

*Amateur*

# RADIO

For all two-way radio enthusiasts

**Across the Pond:  
An American Adventure**

**Construction:  
The BRE Audio Biscuit**



**Two User Reviews:  
The Philips D2935 World Receiver and  
the Beckman T1 10B Digital Multimeter**

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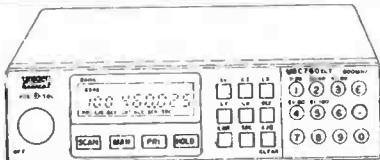


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**ICOM IC-3210**



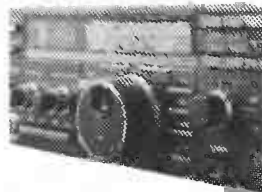
ICOM's popular dual bander, 25 watts on both bands, great looking and readable display, full duplex capability, 40 memories and input monitor for instant repeater check. All you need add is an antenna and we have taken care of that.

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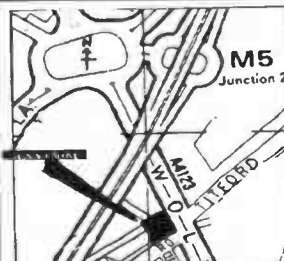
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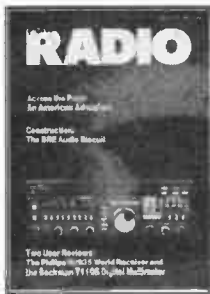
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AF118 3.50	BC161 0.55	BC338 0.09	BD233 0.35	BF183 0.29	BF501 1.75	BU208B 1.35	OC44 1.25	TIP29C 0.42	ZN3738 1.35	25C1959 2.50
AF121 0.60	BC170B 0.15	BC347A 0.13	BD236 0.49	BF184 0.35	BF502 0.35	BU326 1.20	OC45 1.00	TIP30C 0.43	ZN3739 1.35	25C1962 0.80
AF124 0.65	BC171 0.09	BC461 0.35	BD237 0.40	BF185 0.28	BF503 0.35	BU326S 1.50	OC70 1.00	TIP31C 0.55	ZN3742 1.95	25C2029 1.95
AF125 0.65	BC172B 0.10	BC478 0.20	BD242 0.65	BF195 0.11	BFW10 0.55	BU407 1.24	OC71 0.75	TIP32C 0.42	ZN4444 1.15	25C2091 0.85
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<b>EHT MULTIPLIERS</b>		Universal Tripler 5.45	Decca 30 6.35	Decca 80 6.95	Decca 100 6.95	Decca 120 6.35	Decca 1730 6.35	GEC 2040 5.45	GEC 2110 6.95	ITT CV1C-9 6.35	ITT CV2C/25/30 6.35	ITT CV4C5 6.95	Philips GB (550) 6.95	Philips G9 6.95	Pye 697 6.50	Pye 713 4 lead 8.50	Pye 713 5 lead 8.50	Pye 731/25 8.50	Rank A774 6.35	Rank A823 6.95	Rank T20A 6.95	Siemens TVK76/1 Siemens Europa 7.50	Thorn 1500 5.48	Thorn 1600 5.48	Thorn 3500 7.95	Thorn 8000 6.95	Thorn 8500 7.15	Thorn 9000 8.50	Thorn 9600 8.50	TV11 Stick 0.90	TV13 Stick 1.25	TV18 Stick 1.10	TV20 Stick 1.40
<b>VIDEO HEADS</b>		3HSSH 28.50	3HSSHA 25.50	3HSSHB 25.50	3HSSN 18.95	3HSSSF 35.00	3HSSSP 27.50	3HSSUIN 25.90	3HSSU2N 37.50	3HSSU3N 35.00	3HSSV 18.95	3HSSVA 29.80	<p>PYE 713 4 LEAD 8.50</p> <p>PYE 713 5 LEAD 8.50</p> <p>PYE 731/25 6.35</p> <p>RANK A774 6.35</p> <p>RANK A823 6.95</p> <p>RANK T20A 6.95</p> <p>SIEMENS TVK76/1 SIEMENS EUROPA 7.50</p> <p>THORN 1500 5.45</p> <p>THORN 1600 5.45</p> <p>THORN 3500 7.95</p> <p>THORN 8000 6.95</p> <p>THORN 8500 7.15</p> <p>THORN 9000 8.50</p> <p>THORN 9600 8.50</p> <p>TV11 STICK 0.90</p> <p>TV13 STICK 1.25</p> <p>TV18 STICK 1.10</p> <p>TV20 STICK 1.40</p>																				
<b>FUSES</b>		<b>SPECIAL OFFER 100 PER TYPE</b>		2MM Q/B 0.06 each £4.50	100MA 200MA 250MA 500MA 1amp 1.25amp 5amp	1.6amp 2amp 2.5amp 3.15amp 4amp	20MM A/S @ 0.15 each £11.50	100MA 150MA 160MA 250MA 500MA 800MA 1.25amp 2amp 3.15amp 5amp	1.25 inch Q/B @																								

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## ON THE COVER

On the cover this month is the Yaesu FT-736R all mode multiband VHF/UHF transceiver.

The FT-736R covers up to four of the 50MHz, 144MHz, 220MHz, 430MHz, 440MHz and 1.2GHz bands with installable band modules, providing 10W output on 50MHz and 1.2GHz, and 25W on the others.

Operating features include an IF shift and notch, noise blanker, all mode VOX and three-speed AGC.

A special FM mode reduces channel interference in crowded areas. An automatic repeater shift and centre tuning meter are provided for FM repeater operation. The CAT system allows the rig to be used with an external PC.

The FT-736R is powered from 13.5V dc or from the ac mains by its own internal supply. The transceiver weighs 9kg and measures 368x129x286mm. The FT-736R costs £1,359 including VAT.

For further information contact *South Midlands Communications, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY.*

## AF SIGNAL GENERATOR

Jandek have recently announced a new AF signal generator, JD013, as a new addition to their range of construction kits.

The JD013 AF signal generator is the first in a series of simple test equipment. Its specifications include: an approximate frequency range of 45MHz to 40kHz in six overlapping ranges; sine-wave output is continuously variable up to approximately 3V pk-pk; and an auxiliary output to drive a digital frequency meter.

The JD013 kit contains a tinned, drilled PCB; all of the board-mounted components; control potentiometers; range switch and associated off-board components; and instructions which include board layout, wiring and circuit diagrams. The kit costs

£10.75 including postage and packing.

For further information contact *Jandek, 6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0384) 288900.*

## FAIRMATE HP 100E

Nevada have announced a new hand-held scanner which uses the very latest micro computer technology, the Fairmate HP 100E.

This scanner has a frequency range of 25MHz-550MHz, 850MHz-1300MHz, and selectable receive modes: AM, narrowband FM and wideband FM. It has 1,000 channels of memory, and the search steps are fully programmable in 5k or 12.5k steps up to 995kHz steps.

The Fairmate HP 100E is supplied complete with a full set of high-power Ni-Cads, two antennas, carrying case, earphone, dc cable, shoulder strap and a belt clip.

The scanner costs £299.00 from *Nevada, 189 London Road, North End, Portsmouth, Hampshire PO2 90AE. Tel: (0705) 662145.*

## THE PFR-T REGULATOR

Elcomponent Limited have recently introduced their latest range of electronic regulators for power factor correction. The PFR-T regulator provides a choice of options to users who need to connect or disconnect PFC capacitors, depending upon the level of reactive power required.

The PFR-T commands from three to fourteen capacitor banks and features a delay of thirty seconds between the connection of one bank to another.

Because of its modular nature, the PFR-T can incorporate features from different types into a single custom product, thus increasing the options available.

Input voltages can be either 110V, 240V or 415V, and the maximum power consumption is 10VA.

Other features include an output contact rating of 8A, a mains power filter, connection terminal cover and a 144mmx144mm DIN housing.

For further information contact *Elcomponent Ltd, Unit Five, Southmill Trading*



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

Centre, Southmill Road, Bishop's Stortford, Hertfordshire CM23 3DY.

## CONNECTOR SUPPORT TERMINALS

Klippon Electricals Limited have introduced a new range of connector support terminals, designed to be used where a central termination or anchor point is required on a coaxial datacom cable system.

The KCS connector support terminal mounts on to a TS32 DIN mounting rail in the same way as with standard terminals. Also available are two types for both 50 ohm and 75 ohm BNC connectors.

Coaxial, fibre optic or electrical connector products can be fitted into the connector support, provided its outside diameter is not greater than 22mm.

For further information contact *Klippon Electricals Limited, Power Station Road, Sheerness, Kent ME12 3AB. Tel: (0795) 580999.*

## BINDING POSTS

A new range of PCB mounted binding posts with 4mm sockets have been introduced by Watts International Components Ltd.

Available with four or eight terminals, they are used in professional audio and Hi-Fi applications and with test equipment where a non-fixed attachment or probe is required.

There is a choice of cap colours for easy identification in loom wiring use, and the posts accept a standard 4mm banana plug.

For further information contact *Watts International Limited, No 4 Phillips Business Centre, Terminus Road, Chichester, West Sussex PO19 2UL. Tel: (0243) 533479.*

## PC EDGE CONNECTORS

Unitel have announced a further addition to its range of PressaKon interconnection system products.

These PC edge connectors

have 0.100in terminal spacing and are designed for right angle mounting.

They can be supplied with PCB locking hooks and stand-offs and, although designed for mating with PressaKon wafers, can also be used with other industry-standard interconnection products.

For further information contact *Unitel Limited, Unitel House, Fishers Green Road, Stevenage, Herts SG1 2PT. Tel: (0438) 314393.*

## NEW MINIATURES

Rendar Limited have introduced a new range of miniature and sub-miniature jack plugs. Screened and unscreened versions are available with both varying pole and cable restraint options. Straight and right-angled models are also available.

The plugs are ideal for many applications which include stereo, mono and audio signal systems. The plugs mate with 2.5 and 3.5mm jack sockets.

For further information contact *Rendar Limited, Durban Road, South Bersted, Bognor Regis, West Sussex PO22 9RL. Tel: (0243) 825811.*

## TERMINAL BLOCKS

Watts International Components Ltd have introduced a new range of UL/CSA approved PCB mounted terminal blocks.

These heavy-duty PBS terminal blocks are rated at 15A and up to 250V, and have an insulation resistance of 2kV. With M3 and M4 terminal sizes they are available from 2-12-way, as either straight or right-angled terminals.

Applications include power supplies and alarm systems controls; indeed anywhere there is a high power termination requirement. Snap-fit clear plastic covers are also available.

For further information contact *Watts International Limited, No 4 Phillips Business Centre, Terminus Road, Chichester, West Sussex PO19 2UL. Tel: (0243) 533479.*

## EVENT

The London Amateur Radio Show takes place on 9-10 March 1990 at the Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9 0AS.

This event promises to attract many exhibitors and visitors to the huge exhibition centre at Picketts Lock.

You can get to Picketts Lock by car via the A406 North Circular Road, or the W8 bus from Lower Edmonton Station.

Admission is £1.00 (75p for advance sales of ten or ticket). There is ample free parking.

For further information contact *the secretary, London Amateur Radio Show, 126 Mount Pleasant Lane, Bricket Wood, Hertfordshire K12 3XD.*

## CLUB NEWS

The Farnborough and District Radio Society meets on the second and fourth Wednesday of the month at 7.30pm at the Railway Enthusiasts Club Premises, off Hawley Lane (by M3 bridge), Farnborough, Hants.

On 14 February there will be a lecture, and on the 28th there will be the club's First Silver Jubilee Special Evening.

For further information contact *the club honorary secretary Tim Fitzgerald G4UQE, tel: (0276) 29231.*

The South Bristol Amateur Radio Club meets every Wednesday at the Whitchurch Folkhouse Association, Bridge Farm House, East Dundry Road, Whitchurch, Bristol, Avon BS14 0LN.

The club's programme of events for February includes: on 7 February, Training for VHF Field Day; on the 14th, a VHF Activity Evening; and on the 21st, a Computer Activity Evening.

For further information contact *Len Baker G4RZY, tel: (0272) 832222.*

Although the Duxford Radio Society is not an

Amateur Radio Club it is associated with the Imperial War Museum, and the society's members' main purpose is in documentation, collation, restoration and the occasional operation of historic radio gear on the Imperial War Museum's inventory.

The society is looking for new members who are able to contribute to the aims of the society by cataloguing, translating and researching technical manuals.

For further information contact *John Brown G3EUR, tel: (0708) 852371.*

The Loughton and District Amateur Radio Society meets every month at Room 14, Loughton Hall, Rectory Lane, Loughton, Essex, for a 7.45pm start. All visitors are welcome to attend club meetings.

On 9 February Ray Pedley G0LWF will be giving a talk about construction - A Homebrew VHF/HF Converter. A meeting about Any Radio Questions will be held on 23 February.

For further information contact *the secretary, John Ray G8DZH, tel: 01-508 3434 after 6.00pm.*

The Southgate Amateur Radio Club meets at the Holy Trinity Church Hall (upper), Winchmore Hill, London N21 for a 7.45pm start.

The well-known BBC weatherman, Jim Bacon G3YLA will be giving a talk about Sporadic E propagation on 8 February.

For further information contact *the honorary secretary, Peter G0GTE, tel: (0438) 724991.*

The Wimbledon and District Amateur Radio Society meets on the second and fourth Friday of the month at 7.30pm at the St Andrews Church Hall, Herbert Road, London SW19.

On 9 February Nick G6AJY will be giving a lecture about testing your own equipment.

For further information contact *the secretary Nick Lawlor G6AJY, tel: 01-330 2703.*

# A USER REVIEW

# THE PHILIPS D2935 WORLD RECEIVER

It is not often that I have the opportunity to examine a receiver designed and built for the mass market, so I was looking forward to reviewing the D2935 World Receiver from Philips Electronics Ltd. This general-coverage unit copies AM, FM, SSB and CW, although the FM mode is available between only 87.5 and 108MHz. The specifications of the D2935 World Receiver are shown in the Table.

My first impression of this rig is of its workman-like quality. It makes operating for world-wide reception easy. The receiver is capable of AM and SSB reception from 146kHz to 29.999MHz; the FM segment applies to only the popular FM band between 87.5 and 108MHz. The unit is housed in a polystyrene case which has an outer border of dark grey on the front. The inner panel contains the controls and the speaker.

The 4in speaker is on the left-hand side of the panel, the opening of which is covered with a black mesh grille.

## LCD display

The very clear LCD display shows the selected waveband and the chosen alpha-numeric preset memory in addition to the tuned frequency.

Below the display area are six touch buttons and, at the bottom, one is marked STORE. Below this are four more touch buttons covering FM, LW, MW-AM, and SW. Above the display area is a five-element LED tuning indicator which operates on AM.

To the right of the LED tuning indicator is a label which lists all the short wave bands and their respective frequencies; the broadcast bands being shown black on white and the amateur bands white on black. The keypad on the right comprises touch buttons with keys '1' to '0' and a decimal point. The bottom right-hand button is the EXECUTE command.

In a vertical column to the right-hand side of the front panel are four rotary controls, from top to bottom: BFO (anti-clockwise LSB, clockwise USB), AM GAIN control, TONE control and VOLUME control. Above the BFO are three vertical push on/off switches. From left to right these are: an AERIAL FERROCEPTOR (ferrite rod) or TELESCOPIC ROD, ATTENUATOR (cal-

led local/distance) and BFO (on/off). At the top left-hand side of the receiver are, from left to right: the POWER on/off switch, which is blue and has a large operating area, and the OPTIONAL LIGHTING switch for the LCD display, which is brown and only used when operating the radio from the mains. The tuning knob is just below the keypad.

The telescopic antenna housed along the top of the unit is fitted with 30° stops along a horizontal plane. An adjustable quick release carrying strap is also supplied.

On the left-hand side of the panel are four sockets and a voltage adjuster. From top to bottom these are: LINE OUT, HEADPHONES, 12V dc IN and MAINS IN. The voltage adjuster turns between 110/127 or 210/240 volts ac.

The right-hand side of the panel has three screw connectors, from left to

right: AM ANTENNA, EARTH and FM ANTENNA. The battery compartments are on the rear panel; the six D cells having a separate section from the three AA cells for the memory.

## Operation

I found it strange operating this set, having been used to the communications type of receiver, but after familiarising myself with the various controls it was really simple enough.

Programming frequencies into the memories is done by tuning in a station via the tuning knob or keying in the frequency on the keypad. After pressing STORE, you have five seconds to press the channel you want to occupy using the alpha-numeric coding, otherwise the display reverts to the frequency already keyed in.

There are nine memories divided up

## Specifications of the Philips D2935

Radio section	Up conversion double superheterodyne
Frequency range	146 - 29.999KHz (continuous) and 87.7 - 108MHz
With direct access to LW-MW	120m - 90m - 75m - 60m - 49m - 41m - 31m - 25m - 21m - 19m - 16m - 13m - 11m bands
Modes available	AM - FM - SSB - CW
Antennas	Ferroceptor for MW and LW. Telescopic aerial for FM/SW switchable for LW and MW
Input attenuator	Built-in switchable
Beat frequency oscillator	Built-in switchable with variable pitch
AM gain control	Built in (for CW and SSB reception)
Tuning system	Phase-locked loop with direct frequency key in
<b>Amplifier section</b>	
Maximum output	2W ( $\pm 1$ dB with 10% distortion)
	4in high flux speaker
Power supply	127 - 220V $\pm 10\%$ switchable 50/60Hz
Ac mains or Batteries	6 $\times$ 1.5V batteries (D cell or UM1) for radio. 3 $\times$ 1.5V batteries (AA cell or UM3) for memory back up
Battery lifetime	Radio: fifty hours at normal use
External connections	dc input: 12V dc ('-' centre pin) External aerials: terminals for AM/FM Line out: phono socket Headphone: 6.3mm socket
<b>Cabinet</b>	
Material/finish	Polystyrene
Dimensions	320 $\times$ 180 $\times$ 75mm (WHD)
Weight	2.45kg



into this alpha-numeric method: A1, A2, A3, B1, B2, B3, C1, C2 and C3. Assuming that you want to select the first channel, during the five seconds available, press A followed by 1. Consequently A1 will appear at the top right of the display area indicating that the frequency is stored in memory channel A1. Storing the other eight channels is done by following the same procedure. To recall the channels press the necessary letter-figure combination, although in a number of cases the channel can be recalled by pressing only one figure key.

**Selecting the bands**

Band selection is carried out using a group of four touch keys, situated below the memory channel keys. The right-hand key, SW, has a white bar on it, while the others have a grey bar to distinguish them from the short wave band selector. Note that the various short wave bands are selected by sequentially pressing the SW key so that, starting from the lowest frequency, 120m or a readout of 2300kHz, the set switches through the various bands, eg, 90, 75, 60, 49, 41, 31, 25, 21, 19, 16, 13 and 11m. Pressing the key again repeats the sequence once more. This is quite apart from using either the keypad or tuning knob to arrive at a chosen frequency.

**Listening**

I started listening by searching for amateurs on the 7MHz band. I used the telescopic antenna to receive several amateur stations on LSB. To receive SSB, you must switch in the BFO. The actual tone of the BFO is set by a rotary control below the switch and is clearly marked. So, although the tuning knob alters the frequency in 1kHz steps – too large a step in my opinion – it is possible to tune in a signal by adjusting the BFO control.

I then attached my 80m dipole to the receiver. This was fed through an ATU and the coax was attached to the set using two of the three screw connections on the right-hand side of the receiver. Naturally this resulted in a considerable increase in signal strength, and a number of QSOs were monitored during daylight hours.

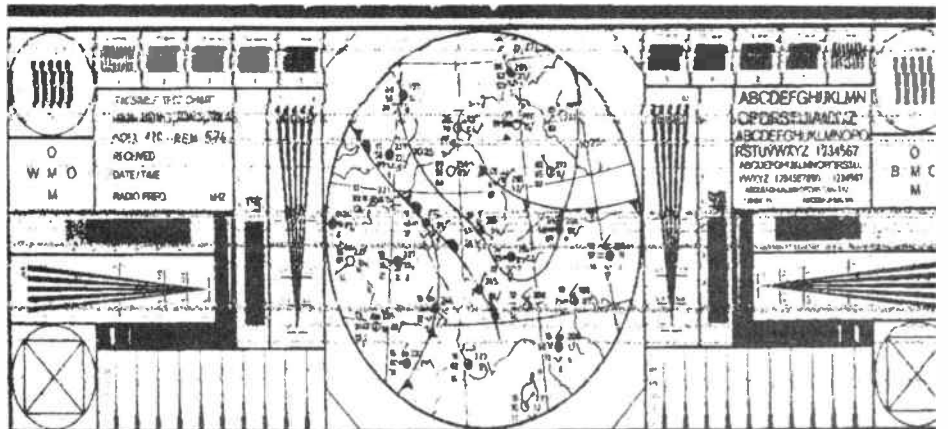
With the telescopic antenna still connected, I then tried to receive fax stations, which were decoded through my ICS FAX-1 using the LINE-OUT phono socket on the side of the receiver. This was more difficult because the setting of the BFO was critical. The tones had to be just right, otherwise the ICS FAX-1 would not respond to either the 'start' signal or the 'stop' signal. I have no complaint about the stability of the receiver, as fax and RTTY signals stayed just where I had tuned them.

**Broadcast stations**

The 1kHz stepping rate of the tuning



Front view



Sample printout of fax reception

knob is not a disadvantage when tuning into broadcast stations on the long wave band. I logged Motala on 189kHz, DLF Munich on 207kHz and others at a reasonable strength. Unlike other rigs this receiver is very receptive to these low frequencies. The long wave stations were received with the aid of a home-brew frame antenna in the attic. Disconnecting the frame antenna and using the built-in telescopic antenna resulted in a great number of stations being heard on medium wave.

**Sensitivity**

There is no doubt about the sensitivity of the receiver when working DX using only the whip antenna. Listening to amateurs on 14MHz was excellent when the band was open and numerous stations were heard. Given reasonable conditions, the same result can be

obtained on 21MHz. I have to point out, however, that the tuning of SSB signals is critical. The AM GAIN control can be used in conjunction with careful adjustment of the BFO knob to receive intelligible speech. And reception of CW is easier since the operator selects the tone manually.

When the D2935 was used outdoors and away from man-made interference the background was relatively silent, allowing some very weak stations to be heard.

**Conclusion**

This receiver is great value for money and a credit to Philips' designers. I would recommend it to any short wave listener.

The D2935 costs £149.50 including VAT. For further information contact Philips Consumer Electronics Ltd, City House, 420 London Road, Croydon CR9 3QR. Tel: 01-689 2166.

# DX DIARY

News for HF operators compiled by Don Field G3XTT

As I write this column, the big news is that XW8DX and XW8CW are finally on the air from Laos after much speculation and rumour. For yours truly, my XW8DX contact should place me on to the DXCC Honor Roll except, that is, there are rumours that the group had no licence. Mind you, I find it difficult to believe anyone would have the nerve to operate from Laos without the appropriate documentation.

It has been many years since Laos was last on the air, but the ice was broken on 14 November when XW8KPL first appeared. This one proved to be genuine and is the result of efforts by JA1UT and others (the same group got XU1SS on the air a few years ago) who went to Laos with equipment and stayed for some time to train the local operators.

XW8KPL is now permanently established at the Pathet Lao News Agency in Vientiane, and the Japanese hope to return in the near future to do some serious operating from there.

After 14 November, however, XW8KPL was difficult to work. The local operators were inexperienced and tended to participate in list and net activities. So when the Hungarian group showed up on 8 December with the aim of repeating their Vietnam success of a year earlier, it was especially welcome. I hope you managed to catch one of these operations but, in any case, it looks as though amateur radio has returned to Laos to stay.

UK amateurs have worked the XW8DX/XW8CW group on 10, 15, 20 and 40m, with 80 and 160m operation promised later.

Send QSLs for both calls to: ARS XW8DX, PO Box 67, Vence, F-06140, France. Do not send cards to F6HIZ's home address.

## Amateur radio in China

China, of course, is another country which was off the air for many years. Meng Chao BZ1FB recently circulated via HF packet radio an interesting resumé regarding recent developments in amateur radio in China.

On 29 March 1982 BY1PK, the Peking club station, became the first Chinese station on the bands for many years. Activity has increased significantly and there are now forty club stations active from all over China. Radio direction finding (DF) is also popular, as in many European countries, with many

thousands of devoted enthusiasts taking part.

The first amateur radio exams took place in February 1989, when thirty-two would-be operators from around China went to Beijing for two weeks of intensive study. They all got their licences and the first appeared on the air on 5 August, sporting their new BZ callsigns. Although these are personal calls, operation must take place from a club station, and the Chinese Radio Sports Association is still working towards licensing home stations, when the BG prefix will be used. The early BZ licensees, since returning to their various clubs, have administered exams on a local basis, so now there are many more new licensees.

Given that operation from home is still impossible, many amateurs spend their time home-brewing various sorts of electronic equipment. The few foreign amateur radio journals which find their way into China are much treasured, though the BY5RA club in Fuzhou now publishes a monthly newsletter containing DX information and much else of interest. To give some idea of activity levels, in just a brief listen around 10m one recent weekday morning, I heard four different Chinese club stations. And BZ1FB, who contributed the preceding information, has been active on both packet and RTTY, much to the delight of the keyboard fraternity.

## Bouvet latest

The Norwegian Bouvet Island expedition, which should have ended by the time you read this, started on 28 December after poor weather conditions had delayed their landing on the island. Within twelve hours of their arrival, UK amateurs were able to work them on 10, 15, 20 and 40m, which was an excellent start. They were due to stay on the air for three weeks with up to five stations on the air at any one time, all using the 3Y5X callsign. Among the recruits to the operating team were F2CW, HB9AHL and JF1ST.

The bad news is that the US expedition, scheduled to start in February, has been cancelled. The reasons for this are complex, but appear to be linked to the success of the Norwegians and also problems in finding a suitable ship. A pity, given the heavyweight sponsorship which had been lined up. Instead, the Northern California DX Foundation has

promised a substantial donation towards the Norwegian operation.

Bouvet Island was discovered in 1739 by Frenchman Jean Baptiste Lozier. Lars Christensen claimed Bouvet Island for Norway in 1927/28 during a scientific exploration there. Great Britain had also laid claim to Bouvet, but renounced it in Norway's favour in 1929. Bouvet formally became a dependency of Norway in 1930. Since then, all Norwegian expeditions to the Antarctic have included Bouvet Island in their itinerary.

The most extended stay was in 1978/79 when a shore group was on the island for two months. The group included Thore 3Y5DQ, a geologist, and John 3Y1VC, a telecommunications engineer. They gave out the greatest number of contacts with Bouvet to date, and also cast doubt on whether Gus Browning W4BPD operated from the island as he had claimed. Gus had signed LH4C some years previously, but the operating site which he had claimed to use turned out to be permanently under water!

## DX news

During December, as well as the operations from Laos, there was a fair amount of other DX on the bands. FR7AIG showed up from Glorioso Island, though mainly in list operations. The Colvins were on as XT2KG, DL8CM did sterling work as TL8CM, K9EL showed up as HS0E, plus there was lots more rare and semi-rare DX.

The KH4 (Midway Island) operation at the end of November went down particularly well, with UK stations making contacts on 10, 15 and 20m. For the future, Alain ex-XT2BR is now active as 5U7NU and will be in Niger for six months.

The islanders of Pitcairn celebrate their bicentennial anniversary during 1990 and the island's nine amateurs will sign VR200PI (regular call) all year. If you work one of these special stations you will be entitled to claim a special award. A special application form is needed, of which G4DYO has copies.

GU0/KD7TT is active from Guernsey for three years, and has already appeared on RTTY. KE2AA/KH3 is a new operator on Johnston Island, while KN0E/KH3 remains very active from there on all bands (he was worked from the UK on 10m during the November contest). KX6DC planned to be especially active on all the LF bands for the

winter season, particularly looking for Europe at his dawn and ours.

G4MVA has returned to Cyprus for a three-year stay and will be active as ZC3CZ again. If Glynn's previous operations are a guide, he should be very active on the bands.

Walvis Bay now has its own prefix, ZS9, and ZS1IS is now signing ZS9A. I know of at least one group who plan to make a big splash on the bands from Walvis Bay as soon as the ARRL accept it on to the DXCC list (if, indeed, that is what happens).

### DXCC

Although the decision still has to be ratified, it appears that the ARRL will add Conway Reef and Banaba to the DXCC list, but will reject the Australs and Marquesas as expected. They have also rejected Frederick Reef but, in any case, no operation had actually taken place from this one. The ARRL has also ruled following Mexican allegations of irregularities in the XF4L operation from Revilla Gigedo. The objections were overruled and the operation continues to count for DXCC.

The November issue of **QST** magazine gives details about the early recipients of the 40m DXCC Award. The following UK stations appeared (the country total is in brackets): G3KMA (310), G3TJW (303), GM3ITN (259), G3XTT (251) and GM4KHE (168). The same issue reported GW4TFX as having gained a Phone DXCC Award, G3MXJ the CW Award, and GW4BLE as the latest UK arrival on the Honor Roll. Congratulations to all.

**QST** also carried a fascinating profile of George De Grenier W1GKK. George has the distinction of being the only amateur in the world to have worked and confirmed all DXCC countries, both current (321 as of late 1989) and deleted (fifty-one of them). Even the famous W6AM, with his rhombic farm, missed the odd one.

What makes George's success even more remarkable is that he operates from a modest location, obstructed to one side by the Berkshire mountains of

Massachusetts. And to cap it all, until recently, he had only operated on 20m. This had been mostly with home-brew equipment and home-made monoband yagis, although he now has a TS830S with outboard VFO, an SB220 linear, and a Cushcraft four-element 20m yagi. Recently, George started operating on 80m with an inverted vee antenna. Quite a record! Indeed, no one will ever match George's achievement, because it is now too late to catch all those deleted DXCC countries.

### DXNS speed challenge

It may be too late to work them all, but there are still plenty of challenges in DXing. A recent one was the speed challenge established by G4DYO, editor of DX News Sheet, to raise money for the Norwegian Bouvet Island expedition. The idea was to work DXCC (100 countries) in the shortest time possible. In the event, it looks as though Brendan won his own challenge, putting in a time of eleven hours and four minutes during the weekend of the CQWW Phone Contest. It took me roughly three times as long during the CW leg of the contest. Lots of fun, though.

### Packet Cluster

In earlier columns I have mentioned the setting up of a Packet Cluster system in the UK. As I write this the system is undergoing trials and is proving extremely valuable. Over the weekend of the ARRL 10m Contest, for example, many DX stations were 'spotted' by users and 'announced' via the system to anyone who was connected. From 1 January the callsign will be GB7DXI, with direct access on 70.325MHz, or via the WOK22 NET/ROM on 144.675MHz. The node is located at G4LJF's QTH in Wokingham. The system will shortly be able to provide WWV data, beam headings, QSL information and much else of value to HF DXers.

### Contests

Firstly, G4FRE recently pointed out to me that his score was omitted from the

1988 CQWW CW results. Dave operated from Gibraltar single-band on 7MHz signing ZB2/G4FRE and scored 22,649 points.

As well as the SSB leg of the CQWW 160 Contest, which I mentioned last month, the Yugoslavian DX CW Contest takes place on the weekend of 3-4 February, and the Dutch PACC Contest (SSB and CW) takes place a week later.

The big one, though, is the ARRL CW Contest on 17-18 February. This is always well supported by UK amateurs, as is the SSB leg which will be held on 3-4 March.

Looking ahead, don't forget the Bermuda Contest on 17-18 March. The UK winner gets a free holiday in Bermuda.

### QSL

I am currently dealing with QSL cards for the GJ6UW operation, which took place last October. A number of stations gave the wrong callsign on the card, while others sent return envelopes but no return postage (from the USA!). One generous (?) US amateur sent three QSLs and only one IRC, which certainly won't cover the cost of return postage. Most, of course, are rather less mean. It is a salutary reminder, though.

When sending QSL cards to DX stations, do ensure that the correct details are on the card, so that the QSL manager doesn't waste his time trying to find the QSO in the log. And, if you want a direct card back, enclose enough IRCs to cover the return postage. A donation towards the cost of the cards never goes amiss; getting several thousand double-sided cards printed (which is a fairly typical situation) is not a cheap occupation!

Of course, many (but not all) expeditions receive financial help towards the cost of QSLs from one of the many DX Foundations. Without this there certainly wouldn't be the many attractive cards in circulation that we have come to expect.

The RSGB also manages a DXpeditions fund to provide such help to UK amateurs who embark on worthwhile operations. Contact G4JVG or G3ZAY if you wish to give or receive!

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# SECOND-HAND

by HUGH ALLISON G3XSE

## Airmec

I've received a few queries about Airmec's stuff over the years. On the whole their equipment is solidly made ('hernia stuff' one reader called it) and very reliable. Obviously the gear hitting the amateur surplus market is old so it's a tribute to their design that there is still plenty of life left in it when it comes into our hands. Their RF signal generators and modulation meters are excellent (though big) bits of indestructible kit and are well worth having, particularly as they seem underpriced in the £10.00 to £30.00 price range.

The only black spot on Airmec's otherwise unblemished record, and I freely admit the fault/lack of knowledge/wrong approach was all down to my incompetence, is their synthesised audio generator. I bought one for £2.00, not working, and had a really bad time repairing it. A day was wasted and I grew a little hostile towards it!

## St Albans Rally

This event is now so popular that the organisers had to stop allowing people in! The hall was packed solid about half an hour after opening time, and there was still a healthy queue of people waiting to get in.

Was the wait worth it? Definitely yes. A non-working BBC computer for £20.00 was the highlight of my day. The seller said the power supply had given up and he had changed the series regulator transistor in the +5V supply. Unfortunately he had mixed up the screws and bolted down the collector of the said transistor with a metal screw, innocently using the requisite nylon one to hold in a board. Swapping them over produced the goods.

The bring and buy did a roaring trade and I nabbed a few bargains.

An excellent do, the organisers have just outgrown the hall it is held in.

## City Boy 100 (Grundig)

I've had a stack of these fine long, medium, VHF and short wave radios in for repair recently. The most common fault by far (about 75%) is the earphone socket. To be more precise, the socket itself is OK but is soldered on to a little board (a 'daughter' board), that is in turn soldered on to the main (or 'mother' board). With all those joints, coupled with physical pressure when the earphone plug is pushed in, you have a recipe for disaster. I've given up reflowing the joints and just link through with a few bits of inch-long insulated wire. The speaker wires are often long enough to be rerouted and soldered on directly.

The other 20% of common failures (5%

are miscellaneous) are battery contacts. Not the normal 'where the battery meets the set' contacts; in these City Boy 100 radios the wires from the contacts go to bits of sprung metal on the back which make contact with the printed circuit board. The idea is that, when the radio needs servicing, the whole back comes off with no trailing wires.

The problem is that the contact area of the PCB, which is only solder, oxidises and goes high resistance. A quick reflow with a hot soldering iron gives a good repair. Rub it over with an abrasive if you are a perfectionist.

These are great sets and are often available for less than a quid, brand new but not working, from 'catalogue return' stalls at rallies.

## Birmingham Rally

Most clubs have enough problems organising one rally a year. MARS, the Midlands Amateur Radio Society, which organises the Tamworth Park Rally, is the first club I know of that runs two. The organiser told me: 'One's no trouble, so why not two?' Is he a masochist?

The people on the gate at the Birmingham Rally seemed to spend all their time saying, 'Yes, we will be running Tamworth next year as well'. Apparently there have been a few regulations preventing a rally on a Sunday in the centre of Birmingham, but by assuring the powers that be that no fudge, sweets or anything non-radio would be offered for sale MARS has finally managed to get it going.

For me it was a bit of a strange rally. I didn't buy a thing from the bring and buy, which is almost unheard of, but there were several club stands and one or two one-man bands that really produced the goods. I only spent £40.00 all told, but bought a couple of cubic yards of real rubbish to play with. If the club runs the rally next year, I'm going.

## Cleartone CM6000

These are fairly new synthesised PMR (Private Mobile Radio) transceivers. They are VHF, FM and look magic. I've seen some for sale quite cheaply at the rallies and they are fine for taking to bits, especially for the PA board, which is well made and capable of chucking out 20+ watts.

Why not use the whole thing on 2m? Well, two reasons. One (a probably insignificant reason) is that most of the screws are 'torquies'. These are star-shaped holes which, to a casual glance, look as though they are made for an Allen key. They ain't, and Allen keys don't fit. Getting the covers off without the correct tool is a nightmare.

Second reason. The taxi boys have to take their sets to a machine to have the frequencies programmed in. The radios are not field programmable, which means the likes of you and I cannot do it. There are, apparently, three versions of this box, all with differing programming difficulty.

As I was saying, they are fine for taking to bits. I've bought a few scrap ones for a pound or two a time and have more than had my money's worth from the components I've scavenged. I've not bothered to try and make the radios work since I cannot fathom out an easy way of banging in useful amateur frequencies. Any bright person got any ideas about programming to pass on?

## Using PMR stuff

I often receive letters on the lines of: 'I've bought a Nagombicom ABC transceiver and wish to use it on 6/4/2/70. No one knows anything about it. I'm a newly licensed amateur and have no test equipment or money'. Just to put the lid on it, I've never heard of it either.

Super. Pray there are some crystals in it and there is a plate, indicating its frequency. Open the bugger up and try to work out which board (or which part of the board) is the receiver and which the transmitter. The transmitter ought to be easy to identify; the styling of the PA transistors is fairly obvious, either a capstan style or a multi-legged transistor - lots of emitter lead-outs.

The game is to find the transmit crystal. Normally it is a plug-in one, so ignore soldered-in ones. Now hopefully you know the output frequency from the plate; divide the output frequency by the crystal frequency and you should get a whole number. For example, the plate says 465MHz and the crystal says 12.916MHz, so the multiplication factor is 36. Now you want to transmit on 432MHz so the crystal you need is  $432 \div 36$ , which equals 12MHz dead. If there's no plate but there is a counter, transmit into a dummy load and read off the final frequency.

Turning now to the receiver, don't expect this to be easy. The aggro is caused by the IF. Most have an IF of either 10.7MHz or 21.4. There are two good ways to find out the IF frequency. One is to look for the filter. The part number stamped on it often gives a clue. 10.7/7.5 might be a 10.7MHz filter with a 7.5kHz bandwidth. However, you are reading an article written by a man who once assumed a filter stamped 85/8 was an 85MHz filter with an 8kHz bandwidth - it was the date code!

The other way to find out the IF frequency is to look for a soldered-in

crystal. Most VHF or UHF stuff is a dual conversion superhet, the second IF normally being 455kHz. The mixing crystal is thus the first IF frequency minus (or plus) the second. 10.7 to 455 will have either a 10.245 or 11.155MHz mix rock, a 21.4 needs 20.945 or 21.855MHz.

So, now you, know the IF, hopefully you've found a receive crystal and you know what the thing was set up to receive. Try the receive frequency plus the IF divided by the crystal frequency to get the multiplication factor or the receive frequency minus the IF divided by the crystal frequency. Whichever gives a whole number is it. For example, receiver on 465MHz; IF, 10.7MHz; crystal, 56.7875MHz  $(465 + 10.7) \div 56.7875 = 8.3768$ . This is obviously wrong.  $(465 - 10.7) \div 56.7875 = 8$  must be correct.

Right. Suppose there are no crystals in it, and so no known final frequency. You're well stuck, aren't you? Perhaps not quite. I assume you have a model or type number (or a name). Try writing to an amateur 'specialist' crystal supplier and telling them everything you know. Quartzlab, for instance, are great at this, I've seen them sort out several people's crystal problems at rallies. Let them know the size of crystal socket, the model numbers, if there's only one crystal in it. Most crystal suppliers keep a book of rigs and the crystals they require, this could be your salvation. Don't be ambitious though, buy just one channel (ie, a pair) to start with, and minimise your losses if the project is a disaster.

### Setting up the transmitter

Most people have a power meter of some sort, even a crude 27MHz SWR meter plus load is useful. Maybe a bulb, if you're desperate. The object of this part of the exercise is to identify which parts of the rig are the twiddlers for the transmitter. With the original, commercial crystals in it twiddle what looks like transmit strip stuff (with the correct tool *please*) and watch the power out go down. If a tweak doesn't alter the power, put it back pronto as it isn't in the transmit chain. It isn't a bad idea to either mark the position of each twiddler or make a drawing before you start. It makes it much easier to reset it all when you bugger it up.

A good move is to get a receiver for your intended transmit frequency. Even an old airband portable that goes at 145MHz for 2m, say. If the crystal frequency is a low frequency start, ie, under 30MHz, then a general-coverage HF receiver can also be used for starters. Chuck in the new amateur bands' rock and see what you can hear, and then twiddle to improve. If there is a row of test points, wop an avo on the first one and see what happens, moving along to suit. If your power supply has a current meter, or if you feel like putting one in series with the rig, any increase in

current is worth trying.

The good news is that any twiddler behind the mixer is in the IF chain and doesn't need touching. With the amateur bands' crystal in, get someone local to call you on that channel. I find that receivers always work, it's just that their sensitivity is well down until tuned on the nose.

A good tip when aligning a single channel 'repeater only' rig is to temporarily lash it up in the car and drive to the repeater site. Get someone to bring up the repeater and get tweaking. Drive away or put the aerial in the boot as you improve sensitivity.

### Tone calling

One final thing which could catch you out is a selcall system. This is where the base station in the network in which your unit was previously used sent out a couple of tones to activate one receiver only, even though several were listening to that channel. Obviously no amateur is going to give you the required bleeps and this needs removing. Often the tone call is a separate board or plug-in module and needs linking out. Worse is a transceiver where this module is missing and no link installed.

There may be a frightening number of pins to the unit but look carefully, both at the rig side of it and the module and discount any pins not used either end. With the set switched off, go round with an avo to earth, on ohms, and find the earths. Do the same thing with the set on, avo 12V and find the rail(s). You will probably be left with only a couple of wires and these are the audio in/out. Try linking them with a 1µF 12V capacitor - try combinations of links until you get a noise. By the way, I'm assuming you have wound out the squelch and wound up the audio fully. Incidentally, I've often found one of the required audio pins by running my finger along the pins and listening for any hum.

### Fuses

In came a very modern VHF all-mode megawatt mobile. Its complaint was low Tx power. On the bench I connected up all services and the receiver sprang into life with very impressive sensitivity and obviously in good health. On to transmit - the low power complaint was true, and it was frequency hopping about the band. No wonder no one else would touch it. Oh well, covers off. One clue though, panel lights were going dim on transmit. Could it be low volts? Into the dc input filter with the trusty avo, sure was low volts. Receive, the requested 13.8V, Tx 8V.

Well, I buggered about a bit before I probed where the red and black wires came in (no socket). It was still doing it. There was only an in-line fuse holder between here and the power supply; it had to be that. Opened it up, fuse was a

bit grey at both ends. A good rub over with Scotchbright and all was wonderful again.

### Belcom LS20 XE

A few months ago I wrote a mini review generally raving about these fine little 2m handi-talkies. I did mention that the plastic case is a bit fragile, and I've obviously hit a raw nerve. In came a couple of letters, one owner saying that he wished he had known that the top corner of the case, where the aerial is mounted, was so fragile. Apparently, he was holding the rig in his hand and accidentally hit the end of the rubber duck 'gently' on a scaffold pole - the case disintegrated in the top corner. Since an example I bought the other day is broken in the same spot, treat the aerial with care.

### Diode matrix

A mate came in with a synthesised commercial hand-portable. It was programmed with a diode matrix and was a six channel machine. He'd got three fitted and wanted another one added. The frequency he wanted was scrawled out on the obligatory fag packet and, surprisingly, it was within range of the unit. No sweat, I said, do it in half an hour. Incidentally, the unit was working perfectly on the three channels already programmed.

The matrix board was quite clearly labelled. Channels 1 to 6 were numbered vertically twice (one for Rx, one for Tx), and the count, in assorted ones, tens and hundreds was numbered horizontally. I knew the step for each count was 12.5kHz but couldn't remember the start frequency. Never mind, I'd wop in a count of 100 (ie, one diode in the 100 line on ch4), see where it came up, take 1.25MHz off and we would have our start point.

In with the diode, on to transmit. Nothing. Flicked back to ch3, it worked. I sodded about with it for a good quarter of an hour and decided to abandon it for the moment, I'd do the receive address. Put in a diode on the receive matrix, the transmitter came up! Why don't they warn you the transmit line is inhibited until there is a receive address on that channel? Arrgh...

### Safety

I know I have mentioned about poking one's fingers inside a rig, but although I assume everyone takes great care with valve equipment with its associated high voltages, transistorised stuff can need great care taken at times as well. Besides gear with a built-in mains power supply, where attention must be given to on/off switches, voltage selectors, fuses etc, an innocent looking 12V powered transistor rig can still pack a punch. Two great sources of hurting yourself (I speak from experience) are the inverter for a fluorescent display and the output stages.

# SECOND-HAND

Although RF solid-state devices are low impedance and, on 12V, you would think safe to touch, the tuning winding, for example, can be a high impedance, high Q job and pack a nasty burn/belt. I still bear the scar from an encounter with a 3W commercial 400MHz installation. The PA coil looked loose and I stupidly touched it whilst it was running. I was startled to receive a bad burn from such low power and even after the event I was convinced that the coil was physically (rather than electrically) 'hot'. It was only after switching it off and cautiously approaching the coil that I realised it was indeed an RF burn that I had just received.

Domestic stuff can pack a belt. Cameras with a built-in flash can hold their charge for yonks. Even if you've taken a picture and turned the flash off pronto there can be a surprisingly large packet waiting to be collected days later. Solid-state TVs and 'scopes can pack a punch too.

## Electric screwdrivers

I've always considered these to be a gimmick - after all I've got through thirty odd years wielding a normal manual screwdriver and could see no need to have a power tool. My wife thought differently though, and bought me one

for a birthday present. The next day I was due for a long encounter with a pile of die-cast boxed transverters, converters and the like so I decided to give the screwdriver a go. Brilliant. I've had bad times undoing tight crosshead screws on these and was well pleased with being able to effortlessly undo them all in a minute or two. The crosshead screwdriver blade seems to be an excellent fit in a wide range of screws.

A few days later I was up a ladder screwing a dipole to the wall. Mr Electric Screwdriver really banged the securing screws in quickly, plus, as it was a one-handed operation I was able to hold on to the roof with the other hand - I don't like heights.

One final mega plus. I already had a 1/4in hex socket drive set. This gave me many other screwdriver heads to use on my new toy, but I also had a 1/4in square driver converter. This gave me 'access' to a mini socket set that I also owned. We recently put up a larger beam, at a height, and did up all the nuts with said screwdriver and sockets. Initially the intention was to do it up, install it, then give a final tighten with a conventional spanner. In the event we couldn't get any more purchase with the spanner, I was truly amazed at the torque these screwdrivers chuck out.

## IC225

In came an IC225, its owner looking very upset. He'd decided to give it a tweak and, horror of horrors, smoke had come out of it. Now I know that the IC225 is all neatly built out of lots of little inch-wide component strips, each about 6in long, and one of these has to come out (and be inverted) to tweak the front end. Had he done this? Yes, he had. Did he undo the screws all the way? Yes (his big mistake). I knew what the trouble was there and then - a good shaking produced an ominous but expected tinkle. The 'strips' are held in with little U shaped clip thingies, these in turn being held by a screw. All you need to do to undo a strip is give the screw a couple of turns - never undo them all the way. He had, and the U shaped thingy was now liberated and had obligingly headed off to the spot where it could do the most harm. Incidentally, each pair of clips holds both the top and bottom strip.

After replacing a handful of burnt-out resistors we had a well and healthy 225 on our hands. Good cheap synthesised machines (25kHz steps only). About a year ago you might have considered yourself lucky to bag one for a hundred quid, now they seem to have fallen in value. I've seen one go for £75.00 and several at £85.00.

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500	41.91	4.23		4	S 8	20.30	3.24
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BFR90	£1.30		MPS918	£0.30	ZN416E	£1.65
BFR91	£1.50		MRF237	£4.35	ZTX327	£1.50
BFR91A	£1.60		NE564	£3.10	2N2369A	£0.45
BFR96	£1.75		NE565	£1.25	2N2905A	£0.45
BFR96S	£1.90		NE587	£1.35	2N3553	£1.95
BFS22A	£1.50		NE570	£3.50	2N3771	£2.20
BFS23A	£1.50		NE592	£1.20	2N3866	£1.35
BFT24	£2.65		NE602	£2.25	2N4416	£0.95
BFW10	£1.45		NE612	£2.25	2N4427	£1.75
BFW16A	£2.05		NE614	£5.40	2N4858	£0.90
BFW30	£1.75		NE5044	£3.25	2N4921	£0.70
BFW92A	£1.35		NE5045	£3.25	2N5179	£0.95
BFX88	£0.50		NE5592	£1.50	2N5486	£0.90
BFX89	£1.15		SL560	£2.25	2SC1306	£2.30
BFY51	£0.40		SL1612	£4.10	2SC1909	£1.75
BFY90	£1.20		SL1640	£4.70	2SC1946A	£14.50
BLU98	£2.65		SL6270	£2.25	2SC1947	£6.75
BLV91	£16.50		SL6440	£3.65	2SC1969	£2.50
BLX65	£2.50		SL6601	£2.95	2SC2053	£1.50
BLX65E	£6.25		SL6700	£4.45	2SK55	£1.00
BLX67	£15.95		SP4740	£2.80	3N201	£1.25
BLX93A	£18.50		SP8660	£3.72	3SK51	£2.60
BLY33	£1.85		TCA440	£1.75	3SK87	£0.40

# AN AMERICAN ADVENTURE

by Trevor Morgan GW40XB

Licensed operators world-wide will quite often say during a QSO, 'If you're ever over here, give me a call.' It's part of the courtesy extended to all amateurs, rarely in the belief that such a meeting will actually take place.

My first contact with Harold Cones came about three years ago through my role as founder/secretary of the International Listeners' Association. Harold, secretary of the Great Circle Shortwave Society, wrote and suggested that our respective members could exchange useful information. Subsequently, we struck up a regular correspondence and the phrase 'If you're ever over here, give me a call', was often used.

Throughout the past three years, Harold has sent me plenty of literature about his Society, about the area in which he lives and about their annual ARRL Convention which is held in nearby Virginia Beach. It certainly seemed to be a very fine convention, with lots of trade stands, local clubs and societies taking part, and some respected names from the world of radio as invited speakers.

## Taking mum somewhere special

1989 was a special year for my wife and me. It was our 30th wedding anniversary and my sons had bullied me for months about taking mum somewhere special to celebrate.

In a mad moment (I must have been at the sauce, or something) I said, 'What about visiting Harold?' And here the story really starts!

The first thing to do was to inform Harold what was afoot and check on the date of the next Convention – we were not going without seeing that! A swift reply came: '...fantastic! Come stay with us. Date will be 16-17 September.'

Now, we had never been outside the UK, let alone flown, so brochures were snatched by the handful from the travel agents and plans were made.

We wanted to see a bit of the country so Amtrak passes (rail, as we don't drive) were essential. We chose Washington as our first destination as it is near Newport News, where Harold lives, and, anyway, is a good place to visit, being the capital city.

Hotels were the next problem. We didn't want anything permanent as we wanted to travel where and when we felt the urge. Bearing this in mind, a major hotel chain voucher scheme was chosen.

Once we had made our plans, we took them to a local travel agent who arranged everything for us including the return flight.

## One more thing to do

A further letter to Harold in the States giving him the details brought the reply, 'Great stuff... by the way, you'll be a guest speaker at the Convention!' Oh dear me (or words to that effect) was my response! I do *not* like speaking to audiences!

There was one more thing to do; apply to the RSGB for a form to send to the US authorities for a reciprocal licence. No way was I going over there and not doing a bit of chatting! I received the licence within a week!

So, everything was set. We were not to know that mother nature had plans in store for us.

September came much faster than we expected and we departed Swansea by Intercity using the Rail Link service to Heathrow.

I had packed my 2m rig and a 20m QRP hand-held in with my cameras so was a bit nervous at the baggage check. I had heard some hair-raising stories about customs, so I had carefully listed my equipment and serial numbers on a card. This was shown to the inspector together with my reciprocal licence. I received a polite 'Thank you, sir'. No hassle or questions at all!

## An unforgettable experience

The flight by TWA 747 was beautifully smooth, an experience neither of us will forget, and we arrived at New York to change for Washington.

US Immigration was having an 'off' day

and it took over two hours to get through. This resulted in us missing our connection but eventually we were away.

We climbed through a New York storm, breaking through the clouds just as the sun set. It was one of the most fantastic sights I have ever witnessed. Brilliant red and orange clouds shot with streaks of white lightning left us open-mouthed as we flew on to Washington.

We had planned a four-day stay in the Capital, allowing plenty of time to see this lovely modern city before the trip south. Of course, we trod the well-worn trails, taking in the short history of this powerful country. Lincoln's assassination, the Treasury, the Smithsonian and the FBI all took their toll on our hot feet. It was warm too. 96° and a humidity of 92% was more than we were used to.

## The Voice of America studios

Then we came across the one place I had to visit. The 'Voice of America' studios are open to the public on a guided-tour basis. This tour begins in a side room which has one of the old valve based studio set-ups on display. In this room we were given a short talk on the history and operation of VOA and given leaflets and souvenirs of our visit.

Next we were taken around the studios to see the everyday operation, the different language studios and the main centre that receives the news from all over the world.

During a question session at the end of the tour I asked, 'Where do the

*The ARRL Convention Centre at Virginia Beach*





Inside the Convention Centre

QSL cards go to?' The lady guide asked more of my interest and my wife and I were asked to stay behind after the other tourists had left. We were taken to the main office of the station and introduced to Annie Morris and Kim Elliott who filled us in on the details of Voice of America.

VOA produces regularly scheduled programmes in no less than forty-three languages while others are especially programmed. The listener mail is phenomenal with over 500,000 letters coming in from around the world each year! The mail is dealt with by *one* lady who does the job *part time*. Unfortunately we couldn't meet Irene, this remarkable person, as she was otherwise engaged, but we did visit her 'department' and saw the incoming mail for ourselves.

For those interested in statistics, VOA has forty-eight studios (forty-three in Washington), employs nearly 3,000 people of whom two-thirds are in the USA, has eighty-four overseas broadcast transmitters and thirty domestic transmitters, uses twenty-two commercial satellite circuits to feed the VOA relay stations, uses a total of 25MHz of power for its 114 transmitters and spends over \$171,000,000 per year!

Our hosts were charming and all in all we spent a very pleasant afternoon, leaving with our bags full of souvenirs of VOA.

### We were met by Dr DX

Newport News, where we headed next, is a thriving town in Virginia. It is famous for the deep-water anchorage and has the world's largest shipyard which fronts the Chesapeake Bay.

Our journey by Amtrak took us via the Virginian capital city of Richmond. When we arrived at Newport News, we were

immediately spotted by Harold, known locally as Dr DX, and his wife Linda. We were welcomed like family and were taken to their home, a lovely bungalow nestling in a wooded suburb of the town.

The following day we were taken to Virginia Beach where, as guests of the Tidewater ARC, we were assigned a room at the Radison Hotel. This was real luxury!

Later that evening we made our way to the nearby Convention Centre where the show was to be held the next day. There we met Paula Marsh KK4OK, of the Virginia DX Century Club, Tom McElvy WDX4KQH, of the Old Dominion DX Association, Charles Foxx, one of our ILA members and ODDXA member, and Kaz Matsuda of Radio Japan. The Centre was being prepared for the weekend and was a hive of activity.

The following day we arrived at the Centre at 9.00am. I was scheduled to speak at noon, so had three hours' grace to tour the show.

### Plenty to see and chat about

We've always thought that the Americans did things in a big way. This Convention was to prove the point. Relatively speaking, this was a 'local' event rather like Leicester or Longleat is to us. However, the show had seventy-six trade and club displays including such names as Icom, Radio Shack, Uniden, Texas, Alinco, Kenwood and many US companies that we do not hear of in the UK.

Individuals with goods to sell were allocated space on the ten banks of tables (comprising some 150 tressle tables!) set up on one-third of the hall space. There, customers could approach and haggle with the seller. Naturally, much of the equipment was US orien-

tated, with 2m transceivers made to different frequencies to ours and other equipment of American origin, but there was plenty to see and chat about with the sellers.

As with our rallies, there was a selection of junk stalls carrying ex-government equipment, but the amount of computer equipment was astonishing. The title of the show was 'Hamfest and Computer Fair' but I have never seen that much hard and software outside a major computer show. Shareware was in abundance and complete computer set-ups were available for as little as \$450.00 for an AT/PC with printer!

Computer user groups were well-represented in a separate show in the entrance hall of the Centre. Tandy, Amiga, IBM, Apple, TI99/4A, Macintosh and Commodore all had separate stands. Rather surprisingly, there was not one amateur radio/computer user group present and there was a curious lack of call signs amongst the exhibitors at these stands.

The Convention was central for eight local radio clubs and each had set up a substantial display in the main exhibition area. These were very impressive, attracting a lot of attention.

### Our chance to 'chew the rag'

That evening we were collected from our hotel by one of our hosts and taken back to Dr DX's home for a barbecue and a get-together of some of the local hams and listeners. It gave us a chance to sample some of the local cooking and beer as well as 'chew the rag' with the lads.

Sunday was another busy day at the Convention with over 4,000 visitors making their way through the Centre.

During the day, a remarkable thing happened. I had taken the opportunity of a break to do some 20m QRP from a seat outside the Centre. It was sunny and very warm so I sat there chatting to W4EJY in West Florida.

A couple approached us and watched for a moment until I signed off. A distinctly English voice asked where I was from and stated, 'Great! Do you know GWKTT?'

Well, it just so happens that KTT was the Mayor of Swansea when I gained my licence and also a member of the Swansea ARC like myself. Moreover, the visitor's wife was KTT's cousin! It's a very small world!

It was a memorable Convention. I met hams I had spoken to over the past seven years, met many listeners and was made extremely welcome.

### Stormy weather

The next day, we were to have visited one of those hams in Ohio but mother nature's hand was to be revealed in a terrifying way.

A call from Bob the previous night had



## AN AMERICAN ADVENTURE

warned us that bad weather in his area had caused flooding so the trip was off.

We decided to stay in Virginia Beach for a couple more days, then to go to stay with Harold until our next planned trip to Florida. During that stay, we were given tours of Colonial Williamsburg and the local area.

We began our trip to Florida in Richmond, where we planned to spend a day before taking the overnight train.

We left our baggage in store, and took a cab to the heart of the city. It was again very warm but not quite so humid and we spent a pleasant day visiting the centre of the American Civil War.

### All trains were cancelled

On our return to the railway station we were informed that Hurricane Hugo was about to strike the mainland and all trains were cancelled until further notice!

Stranded! Thank goodness for our hotel vouchers. A quick phone call to the agent soon found us settled in a hotel close to Richmond. It was Thursday and we would not be able to travel until Saturday. Meanwhile, Hurricane Hugo was wreaking havoc directly across our route!

Saturday soon came and we boarded the Amtrak express at 5.00pm in the middle of a storm that blew out of

nowhere. One moment we were bathed in sunshine, the next minute the temperature had dropped to fifty and the rain was torrential!

I had never seen a long-distance train before. It was enormous! Over twenty coaches long, it was hauled by three massive locomotives. We were to get to know this train quite well as the overnight journey took us through five states and severe flooding.

When we arrived in Jacksonville, we watched from the train as water climbed over the wheels. The town was devastated. We were there for two hours, waiting to be hauled out of the station.

A journey that took twenty-nine hours (twice the norm) ended in Orlando on a dry, hot and humid night!

### What an adventure

What had started as a simple trip to visit friends in America had turned into an adventure we never could have planned. We experienced only the tail-end of the hurricane but we saw the trail of devastation left in its wake. The terrible flooding we watched helplessly in Jacksonville was as dreadful as the destruction we saw in Charlotte and many other towns on the route back to Richmond.

Despite the problems we really enjoyed our holiday, thanks to the

tremendous hospitality shown to us, not only by the radio fraternity but all those American people we met.

Our final night in Virginia was our 30th wedding anniversary. Our friends, Harold and Linda, had planned something special and our evening with them at Fisherman's Wharf will never be forgotten.

**Footnote:** For those of you planning a first trip to the USA, the following information may be helpful.

Amtrak 'Tour America' passes cover from one to four areas. The 'all area' pass is valid for forty-eight days and costs about £200.00.

Hotel vouchers cost from £25.00 each and pay for a room in a hotel or motel for a night. (You can get both hotel vouchers and Amtrak passes through your travel agent).

An application form for a reciprocal licence is available from the RSGB Member Services Dept. It takes about ten days to get the permit.

I found it saved time to have the permit readily available, with a list of items you are taking, at customs.

Take a bit of cash but credit cards are the way of life there, although some food stores will not accept any cards!

Relax and enjoy a holiday amongst 'real neighbourly' folk!

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# SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

There are thousands of scanning receivers in use amongst the listening fraternity and even more normal tunable receivers that cover frequencies outside either the amateur or general broadcast bands.

Logging stations on these bands has been a regular pastime for thousands of keen listeners for years and there have been very few problems.

There are publications from various sources detailing the frequencies of practically every type of transmission from regular broadcasts to shipping, meteorological, aeronautical, satellite and even government and military users of the bands. Quite often regular listeners have been responsible for reporting SOS signals, resulting in lives being saved and many have been rewarded by grateful survivors or their respective governments.

I should think that all responsible listeners obey the 'rules' and keep what they hear to themselves or, at worst, to their colleagues within the hobby.

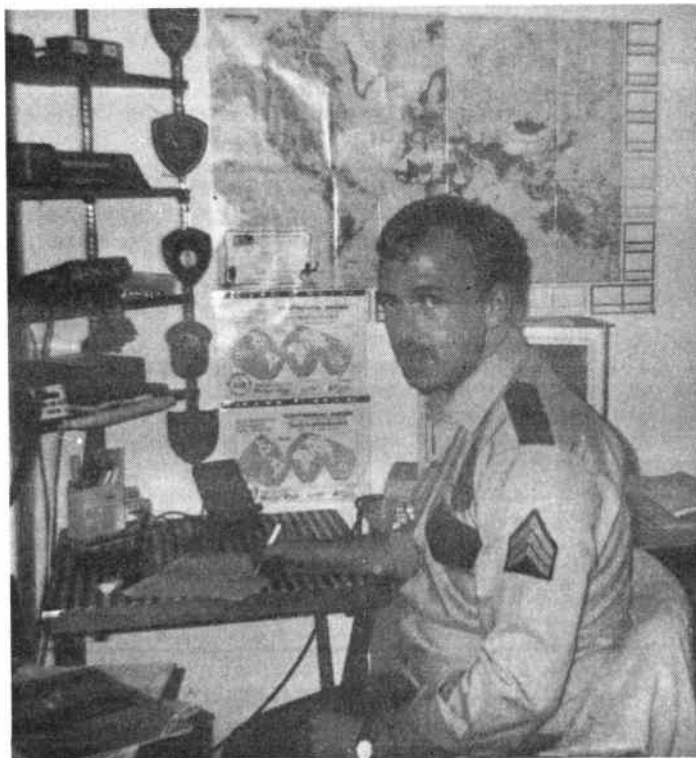
## Radio ham prosecuted

The reason for this piece is that a radio ham in York has been prosecuted and found guilty of using a scanner radio receiver without the correct licence to tune into police transmissions with intent to obtain information.

In court, a DoT radio investigator said that the scanner could monitor frequencies used by North Yorkshire County Council, the ambulance service, taxi companies and car radio phones, as well as the police.

He went on to say that ship to shore, air traffic control and police messages should not be listened to without a special licence, which is rarely granted.

The defendant told the court that he thought he could tune into the frequencies as long as he didn't tell



Martin Whyte of Edinburgh, Premier Award Winner

anyone what he heard. His brother, a policeman, and post office workers had all told him that he didn't need a licence.

The defendant was fined £100.00 and £46.00 costs. The scanner was confiscated.

The chap who informed me of this is naturally concerned, and poses the questions:

1. Do you need a licence to have a scanner?
2. Does owning any receiver which is capable of receiving anything other than regular broadcast or amateur transmissions, render the owner liable to prosecution?

## Looking for answers

In an attempt to find the answers, I invaded the local public library and commandeered the assistance of the librarian.

Have you ever attempted to look up official documents? Take my advice and carry a bottle of aspirin!

So, what did I find?

Firstly, the Wireless

Telegraphy Act 1949, Chapter 54, Part 1 (5)b states: 'Otherwise than under the Authority of the Secretary of State, it is an offence to use any wireless telegraphy apparatus to obtain information as to the contents, sender or addressee of any message whether sent by wireless telegraphy or not.'

Under the 1984 (1053) Regulations (Licensing; Exemption for Sound), it is permissible to receive transmissions originating from the standard frequency services or amateur radio stations without a licence.

This puts the listener in a very delicate situation unless there is some other clause which puts a different light on the matter, which could be the case.

However, it is not only the listener who has a problem as it may also be an offence to supply equipment capable of receiving signals outside the standard broadcast or amateur fields. All those

scanners, general-coverage receivers and other receivers for aircraft and marine reception may be illegal and subject to the Wireless Telegraphy Acts, which leaves the dealers in a hell of a mess!

I have written to the authorities concerned for their comments. It's about time we had some official information, preferably in plain language, on how the listener stands legally.

## Watch this page!

So to listening. A thud on my hall floor announced the arrival of a claim for the *Premier Prefix Award* from Martyn Whyte of Edinburgh.

Martyn says, '... when you set a challenge, you really do know how to turn the thumbscrew!' (Right little sadist, I am!). Well, it wasn't my fault Martyn's monitor got fed up and he couldn't read the log. Poor chap had to dig through the paper one and type out the sheets!

Nevertheless, 'a superb selection of over 2,000 prefixes gets the lad his well-deserved trophy! Loggings included: A7, A35, A41, A92, AH6, AL0, AP4, AX3, AZ6, BT0, BZ4, C53, CE0, CO7, D44, E39, ET5, FO5, H5, HC8, HK0, JT4, JW8, JX7, KG4, KH2, KP1, KP5, KX6, PJ5, PQ9, S79, T31, T32, TZ6, VP2V, VQ9, XE4, YJ0, YV0, ZD9, 3B9, 4D9, 7P8 and sundry other prefixes, enough to make the average DXer cry in his beer!

Between listening and working as a security manager, Martyn now hopes to take the RAE so that he can chat to a few of the stations he's logged over the past two years. Congratulations, Martyn, and good luck!

Nathan Rosen of New Jersey has put in yet another claim for the Continental Award, this time for Oceania (which includes the Pacific in this case). Some lovely stuff here, including: C21DX (Nauru), FW8CO (Wallis Island), JD1BAT (Marcus Island), KC6IN (Micronesia),

KG6SM (Mariana Island), KH0AC (Saipan Island), AD0S/KH5/K (Kingman Reef), P29KY (Papua New Guinea), T3LA (Christmas Island), XF1C (Cedros Island), XF4FFC (Revillagigedo) and 5W1AR (Western Samoa). Very nice effort, Nat!

Peter Cardwell of Sheffield has been trying the Butternut HF6V vertical multiband antenna with his shiny new IC725 set-up. The reception has been very good with VP5Z (10), VP9AD (20), ZS3HL (20), HZ1LY (10), 5B4TI (10), Y10BIF (10), OD5DU (20), HI8JON (20), LU9DJD (16), XE1ACC (20), KL7KN (16), 9K2FR (15), LU9FFD (10), 1Z9B (20), YK1AA (20) and 5H1FRI (10) logged in the first couple of days. Nice to see 18MHz in there.

The 725 has all the options fitted and Pete finds the DDS (Direct Digital Tuning) better to handle than the original. The set also seems a lot quieter, not suffering from PLL noise and able to reject a lot of household and computer noise. The first transmissions (by G4ZJB) verified that that side of things was OK so Pete is now looking towards his own licence.

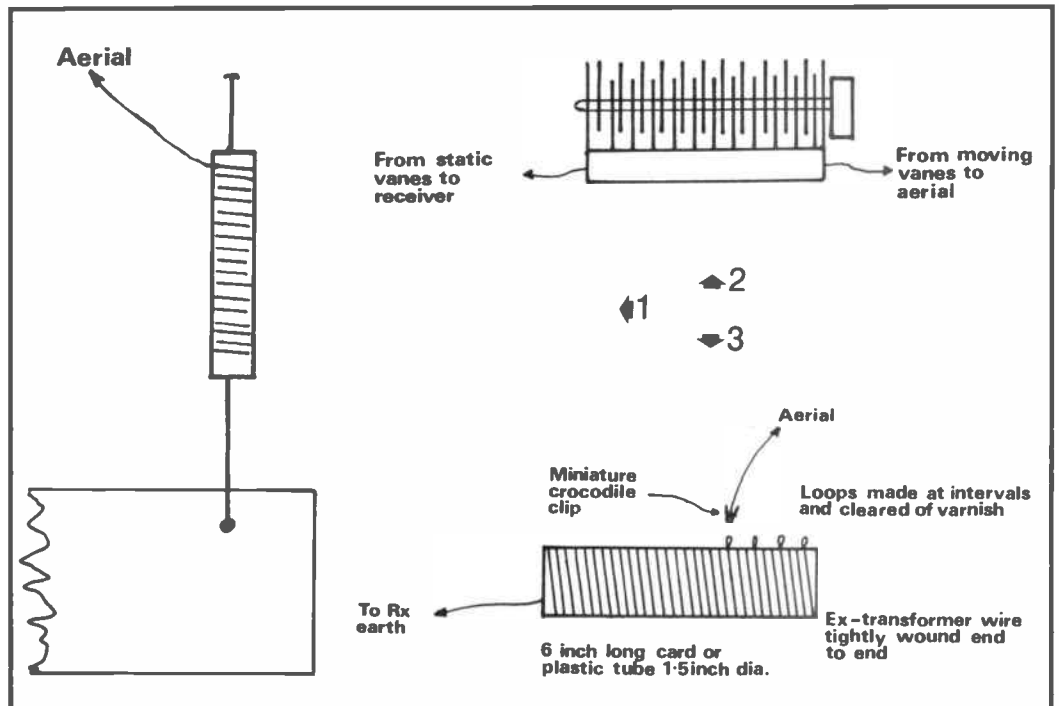
Luciano Marquardt G1VDW, of Hereford, has also been logging some nice ones with JA6SVP, 9V1NQ and TT8GA on 20m and HC2G, V29OA, VP9LR and ZW5B on 15m. Recent QSLs include FH/DL7FT (Island of Mayotta), VK2RK, ZS6MAR and A92BE. About this time, Luciano (Lucky?) should be off to 9H country for a rest (from radio?).

### Using external aerials

Usually at this time of year there are newcomers to the listening hobby courtesy of that chap in the red suit and white beard. Likely as not, the newcomer's shiny new receiver is one of those smart Far Eastern portable jobs with digital readout and lots of memories, and excellent they are too.

Unfortunately, many of them fall down badly when it comes to using an external aerial. Quite often there is only the built-in telescopic one and no outlet for any other type.

If this is the case, you have



three options. You can simply couple a long length of wire to the telescopic one, but this will probably overload the receiver when there are strong stations about and you may find all sorts of stations appearing on bands they shouldn't be on.

The second method is to connect the wire using a loose coupling method. The third method is really the first step to having an antenna tuning unit (ATU). This simply consists of placing a variable capacitor between the telescopic aerial and the wire and tuning for the best reception.

Those fortunate to have a receiver with external aerial sockets may find that it has two or even three outlets. On a multiband receiver, you may be presented with a coaxial type socket for a short wave aerial of 50 ohms impedance, a pair of terminals for a short wave dipole of 300 ohms impedance and either screw terminals or a two-pin socket for an FM aerial at 75 ohms.

The impedance is the important part. For instance, if you use an aerial with a 300 ohm impedance in a 50 ohm input, there is an obvious mismatch which will result in poor signal reception.

How do you know what the impedance of the aerial is? Without going too deeply into

the technicalities, dipole aerials using twin feeder are usually about 300 ohms (some shop-bought dipoles are 50 ohm coax fed), while verticals and most manufactured beams are about 50 ohms and these should be fitted to the sockets provided. FM aerials are usually the folded dipole type and are usually 75 ohms.

### The endfed aerial

The most popular and easy to use aerial for the beginner is the 'long wire', better termed as an endfed ('cos it's fed from one end!). This weighs in at around 600 ohms so you haven't got a place for it, have you? Temporarily, you can couple this up to the + terminal of the 300 ohm input or, if you've only one input, to the centre pin of the plug.

Endfed wires and verticals rely on a good earth for the best results. This can be a true earth such as a copper spike buried in the garden or an artificial earth or counterpoise wire either stretched out along the garden or laid under the carpet, depending on conditions. Ideally, the length of the wire should be a quarter wavelength at the frequency being used, but as we are running up and down the bands frequently, it's just not feasible.

Once again, there is an easy solution and a simple tapped

coil can be used to artificially lengthen or shorten the wire.

At radio rallies and car boot sales you will often see ex-government flexible tank whip aerials. These come in screw-together sections and are made of copper. They make very good aerials for listening, are unobtrusive and can be used in awkward places like balconies. Tuned as an endfed against a counterpoise they can give excellent results.

Experimenting with wires and trying different configurations such as square or round loops, centre feds etc, can be very interesting. If you tune to a regular station or have a local amateur who doesn't mind helping, you could try a number of types to get the best reception from your location.

The important thing is to keep any wires away from telephone or electrical cables (burning flesh smells awful!) and try to keep the 'live' end of any aerial out in the clear as buildings contain lots of noise-making equipment.

Now, all you want is a clear weekend, a couple of hundred metres of wire, a few capacitors, an understanding wife and friendly neighbours.

Please send enquiries or reports to 1 Jersey Street, Hafod, Swansea SA1 2HF.

# THE BECKMAN T110B DIGITAL MULTIMETER

by Steven Goodier G4KUB and John Goodier G4KUC

Beckman Industrial Ltd have been producing a range of high quality test instruments for a number of years, and have gained a reputation for both reliability and ease of use.

One area which they concentrate on is the digital multimeter field, and their range extends from a very basic model up to a sophisticated and highly accurate bench meter.

## Description

The T110B digital multimeter has been designed to survive the many knocks encountered in everyday use. It measures 174mm x 90mm x 36mm, and is housed in a tough plastic case. It incorporates a handy tilt-up stand which props up the meter when it is on the test bench.

Power source is provided by a standard 9V battery, which should give approximately 200 hours' use under normal working conditions. Built into the battery compartment is a 20mm fuse holder which forms part of the meter's overload protection circuit. The fuse fitted is of the 2A quick blow type.

There is a number of sockets and switches mounted on the front panel,

dominated by the large rotary switch which is used to select all the meter's many ranges. The digital display is a large 3½in LCD readout with a maximum reading of 1999. It incorporates automatic polarity, decimal point, overrange and a low battery indicator.

There are four 4mm banana sockets located near the bottom of the unit which take the test leads. The first is labelled V-OHMS and is the usual socket for the red test lead when measuring voltage and resistance. When you wish to measure amps, place the positive lead into either the socket marked A for reading up to 2A, or the socket marked 10A for reading up to 10A. The negative lead is placed in the COM socket and does not require changing for any measurements.

The T110B offers a total of twenty-eight selectable steps for various measurements of ac/dc voltage, resistance and ac/dc current (see the Table). The ranges are separated by tones of grey and labelled with their various functions.

The unit has five dc voltage ranges up to 1000V, five ac voltage ranges up to 750V, six ac/dc current ranges up to 10A and six resistance ranges that can measure up to 20 megaohms. Each range is fully protected against overload and has automatic negative polarity indication. The meter samples the input at 2.5 measurements per second, and any sudden change on the input is immediately shown on the display.

Each voltage range has an input impedance of 10 megaohms to ensure an accurate reading without putting unnecessary load on to the circuit under test.

## Continuity checker

All resistance ranges on the T110B are low power except the 200 ohm range. The use of low power ohms ranges allows accurate measurement of components in circuit and saves time when checking components for faults.

Another feature built into this meter is an audible continuity check function. This is ideal for circuit tracing and trying to locate hairline fractures sometimes found on PCBs.

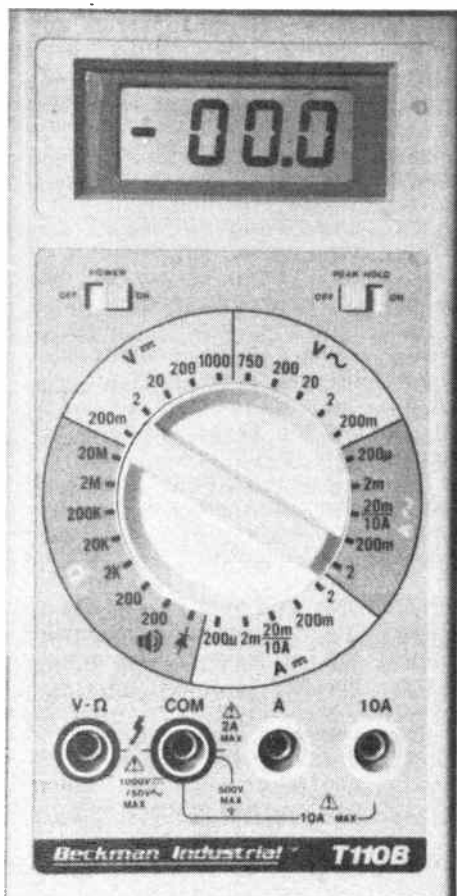
Note that the continuity buzzer will only sound if the resistance between the two points being checked is below 100 ohms. If the resistance is higher, an overload condition will be shown on the LCD display, indicating that there is a possible break in the circuit you are checking.

## Diode tester

If the selector switch is moved to the position marked with the circuit symbol for a diode, the meter can be used to check whether a diode is working or not. Checking is very simple. First, place the black probe on the positive end of the diode, and the red probe on the negative end. If the component is working, the display will indicate a reading of around 400 to 700mV. Reversing the leads will show an overload condition. Diodes may be checked in or out of circuit.

## Peak Hold

Another feature included on the T110B is the Peak Hold facility. This switch is mounted on the front panel opposite the power switch and is either ON or OFF. By using it you can take a reading on both



## Specifications of the T110B

dc Voltage	200mV, 2V, 20V, 200V, 1000V
ac Voltage	200mV, 2V, 20V, 200V, 750V
dc Current	200µA, 2mA, 20mA, 200mA, 2A, 10A
ac Current	200µA, 2mA, 20mA, 200mA, 2A, 10A
Resistance	200 ohms, 2k, 20k, 200k, 2M, 20M
Peak hold	Works on both ac/dc voltage and current ranges. Positive dc measurements only
Accuracy	0.25% ± 1 digit (dc voltage)
Diode test	Will test diodes in or out of circuit
Continuity	Continuity tester built in
Protection	Up to 1200V on both the ac/dc voltage range. Up to 2A for 200µA/2A ranges. 10A range unfused. 250V ac/dc on resistance and 250V ac/dc on both diode tester and continuity tester
Display	3½ digit LCD readout
Measurement	2.5 measurements per second
Power source	9V PP3. 200 hours' life
Size	174mm (H) x 90mm (W) x 36mm (D)
Weight	265g including battery
Accessories	Test leads, battery and spare fuse
Price	£73.00 plus VAT, post and packing

current and voltage ranges without having to look at the meter.

In operation the meter will store the highest reading taken and keep it displayed on the LCD readout after the probes have been removed from the circuit under test. If other test points with a higher voltage are touched, the display will be updated and keep that value shown.

The compact, twelve-page User Manual is very well written, containing clear and precise operating instructions.

For example, it details how to calibrate the T110B; this is carried out by the use of a precision ac/dc source and adjusting the two preset resistors.

#### Conclusion

Without doubt the Beckman T110B is a very useful and robust instrument and a worthwhile addition to the shack.

The digital multimeter excels in the accuracy of its readings. This can rarely be beaten on an analogue scale. As an example of the measurements that can

be made using this type of instrument, I recently used it to test for a volts drop on a prototype power supply unit. I was able to measure a 200mV drop in output voltage on a 13.8V 20A PSU. The 200mV drop occurred when I was drawing around 19A from the PSU.

The Beckman T110B digital multimeter is supplied complete with test probes. It can be obtained from STC Electronic Services, Edinburgh Way, Essex CM20 2DF, for £73.00 plus VAT and post and packing.

# PROJECT BOOK

by Martin Williams

For this month's offering we will look at the subject of heatsinks. These are obviously of immediate interest to the power supply designer but are equally used in other applications, such as cooling PA transistors. In fact, they are used in any situation where one has to dispose of surplus generated heat.

#### Worrying

Let us state right at the start that most people tend to worry unduly about the rise in temperature of a heatsink. The moment the sink gets perceptibly warm, cries of distress go up. This is completely unnecessary as the heatsink can, in fact, get too hot to touch and yet still do its job correctly.

Let us look at some figures and see just what to expect. The average power transistor, let's say a 2N3055 type, as used in most power supplies, is rated by the maker to run with a collector junction temperature of around 150 to 200°C. We will use the lower figure of 150 for our calculations.

#### Power

Now we obviously cannot connect a heatsink to the collector itself; the nearest we can get is the case that the transistor is mounted in. There will be a difference in temperature between the two components and this is usually around 1.5°C per watt of dissipation.

We need to know the power involved in the circuit. So let's assume the input voltage to the transistor collector is 17V, the output voltage from the emitter is 12V, thus giving a drop of 5V. If we further assume a collector current of 2A then the amount of redundant power is 10W.

#### Case temperature

So now we have the following informa-

tion available: an allowable 150°C collector junction temperature, 10W of redundant power to dissipate and 1.5°C per watt for the case to junction gradient. If we multiply the last two figures we discover that it gives us 15°C to take away from the 150°C junction temperature, making 135°C as the maximum allowable case temperature. Anything over this figure and we shall exceed the maximum allowable junction temperature.

#### Moving on

The next thing to establish is the ambient temperature that the equipment is going to operate in. In the average room it is safe to assume that this will not exceed 20°C. Bear in mind that it is the air temperature in which the heatsink will operate that is of interest and if the gear is operating in an enclosed space, this might rise to as high as 40°C.

#### Thermal resistance

All commercial heatsinks are rated in terms of °C per watt of dissipation. This is easily calculated in °C using the formula:  $T(\text{case}) - T(\text{ambient}) \div P(\text{total})$ . In our example, this gives  $135 - 40 = 95 \div 10$ . This means that the heatsink must have a rating of better than 9.5°C per watt. It also means that when the equipment is running the heatsink will reach a temperature of 95°C, and you would not want to put your hand on that for very long.

#### Safety factor

In the above example we have calculated values which just keep us inside the transistor specifications. In fact, good practice would demand a safety factor of at least three, and this could be obtained using a heatsink with a thermal resistance of 3°C per watt. In this case

the heatsink temperature will rise to only 30°C or, to put it in the Fahrenheit scale which most of us are more used to, a temperature of about 90°C. Still far too hot to handle, but completely safe for the equipment.

#### Make your own

You can make your own heatsinks with little trouble, provided you keep to the following rules.

Use flat aluminium of about 1/16in thickness, mounted vertically in free air. Mount the transistor at the centre of the heatsink and use a length to width ratio of less than 2:1. Paint the entire heatsink surface with a good quality matt-black paint.

Using the above guidelines and only measuring one side of the heatsink will obtain the following figures in °C per watt. 16in square will give 5. 25in square equals 3.5, 36in square gives 3 and 50in square will provide a figure of 2.5. For heavier power requirements commercial sinks are available with figures as low as 1.1°C per watt.

## Coming soon

In next month's Project Book Martin Williams looks at the important subject of voltage regulation and the many ways of advancing it.

# ICOM

## THE NEW IC-2SE, SIMPLE OR MULTI-FUNCTION 144 MHz FM TRANSCEIVER

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Even with its tremendous versatility and a wide variety of functions, the IC-2SE is easy to use. All functions are performed by a total of just six switches and three controls. The IC2SE includes both simple and multi-function modes. The result is two transceivers in one: both an easy-operation and multi-function transceiver. Simple mode ensures totally error-free operations. Multi-function mode allows you a variety of function settings depending on your operating requirements.

### Other advanced features:

Reduced size doesn't have to mean reduced quality. The IC-2SE proves this with a wide variety of advanced functions.

- Tuning control on the top panel for quick QSYing.
- Monitor function that allows checking of the input frequency of a repeater.
- Function display that clearly shows all information required for operations.
- Splash resistant design and durable aluminum die-cast rear panel for dependable outdoor operations.

### Options

• **BA-11, Bottom Cap.** Protective cap for terminals on the base of the IC-2SE.

• **Battery packs and case.**

BP-81 .....	7.2V, 110mAh
BP-82 .....	7.2V, 300mAh
BP-83 .....	7.2V, 600mAh
BP-84 .....	7.2V, 1000mAh
BP-85 .....	12V, 340mAh
BP-86 .....	Case for six R6 (AA) size batteries

• **BC-72E, AC Battery Charger.**

Desk top charger for the BP-81- BP-85.

• **CP-12, Cigarette lighter cable with noise filter.** Allows you to use the IC-2SE through a 12V cigarette lighter socket. Also charges the BP-81 - BP-85.

• **FA-140SB, 144MHz flexible antenna.** Flexible antenna for 144MHz band operation. Same type supplied with the IC-2SE.

• **HM-46, Speaker/Microphone.**

Combination speaker and microphone equipped with an earphone jack. Clips to your shirt or lapel.

• **HS-51, Headset.** Headset with VOX function that allows you hands-free operation.

• **Carrying Cases.**

**Carrying Case**      **Battery Packs, Battery Case**

LC-53 .....	BP-81
LC-55 .....	BP-81, BP-83 or BP-86
LC-56 .....	BP-84 or BP-85

• **MB-30, Mounting Bracket.**

Mounts the IC-2SE in a vehicle or on a wall.

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\* At 13.8V DC

### 48 Memory Channels.

The IC-2SE has 48 fully-programmable memory channels and one call channel. Each memory and call channel stores an operating frequency and other information required for repeater operations.

### Convenient Repeater Functions.

The IC-2SE is equipped with programmable offset frequencies for accessing repeaters. All memory channels and a call channel store repeater information for your convenience. The IC-2SE includes a newly designed 1750 Hz tone call transmit function. A 1750 Hz tone call transmits when the PTT switch is pushed twice quickly.

### Power Saver for longer operating time.

The power saver ensures lower current flow during standby conditions. Operating times are much longer than with older, more conventional transceivers.

### Built-in Clock with timer functions.

The IC-2SE is equipped with an advanced 24-hour system clock with timer function. The transceiver automatically turns on when real time matches a pre-programmed time. This is perfect for scheduling QSO's. Auto power-off timers and other settings can be made in clock mode.

### Convenient Scan Functions.

The IC-2SE is equipped with VFO and memory scan.

- **VFO Scan.** VFO Scan repeatedly scans all VFO frequencies. In addition, unnecessary frequencies can be skipped.

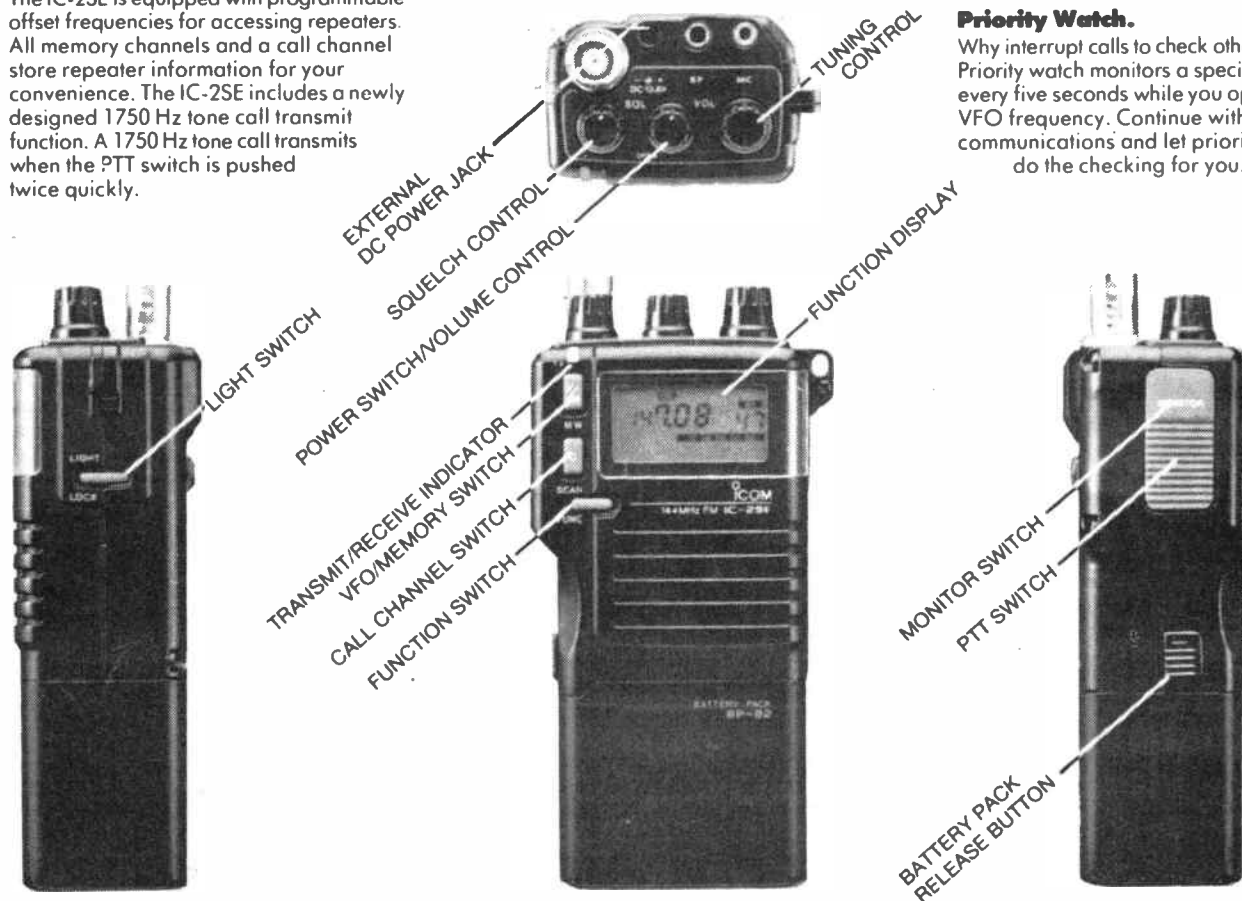
- **Memory Scan.** Memory scan repeatedly scans memory channels.

### Auto Power Off Timer Function.

If you ever forget to turn the IC-2SE off, don't worry. It will turn itself off. Power-off time can be selected or deactivated using multi-function mode. Preserve battery pack power for the times when you need it most.

### Priority Watch.

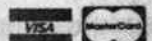
Why interrupt calls to check other stations? Priority watch monitors a specified station every five seconds while you operate on a VFO frequency. Continue with your communications and let priority watch do the checking for you.



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# The World of D | A | T | A

## BY DON FIELD G3XTT

Another mixed bag this month, including the item I promised on log-keeping. There are some interesting hardware developments to record, though there always seems to be more happening on the software front. More amateur radio related software is becoming available, mainly from the USA and geared to the IBM and Macintosh PCs. Logging programs are especially popular, together with software to organise your record-keeping for awards claims, locator square tables, and so on. The problem is knowing which is best before you splash out or, more to the point, invest lots of valuable time learning how to drive a program, only to realise that it doesn't suit your requirements.

As last year, I hope to have a number of packages on display at the HF Convention, though that won't be until 30 September. I would urge other event organisers to think along the same lines. Meanwhile, if readers have a particular package which they are pleased with, I would be interested to have your comments.

### Log-keeping

I have seen various messages on packet asking about log-keeping requirements and there seems to be some confusion about this. Packet radio is no different from any other mode in its log-keeping requirements. The mode you enter into your logbook will depend upon whether you are modulating an FM rig (as on 2m) or an SSB rig (as on HF).

What is not entirely clear is whether RTTY, packet and AMTOR count as Telegraphy – for Automatic Reception or Data Transmission, Telemetry, Telecommand. My own interpretation, given that RTTY, at least, predates data transmission as it is currently understood, is that the former is the correct definition for RTTY and AMTOR. Data transmission I take to mean coded information, with packet transmissions falling into this category.

On this basis, the correct emission codes are as follows: FM transmitter – F2B (RTTY and AMTOR), F2D (packet); SSB transmitter – J2B (RTTY and AMTOR) and J2D (packet).

I am quite prepared to be dissuaded

from this view. Life was much simpler in the old days!

### Credit card verification

The professional world seems to have come up with another use for packet radio – credit card verification. A joint venture company, Paknet, set up by Racal and Cable and Wireless, will operate a service based on putting self-contained terminals into retailers' premises. These terminals incorporate, as far as I can tell, a TNC plus low power radio transceiver in the 160MHz band.

### AMTOR

I was delighted to see that the US journal **QST** recently carried an article on AMTOR operation, by Donald Huff W6JL. Let's hope it encourages more AMTOR operation from that side of the pond. It has been four years since **QST** carried an article on AMTOR, and the situation has not been much better in the UK, though one of the other UK magazines recently followed my lead in carrying information on how to get started on AMTOR.

### Fancy hardware

It is also a sign of the times that the new FT1000 transceiver includes interfaces for both a packet TNC and RTTY/AMTOR terminal unit, along with front panel switching between these interfaces and the ability to optimise the internal filtering to the mode in use. I assume that similar facilities are now provided by top-of-the-range rigs from the other major manufacturers. Let's hope they are put to good use by their owners.

While on the subject of fancy new hardware, AEA have introduced the AMT-3 terminal unit for AMTOR and RTTY, which replaces the popular AMT-2. The AMT-3 is more than just a cheap alternative to the various multimode TNCs which are available. The latter are usually designed for packet radio, with the other modes as an 'added extra'. The AMT-3, on the other hand, is optimised for AMTOR and RTTY operation and is likely to give much better results, particularly on the busy HF bands.

Having said this, there has been an interesting bulletin circulating on the

packet network, put out by G3IOI but originating in the USA, regarding modifications to the PK232 to improve its performance on HF. The mods are intended to filter out hash which appears on the pins of some of the ICs and apparently lead to better weak-signal reception on the HF bands. I will provide anyone with hard copy of the packet bulletin in return for an sae.

The other 'goody' which caught my eye is Pac-Comm's Handipacket, a full-function TNC with personal message store but smaller than most hand-talkies. No need to be out of touch now – just take your packet station with you wherever you go!

### RTP+

A recent issue of Gateway, the ARRL packet radio newsletter, carried information about RTP+, a new terminal emulator program written for the IBM PC and its compatibles. It is designed to work with a TAPR-compatible TNC or multimode controller such as the PK232, KAM or MFJ1278. From the description RTP+ is much more sophisticated and versatile than any of the terminal emulation packages I have seen to date, offering facilities such as a personal mailbox which, up to now, have required new TNC firmware. RTP+ supports file upload and download in ASCII, XPACKET, XMODEM and binary, and many other useful features.

RTP+ is available in the US from: N4PY software, Rt 3 Box 260, Franklinton, NC 27525 and costs \$39.95. The price also includes a thirty-nine-page manual. I don't know whether there are any plans to market it in the UK. Let's hope so.

One of my own moans about terminal emulators is that, for the most part, they cannot be run at the same time with other software. Now that the Chiltern DX Club's Packet Cluster system is running in the Thames Valley, I want to remain connected to this so that I don't miss any DX, but also want to be able to use the computer for other jobs around the shack. A solution to this problem is to use a multi-tasking operating system, such as DesqView.

One interesting trend, though, is to incorporate a degree of terminal emula-



tion in other packages; this had already happened with the K1EA contest logging software, and I see that MFJ now have a DXCC tracking program with interfaces to some of the popular logging software, and with a built-in terminal emulator. I spotted their advertisement in one of the US journals, so I don't know whether the package will be available in the UK.

#### Packet Cluster

The Chiltern DX Club's Packet Cluster system is now up and running at the QTH of Ian Shepherd G4LJF under the callsign GB7DXI (DX information). Direct access is on 70.325MHz, though it is also possible via the NET/ROM network on 144.675MHz (Ian also runs the WOK22 NET/ROM node). The system is geared to the needs of HF DXers and will provide on-line access to WWV propagation data, beam headings, QSL manager information etc, as well as realtime DX alerts.

The RSGB Packet Working Group is following developments closely given that this is the first true realtime application for packet radio in the UK. If it is a success, then similar systems will be established for other user communities. This will enable a database of identification features to be established and alerts to be given when a rare one turns up for example.

#### OSCAR

If your particular area of interest is VHF, then why not think about taking

advantage of the new amateur satellites? The planned launch of the MicroSats plus UoSATS D and E had been rescheduled for 9 January, so these exciting new satellites should be in orbit by the time this column appears in print.

It may well be that, like me, you have never taken much interest in amateur satellites. They have tended to appeal to a particular specialist group within the hobby. However, as a data enthusiast you will want to know more about this particular group of satellites, and I will try to keep you abreast of developments. For the moment let me say a bit about what is planned.

#### Orbiting packet mode

UoSATS D and E are the work of the team at the University of Surrey. UoSAT D is the one which will be of interest to data enthusiasts. It will carry the Packet Communications Experiment (PCE), which is an orbiting packet node with 4Mbytes of message-storage, effectively a BBS in space. However, although UoSAT D will operate in a very similar way to a terrestrial BBS, you will require a special modem to use it, as conventional modems cannot cope with the phase and frequency-shifts associated with satellite working. In fact, the uplink will be on 2m and downlink on 70cm, with 9,600bps frequency-shift keying, compatible with the G3RUH and K9NG modems. Special terminal software will be required, and this will be made

available by UoSAT to take full advantage of the facilities of the PCE.

The MicroSats, so called because of their small size compared with previous amateur satellites, again carry BBS software with the familiar WORLI/WA7MBL command interface. As with a UoSAT, special modems will be required, with initial operating at 1,200bps but later at 4,800bps, as suitable modems become available.

The satellite mode used in both PACSAT and LUSAT (the two MicroSats of most interest to the packet fraternity) is JD. This requires a 2m FM capability on the uplink and 70cm SSB receiver on the downlink.

If you intend taking direct advantage of these various satellites, then it will probably be worth getting more detailed information from AMSAT-UK. However, I think all packet users will benefit insofar as the satellites will also be used for message forwarding between the terrestrial packet networks in different continents.

#### Sign-off

That's it for this month. Do please keep me in touch with data-comms developments in your own part of the world - I am well aware that there are active groups around the country which I don't necessarily get to hear about. A bit of publicity can help a lot, especially when you are trying to fund some improvements to the network. 73 and happy keyboarding.

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# THE SOFTWARE FILE

## Stephen Phillips with a program to calculate the dimensions of J-Pole aerials. It is written in GW-Basic but is easily converted for other details

### The program

In line forty CLS means clear the screen; SCREEN 2 sets the display to graphics and KEY OFF blanks the display the function key uses at the bottom of the screen. In line fifty and others, LOCATE x, y moves the cursor to a particular point on the screen. If your computer does not have a similar command, simply omit all LOCATE statements and the input and output lines will be printed consecutively at the left-hand edge of your screen.

### The graphics

Lines 200 to 310 contain all the commands to draw the layout of the aerial at the left-hand side of the screen. Omit these lines if your computer will not handle graphics. If you have deleted any lines do not renumber the following lines, but enter them exactly as shown.

### The maths

Line 330 asks for the frequency of interest. Line 340 checks that it is within acceptable limits. If it is not, line 360 erases your original input and also returns the program to ask for the amended input. Line 370 calculates the length of the longer element, 380 calculates the shorter one and 390 works out the matching points. The group of lines from 400 to 450 determines the spacing between the rods, and the rest of the program displays the results and asks if you wish to rerun the program.

### Check it out

If you input a frequency of 145MHz you should get the following result: long arm 1364mm; short arm 416mm; matching points at 38mm and spacing of 50mm.

### Correction

Line 350 in the ERP program shown in the October 1988 issue should have .5db not .56, and line 590 should have IF EL>15. These changes do not affect the accuracy of the results.

### The Program

```
10 REM
20 REM Copyright AMSOFT 1989
30 REM
40 CLS:SCREEN 2:KEY OFF
50 LOCATE 3,25
60 PRINT "This program designs J-Pole type aerials with
70 LOCATE 4,25
80 PRINT "a useable frequency range from 10 to 500 MHz."
90 LOCATE 6,25
100 PRINT "The designs are based on ARRL handbook data
110 LOCATE 7,25
120 PRINT "and are intended for 50 ohm co-ax feeder.
130 LOCATE 8,25
140 PRINT " .....
150 REM
160 REM Lines 200 to 310 draw a diagram of the aerial.
170 REM These lines should not be entered unless your computer uses a CGA or
180 REM similar graphics card.
190 REM
200 LINE (15,15)-(15,175):REM long aerial rod.
210 LINE (15,175)-(50,175):REM aerial base line.
220 LINE (50,175)-(50,110):REM short aerial rod.
230 LINE (15,147)-(42,147):REM coax inner line.
240 LINE (55,147)-(100,147):REM coax centre line.
250 LINE (70,149)-(68,149)
260 LOCATE 19,9
270 PRINT "OOOO":REM draw co-ax cable.
280 LINE (51,150)-(95,150):REM coax top line.
290 LINE (65,144)-(95,144):REM coax bottom line.
300 LOCATE 19,15
310 PRINT "50 ohm.":REM mark impedance.
320 LOCATE 10,28
330 INPUT "Enter frequency [ 10 to 500 ] MHz.":F
340 IF F<10 OR F>500 THEN BEEP ELSE 370
350 LOCATE 10,62
360 PRINT SPACES(10):GOTO 320
370 A=(8200/F):A=CINT(A*25)
380 B=(2700/F):B=CINT(B*25)
390 C=(220/F):C=CINT(C*25)
400 IF F<25 THEN S=150:GOTO 460
410 IF F<40 THEN S=125:GOTO 460
420 IF F<60 THEN S=100:GOTO 460
430 IF F<100 THEN S=75:GOTO 460
440 IF F<250 THEN S=50:GOTO 460
450 IF F<500 THEN S=30
460 LOCATE 13,28
470 PRINT "The longer arm is ";A-S;" mm long."
480 LOCATE 15,28
490 PRINT "The shorter arm is ";B-S;" mm long."
500 LOCATE 17,28
510 PRINT "Feed points are about ";C;" mm from closed end."
520 LOCATE 19,28
530 PRINT "The precise point must be set using an SWR bridge."
540 LOCATE 21,28
550 PRINT "Spacing between rods is ";S;" millimetres."
560 LOCATE 23,28
570 PRINT "Type C to change data or E to end..... "
580 LOCATE 23,75:A$=INKEY$
590 IF A$="E" OR A$="e" THEN CLS:END
600 IF A$="C" OR A$="c" THEN 10 ELSE 580
```

# MUSINGS OF AN OLD TIMER

A month or two ago, I spent the best part of a weekend camped on a hilltop, together with most of the members of the radio club of which I am a member and their wives and girlfriends.

The occasion was the annual VHF field day. This is when radio clubs up and down the country set up similar stations and attempt to contact as many stations as possible in order to accumulate points on a distance/number of contacts basis.

Field days have been a popular facet of amateur radio operation and one of the highlights of club activities for well over fifty years.

With the development of technology now far beyond 'kitchen table' constructional techniques, together with 'black box' operation on all but the highest frequency bands, the question must be asked whether field day operation as we know it today is only practical for the largest and richest clubs? In order for a club to even stand a chance of appearing in the upper part of the final results table of VHF/NFD it must operate five separate stations, each radiating near the maximum legal power allowed for the appropriate band, for the twenty-four hour duration of the contest.

## Logistics

The logistics of such a commitment is enormous. Consider first the 2m station. Over the twenty-four hour duration, this contest will probably make more contacts than the other four stations combined, so a good performance is essential if success is to be hoped for. The station will therefore be equipped with an up-market multimode transceiver and a high power linear amplifier. To guard against the possibility of equipment failure, standby equipment of a similar standard will be available for immediate switch on. The output from the linear amplifier will feed into a system of at least two stacked, large commercial beam aerials mounted on top of a mast, or even a lattice-tower 50ft high, or more.

The station will be powered by a petrol electric-generator which, when allowing for lighting, ancillary equipment etc, will need to be at least 2kW rating, consuming up to six gallons of petrol during the twenty-four hour contest.

Operating this station will require a minimum of six operators working to a two hours on - four off schedule. In addition, the operators will have to be provided with food, drink and rest while off-duty, which will require additional tentage, catering facilities and personnel.

In summation: the overall requirement for this single station is for more than £6,000 worth of equipment and the undivided attention of six operators for more from twenty-four hours, in addition to the forward planning necessary to ensure that all the equipment and personnel arrive on site at the required time.

The 70cm and 4 to 6m stations present similar logistical problems, whilst those for the 23 and 13cm stations are only slightly less for, with the lower level of activity, they can be single-manned for long periods.

## Commitment

To realistically compete in a VHF Field day, a radio club accepts a commitment for its members to loan in excess of £25,000 worth of radio, electrical, catering and camping equipment. This, which probably weighs around three tons, will have to be transported to a distant hilltop and operated by thirty people for the duration of the contest. To provide power for these, several petrol electric generators, consuming at least thirty gallons of petrol will also be required.

Apart from the capital equipment involved, how many clubs can honestly claim to have a sufficient number of operators available for the duration of such a contest?

Even when the contest is over and the last vehicle has left the site, there still remains the enormous task of calculat-

ing the scores and preparing entry forms, a task which will be left to the same few members each year.

This is a far cry from the past when perhaps only a couple of stations needed to be set up; the equipment for which could be carried in one car and the tents in another.

## An overwhelming burden

No one in his right mind would suggest that we turn back the clock and reject modern technology, but has the concept of the whole operation gone over the top? The logistics have now reached the point where competing in such a field day can be compared to a military operation, with financial implications which can be an overwhelming burden on all but the largest and richest clubs.

Admittedly, in general the operational equipment is loaned by club members, but most clubs possess a considerable number of aerials, masts and tentage which must be stored, maintained and accounted for, yet only see the light of day once or twice each year - all of which must be purchased at some time from club subscriptions.

It may be suggested that merely 'to compete is the thing' but there seems little point in doing so without the remotest chance of success.

With such effort involved and assets to purchase and maintain, what proportion of club members can really be considered as enthusiastic contest operators? I suspect that in most clubs this is quite small, with the vast majority tagging along just to support the club.

Perhaps a change in the rules to reduce the logistical commitment and thus enable more clubs to compete on equal terms would be the answer.

The sport of ocean racing has now reached the point where even millionaires cannot afford to compete for the most prestigious prize in the yachting calendar - The America Cup. Let us only pray that amateur radio does not go in the same direction.

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# BITS TO BUILD

## THE BRE AUDIO BISCUIT KIT

If you have ever dared to look inside one of those miniature hand-held VHF transceivers, which are so common in our hobby, you may have noticed that their construction is unlike that of a conventional PCB. Most of them are built using surface mount technology (SMT). The components are much smaller than conventional components and are mounted on the surface of the board, rather than being soldered by leads into drilled holes. These are called surface mount devices (SMDs).

These compact and sophisticated boards have probably been made using automatic pick and place machines, and the connections are likely to have been made in reflow soldering ovens. This technology has produced a comprehensive range of miniature components which, with the exception of some VHF and UHF circuits, has been ignored by the amateur constructor.

### Low profile components

An SMD is a leadless component in 'chip' form with solder contacts at each end. The active SMD components, transistors and integrated circuits have small pads rather than leads. The components are laid on the surface of the board and soldered on the 'top side'. There are no holes in the boards because there are no leads on the components. The components have a very low profile, so the finished board will fit into limited spaces that would not be possible using conventional components.

### Hand-made

Although pick and place machinery is usually associated with SMD construction, the components are not too small for 'hand working'. In building SMD projects by hand, the 1206 size components are probably the best size. The 1206 1/8W chip resistors measure 1.06mm long x 0.6mm wide and capacitors of 220nF or less are of similar size. It is possible to place and solder such components by hand. The SMD transistors and integrated circuits are very small, but they can be hand-placed and soldered with care.

Fig 1 shows four types of common SMD components. They may be small and look simple but this is not so. They are high-quality components made to exact specifications, and it takes time to get used to the SMD packages and markings.

The resistors are marked with a simple three digit code. The third digit denotes the number of zeros in the value. For

example, 122 would be a value of 1.2k ohms.

Larger electrolytic capacitors are marked with a positive band and the value in  $\mu\text{F}$  and working voltage. The common ceramic capacitors are another matter: they have no markings at all. Thankfully, they are not sold loose but come embedded in ribbon. Do not unwrap these components until they are ready for use.

### Economy

Why bother to build amateur radio circuits with SMD components? Well, there are several reasons. One of the most important factors is that these devices are getting cheaper all the time owing to their increasing popularity. This

has reached the point where many of the common conventional devices used in amateur radio construction are now available in SMD at similar cost. However, the main reason why I decided to try SMD construction is that it's new to me, it's fun and it's a challenge. And that is what a good hobby is about!

### Trying SMD construction

Until recently it was not easy for amateurs to get hold of SMD components and even more difficult to get hold of the range of devices that is commonly used for our types of circuit. A new company has appeared on the scene which specialises in SMD construction for the amateur. Founded by Bill Mooney G3VZU, Blue Rose Electronics supplies a

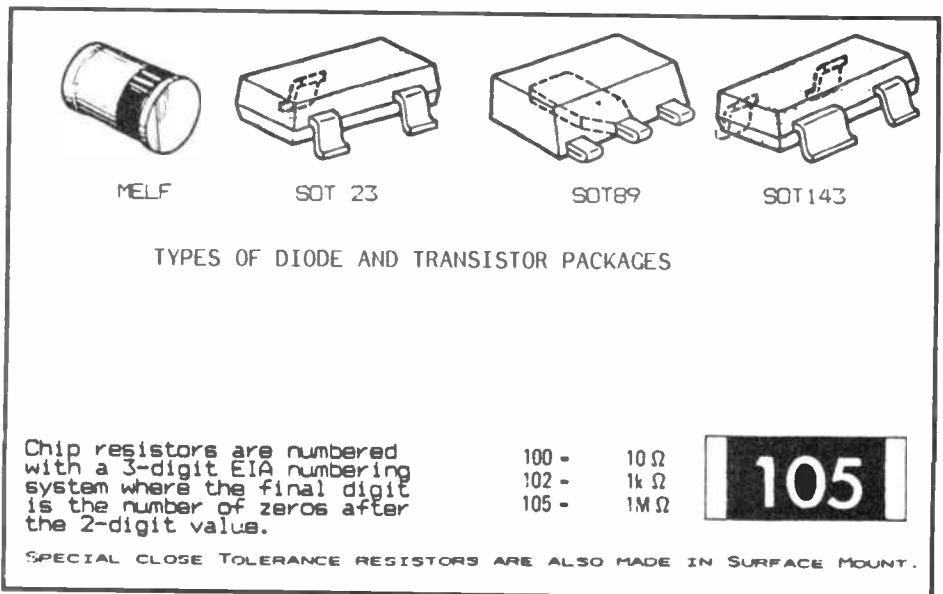
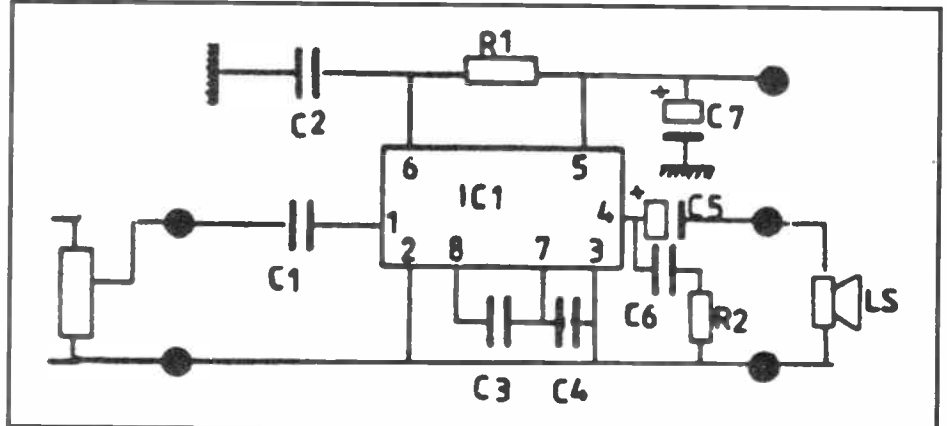


Fig 1: Examples of SMD components

Fig 2: Audio Biscuit circuit diagram



full range of passive and active components suitable for the amateur who wishes to build projects using SMDs. Blue Rose Electronics is also building a range of kits for the radio amateur.

### The BRE Audio Biscuit

The novelty of SMD as an amateur construction medium appealed to me, so I obtained a catalogue from Blue Rose and decided to try their starter kit for would-be SMD constructors. The kit comprises an audio amplifier board and is called the BRE Audio Biscuit. It is a simple and useful project, which can be built easily by a constructor without previous experience of surface mount techniques. The kit comes complete with a PCB and components.

The circuit diagram of the Audio Biscuit is shown in Fig 2. It is a single integrated circuit amplifier using the BRE1015, a purpose-made SMD chip. It is certainly a useful device, and its performance details are shown overleaf.

The component layout of the Audio Biscuit is shown in Fig 3. The layout is easy to follow on the board. One of the immediate advantages with SMD construction is being able to see the tracks on the top of the board: As I soldered in the components, I could instantly check that they were correctly placed from the circuit diagram. The construction method is self-checking, because the interconnections are seen during the construction process.

### Building the board

Very little special equipment is needed to make this simple board. A fine soldering iron is essential but the common 13W Antex iron with a 1/16in bit will do the job. I used my Weller 12W miniature soldering iron which has interchangeable bits secured by a grub screw. I made a small bit from 18swg copper wire, with a small portion turned over at one end and held by the grub screw and the other end filed to a sharp point. Ideally fine solder (1mm-0.7mm diameter) should be used, which is standard for many electronic construction techniques.

A pair of tweezers should be used to move the components about the board. The simplest way to hold the components on the board prior to soldering is to use a wooden toothpick or cocktail stick. I found some large dressmaker's pins in my wife's work basket and these are useful for component manipulation. The components are small so working on a tray is advisable. I found this board easy to see with the naked eye, although some constructors may like to use a magnifier.

### Avoid tombstones

It is best to begin soldering one of the larger components on to the board first. The tantalum chip capacitors are large by SMD standards, so C5 and C7 are

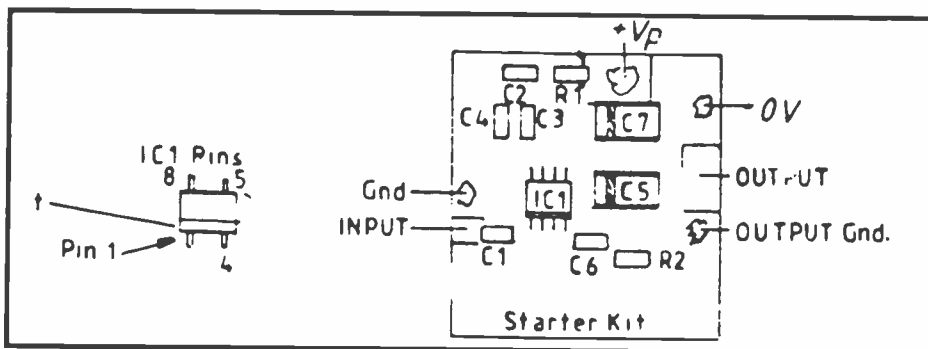
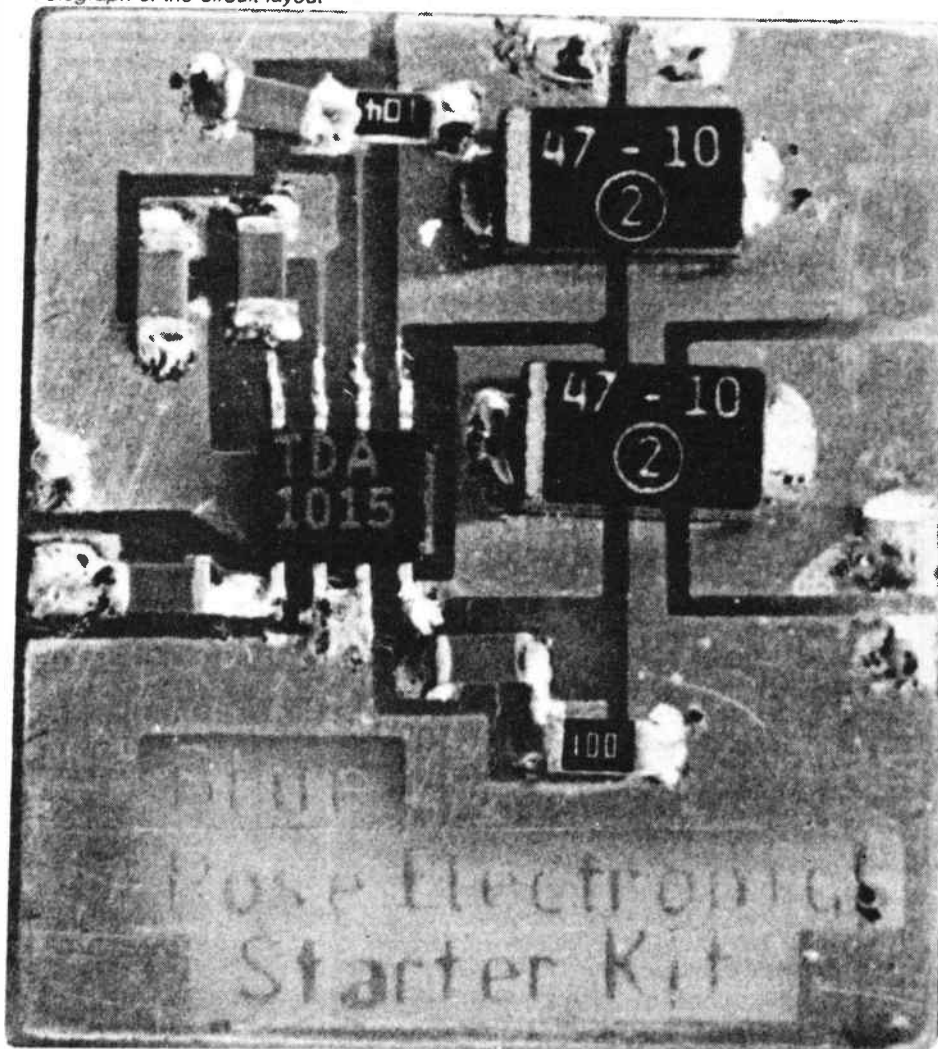


Fig 3: Layout of components on audio biscuit

ideal. When a component has been set in place, it must be held down firmly before it is soldered, otherwise the surface tension of the solder may cause it to stand up from the board. This effect is known as 'tombstoning'. The only remedy for this is to unsolder the component and start again. In fact, it is best to solder one end of the components to the board and then go around the board again – the toothpick is not required – and solder all the other ends of the chip components.

Soldering the pins of the integrated circuit requires care and precision. Hold the chip firmly in place, solder pins 1 and 5 which are diagonally opposite each other, and then finish soldering the rest of the pins. Avoid using excessive solder which may cause bridges between the tracks. Throughout the work I carried out, this is usually considered bad practice. Melting the solder on the joint is better because it means that the joint is hot enough for the solder to flow.

Photograph of the circuit layout



# BITS TO BUILD

However, with SMD the areas being soldered are so small that this does not cause any problems.

Blue Rose Electronics sell a range of special equipment for hand-working SMD circuits, the most useful of which is a jig to hold the components in place during the soldering process. Also available are 26swg low melting point solder and an excellent soldering iron, the SMD10.

When the board is completed and you have checked that the components are correctly placed and there are no solder bridges or splashes, it can be tested. Testing requires an 8 ohm loudspeaker, a 5k ohm volume control and a power supply. If a variable supply is available, the voltage can be increased slowly from 0V whilst monitoring the current. It should be around 8mA at 4V and 13mA at

12V. The simpler approach is to connect a 9V battery and see how it goes.

A signal connected to the input should give good-quality sound output. With the high 52dB gain, even a 10mV signal will give full output. It is useful to measure the output if a 12V supply is used, as it may cause the device to over dissipate with an 8 ohm loudspeaker. A safety precaution would be to add a 10 ohm resistor in series with the loudspeaker.

There is space available on the board to drill holes for small mounting screws

(M2 or 8BA bolts) so that the board can be glued into place. The finished board can be given a coating of Electrolube clear lacquer, or similar PCB lacquer.

### Conclusion

I enjoyed building the Audio Biscuit, even though it was my first attempt at SMD construction. I have since built other SMD boards and can see interest in this form of construction growing among radio amateurs. Why not try SMD construction - it's fun!

### Performance Specifications

Supply voltage	3.6 toV
Output power	0.5W into 8 ohms (at 7V Supply)
Voltage gain	52dB
Distortion	Less than 0.5%
Input impedance	200k ohms
Quiescent current	10mA at 8V

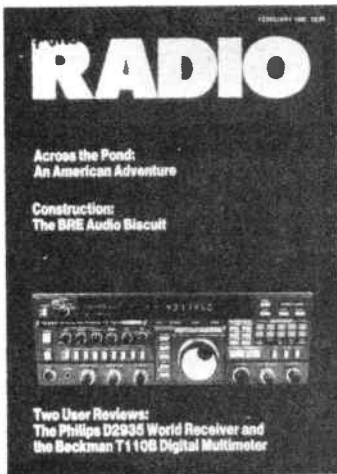
### Parts List

C1, C2, C3 and C6	100nF, 1206 ceramic chip
C4	10nF, 1206 ceramic chip
C5 and C6	47µF, tantalum chip
R1	100k ohms
R2	10 ohms
IC1	BRE1015

### Source

The Audio Biscuit Starter Kit costs £6.80 and is available from: Blue Rose Electronics, 538 Liverpool Road, Great Sankey, Warrington WA5 3LU. Tel: (0925) 727848.

Blue Rose will also supply a catalogue of SMD components, SMD tools and a range of SMD kits for the amateur for 50p.



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## News and comment from Glen Ross G8MWR

Over the last few months I have had several letters from newly licensed amateurs on the subject of QSL bureaux and how good/bad/fast/slow they are. There has also been a number of enquiries from readers as to just how you use the facility. So, let us see how the system works.

### Envelopes

All cards are handled in this country by the RSGB and people often think that you need to be a member of the Society before they will handle your cards. This is only partly true. They will handle all your incoming cards providing you keep a supply of suitably sized envelopes with whoever handles your cards. A list of the various people involved can be obtained from the RSGB.

The envelopes they require are what are commonly known as bank passbook size and you should mark your callsign in reasonably large letters in the top left-hand corner. This is so that your envelope is easy to find when it is filed away in the discarded shoebox or whatever else the person uses to store the envelopes in.

### Postage

You should also fix sufficient stamps to cover the return postage of the envelope and, say, ten or twelve cards. Obviously it makes sense to send your manager several envelopes at one time so that he has a few spares in stock. Don't go mad and send too many or you may find that before the last envelopes come back to you the Post Office have increased the postage rates again. All this is handled by the RSGB because it does not cost them any money.

### Outgoing

Sending outgoing cards is a different matter as the postage to send several million cards to overseas destinations each year is very high indeed. Therefore, to avail yourself of outgoing facilities you have to be a member of the Society.

There are still a few things you can do to help the system. The first is to remember to write the callsign of the station you are sending the card to in large letters on the back of the card. The manager has not got the time to read through all the guff on the front of the card to find out where to send it.

The next helpful point is to sort out your card so that all the cards destined for a certain country are in one block; all F cards together, all SM cards together and so on. If you now arrange the blocks in alphabetical order you will have made the manager's job a lot easier. If you don't he may put your cards to one side and sort another pile instead, so contributing to a delay in getting your cards back.

### The system

To understand why there are often what seem to be long delays in getting cards back we need to appreciate how the system works.

First of all you may be accumulating cards for several weeks until you have enough to send to the RSGB collecting system. Next, there will be another delay before the cards are sent on to, say, Germany. When the cards arrive there they will be sorted into the various regions and sent on to the sub-managers. They in turn sort the cards into the recipients' envelopes. When the envelope is full, which could take months if the operator you sent the card to is not very active, they will send the cards on to him.

### Coming home

It may be some weeks before he has enough cards to send to his bureau and then the whole system goes into reverse to get the card back to you.

As you can see, there are plenty of opportunities for delays and the amazing thing is that the system works as well as it does. My record for slow delivery at the moment is a card from Norway which took seven years to do the round trip!

Most of the time you should reckon on about twelve months' turnaround time as an average figure but, as you will see below, sometimes things are not organised to best effect.

### The mole report

Until recently all incoming cards were handled by one person at his private address and then sent to the various sub-managers. The same person did this job for many years and all credit and thanks are due to him. However the load got impossible to handle and the RSGB in its infinite wisdom decided to handle the cards at HQ.

When they went to collect them they found they had to collect over thirty sackfuls and a similar number of large boxes. The RSGB's own estimate is that this constituted a backlog of around a quarter of a million cards. And you wondered why you had to wait so long?

### New Ideas

The RSGB then decided that it ought to get together with the Post Office and find out what would be the most efficient way of sending the cards on to the various sub-managers. After a considerable amount of experimentation it was found that the most cost effective way was to send the cards in parcels of 10kg. To quote from an RSGB letter, 'Some sub-managers are now... going to have to wait months before their boxes reach the (weight) limit. (We) prefer to wait rather than send... parcels every month.'

### Even more

So you now have an extra built-in delay of up to several months, but there is still more to contend with. Quoted from the letter, more or less verbatim: 'Some parcels will be found to contain a bunch of cards which ought to have been sent to another sub-manager. It is easy to chuck a handful in the wrong box.' Of course, if this has happened to your cards, then there is going to be another long delay while they go back through the system and get properly sorted out.

### Additional delay

From information received it appears that under the old system the sub-managers were getting a packet containing about 500 cards at around five week intervals. This was fairly easy to cope with.

Under the new arrangements the estimate is that they will receive a box containing some 3,500 cards at about six monthly intervals. So we are looking at an additional delay of about five months, compared with the old method.

When this point was put to the organiser the following advice was obtained: 'If you have been used to frequent small parcels, just put the large one in a corner and take a double handful every month and pretend it is a small one. The QSL bureau was never intended to be fast, nor even very reliable, just cheap.' If you now add in the delay while all the small handfuls are taken from the box you get... no, you work it out.

The final comment is that 'Reduced costs will help bring the Society accounts back into the black.' At long last they admit that they are in the red!

### Saving cash

The mole has not finished yet. If the Society is so keen on saving cash, then perhaps they would like to explain why they are also so keen to squander it. Reports have arrived that they have had to pay a 'fine' of £8,000 for late payment of VAT due. I doubt if you will see a report on this payment in **RadCom**. There is even less chance of getting an explanation as to why the payments were so late in the first place. And if all that were not enough, there are also rumours of threats to put the Society into bankruptcy. Perhaps QSL cards are the last thing you should be worrying about, by this time next year we may not even have a society to handle them.

### Running costs

One of the costs that repeater groups have to keep in mind is the site rental fees which they have to pay. Many organisations provide sites to amateurs at peppercorn rents, and one of these has been the BBC. They are now rethinking the situation and it seems likely that the going rate is to be increased to around £600.00 per year. Even this is a relaxation of charges as the rate for commercial users is set at about double this amount.

### Microwaving

10 December was the day when microwave enthusiasts got together at the BBC Pebble Mill complex in Birmingham and a good crowd assembled. There were the usual displays of gear for the bands up to 24GHz, with several working demonstrations. The discussion period centred mainly on the provision of additional beacon stations on the middle microwave bands. A decision in principle was made to instal beacons for 5.6, 10 and 24GHz at a high spot near Birmingham, from which excellent coverage should be obtained over the whole of central England.

### Activity

It was also confirmed that the first Sunday of every month would be used as an activity day using the talk-back frequencies of 144.175MHz on SSB and also 144.525MHz FM for those who have only 2m hand-helds available. Good use was made of the test gear which was available and another meeting is planned for early April. Details can be obtained from G0DJA who is QTHR.

### Early warning

One of the more civilised of our contests is that organised by the Derby and District Amateur Radio Club. This year the contest takes place from 1300 to 1700GMT on Sunday 11 March and is run on the 2m band.

Full details of the contest including

scoring rules can be obtained from the club by sending an sae to the secretary at 119 Green Lane, Derby DE1 1RZ.

### 50MHz

At one time it was worth publishing news of openings and so forth on this band to give people some idea as to what its capabilities were. At the moment this is just about impossible for the simple reason that the band is wide open to many parts of the world for hours on end practically every day.

For instance on 23 November, between 1300 and 1630GMT, a total of seventy-five stations in fifty squares was worked by PA0HIP, with many more being heard. Excellent signals have been received from various beacons, including ZD8VHF and FY7THF. With sunspot counts as high as 250 and still rising things can only improve.

One contact which should be noted was made on 22 November between G4IJE and WA1UQC in FN31 square. Over a period of nearly one hour they exchanged high resolution slow scan colour TV pictures. This gives a good idea of the current state of the band.

### Close-down

Once more we reach the end of the available space and it is time to sign off. Please keep all your news and comment coming to me at: 81 Ringwood Highway, Coventry CV2 2GT, or contact me on packet via GB7NUN.

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# MEDIUM WAVE DXING

by Steve Whitt G8KDL

Last time we got together, I reported on a recent DXpedition to northern Scotland where many unique and rare stations were heard. However that was just the first part of the story. On my return home I had a shoe-box full of cassette recordings of the DX I had heard which needed to be analysed.

Although many signals are strong and clear, many more are obscured by interference or noise. Some signals may be strong yet without any obvious form of identification. So listening to the cassette recordings gives you another chance to listen to the DX. It is surprising what this sort of analysis can reveal, and the information can help to identify some of the mystery stations.

## The identification question

Identifying a medium wave broadcast signal is a world apart from your average amateur radio contact. Callsigns are not often used and they certainly are not given phonetically, nor are they repeated if you didn't hear them first time round. Whereas an amateur contact can be established in seconds it could take half an hour or more to identify mystery medium wave DX signals.

If you tune in to your local radio station it soon reveals its identity through a number of clues: its strength, frequency, programme style and, most importantly, its on air ID, which is easily heard since there is no interference.

We now need to ask what happens when you try to decipher a weak, fading signal from a distant station using an unfamiliar language. The fundamental question is, at what point is a station identified and how should a station that is not fully identified be described?

The process of identifying stations should be viewed as a broad spectrum of probability. At one end is the completely unidentified station, an example of which is the open or blank carrier with no modulation. Although you may have a good idea as to its identity, such a signal really is unidentified.

At the other end of the spectrum is the positively (100% probability) identified station (eg, '... the powerful missionary outreach station, the Atlantic beacon running 50,000W at 15-70, broadcasting from the beautiful Turks and Caicos Islands in the West Indies...').

Many DX stations fall somewhere between these two extremes. For example, you may hear only part of a callsign in a poorly understood language, or maybe in the midst of heavy interference or jamming. Perhaps no identification is heard but certain characteristics of the signal or programme content point in the direction of one particular station. Generally speaking, the longer one listens to a station, on one date or over many days, the more clues there are successful identification. If you can't ID a station keep listening, or go back over your tape recording to see if you missed any clues.

The factors which contribute to the identification of a station are almost limitless. Among them are time of reception, frequency, quality of signal and programming style. The last clue to its identification is usually one of the most important, since valuable information can be gleaned from the languages used and music played, as well as from advertising, weather reports, time checks and so on.

## Playing detective

It should be appreciated that one's ability to identify a station depends mostly on being able to interpret what is being heard. And, rather like a detective investigating a crime, it takes experience as a DXer to reach a correct conclusion, based upon the clues available. Even the most experienced DXer will not be able to identify everything heard, so there needs to be some way of indicating how certain (or uncertain) a particular identification is. Hence, the following shorthand expressions offer a solution to this problem.

**Identified:** The listener is 100% certain of a station's identity, since a full announcement by the station was clearly heard. Fortunately it is almost unheard of in broadcasting circles for one station to masquerade as another, although sometimes clandestine stations intentionally mislead people about their location.

**Presumed:** The listener has had sufficient clues to be almost certain (90-99% probability) of the station's true identity. About all that is missing is a formal ID announcement.

**Tentative:** This term usually describes a situation where the listener is fairly

certain that a particular station is being heard – indeed, the probability is substantially greater than 50%, typically from 75%-90%. However, it is important to note that a tentative logging is not just a pure guess since a number of clues must still point in the right direction.

**Unidentified:** Anything short of tentative is called 'unidentified'. The DXer should not classify loggings as tentative if there is insufficient evidence. When there is any doubt about a logging, it is wise to list it as unidentified; however, it may be worth indicating which station you think it might have been if you have an idea.

## Station listings

All DXers use lists of one sort or another to help them in their hobby (eg, WRTH, club bulletins etc) but it is dangerous to rely on a list (even the most up-to-date) as the *only* means of identifying a station. That is not to say that lists should not be part of a DXer's 'tools of the trade', but just that caution should be exercised in their use.

Lists are invaluable when it comes to identifying a mystery station; they guide a listener to the right place on the dial to hear a particular station. But they cannot actually identify a station – only the station itself can do that. Over reliance on lists and 'wishful thinking' result in the practice known as 'list logging', sometimes observed as anomalous loggings reported in the DX logs of some magazines and club bulletins.

## Station profile

Suppose I pose the question, 'What was the first commercial station to take to the air in Great Britain?' Hands up everyone who said LBC in London or even the offshore pirates. Well the correct answer is Manx Radio, operating from the Isle of Man. This pioneering station first took to the air in June 1964, long before the advent of independent local radio.

Manx Radio was made possible since the Isle of Man has its own government and is not constitutionally part of Britain. Nevertheless the station had to obtain a licence from the Post Master General of Britain, which was granted, albeit with some reluctance and suspicion.

Manx Radio started operating from a

# MEDIUM WAVE DXING

caravan just outside Douglas with one cramped studio and a VHF transmitter. In November 1964 operation on 188m medium wave started and so did commercial advertising. In the early days power output was severely restricted and the broadcasting day short.

In May 1965 the caravan was abandoned in favour of a basement studio on the Douglas seafront and the medium wave outlet moved to 232m. This channel remained in use for the following thirteen years. Another move, this time in October 1969, to its current home at Broadcasting House overlooking Douglas Bay, signalled the end of the station's Bohemian days.

Since 1969 Manx Radio has developed its programming to a position of strength whereby, in some areas, it has achieved up to 90% audience penetration. However, in recent years Manx Radio has faced much stiffer competition from ILR stations in the North West and from independent commercial stations in the Irish Republic. Manx's policy is mainly easy listening with extensive local news coverage, and they can be heard on 1368kHz from the Foxdale transmitter with programming from 0600-0100hrs.

## Book corner

By the time you read this column, the

1990 edition of the **World Radio TV Handbook** should be nearing completion. The 1990 **WRTH** includes the usual station information, but also to be found in its 576 pages are articles on satellite broadcasting, radio related software and equipment reviews. **WRTH** will also present the second annual industry awards for the best receivers and software.

The 1990 edition of the **WRTH** costs £18.99 but, as usual, several radio clubs have negotiated special pre-publication deals for their members. You'll have to be very quick to seize this opportunity; contact the secretary, **Medium Wave Circle**, 137A Hampton Road, Southport, Merseyside PR8 5DY.

## Speaker's corner

It is surprising how word gets round, since soon after my return from Scotland the Ipswich Amateur Radio Club asked whether I'd be interested in giving a presentation to the club. This was a splendid idea so I rummaged through my drawers for OHP transparencies and pens and compiled a talk covering all aspects of conducting a DXpedition. On the appointed night in a cold pub annex a group of twenty or so stalwarts joined me for the half hour presentation, which subsequently generated some brisk

discussion until closing time; perhaps one way of driving off the chill!

## DX file

As a result of tape analysis of my DXpedition to Scotland, several extra stations can be added to the lists: 1240 ZYH654 R São Fransisco, Canindé, Brazil; 1490 CKEN Kentville, Nova Scotia, Canada; 1570 YVUZ R Guarapiche, Maturin, Venezuela; and 1600 WKWF Key West, Florida.

## Long delays

Sadly the response to my reports has been either very poor or even slower than usual; so far just two QSLs received - from Colombia and Thailand. Talking of long delays in getting a QSL card, I have only just received a letter from Radio Sana'a, in the Yemen, after a six month wait. That is by no means unusual and I have seen reports of QSLs coming back as much as three, four and even five years late!

Recently the medium wave band hasn't produced much for me except for the occasional glimpse of CJYQ 930kHz, WKKU 1510kHz, and the Caribbean beacon on 1610kHz. These are often heard from about midnight till dawn. Let me know what you hear and till next time, good DXing.

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# DESIGN

# AND USE OF DIP METERS

by Joe Pritchard

In the last part of this series, I'll be examining the use of a dip meter in an active role; that is, when it provides the RF energy. In addition, I'll examine potential problems that you may encounter with dip meters.

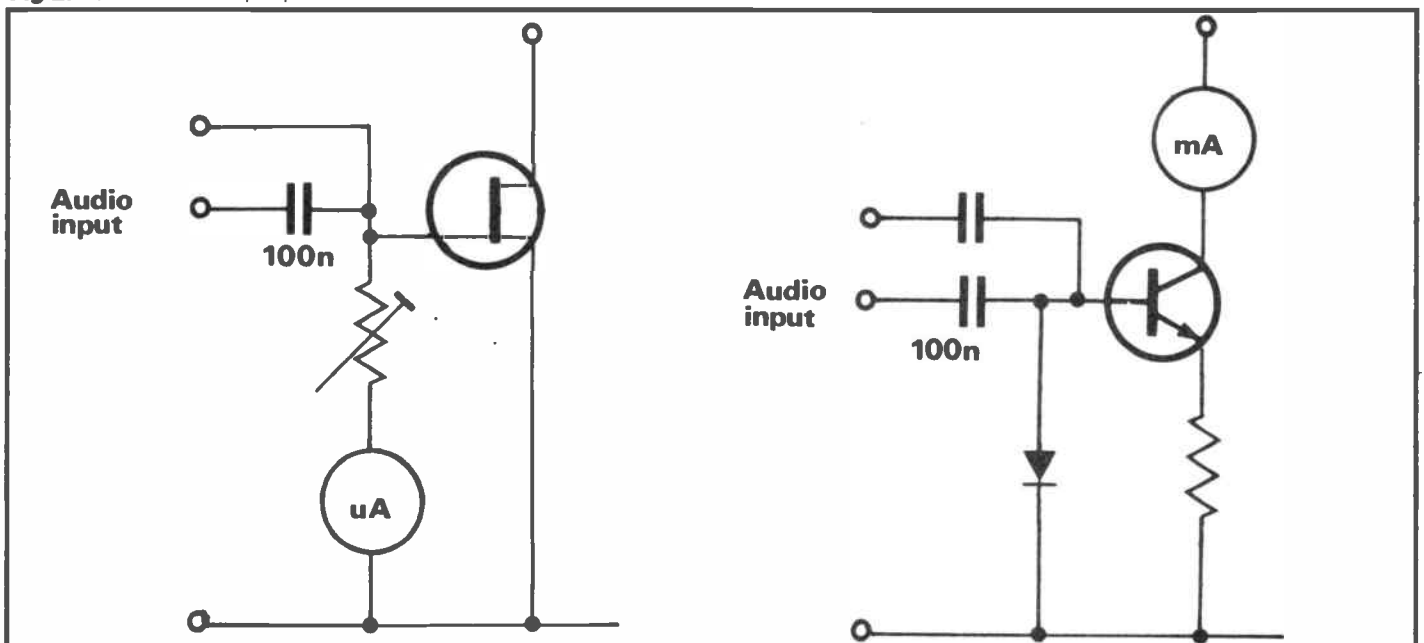
## Use as a signal generator

This is perhaps the most obvious use of a dip oscillator – to provide test signals for receivers, amplifiers, etc. The frequency of interest is set up on the tuning control and the output is coupled to the circuit under test by connecting a pick-up coil to the test circuit and loosely coupling this to the coil of the GDO (Fig 1).

It's not a good idea to attach any wiring directly to the oscillator, as this is likely to detune it or, in some cases, stop the oscillator working at all because of loading. As with all signal generators, take care not to overload the circuit under test by coupling the pick-up coil to the GDO coil too closely, or by having the output control of the oscillator (often also used as a sensitivity control) if fitted set too high. The correct level of drive to apply from the GDO is the minimum required to get the job done.

You can provide audio modulation to

## Fig 2: Possible audio input points



the GDO output where this is not available as standard on the unit. A low level sine-wave source can be applied to the dip oscillator RF oscillator in a variety of ways; if you've got a commercial unit you can try injecting a low level audio signal into any earphone socket that your GDO has. Alternatively, on a homebrew meter you can try injecting an audio signal to the point in the circuit where the RF output is sampled for the metering process (Fig 2). There are a couple of points to note with respect to modulating the GDO output.

1. The depth of modulation will depend upon the peak to peak amplitude of the applied audio signal.
2. Too great an amplitude may 'block' the oscillator, turning the RF on and off in sympathy with the modulating signals, or may overload the oscilla-

tor causing the generation of harmonic signals from the GDO.

3. Be careful about unintentional frequency modulation of the GDO; in certain cases the application of a modulating voltage may 'pull' the oscillator. One way to test for this is to apply a fixed dc voltage of the level that you will be applying as a modulating signal, and see if the output frequency varies much. Some pulling is almost inevitable on simple equipment.
4. If you want to apply frequency modulation, the easiest way is to use a variable capacitance diode across the tuned circuit, as shown in Fig 3.

## Testing tuned circuits

The essential feature about the dip

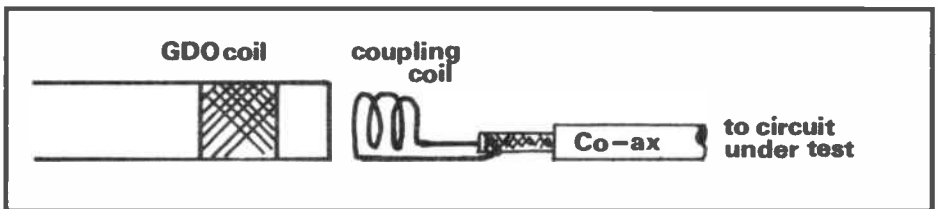


Fig 1: Coupling the output to the circuit under test

# DESIGN AND USE OF DIP METERS

meter is that it registers a meter reading when energy is removed from the dip oscillator tuned circuit by a nearby circuit exhibiting resonance at the frequency of use. In use, the dip oscillator coil is positioned close to the coil of the tuned circuit under test, as shown in Fig 4. Remember, it is important that you don't couple the circuits too tightly, as if you do a rather 'flat' dip is likely to result. If the circuit is part of a piece of equipment, don't have the equipment powered up from these tests, as mixer products between any signals present in or generated by the circuit under test and the GDO could cause erroneous results.

Set the selectivity control of the meter so that a reasonable meter reading is indicated, then slowly tune the oscillator across a range of frequencies where you expect the tuned circuit to resonate. Don't forget to allow for the fact that the calibration of GDOs is not accurate to a couple of kHz, and that any dip measured is likely to be  $\pm$  a few tens of kilohertz. However, this is usually adequate for most purposes as finer tuning of tuned circuits can be done using off air signals or a calibrated receiver, once the 'ball park' performance has been set up with the dip meter.

## Screening

One point to watch when using the dip meter in crowded equipment is that other tuned circuits near to that under test may also resonate within the range of the dip meter. I find it useful to temporarily put a screening can over such coils not being tested, and then earth the can. However, if you see from the circuit diagram that the coils in question are coupled deliberately when the circuit is in use—for example, two air-cored coils near to one another on a circuit board may be acting as a transformer to couple signals from one circuit to another—there is a case for testing the resonance of the assembly as a whole.

## Testing components

As well as testing tuned circuits in situ, the GDO can be used to test components before inclusion into equipment. This can be very useful, as it allows us to homebrew inductances and test that they will resonate with an appropriate capacitance before we solder the coil into a circuit.

## Capacitors and Inductors

The dip oscillator can be used to test capacitors and inductors because they can be formed into a resonant circuit, and so cause a dip on the meter. To measure unknown capacitances, we can use one of two approaches. The first is to resonate the unknown capacitance with a coil of known inductance and then estimate the capacitance with the equa-

tion:  $C = 25300 / L \cdot F^2$ . F is the frequency in MHz, C is the capacitance in pF and L the inductance in  $\mu$ H. However, a coil of accurately known inductance is not always easy to come by, so an alternative technique is to use an unknown coil and a second, known capacitance.

This method is mentioned in the RSGB **Radio Communications Handbook** and briefly the coil and known capacitance (C1) are connected up and resonance checked with the GDO. Call this frequency F1. Then, the unknown capacitance is connected up to the coil instead of C1, and resonance again obtained with the dip meter. Call this frequency F2. An approximate value for the capacitor is then given by:  $C2 = (F1^2 \cdot F1 \cdot C1) / (F2^2 \cdot F2)$ , where the capacitances are in pF and the frequencies in MHz.

For measuring the value of an inductance, the coil is simply connected across a capacitor of known value, and the tuned circuit thus formed is resonated using the GDO. The value of the coil, in  $\mu$ H, is then given by:  $L = 25300 / (C \cdot F^2)$ , where F is in MHz and C is in pF.

In all these measurements, the GDO should be loosely coupled to the tuned circuit under test to ensure a sharp dip. The depth of the dip will be affected by the 'Q' of the tuned circuit formed, and so will depend upon the resistance of the coil and the quality of the capacitors used.

## Crystals

Most dip meters can be used to check the activity of crystals. These are simply plugged in to the GDO instead of a coil, and the tuning control set to minimum capacitance. The meter reading will indicate the level of activity of the crystal; a 'lively' crystal will give a large meter reading, while a low reading will indicate a crystal which may not always oscillate reliably.

## Aerials

In the active mode, we can use the GDO to check the resonance of aerials, as shown in Fig 5. The oscillator is tuned for a dip, and this dip indicates the resonant frequency of the aerial. This method works because the aerial can be treated as a tuned circuit, resonant at the frequency for which it has been 'cut'.

## Potential problems with GDOs

GDOs, whether homebrew or commercial, can cause a few problems to the unwary. To finish off this series, I'd like to examine a few of these, how you can spot them, and what you can do about them.

## Variable output over tuning range

It's likely that over the tuning range of the GDO, even on a single coil, the meter reading when it's not dipping may vary slightly, often decreasing as frequency increases. This is something you'll have

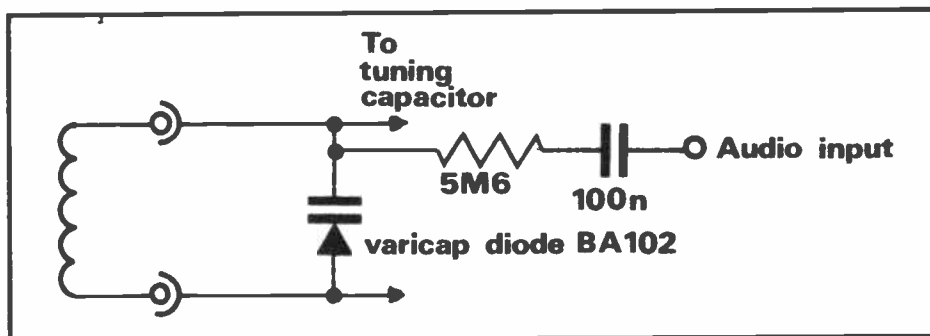
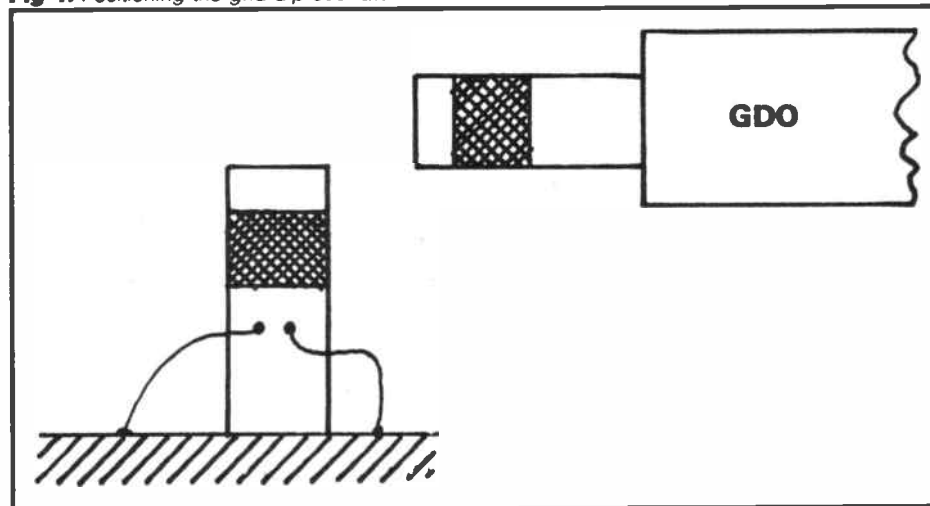


Fig 3: Using a variable capacitance diode

Fig 4: Positioning the grid dip oscillator



to live with, but be wary of sudden dips in the meter reading – it could indicate spurious resonances.

#### Alignment problems

Calibration of dip meters can cause problems for homebrew units, but even commercial units may get knocked out of alignment or drift with time. Try and check your meter against a known source of accuracy occasionally, especially if you're using it to check your transmitted signals!

#### Harmonic output

Any GDO can generate harmonics if it's treated badly enough; overmodulating using an audio signal, or poor design, can cause the active device in a GDO to go non-linear and so start producing harmonic signals as well as the fundamental signal. The harmonic signals will also be present as part of the signal being displayed on the meter, and so a dip may occur if a tuned circuit is tuned to an harmonic that's being generated by the GDO. The size of the dip will depend upon the tuned circuit and the quantity of harmonic signal in the output from the GDO.

The solution here is to either ensure that the design of the GDO is such that it

can't go non-linear, or to cut down the modulating voltage to such a level that it doesn't drive the oscillator into non-linearity. If you get the opportunity, always check the output of the GDO on a 'scope – a smooth sine-wave signal, without any clipping or 'fuzz', probably indicates a clean, harmonic-free signal.

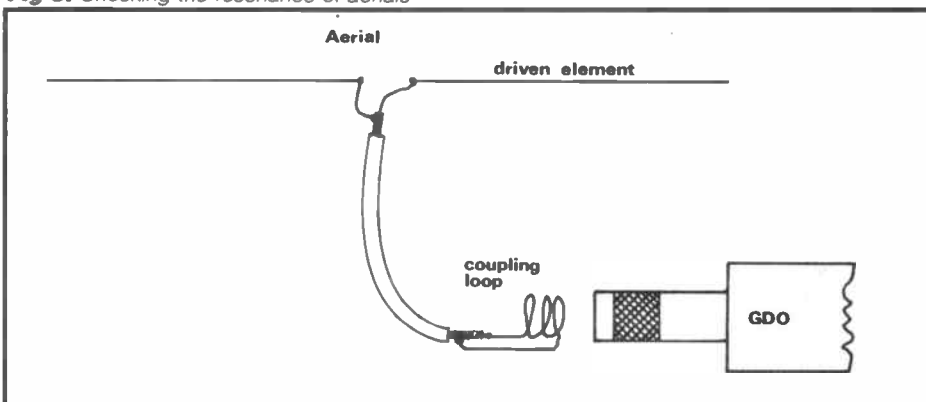
#### Spurious resonances

At higher frequencies, you may find spurious responses in the form of dips when there is no tuned circuit coupled to the dip meter coil. These spurious

resonances are caused by the construction of parts of the meter, particularly the wiring around the tuned circuit. This is why it's crucial to have leads as short and as straight as possible in all parts of the circuit.

If this is done, and resonances are still noted, then you simply have to live with them. However, with correct construction techniques you can often kick these spurious resonances into the low hundreds of MHz where they aren't too important, but it's still useful to know about them!

Fig 5: Checking the resonance of aerials



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■ Philips D2935 world receiver: AM/SSB/CW/LSB/USB, LCD, memories, keypad, as new, £100.00. 2m Icom IC240, FM, twenty-six channels, mobile, £100.00. ERA microreader

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■ FT01 general-coverage transceiver, little used, £750.00. Trio R2000 with VHF aircraft ship bands, general-coverage, £475.00. R7000 Icom scanner, as new, discone available, £750.00. SPC 300 antenna matcher, £150.00. Buyer collects. Tel: (0425) 472640

■ Scanner antenna leads (5m long), £7.50 each. (State scanner's antenna socket, BNC, CAR or UHF). Also, 'Suma Designs' MTX built (17x17x13mm), £7.00. Write to: Robert Anderson, 10 Newbiggin Crescent, Tullibody, Clacks, Scotland FK10 2RT. Tel: (0259) 212606

■ FT102, spare valves, manual vgc, £500.00. Nevada TM1000 ATU, new, £130.00. RN Electronics 50MHz/28IF Rx converter, £30.00. Tatung TMR7602 world band Rx: AM/FM/MW/LW, full range: 150-2999kHz, AM/SSB/CW and manual, £70.00 ono. Tel: (0202) 604 806

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■ Yaesu FT-707 100W HF transceiver, fitted with 11m but still has original 10m x-tals, good condition, £300.00. Tel: (0469) 40962 after 6.00pm

■ Yaesu FRG 9600 RWC scanner, modified, 0.1-950MHz, no gaps, all modes, with PSU and discone, unused, still boxed with manuals, offers? Tel: (0803) 64139

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Apr 1990	28 Feb 90	1 Mar 90	7 Mar 90	9 Mar 90	29 Mar 90	
May 1990	28 Mar 90	29 Mar 90	4 Apr 90	6 Apr 90	26 Apr 90	
June 1990	2 May 90	3 May 90	9 May 90	11 May 90	31 May 90	

CONDITIONS & INFORMATION			
<p><b>SERIES RATES</b> 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.  <b>COPY</b> 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><b>PAYMENT</b> Above rates exclude VAT. All single insertion ads are accepted on a prepayment 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. <b>FOR FURTHER INFORMATION CONTACT</b> Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219676</p>	<p>Commission to approved advertising agencies is 10%.  <b>CONDITIONS</b> 10% discount if advertising in both Amateur Radio and Radio &amp; 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 ORIGINAL SURPLUS WONDERLAND!

## THIS MONTH'S SPECIAL!

Very high resolution, fully cased 14" green or amber screen monitor with non-glare screen and swivel/tilt base. The very latest technology at the very lowest price! Fully compatible and plug compatible with all IBM PCs and clones fitted with a high res Hercules or equivalent card! Enables superb graphics and resolution, all at a give away price. Has many extra features including aux +5 & 12v DC outputs to power at least 2 disk drives, if your PC power supply is getting hot! Supplied BRAND NEW and boxed. State whether amber or green screen required.

Amber .....£79 Green .....£69 (E)

## COMPUTER SYSTEMS

**TATUNG PC2000.** Big brother of the famous Einstein. The TPC2000 Professional 3 piece system comprises: Quality high resolution Green 12" monitor. Sculptured 92 key keyboard and plinth unit containing Z80A CPU and all control circuits. PLUS 2 integral TEAC 5.25 80 track double sided disk drives. Generous other features include dual 8" IBM format disk drive support. Serial and parallel outputs, full expansion port, 64K ram and ready to run software. Supplied complete with CP/M, Wordstar and Basic. Brand new and covered by our famous 90 day guarantee and backup. Normal price of this unit is over £1400!

Our price .... only .....£299 (E)

**PC-AT 286 CLONE** Lowest ever priced 8 mhz PC-AT clone complete with a 20mhz hard drive, a 5.25" 360k floppy, 640k of RAM plus Hercules card compatibility. The keyboard is NCR with 85 keys in an attractive beige, grey and cream finish to match the computer. The monitor is very high resolution 14" non-glare, with your choice of amber or green screen. A very nice package at a super price!

Our price .... only .....£799 (E)

## SPECIAL PURCHASE V22 1200 baud modems

We got a tremendous buy on further stocks of this popular Master Systems 2/12 microprocessor controlled V22 full duplex 1200 baud modem - we can now bring them to you at **half last advertised price!** Fully BT approved unit, provides standard V22 high speed data comm, which at 120 cps, can save your phone bill and connect time by a staggering 75%! Ultra slim 45 mm high. Full featured with LED status indicators and remote error diagnostics. Sync or Async use; speech or data switching; built in 240v mains supply and 2 wire connection to BT. Units are in used but good condition. Fully tested prior despatch, with data and a full 90 day guarantee. What more can you ask for - and at this price!

Only £69 (D)

Write to us today and get your name on our mailing list for our FREE eight weekly bargain flyer *The Display* - Agnus with thousands of unadvertised special offers.

## MONITORS

### COLOUR MONITORS

Decca 16" 80 series budget range colour monitors. Features include PIL tube, housed in a beautiful teak style case and guaranteed 80 column resolution, features which are only normally seen on colour monitors costing 3 times our price! It is absolutely ready to connect to a host of computer or video outputs. Manufacturers fully tested surplus, sold in little or hardly used condition with 90 day full RTB guarantee. Decca 80 COMPO 75 ohm composite video input with integral audio amp & speaker. Ideal for use with video recorder or our Telexbox ST, or any other audio visual use.

Only £99.00 (E)

### HI-DEFINITION COLOUR MONITORS

Brand new Centronic 14" monitor for IBM PC and compatibles at a lower than ever price! Completely CGA equivalent, Hi-res Mitsubishi 0.42 dot pitch giving 669 x 507 pixels. Big 28 Mhz bandwidth. A super monitor in attractive style moulded case. Full 90 day guarantee.

Only £149 (E)

### 20", 22" and 26" AV SPECIALS

Superbly made UK manufacture. PIL all solid state colour monitors, complete with composite video & sound inputs. Attractive teak style case. Perfect for Schools, Shops, Disco, Clubs. In EXCELLENT little used condition with full 90 day guarantee.

20"....£155 22"....£170 26"....£185 (F)

### MONOCHROME MONITORS

Wang green screen 12" chassis monitor with composite video input. Adjustable for tilt. Requires 12 vdc. Brand new and boxed in perfect condition. Only £39 each or 2 for £75 (F)

**Motorola M1000-100 5"** black & white compact chassis measuring only 11.6H x 12W x 22D. Ideal for CCTV or computer applications. Accepts standard composite or individual H & V syncs. Needs 12vdc at only 0.8a. Some units may have minor screen blemishes. Fully tested with 30 day guarantee and full data. £29.00(C)

Fully cased as above in attractive moulded desk standing swivel. Dim 12 x 14.5 x 26cm. £39.00(C)

**JVC 751 ultra compact chassis monitor** for 12vdc 0.7a. Dim 11 x 14 x 18cm. Simple DIY data included to convert to composite video input. Full data. BRAND NEW £65.00(B)

**20" Black & white monitors** by Aztek, Cotron & National. All solid state, fully cased monitors ideal for all types of AV or CCTV applications. Standard composite video inputs with integral audio amp and speaker. Sold in good used condition - fully tested with 90 day guarantee. £85.00(F)

## FLOPPY DISK DRIVES BARGAINS GALORE!

NEW 5 1/4 inch from £29.95!

Massive purchases of standard 5 1/4" drives enables us to present prime product at industry beating low prices! All units (unless stated) are removed from often brand new equipment and are fully tested, aligned and shipped to you with a 90 day guarantee and operate from +5 & +12vdc, are of standard size and accept the standard 34 way connector.

**SHUGART SA405. BRAND NEW** £29.95(B)  
TANDON TM100-2A IBM compatible DS £39.95(B)  
TANDON TM101-4 80 Track DS £49.95(B)  
CANON, TEC etc. DS half height. State 40 or 80T £75.00(B)  
TEAC FD-55-F.40-80 DS half height. BRAND NEW £99.00(B)

**3 1/2 INCH BRAND NEW AT £19.95!!**  
Never before seen price for a 3 1/2" drive. Standard size believed to be by Canon. Brand new and packaged - mint condition! 40 track SS, run from +5 & +12vdc with standard power connector.....Only..... £19.95 or 2 for £34.50(B)

### CHOOSE YOUR 8 INCH!

**Shugart 800/801 SS** refurbished & tested £125.00(E)  
**Shugart 851 double sided** refurbished & tested £195.00(E)  
**Mitsubishi M2894-63** double sided switchable hard or soft sectors. BRAND NEW £250.00(E)

### SPECIAL OFFERS!!

**Dual 8" drives** with 2 megabyte capacity housed in a smart case with built in power supply! Only £499.00 (F)  
Ideal as exterior drive!

**End of line purchase scoop!** Brand new NEC D2246 8" 85 megabyte of hard disk storage! Full CPU control and Industry standard SMD Interface. Ultra Hi speed transfer and access time leaves the good old ST506 interface standing. In mint condition and comes complete with manual. Only.....£399(E)

## MAINS SUPPRESSORS & FILTERS

The "Filtan" from Crotan is a British made high current mains spike suppressor and RF filter in one, capable of handling up to 10 amps! The attractive case has an integral 13 amp socket for your equipment plug and a flying lead terminates in a quality plug (to BS 1363A standard) to go to the mains socket. There is an internal fuse plus one in the plug. Two LED indicators, one for power on and the other lights if the internal fuse fails. Dims: 6" x 3" x 2". Brand new. Distributor's price - £65.00! Continental plug version Filt-C. Either only £15.95 each or 2 for £29.95 (B)

**Belling-Lee type L2127** mains RFI filters rated at 250 volts 3 amps maximum. Comes complete with a built in mains cable (English coding), and a three pin miniature non-reversible socket and a mating plug, to go to the equipment. Ideal for those who are bugged by RF interference. Very compact. Dims 3-1/8" x 2.5" x 1.5".....£3.95 each or 3 for £10 (A)

## COOLING FANS

Please specify 110 or 240 volts for AC fans.

3 inch	AC. 1 1/2" thick	£ 8.50(B)
3 1/2 inch	AC ETRI slimline. Only 1" thick.	£ 9.95(B)
4 inch	AC 110/240v 1 1/2" thick.	£10.95(B)
4 inch	AC 1 1/2" thick	£ 9.95(B)
10 inch	Round. 3 1/2" thick. Rotron 110v	£10.95(B)
62 mm	DC 1" thick. No. 812 for 6/12v. 814 24v.	£15.95(A)
92 mm	DC 1 1/2" 18 mm thick.	£14.95(A)
4 inch	DC 12v. 12w 1 1/2" thick	£12.50(B)
4 inch	DC 24v 8w. 1" thick.	£14.50(B)

## RECHARGEABLE BATTERIES

### LEAD ACID

Maintenance free sealed long life. Type A300.

12 volts	12 volts 3 amp/hours	£13.95(A)
6 volts	6 volts 3 amp/hours	£ 9.95(A)
12 volts	Centre tapped 1.8 amp hours	£ 9.95(A)
12 volts	12 volts 24 amp hours. A200. RFE.	£29.00(B)

### SPECIAL OFFER!

**100 amp/hours at 6 volt!** Brand new Chloride Powersale 3VB11. Leakproof with additional snap-on security lid. Perfect for uninterrupted power supplies, portable power source, caravans etc. Normally costs £80! £39 (E)

### NICKEL CADMIUM

Quality 12v 4ah cell pack. Originally made for the Technicolor video company. Contains 10 GE top quality D nicad cells in a smart robust case with a DC output connector. Ideal for portable equipment. Brand new. £19.95(B)  
Ex-equipment NICAD cells by GE. Removed from equipment and in good, used condition: D size 4ah 4 for £5(B)  
F size 7ah 6 for £8(B)

### SPECIAL INTEREST

**Racal-Redac** real time colour drafting PCB layout system. Includes furniture and huge monitor. Complete ready to go! £3950  
**DEC VAX11/750 inc. 2 Meg Ram DZ** and full documentation, in brand new condition! £3900  
**Calcomp 1036** large drum 3 pen plotter £ 650  
**Thurlby LA 160A** logic analyser £ 275  
**1.5kw 115v 60hz power source** £ 950  
**Wayne Kerr RA200** audio real time freq.res. analyser. £3000  
**VG Electronics 1033** Telexbit Bridge £3750  
**Tektronics R140** NTSC TV test signal standard. £ 875  
**Sony KTX 1000** Videotex system - brand new £ 790  
**DEC LS1102** CPU board £ 150  
**ADDS 2020** VDU terminals - brand new £ 225



**Microwave  
Speech / Data  
Links**



Made for the US military to the highest possible spec, these units were originally designed as a highly rugged portable point to point distance measuring set. Inbuilt in the unit is a full duplex speech link which may be used as is, or adapted for use as a data link. Many features include 50 km point to point range, approx 10.5 GHz operation for max security, low power consumption (typ. 2 amps at 12 vdc), and small physical size 14w, 15h x 13d including built in dish, fully portable weatherproof case. Supplied in used but tested condition complete with instructions and accessories.

Only £295 per pair (E)

Optional 12v integral nicad pack

(3 hours approximate duration).....£22  
**Limited quantity - don't miss out this time!!!**

May require licence for UK use

## POWER SUPPLIES

All PSUs 220-240vac input and are BRAND NEW unless stated. Many types ranging from 3v to 10kv always in stock. Fine OP-8619 20 watts switch mode. +5v @ 2a. +12v @ 1a, -12v @ 0.1a. 5" x 3" x 1-1/2". £15.95(B)

**Astec AC-9151** 40 watts. Switch mode. +5v @ 2.5a. +12v @ 2a. -12v @ 0.1a. 6-1/4" x 4" x 1-3/4". £19.95(B)

**Greendale 19ABOE** 60 watts switch mode. +5v @ 6a. ±12v @ 1a. ±15v @ 1a. RFE and fully tested. 11 x 20 x 5.5cms. £24.95(C)

**Conver AC130.** 130 watt hi-grade VDE spec. Switch mode. +5v @ 15a. -5v @ 1a. ±12v @ 6a. 2.7 x 12.5 x 6.5cms £49.95(C)

**Boehert 13090.** Switch mode. Ideal for drives & system. +5v @ 6a. +12v @ 2.5a. -12v @ 0.5a. -5v @ 0.5a. £29.95(B)

**Farnell G6/40A.** Switch mode. 5v @ 40a. Encased £95.00(C)

**Farnell G24/5S.** As above but 24v @ 5a. £65.00(C)

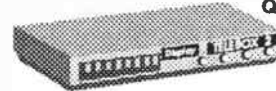
## IBM KEYBOARD DEAL

A replacement or backup keyboard, switchable for IBM PC, PC-XT or PC-AT. LED's for Caps, Scroll & Num Locks. Standard 85 keyboard layout. Made by NCR for the English & US markets. Absolutely standard. Brand new & boxed with manual and key template for user slogans on the function keys. Attractive beige, grey and cream finish, with the usual retractable legs underneath. A generous length of curly cord, terminating in the standard 5 pin DIN plug. A beautiful clean piece of manufacturers surplus. What a deal!

BRAND NEW AND BOXED ONLY..... £49 (B)

## THE AMAZING TELEBOX!

Converts your colour monitor into a  
QUALITY COLOUR TV!!



**TV SOUND  
& VIDEO  
TUNER!**

Brand new high quality, fully cased, 7 channel UHF PAL TV tuner system. Unit simply connects to your TV aerial socket and colour video monitor turning same into a fabulous colour TV. Don't worry if your monitor does not have sound, the TELEBOX even has an integral audio amp for driving a speaker plus an auxiliary output for headphones or Hi Fi system etc. Many other features: LED Status indicator, Smart moulded case, Mains powered, Built to BS safety specs. Many other uses for TV sound or video etc. Supplied BRAND NEW with full 1 year guarantee.

Telexbox ST for composite video input monitors.....£29.95(B)  
Telexbox STL as ST but with integral speaker.....£34.95(B)  
Telexbox RGB for analogue RGB monitors.....£65.95(B)

NOT suitable for IBM or Clone type colour monitors.  
PAL overseas version please call. SECAM not available.

## BRAND NEW PRINTERS

**Epson MX-80 FT** One of the most popular printers around! Bi-directional printing with full logic seeking. 9 x 9 dot matrix for enlarged, bold, condensed etc. Standard parallel interface. Brand label removed from front. Handles tractor, fanfold and individual paper. OK with IBM PC and most others. A tremendous buy! FOR A LIMITED TIME ONLY.....£129.00 (E)

**Hazeltine Exprint** small desktop. 100 cps with RS232 and standard parallel. Full pin addressable and 6 user selectable fonts. Up to 9.5" paper. Sheet & tractor feed. SPECIAL SALE £99.00(E)

**Centronics 150** series. Always known for their reliability in continuous use - real workhorses in any environment. Fast 150 cps with 4 fonts and choice of interfaces.

150-SN up to 9.5" paper.....£155.00(E)  
150-SW up to 14.5" paper.....£199.00(E)

Specify whether serial or parallel required.

**CALL FOR THE MANY OTHERS IN STOCK  
INCLUDING DAISY WHEELS.**

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All prices for UK Mainland, UK customers add 15% VAT to TOTAL order amount. Minimum order £10. PO orders from Government, Universities, Schools & Local Authorities welcome - minimum account order £25. Carriage charges (A)=£2.00, (B)=£4.50, (C)=£8.50, (D)=£10.00, (E)=£12.00 (F)=£17.00 (G)=Call. All goods supplied subject to our standard Conditions of Sale and unless otherwise stated guaranteed for 90 days. All guarantees on a return to base basis. We reserve the right to change prices & specifications without prior notice. Orders accepted subject to stock. Quotations willingly given for higher quantities than those stated. Bulk surplus always required for cash.



### BAKERS DOZEN PACKS

All packs are £1 each. 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.
- 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 BOAC 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 uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
- 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 coils 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.
- 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 to 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 2 amps so could be footswitch 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.
- BD305 1 Tubular dynamic mic with optional table rest.
- BD653 2 Miniature driver transformers. Ref LT44. 20k to 1k centre tapped.
- BD548 2 3.5V relays each with 2 pairs changeover contacts.
- BD667 2 4.7µF 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. Geiger Counter Kit includes PCB loudspeaker etc to build a 9v Geiger counter only £39.00 Ref 39P1

Alkaline PP3 Batteries These are past their sell-by date but test OK, only 2 for £1.00 Ref BD758

1 1/4 Fuse Holders 5 for £1.00 Ref BD752

Uncased Keyboards Brand new mounted on PCB with components only £3.00 Ref 3P27

Toasters 2 slice with browning control, may need slight attention only £3.00 Ref 3P84

Microwave Control Panel Brand new, mains operated including digital clock, relay output, good for all sorts of timer applications. Good value at £6.00 Ref 6P18

EQUIPMENT WALL MOUNT It is a multi-adjustable metal bracket that could be used for mounting floor 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-MIN TOGGLE SWITCH** 800y size 8mm x 4mm x 7mm SBDT with chrome dolly fixing nuts. 3 for £1. 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 1/16in) 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.

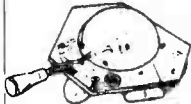
**REAL POWER AMPLIFIER** for your car, it has 150 watts output. Frequency response 20Hz to 20kHz and signal to noise ratio better than 60dB. Has built-in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers ref 30P7 described below. A real bargain at only £27.50. Order ref 5P71.

**REAL POWER CAR SPEAKERS.** Stereo pair output 100W each. 4 ohm impedance and consisting of 6 1/2in woofer, 2in mid-range and 1in tweeter. Each set in a compact purpose-built shell mounting unit. Ideal to work with the amplifier described above. Price per pair £29.95. Order ref 30P7.

**STEREO CAR SPEAKERS** Not quite so powerful - 70W per channel. 3in woofer, 2in mid-range and 1in tweeter. Again, in a super purpose-built shell 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 you hit 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 £10. Our ref 10P81.



**12in HIGH RESOLUTION MONITOR.** Amber screen, beautifully cased for free standing, needs only a 12V 1.5 amp supply. Supplied with connection data for H sync, V sync & Video. Brand new in maker's cartons. Price £22.00. Free delivery. Order ref 25P10.

**COMPOSITE VIDEO KIT** converts composite video to H sync, V sync & sep video. Price £8.00. Ref 8P.

**14in 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 4 ohms 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 manufacturer's metal case with leads and IDC connectors. Price £40. reference 40P1. Also a double-sided, 80 track, by NEC. This is unrefused. 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. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 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.

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

**VERY POWERFUL 12 VOLT MOTORS.** 1/2 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 a 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. Complete kit with tube & power supply. £46.00.

**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. Comes complete with Spectrum 128 software. Brand new only £22.00. Ref 22P1.

**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 or used 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 1/4in). The electronically run fans not only consume very little current but also they do not cause interference as the brushy type motors do. Ideal for cooling computers, etc. or for a caravan. £8 each. Our ref 8P26.

**MINI MONO AMP** on PCB, size 4in x 2in (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 AR250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT.

**MAIL ORDER TERMS:** Cash, PO or cheque with order. Orders under £20 add £2.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/Card orders accepted - minimum £5. Phone (0273) 734648 or 203500. Fax No 0273-23077

### POPULAR ITEMS - MANY NEW THIS MONTH

**JOYSTICKS** for BBC Atari, Dragon Commodore, etc. All £5.00 each. Our ref 5P10.

**TELEPHONE TYPE KEYPAD** Really first class rear mounting unit. White lettering on black buttons. Has conductive rubber contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut-out and has a 10 IDC connector. Price £2.00. Ref 2P251.

**SUB-MIN PUSH SWITCHES.** Not much bigger than a plastic transistor but double pole PCB mounting. 3 for £1.00. Our ref 3D668.

**AA CELLS** Probably the most popular of the rechargeable NICAD types. 4 for £4.00. Our ref 4P44.

**20 WATT 4 OHM SPEAKER.** With built-in tweeter. Really well made unit which has the power and the quality for hi-fi 6 1/2in dia. Price £5.00. Our ref 5P155, or 10 for £40.00. Ref 40P7.

**MINI RADIO MODULE.** Only 2in square with ferrite aerial and solid diu tuner with own knob. It is superb and operates from a PP3 battery and would drive a crystal headphone. Price £1.00. Our ref BD716.

**BULGIN MAINS PLUG AND SOCKET.** The old and faithful 3pin with screw terminals. The plug is panel mounted and the socket is cable mounted. 2 pairs for £1.00 or 4 plugs or 4 sockets for £1.00. Our ref BD715, BD715P, or BD715S.

**MICROPHONE.** Low cost hand-held dynamic microphone with on/off switch in handle. Lead terminates in 1.35mm and 1.25mm plugs. Only £1.00. Ref BD717.

**MOSETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES.** 140V 100 watt pair made by Hitachi. Ref 25K413 and its complement 25J118. Only £4.00 a pair. Our ref 4P42.

Also available in H pack Ref 25J99 and 25K343 £4.00 a pair. Ref 4P51.

**TIME AND TEMPERATURE LCD MODULE.** A 12 hour clock, a Celsius and Fahrenheit thermometer, a too hot alarm and a too cold alarm. Approx 50 x 20mm with 12.7mm digits. Requires 1AA battery and a few switches. Comes with full data and diagram. Price £6.00. Our ref 6P12.

**REMOTE TEMPERATURE PROBE FOR ABOVE.** £3.00. Our ref 3P60.

**A REAL AIR MOVER.** Circular axial fan moves 205 cubic foot per min, which is about twice as much as our standard 4 1/2in fans. Low noise mains operated, 6 1/2in dia, brand new. Regular price £10.00. Our price only £10.00. Our ref 10P71.

**600 WATT AIR OR LIQUID MAINS HEATER.** Small coil heater made for heating air or liquids. Will not corrode, lasts for years. Coil size 3in x 1in, mounted on a metal plate for easy fixing. 4in dia. Price £3.00. Ref 3P78 or 4 for £10.00. Our ref 10P76.

**EX-EQUIPMENT SWITCHED MODE POWER SUPPLIES.** Various makes and specs but generally ±5, ±12V, ideal bench supply. Only £6.00. Our ref 8P36.

**ACORN DATA RECORDER.** Made for the Electron or BBC computer and others. Includes mains adapter, leads and book. £12.00. Ref 12P15.

**PTFE COATED SILVER PLATED CABLE.** 19 strands of .45mm copper, will carry up to 30A and is virtually indestructible. Available in red or black. Regular price is over £120 per reel. Our price only £20.00 for 100m reel, Ref 20P21, or 1 of each for £40.00. Ref 3P20. Includes superb speaker or aerial cable.

**NEW PIR SENSORS.** Infra-red movement sensors will switch up to 500W mains. UK made, 12 months manufacturer's warranty, 15-20cm range, with a 0-10min timer, adjustable wall bracket. Only £20.00. Ref 20P24.

**MITSUBISHI 3 1/2in DISC DRIVES.** Brand new drives, 1/2 height, double-sided, double density, warranted. Our price £60.00. Ref 60P5.

**10 MEMORY PUSHBUTTON TELEPHONES.** These are custom returns and sold such so may need slight attention. Price £6.00. Ref 6P16 or 2 for £10. Ref 10P77. BT approved.

**NON-MEMORY PUSHBUTTON TELEPHONES.** Same condition as above with radial £3.00. Our ref 3P79. BT approved.

**DEHUMIDIFIERS.** Domestic mains powered dehumidifiers, these are custom returns and sold as seen. Price £30.00. Our ref 30P55.

**SPECTRUM PRINTER INTERFACE.** Add a Centronics interface to your Spectrum, complete with printer cable for only £4.00. Our ref 4P52.

**SPECTRUM SOUND BOX.** Add sound to your Spectrum with this device. Just plug in. Complete with speaker, volume control and nicely boxed. A snip at only £4.00. Our ref 4P53.

**BBC JOYSTICK INTERFACE.** Converts a BBC joystick port to Atari 1P80 port. Price £3.00. Our ref 2P261.

**TELEPHONE EXTENSION LEAD.** 5m phone extension lead with plug on one end, socket on the other. White. Price £3.00. Our ref 3P70, or 10 leads for only £19.00! Ref 19P2.

**LCD DISPLAY.** 4 1/2in digits supplied with connection data £3.00. Ref 3P77, or 5 for £10. Ref 10P78.

**CROSSOVER NETWORK.** 8 ohm 3-way for tweeter mid-range and woofer, nicely cased with connections marked. Only £2.00. Our ref 2P255, or 10 for £15.00. Ref 15P32.

**REVERSING LIGHT ALARM.** Fits to car reversing light and sounds when reversing. Only £2.00. Our ref 2P248.

**BAS STATION MICROPHONE.** Top quality uni-directional electric condenser mic 6000 impedance sensitivity 16-18kHz - 68dB built-in chime, complete with mic stand bracket. £15.00. Ref 15P28.

**MICROPHONE STAND.** Very heavy chromed mic stand, magnetic base 4in high. £3.00 if ordered with above mic. Our ref 3P80.

**SOLAR POWERED NICAD CHARGER.** 4 Nicad AA battery charger. Charges 4 batteries in 8 hours. Price £6.00. Our ref 6P3.

**MAINS SOLDERING IRON.** Price £3.00. Our ref 3P65.

**SOLDERING IRON STAND.** Price £3.00. Our ref 3P66.

**PIR SENSORS.** Suitable for alarm systems etc. Nicely boxed. Priced at only £10.00. Our ref 10P79.

**SHARP PLOTTER PRINTER.** New 4 colour printer originally intended for Sharp computers but may be adaptable for other machines. Complete with pens, paper etc. Price £16.00. Our ref 16P3.

**CAR IONIZER KIT.** Improve the air in your car, clears smoke and helps prevent fatigue. Case ref. Price £12.00. Our ref 12P8.

**NEW FM BUG KIT.** New design with PCB embedded coil 9V operation. Priced at £5.00. Our ref 5P158.

**NEW PANEL METERS 50µA** movement with three different scales that are brought into view with a lever. Price only £3.00. Ref 3P81.

**STROBE LIGHTS.** Fit a standard Edison screw light fitting. 240V 40min flash rate, available in yellow, blue, red and green. Complete with socket. Price £10 each. Ref 10P80 (state colour required).

**ELECTRONIC SPEED CONTROL KIT.** Suitable for controlling our powerful 12V motors. Price £17.00. Ref 17P3 (heatsink required).

**EXTENSION CABLE WITH A DIFFERENCE.** It is flat on one side, making it easy to fix and look tidy. 4 core, suitable for all uses. Our price only £5.00 for 50m reel. Ref 5P153.

**METAL PROJECT BOX.** Ideal for battery charger, power supply etc. Sprayed grey, size 8in x 4in x 4 1/2in. Louvered for ventilation. Price £3.00. Ref 3P75.