, 9 Grampian Way, Oulton Broad, Lowestoft, Suffolk NR32 3EP

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<p>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.</p>	<p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.</p> <p>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.</p>
<p>PAYMENT Above rates exclude VAT. 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 or credit card.</p> <p>FOR FURTHER INFORMATION CONTACT Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219876</p>	<p>Commission to approved advertising agencies is 10%.</p> <p>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.</p>

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The People
News of the World

datalink

Find love with Britain's foremost and least expensive National Computer Dating Agency

NO MATTER where you live, or who you are, Datalink is able to find you AMPLE introductions ... all personally selected by our experienced staff.



LAST YEAR, Datalink spent more on National Press advertising - to guarantee you partners near home - than any other agency in GREAT BRITAIN.

FOR DATALINK does not cater only (or even largely) for the London area, but for the whole of the British Isles.

THAT'S WHY Datalink is so large ... so obviously successful ... so competitive ... and so up-to-date.

LOOK AT THE FACTS:

Our STAFF SELECT your Introductions themselves ... not a large impersonal computer.

Our STAFF CHOOSE LOCAL contacts, often on your doorstep. Unlike other Agencies Datalink does not ask its Members to complete a mini-map of Britain ... where each square covers a vast area.

DATALINK IS A UNIQUE PERSONAL SERVICE

Our system is unique because our staff (not machines) make all the final decisions. We didn't invent computer dating ... an American did ... but we've certainly improved and modernised it.

AND NOW another first!

WE NOW HAVE A GOLD SERVICE ... Whether work, studies or divorce keep you out of the social scene longer than expected, we have something SPECIAL just for you. All details ... sent along with Brochures.

PUT SIMPLY...DATALINK is a veritable National Institution, widely respected everywhere for its honesty, integrity ... and ITS FRIENDLY SERVICE! We take the hard work out of meeting people, and have a wealth of 'knowhow', second to none.

You needn't live near Datalink. Quite the contrary ... whether you reside in Northern Ireland, the Isle of Man, John O' Groats or possibly at Land's End, we are simply a phone call from you ... ALL DAY - even AFTER WORK until 10.00 pm. We, at Datalink, are here for YOUR service and YOUR convenience ... don't settle for less!

ONLY DATALINK GUARANTEE MEMBERS AT LEAST THREE SUITABLE CONTACTS IMMEDIATELY (Usually you will receive six)

DATALINK: P.O. BOX 100 STRATFORD-UPON-AVON CV37 6LE



FREE COMPUTER TEST

In less than ten years nearly one million people have completed our questionnaires. Why not fill in this simple version. We will send you FREE and in COMPLETE CONFIDENCE full information about Datalink and details of just ONE OF THE MANY Datalink Members who we feel you would like to meet.

Please process the completed questionnaire and send me full information on Datalink, AND details of someone you believe will be compatible. I understand that this is FREE and WITHOUT OBLIGATION.

START HERE I am over 17

Occupation _____

Nationality _____

Your Sex (M/F) _____

Your Height _____ Your Age _____

Age range of person you wish to meet

Min _____ Max _____

Surname _____

First Name _____

Address _____

YOUR PERSONALITY

Are You... ^{L 77}

Shy _____	<input type="checkbox"/>	Outgoing _____	<input type="checkbox"/>
Nervous _____	<input type="checkbox"/>	Self-Confident _____	<input type="checkbox"/>
Affectionate _____	<input type="checkbox"/>	Fun Loving _____	<input type="checkbox"/>
Romantic _____	<input type="checkbox"/>	Ambitious _____	<input type="checkbox"/>
Intellectual _____	<input type="checkbox"/>	Creative _____	<input type="checkbox"/>
Tolerant _____	<input type="checkbox"/>	Generous _____	<input type="checkbox"/>

YOUR INTERESTS AND ACTIVITIES

If you enjoy the following please tick. If you dislike them please indicate with a cross. Otherwise leave blank.

Pop Music _____	<input type="checkbox"/>	Classical Music _____	<input type="checkbox"/>
Pub Evenings _____	<input type="checkbox"/>	Dancing _____	<input type="checkbox"/>
Dining Out _____	<input type="checkbox"/>	Collecting Things _____	<input type="checkbox"/>
Travelling _____	<input type="checkbox"/>	Spectator Sport _____	<input type="checkbox"/>
Theatre/Cinema _____	<input type="checkbox"/>	Poetry/Reading _____	<input type="checkbox"/>
Walking/Cycling _____	<input type="checkbox"/>	Gardening _____	<input type="checkbox"/>
Committee Work _____	<input type="checkbox"/>	Conversation _____	<input type="checkbox"/>
Watching TV _____	<input type="checkbox"/>	Museum Visits _____	<input type="checkbox"/>

Please enclose 2 First Class Stamps

For Brochure by return post, phone (0789) 750092 (24-hr Reply Service)

DATALINK: P.O. BOX 100, STRATFORD-UPON-AVON CV37 6LE



BAKERS DOZEN PACKS



All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

- BD2 5 13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.
- BD7 4 In flex switches with neon on/off lights, saves leaving things switched on.
- BD9 2 6V 1A mains transformers upright mounting with fixing clamps.
- BD11 1 6 1/2in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.
- BD13 12 30 watt reed switches, it's surprising what you can make with these—burglar alarms, secret switches, relay, etc., etc.
- BD22 2 25 watt loudspeaker two unit crossovers.
- BD29 1 B.O.A.C. stereo unit is wonderful breakdown value.
- BD30 2 Nicad constant current chargers adapt to charge almost any nicad battery.
- BD32 2 Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.
- BD42 5 13A rocker switch three tags so on/off, or change over with centre off.
- BD45 1 24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day. original cost £40 each.
- BD49 10 Neon valves, with series resistor, these make good night lights.
- BD56 1 Mini unisector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
- BD59 2 Flat solenoids—you could make your multi-tester read AC amps with this.
- BD67 1 Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.
- BD103A 1 6V 750mA power supply, nicely cased with mains input and 6V output leads.
- BD120 2 Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.
- BD128 10 Very fine drills for pcb boards etc. Normal cost about 80p each.
- BD132 2 Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.
- BD134 10 Motors for model aeroplanes, spin to start so needs no switch.
- BD139 6 Microphone inserts—magnetic 400 ohm also act as speakers.
- BD148 4 Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.
- BD149 6 Safety cover for 13A sockets—prevent those inquisitive little fingers getting nasty shocks.
- BD180 6 Neon indicators in panel mounting holders with lens.
- BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.
- BD196 1 in flex simmerstat—keeps your soldering iron etc. always at the ready.
- BD199 1 Mains solenoid, very powerful, has tin pull or could push if modified.
- BD201 8 Keyboard switches—made for computers but have many other applications.
- BD211 1 Electric clock, mains operated, put this in a box and you need never be late.
- BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
- BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.
- BD252 1 Panostat, controls output of boiling ring from simmer up boil.
- BD259 50 Leads with push-on 1/4in tags—a must for hook-ups—mains connections etc.
- BD263 2 Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into patress.
- BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.
- BD283 3 Mild steel boxes approx 3in x 3in x 1in deep—standard electrical.
- BD293 50 Mixed silicon diodes.
- BD305 1 Tubular dynamic mic with optional table rest.
- BD400 4 Books, useful for beginners, describes amplifiers equipment and kit sets.
- BD653 2 Miniature driver transformers. Ref. LT44. 20k to 1k centre tapped.
- BD553a 2 3.5V relays each with 2 pairs changeover contacts.
- BD667 2 4.7 µf non-polarised block capacitors, pcb mounting. There are over 1,000 items in our Bakers Dozen List. If you want a complete copy please request this when ordering.
- EQUIPMENT WALL MOUNT** It is a multi-adjustable metal bracket that could be used for mounting flood light, loudspeaker, TV camera, even a fan and on almost any sort of wall or ceiling even between wall and ceiling. The main fixing brackets rotate such that an inward or an outward corner can be accommodated. Front panel also tilts upward or downwards to a reasonable angle and can be easily removed separately for wiring. A very useful bracket. Regular price would be around £6 each. Our price only £3. Our ref 3P72. Or 2 for £5. Our ref 5P152.
- SUB-MAN TOGGLE SWITCH** Body size 8mm x 4mm x 7mm SBDT with chrome dolly fixing nuts. 3 for 1.00. Order ref BD649.
- COPPER CLAD PANEL** for making PCB. Size approx 12in long x 8 1/2in wide. Double-sided on fibreglass middle which is quite thick (about 1 1/16in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD683.

POWERFUL IONISER

Generates approx. 10 times more IONS than the ET1 and similar circuits. Will refresh your home, office, workroom etc. Makes you feel better and work harder—a complete mains operated kit, case included. £12.50 + £2 P&P. Our ref 12P5 1.

REAL POWER AMPLIFIER for your car, it has 150 watts output. Frequency response 20Hz to 20KHz and signal to noise ratio better than 60dB. Has built in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers ref. 30P7 described below. A real bargain at only £57.50. Order ref: 57P1.

REAL POWER CAR SPEAKERS. Stereo pair output 100W each. 4-Ohm impedance and consisting of 6 1/2" woofer, 2" mid range and 1" tweeter. Each set in a compact purpose built shelf mounting unit. Ideal to work with the amplifier described above. Price per pair £29.96. Order ref: 30P7.

STEREO CAR SPEAKERS. Not quite so powerful—70w per channel. 3" woofer, 2" mid range and 1" tweeter. Again, in a super purpose built shelf mounting unit. Price per pair: £27.95. Order ref: 28P1.

VIDEO TAPES These are three hour tapes of superior quality, made under licence from the famous JVC Company. Offered at only £3 each. Our ref 3P63. Or 5 for £11. Our ref 11P3. Or for the really big user 10 for £20. Our ref 20P20.



ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the pcb. Complete kit £8. Our ref 8P30.

12" HIGH RESOLUTION MONITOR. Black and white screen, beautifully cased for free standing, needs only a 12v 1.5 amp supply. Technical data is on its way but we understand these are TTL input. Brand new in maker's cartons. Price: £25.00 plus £5 insured delivery. Order ref: 25P10.

14" COLOUR MONITOR made by the American Display Tek Company. Uses high resolution tube made by the famous Japanese Toshiba company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec. on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price: £89 each plus £6 insured carriage. Order ref: 89P1.

BUSH RADIO MIDI SPEAKERS Stereo pair. BASS reflex system, using a full range 4in driver of 40hms impedance. Mounted in very nicely made black fronted walnut finish cabinets. Cabinet size approx 8 1/2in wide, 14in high and 3 1/2in deep. Fitted with a good length of speaker flex and terminating with a normal audio plug. Price £5 the pair plus £1 post. Our ref 5P141.

3 1/2in FLOPPY DRIVES We still have two models in stock: Single sided, 80 track, by Chicon. This is in the manufacturers metal case with leads and IDC connectors. Price £40, reference 40P1. Also a double sided, 80 track, by NEC. This is uncased. Price £59.50, reference 60P2. Both are brand new. Insured delivery £3 on each or both.



ATARI 65XE COMPUTER AT 64K this is most powerful and suitable for home and business. Complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 insured delivery.

REMOTE CONTROL FOR YOUR 65XE COMPUTER With this outfit you can be as much as 20 feet away as you will have a joystick that can transmit and a receiver to plug into and operate your computer and TV. This is also just right if you want to use it with a big screen TV. The joystick has two fire buttons and is of a really superior quality, with four suction cups for additional control and one handed play. Price £15 for the radio controlled pair. Our ref 15P27.

ASTEC PSU. Mains operated switch mode, so very compact. Outputs +12v 2.5A, +5v 6A, +5v .5A, +12v 5A. Size: 7 1/2in long x 4 1/4 in wide x 2 1/4 in high. Cased ready for use. Brand new. Normal price £30+, our price only £12.95. Order ref 13P2.

VERY POWERFUL 12 VOLT MOTORS. 1/2hp Horsepower. Made to drive the Sinclair C5 electric car but adaptable to power a go-kart, a mower, a rail car, model railway, etc. Brand new. Price £20 plus £2 postage. Our ref: 20P22.

PHILIPS LASER

This is helium-neon and has a power rating of 2mW. Completely safe as long as you do not look directly into the beam when eye damage could result. Brand new, full spec. £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15. As above for 12V battery. Also £15. Our ref 15P22.

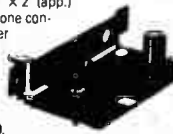
ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold plated contacts and is complete with ribbon cable and edge connector. Can be used with many computers, request information sheet. Brand new, only £15 plus £3 postage. Our ref 15P15.

FULL RANGE OF COMPONENTS at very keen prices are available from our associate company SCS COMPONENTS. You may already have their catalogue, if not request one and we will send it FOC with your goods.

HIGH RESOLUTION MONITOR. 9in black and white, used Philips tube M24.306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new. £16 plus £5 post. Our ref 16P1.

12 VOLT BRUSHLESS FAN. Japanese made. The popular square shape (4 1/2in x 4 1/2in x 1 3/4in). The electronically run fans not only consume very little current but also they do not cause interference as the brush type motors do. Ideal for cooling computers, etc., or for a caravan. £8 each. Our ref 8P26.

MINI MONO AMP on p.c.b. size 4" x 2" (app.) Fitted Volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of £1.15 each, or 13 for £12.00.



J & N BULL ELECTRICAL

Dept AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO or cheque with order. Orders under £20 add £2.00 service charge. Monthly account orders accepted from schools and public companies. Access and B Card orders accepted—minimum £5. Phone (0273) 734648 or 203500.

POPULAR ITEMS — MANY NEW THIS MONTH

JOYSTICKS for BBC, Atari, Dragon, Commodore, etc. All £5 each. State which required.

TELEPHONE TYPE KEY PAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubbers contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut out and is connected by 10-pin IDC socket. Price: £2.00 each. Order ref: 2P251.

TELESCOPIC FM AERIAL. Stands up or folds over. Solidly constructed and heavily nickel plated. Supplied complete with fixing nut. Price £1 each. Order ref: BD741.

SUB-MIN PUSH SWITCHES Not much bigger than a plastic transistor but double pole. PCB mounting. Three for £1. Our ref BD688.

CARTRIDGES for the Double Microdrive. Price 4 for £5. Our ref 5P146.

NICAD CHARGER UNIT Metal pronged, plastic case contains mains transformer and rectifiers with output lead and plug—made to charge two cells but no doubt adaptable or wonderful spares value. Only 50p each, two for £1. Our ref BD385.

EDGEWISE PANEL METER If you are short of panel space then this may be the answer. It has a FSD of 100µA and a nice full vision scale. It fits through a hole approx 1 1/4in x 1/2in. Another feature is that it has an indicator lamp behind the scale which you could light up, it would then serve as an on/off indicator. Price £1. Our ref BD700.

AA CELLS Probably the most popular of the rechargeable NICAD types. 4 for £4. Our ref 4P44.

COMPUTER SPECIAL The Perex 16meg Byte tape streamer. These are brand new and really an exceptional bargain. A few only so hurry. Only £15. Our ref 15P29.

20 WATT 40HM SPEAKER With built in tweeter. Really well made unit which has the power and the quality for hi-fi reproduction. 6 1/2in diameter. Price £5. Our ref 5P155. It is heavy so please add £1 to cover postage if not collecting.

MINI RADIO MODULE Only about 2in square with ferrite aerial and solid dia tuner with its own knob. It is a superhet and it operates from PP3 battery and would drive a crystal headphone direct but be better with our mini mono amp. Price £1. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET The old faithful 3 pin with screw terminals. The socket mounts through a 1 1/2in hole and the mains is brought in by the insulated plug. Used to be quite expensive but you can have 2 pairs for £1 or 4 of either plug or socket for £1. You could make yourself a neat and compact bench panel with these. Our ref BD715, BD715S or BD715P.

MICROPHONE If you want a low cost microphone then just arrived we have a very small hand-held dynamic mic with on/off switch in the handle, its lead terminates with one 3.5 plug and the other a 2.5 plug for remote control. Price only £1. Our ref BD711.

EXTENSION CABLE WITH A DIFFERENCE It is flat on one side making it easy to fix and to look tidy. It is 4 core so suitable for telephone, bell, burglar alarms, etc. 50 yard coil for £5. Our ref 5P153.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES 140v 100w pair made by the famous Hitachi Company. Reference 25K413 and its component 25J11B. Only £4 the pair. Our ref 4P42.

BATTERY OPERATED TRAVEL MECHANISM On a plastic panel measuring approx. 3in x 3 1/2in. Is driven by a reversible 12v battery motor, fitted with a pulley and belt which rotates through a threaded rod and causes a platform to travel backwards and forwards through a distance of approx. 5in. Price £5. Our ref 5P140.

MAINS OPERATED WATER VALVE with hose connection for inlet and outlet suitable for low pressure. Auto plant watering, etc. Only £1 each. Our ref BD370.

20 VOLT 4 AMP MAINS TRANSFORMER Upright mounting with fixing feet. Price £3. 3P59.

16 OHM PM SPEAKERS Approx. 7in x 4in. 5 watts. Offered at a very low price so you can use two in parallel to give you 10 watts at 8 ohms. £1 for the two. Our ref BD684.

EHT TRANSFORMER 4kv 2mA Ex-unsupplied equipment. £5. Our ref 5P139.

4 CORE TINSEL COPPER LEAD As fitted to telephones, terminating with flat BT plug. 2 for £1. Our ref BD639.

EHT TRANSFORMER 8kv 3mA. £10. Our ref 10P56.

VERY USEFUL MAGNETS Flat, about 1in long, 1/2in wide and 1/4in thick. Very powerful. 6 for £1. Our ref BD274(a).

ACORN COMPUTER DATA RECORDER Ref ALF03. Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44. Add £2 special packing.

SOLAR CELLS Will give good current (depending on size) from sunlight or bright daylight. Module A gives 100mA. Price £1. Our ref BD631. Model C gives 400mA. Price £2. Our ref 2P199. Model D gives 700mA. Price £3. Our ref 3P42.

SOLAR POWERED NI-CAD CHARGER 4 Ni-CAD batteries AA (HP7) charged in eight hours or two in only 4 hours. It is complete, boxed ready to use unit. Price £6. Our ref 6P3.

METAL PROJECT BOX Ideal for battery charger, power supply etc., sprayed grey, size 8 1/4" x 4" x 4" high, ends are louvred for ventilation other sides are flat and undrilled. Price £3. Order ref 3P75.

CAPACITOR BARGAIN Axial ended—4700µf at 25v. Jap made. Normally 50p each, but you will get 4 for £1. Ref 613.

SINGLE SCREENED FLEX 7.02 copper conductors, pvc insulated then with copper screen, finally outer insulation. In fact quite normal screened flex. 10m for £1. Our ref BD668.

3 CORE FLEX BARGAIN No. 1 Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15m £2. ref 2P189.

3 CORE FLEX BARGAIN No. 2 Core size 1.25mm so ideal for long extension leads carrying up to 13 amps or short leads up to 25A. 10m for £2. Order ref 2P190.

ALPHA-NUMERIC KEYBOARD This keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area field is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" x 4" — brand new but offered at only a fraction of its cost namely £3 plus £1 post. Ref 3P27.

1/2 HORSEPOWER 12 VOLT MOTOR Made by Smiths, the body length of this is approximately 3in., the diameter 3in. and the spindle 3/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6P1, discount for quantities of 10 or more.