

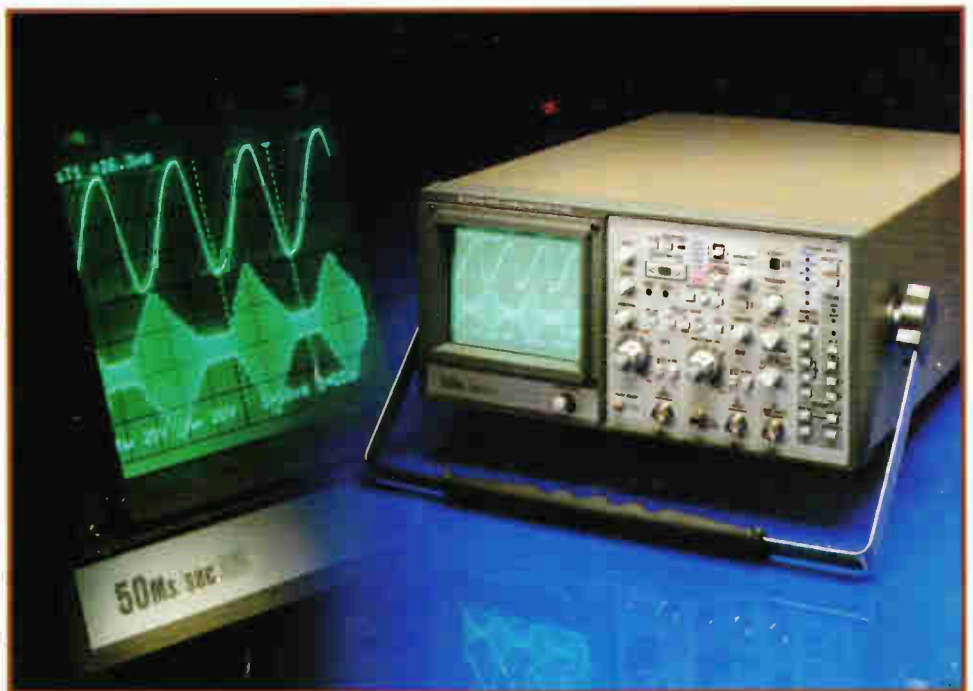
# Radio & Electronics

The communications and electronics magazine **World**

**EXPERIMENTAL LF  
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ANTENNA SYSTEM**

**AN AUDIO DIGITISER  
FOR THE AMIGA A500  
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**DATA FILE:  
DC LAMP/LED FLASHER,  
SWITCHER AND BRIGHTNESS  
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## ON THE COVER

This month's cover shows **top**: the Hitachi VC6065 digital storage oscilloscope; combining 100MHz bandwidth real-time operation with digital storage at up to 50 megasamples per second on two channels simultaneously. Available from Reltech Instruments. Tel: (0480) 63570. **Bottom**: the Thandar TA1000 portable logic analyser; features include multi-level triggering with restart, event count and delay, high impedance (1mΩ/5pF) clock with data inputs and three external clocks. Available from STC Instrument Services. Tel: (0279) 641641

<p><b>Editorial</b> Iain Mackenzie Penny Phillips</p> <p><b>Advertisement Manager</b> Marian Vidler</p> <p><b>Advertisement Executive</b> Maria Smith</p> <p><b>Publisher</b> Peter Williams</p> <p><b>Published by</b> Radio &amp; Electronics World Magazines Sovereign House Brentwood, Essex. CM14 4SE, England Tel: (0277) 219876</p> <p><b>ISSN</b> 0262-2572</p> <p><b>Printed</b> In Great Britain</p>	<p><b>Newsagents sales</b> S M Distribution 6 Leigham Court Road Streatham, London SW16 2PG. Tel: 01-677 8111</p> <p><b>Subscriptions</b> Tel: 01-684 9542</p> <p><small>© Copyright 1989 Radio &amp; Electronics World Magazines</small></p> <p><b>Safety in the shack</b> Some of the constructional projects featured refer to additions or modifications to equipment; please note that such alterations may prevent the item from being used in its intended role, and also that its guarantee may be invalidated. When building any constructional project, bear in mind that sometimes high voltages are involved. Avoid even the slightest risk - safety in the shack please, at all times.</p> <p><small>Whilst every care is taken when accepting advertisements we cannot accept responsibility for unsatisfactory transactions. We will, however, thoroughly investigate any complaints. The views expressed by contributors are not necessarily those of the publishers. Every care is taken by RADIO AND ELECTRONICS WORLD to ensure that the information given to our readers is reliable. We cannot however guarantee it and we cannot assume legal responsibility for it nor for any effects whatsoever caused</small></p>
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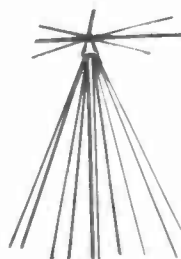
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# DATA FILE

## Ray Marston looks at a variety of dc lamp/LED flasher switches and brightness — control circuits in the latest part of his power control series

We concluded last month's episode of 'Data File' by looking at various dc power control principles. This month we show how these principles can be put to use to make a variety of practical dc lamp/LED power control circuits. We start by looking at simple LED flasher designs.

### LED 'flasher' circuits

Simple 'static' dc on/off lamp or LED power switching actions are usually best carried out via conventional electro-mechanical switches or relays, which give minimal voltage loss but generate slight switching RFI. Repetitive dc switching, such as in lamp or LED flasher (pulsar) circuits, however, is often best carried out via solid-state power switches, to minimise RFI problems. **Figs 1 to 6** show a variety of practical circuits of this type.

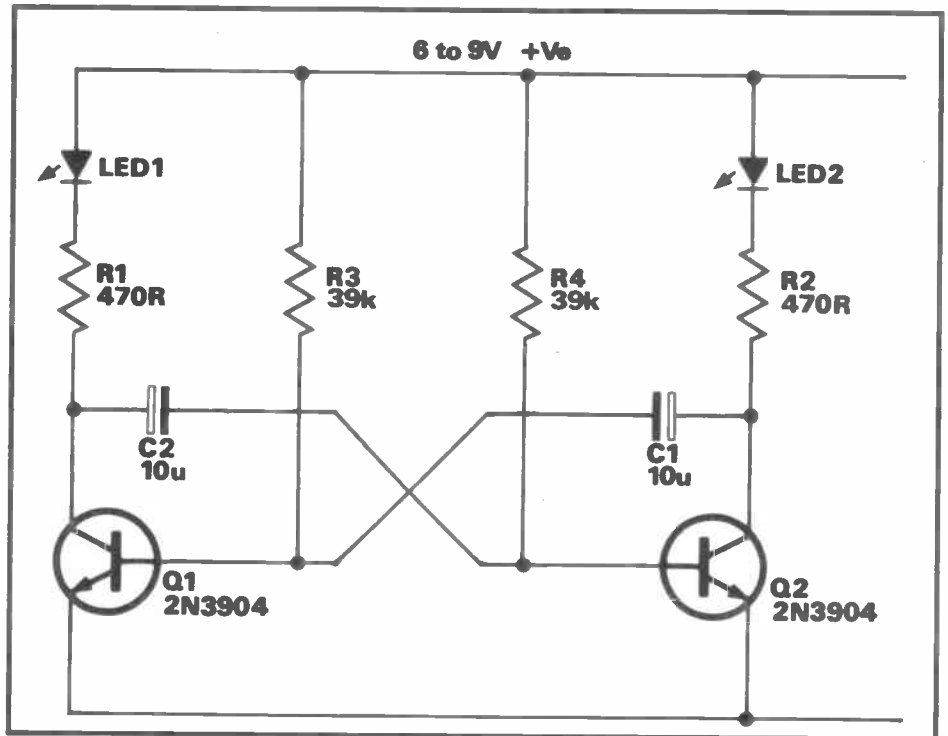
**Fig 1** shows a transistor 2-LED flasher circuit that operates at about one flash per second and turns one LED on as the other turns off, and vice versa. The circuit is wired as an astable multivibrator, with its timing controlled via C1-R3 and C2-R4. The LEDs and their current-limiters (R1 and R2) are used as the transistor collector loads. This circuit can be converted to single-LED operation by replacing the unwanted LED with a short circuit.

**Fig 2** shows an IC version of the 2-LED flasher based on the faithful old 555 timer chip or its more modern CMOS counterpart, the 7555. The IC is wired in the astable mode, with its time constant determined by C1 and R4. The action is such that IC output pin 3 alternately switches between the ground and positive supply voltage levels, shorting out and disabling one or other of the two LEDs. The circuit can be converted to single-LED operation by omitting the unwanted LED and its associated current-limiting resistor.

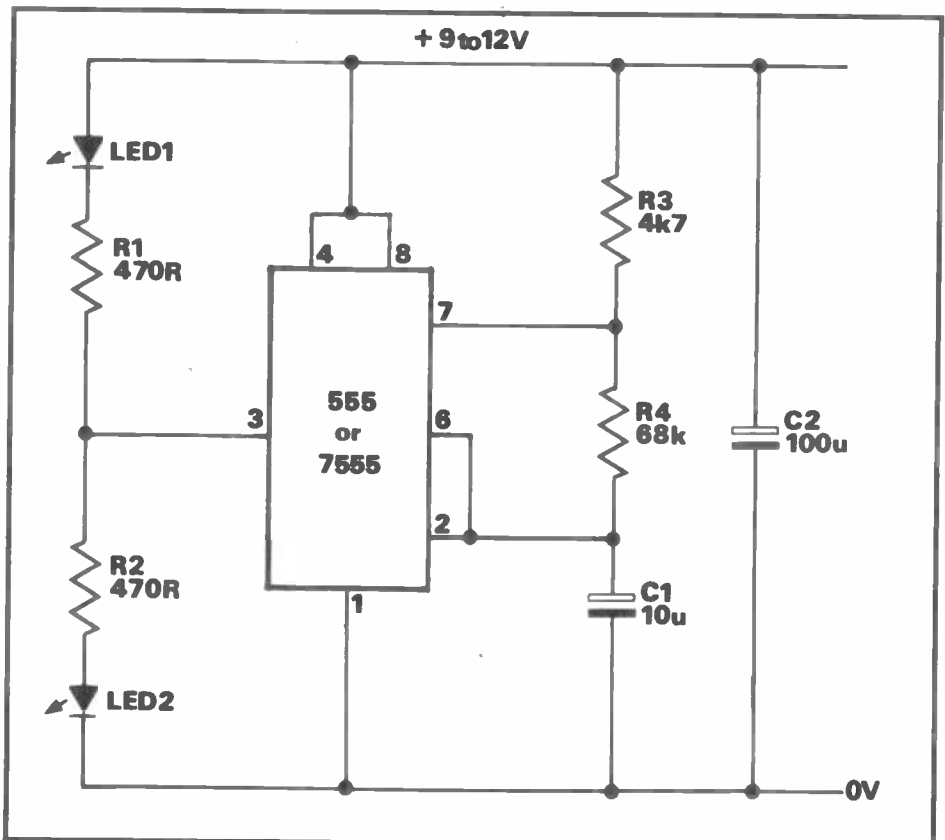
### Lamp flasher circuits

The above two circuits are suitable for driving LED loads up to only a few tens of mA; if desired, greater output currents can be obtained by interposing a suitable transistor 'booster' stage between the astable output and the external load, as shown in **Figs 3 to 6**. In each of these circuits the astable is designed around one half of an inexpensive 4001B CMOS IC, and Q2 can drive a 12V lamp load at maximum currents of up to 2A.

In **Fig 3**, the astable operates at a fixed rate set by R1 and non-polarised (NP) capacitor C1, and turns the lamp on and off about forty times per minute (ie, at 1.5 seconds per flash). The astable output (from pin 4) switches alternately between 0V and the full positive supply voltage; when this output is at 0V, Q1-Q2

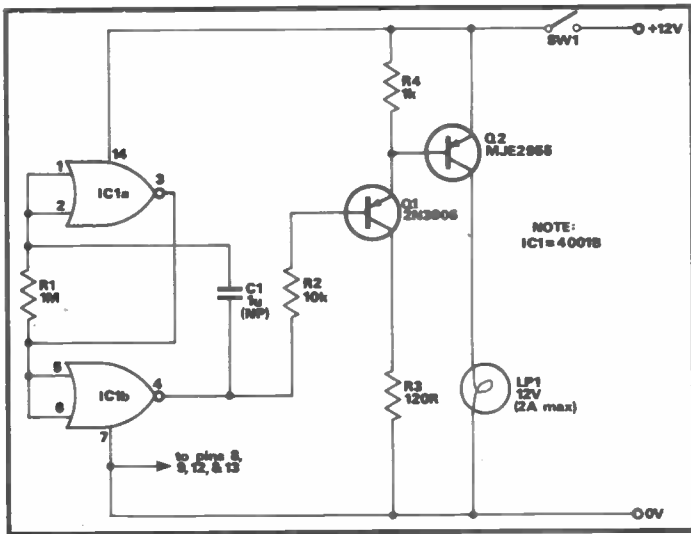


**Fig 1** Transistor 2-LED flasher circuit

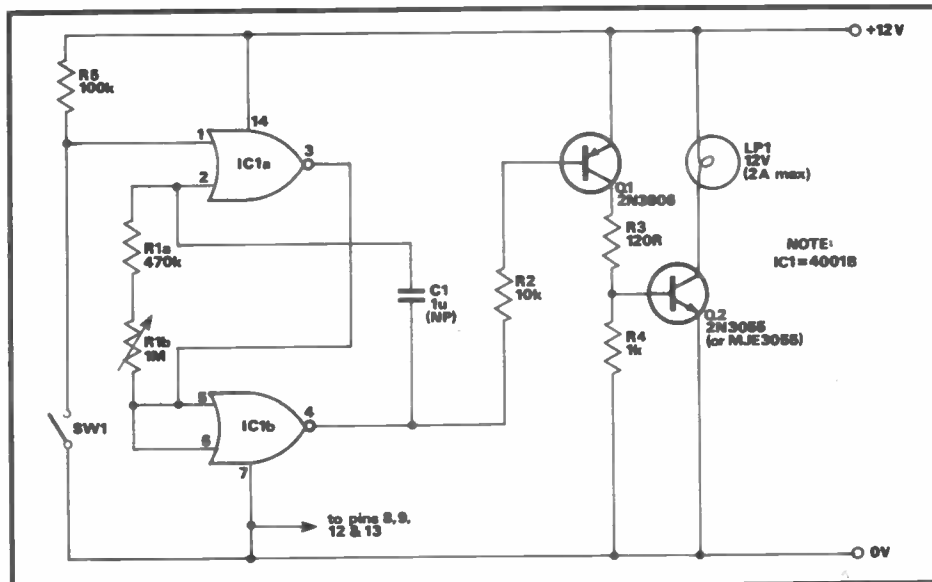


**Fig 2:** IC 2-LED flasher circuit

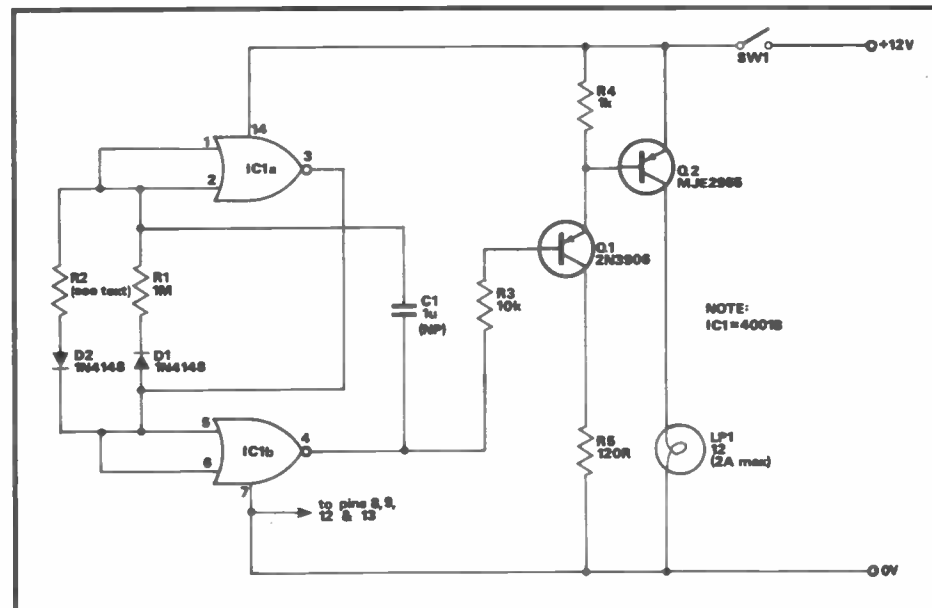
are driven on via R2, and the lamp is illuminated, but when the output is fully positive Q1-Q2 are cut off, and the lamp is also off. Note that this circuit drives a



**Fig 3:** Simple dc lamp flasher



**Fig 4:** Modified dc lamp flasher circuit



**Fig 5:** Programmed duty cycle (PDC) lamp flasher circuit

lamp that has one side tied to the zero-volts rail.

The basic **Fig 3** circuit can be usefully modified in a number of ways, as shown in **Fig 4**. Firstly, the astable frequency can be made variable by replacing R1 with a series-connected 470k resistor and a variable 1M0 resistor, thus making the flash rate variable between twenty-seven and eighty times per minute. Secondly, the output can be used to drive lamps that have one side tied to the positive supply rail by using the alternative output stage shown in the diagram. Finally, the astable can, if desired, be turned on and off via SW1 and the high-impedance pin 1 'gate' pin of the IC1a, as shown, rather than via a switch wired in series with the positive supply rail.

The above two astable circuits generate 1:1 duty cycles or mark/space ratios, and thus turn the lamp on and off for equal periods. **Fig 5** shows how the basic circuit can be modified to give a programmed duty cycle (PDC) so that, for example, the lamp gives a 0.75 seconds flash once every 8.25 seconds, thus giving a 1:10 duty cycle and giving great current economy as an emergency lamp flasher. The lamp's on time is controlled by D1-R1 and is fixed at about 0.75 seconds, but the off time is controlled by D2-R2 and can be varied over a wide range; the R2 value can vary from a few kilohms to tens of Megohms, and gives an off time of 0.75 seconds at 1M0, or 7.5 seconds at 10 Megohms, etc.

**Fig 6** shows how the above circuit can be modified for use with the alternative type of output stage, and with direct astable on/off gating. This diagram also shows how R2 can be replaced with a fixed and a variable resistor in series, so that the off time of the lamp is made variable. No specific values are shown for these two resistors, but note that R2a determines the minimum value of the off time, and R2b determines the maximum off value.

### Automatic flashers

Each of the above four lamp flasher circuits are manually activated; **Figs 7** and **8** show how the basic and the PDC circuits can be modified so that they activate automatically when the ambient light level falls below a pre-set value.

Both of these circuits operate in the same basic way; in each case, the astable is wired in the 'gated' mode, but has its gate (pin 1) signal applied in the form of a variable voltage that is generated via light-sensitive potential divider LDR-RV1. The action of the astable is such that it is disabled, with its pin 4 output driven high, when this gate voltage exceeds a 'threshold' value of approximately half-supply volts, but is automatically enabled when this voltage is below the threshold value.

In these circuits, the light-sensitive LDR gives a low resistance under bright

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conditions, and a high resistance under dark ones. Thus the LDR/RB1 divider generates a high voltage when it is bright and a low voltage when it is dark. RV1 enables this voltage to be adjusted so that it precisely matches the IC's 'threshold' value at the desired light 'trip' level. Consequently, when RV1 is suitably adjusted, these lamp flasher circuits turn on automatically when the light level falls below the desired trip level, and turn off again when it rises above that level.

## NB . . .

The LDRs used in these circuits can be any cadmium-sulphide photocells with resistances greater than a few thousand ohms at the required turn-on light levels; RV1 should have a maximum value roughly double that of the LDR under the turn-on condition. When building these circuits, note that the LDR faces must be shielded from the light of the flasher lamps, so that the LDRs respond to ambient light level but are unaffected by the lamp-flashing action. Also note that master on/off switch SW1 is wired in series with the supply line of each circuit, so that each circuit can be disabled when put away in a dark storage area.

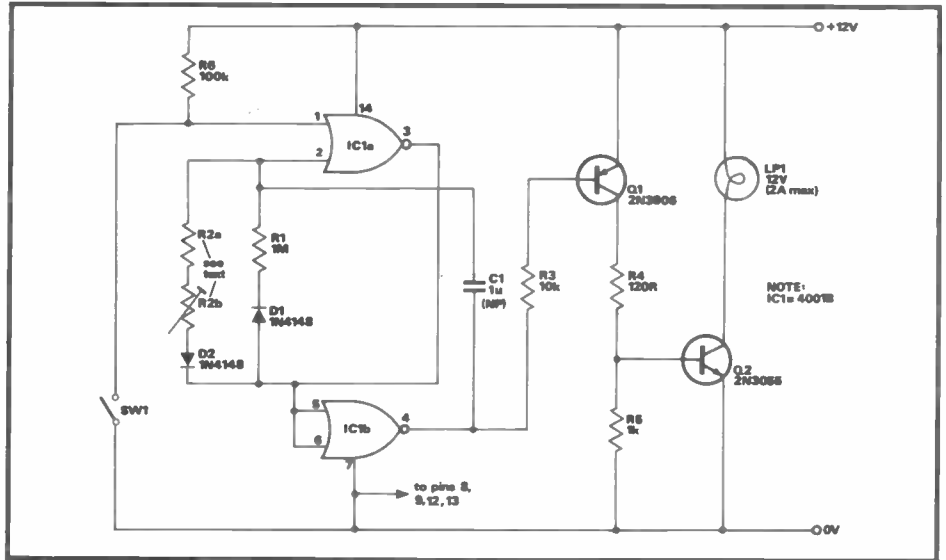
## One-shot lamp drivers

Another useful type of dc lamp-driving power control circuit is the one-shot or auto-turn-off design. This turns the lamp on as soon as a start button is pressed, but then turns it off again automatically after a pre-set interval variable from a few seconds to several minutes. **Figs 9** and **10** show practical circuits of this type.

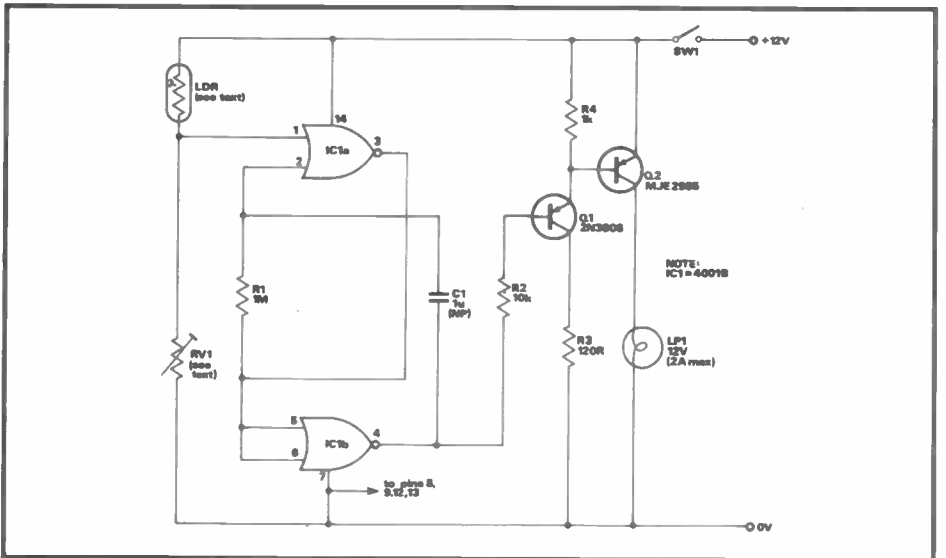
Both of these operate in the same basic way, and have two gates of a 4001B CMOS IC wired as a simple manually-triggered monostable multivibrator. Normally, the monostable output is low, so Q1 and Q2 are both cut off and zero power is fed to the lamp. When SW1 is briefly closed the monostable triggers and its output switches high, driving the transistors and lamp fully on. After a pre-set delay, the monostable output automatically switches back to the low state again, and the transistors and lamp turn off. The circuit action is then complete.

The time delay of each circuit is determined by the C1-R1 values, and equals roughly  $0.5 \text{ sec}/\mu\text{F}$  of C1 value when R1 equals 680k. C1 can be an electrolytic component and can have any value up to a maximum of about  $1000\mu\text{F}$ , thus giving time delays of up to several minutes; this capacitor must, however, have reasonably low leakage characteristics.

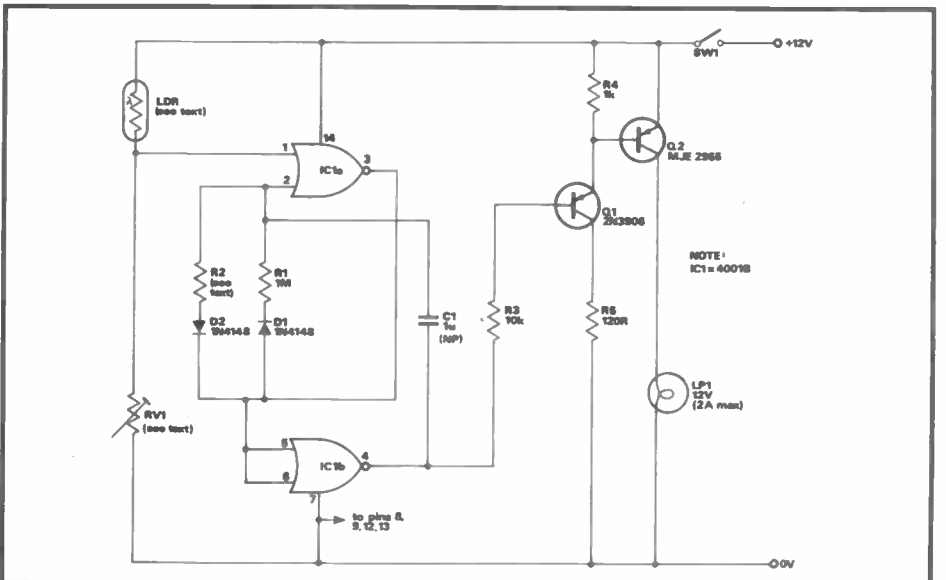
Note that these two circuits can give control of lamps that have one side taken to either the positive or the zero voltage rail, but that the transistor output stages differ from those described earlier.



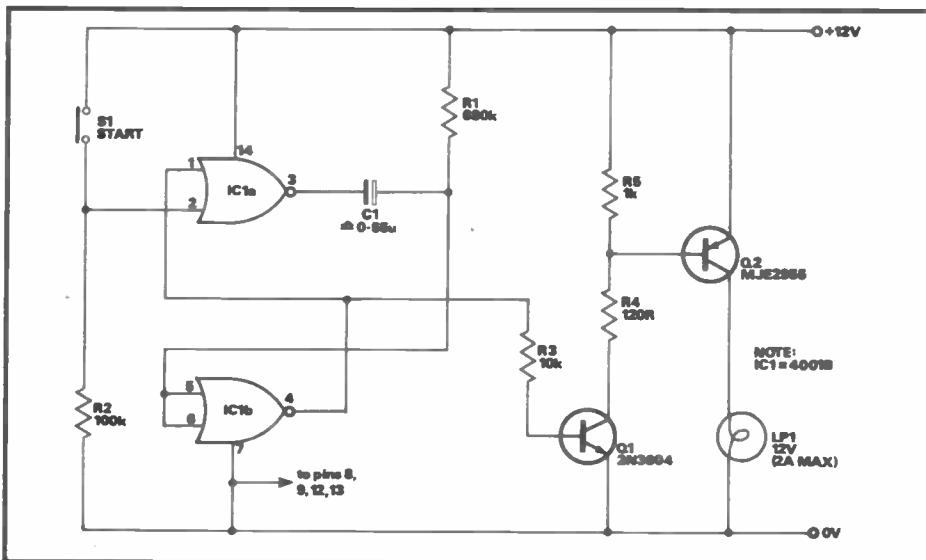
**Fig 6:** Gated and modified PDC lamp flasher



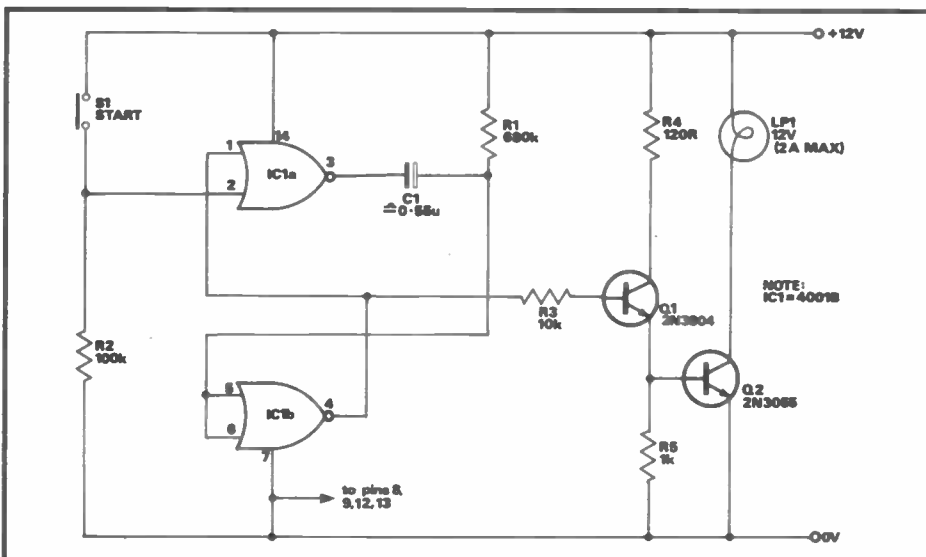
**Fig 7:** Automatic (dark-activated) dc lamp flasher



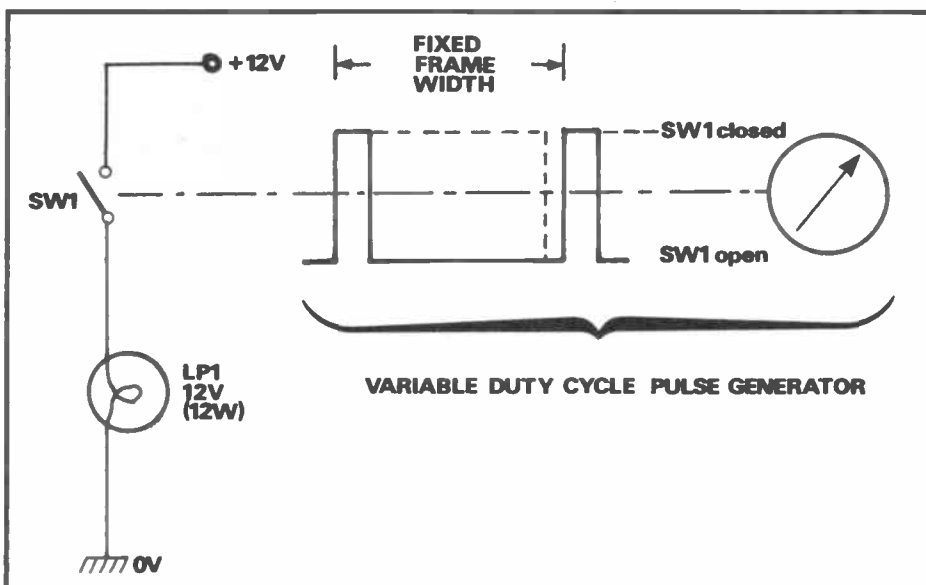
**Fig 8:** Automatic PDC lamp flasher



**Fig 9:** Auto-tum-off, time-controlled dc lamp driver



**Fig 10:** Alternative auto-tum-off lamp driver circuit



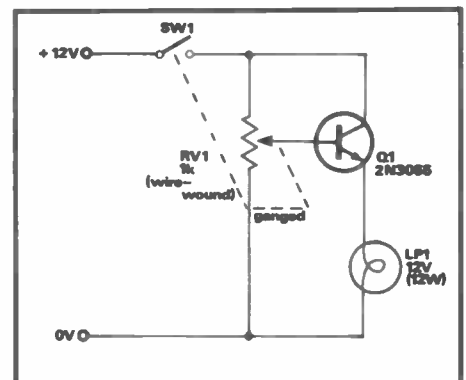
**Fig 12:** Basic switched-mode dc lamp brightness-control circuit

## Dc lamp-dimmer circuits

It was explained earlier in this series that a load's dc power levels can be varied by using either 'variable-voltage' or 'switched-mode' control techniques, and either of these techniques can in fact be used to control the brightness of a dc filament lamp. **Fig 11** shows the practical circuit of a simple variable-voltage type of dc lamp dimmer.

In **Fig 11**, RV1 acts as a variable potential divider which applies an input voltage to the base of emitter follower Q1, which buffers (power boosts) this voltage and applies it to the lamp. RV1 thus enables the lamp voltage (and thus its brilliance) to be fully varied from zero to maximum. Disadvantages of this simple circuit are that it is very inefficient, since all unwanted power is 'lost' across Q1, and Q1 needs a large power rating and must be capable of handling the cold current of the lamp.

**Fig 12** illustrates the basic principles of switch-mode variable power control. Here, an electronic switch (SW1) is wired



**Fig 11:** 'Variable-voltage' dc lamp brightness-control circuit

in series with the lamp and can be opened and closed via a pulse-generator waveform. When this pulse is high, SW1 is closed and power is fed to the lamp; when the pulse is low SW1 is open, and no power is fed to the lamp.

The important thing to note about the **Fig 12** pulse generator is that it generates a waveform with a fixed frame width but with a variable mark/space (M/S) (on/off) ratio or duty cycle, thereby enabling the mean lamp voltage to be varied. Typically, the M/S ratio is fully variable from 1:20 to 20:1, enabling the mean lamp voltage to be varied from 5% to 95% of the dc supply-voltage value.

Because of the inherently long thermal time constant of a filament lamp, its brilliance responds relatively slowly to rapid changes in input power. Consequently, if the frame width of the **Fig 12** waveform generator is less than roughly 20mS (ie, the repetition frequency is greater than 50Hz), the lamp will show no sign of flicker, and its brilliance can be varied by altering the M/S ratio.

Thus, if the M/S ratio of the **Fig 12**

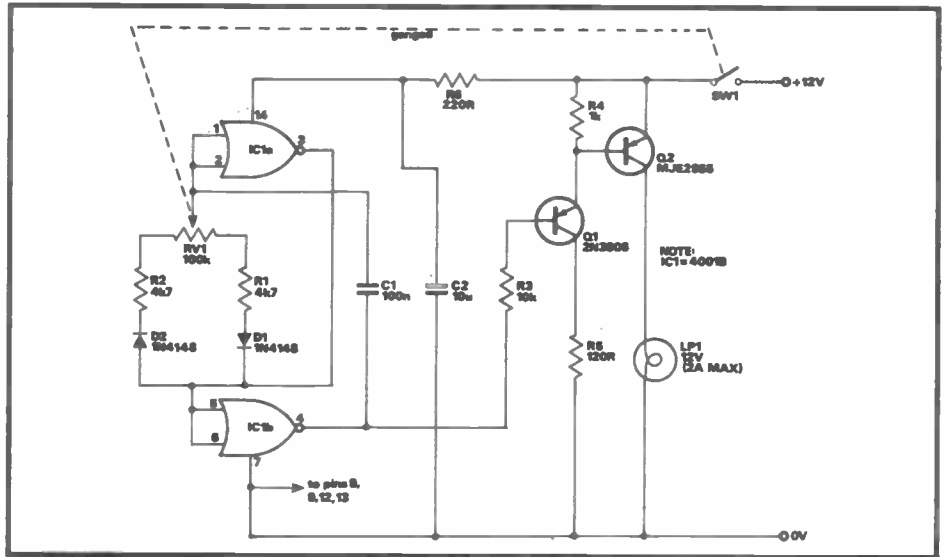
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circuit is set at 20:1, the mean lamp voltage is 11.4V and the consequently hot lamp consumes 10.83W. Alternatively, with the M/S ratio set at 1:20, the mean lamp voltage is only 600mV, so the lamp is virtually cold and consumes a mere 120mW. Therefore, the lamp power consumption can be varied over a 90:1 range via the M/S ratio control. Note, however, that this wide range of control is obtained with virtually zero power loss within the system, since power is actually controlled by SW1, which is always either fully on or fully off. So, the switched-mode control system is highly efficient (typical efficiency is about 95%).

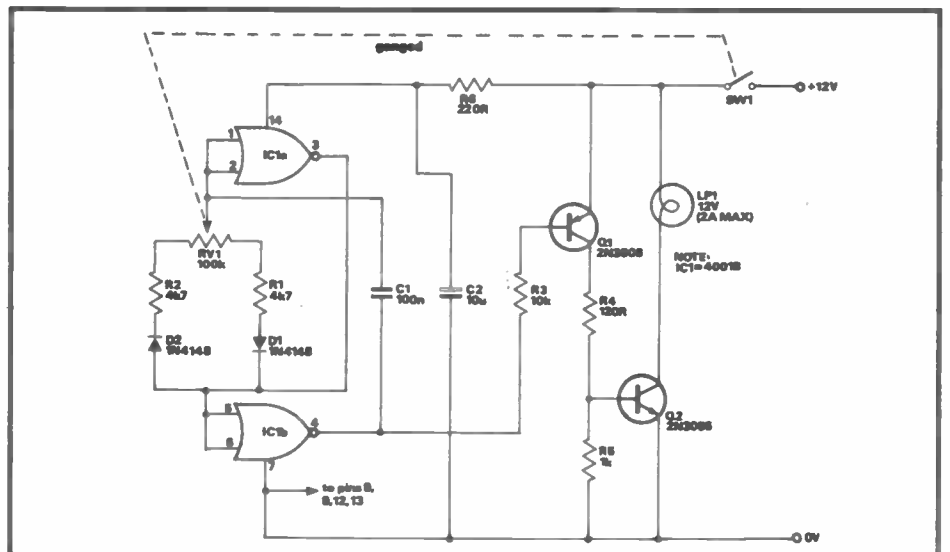
**Fig 13** shows a practical switched-mode dc lamp dimmer circuit. Here, IC1a and IC1b are wired as an astable multivibrator that operates at a fixed frequency of about 100Hz and has its output fed to the lamp via Q1 and Q2. However, it has the mark part of its waveform controlled via C1-D1-R1 and the right-hand part of RV1, and the space part controlled via C1-D2-R2 and the left-hand part of RV1, thus enabling the M/S ratio to be varied from 1:20 to 20:1 via RV1, and so enabling the mean lamp power to be varied over a 90:1 range. Note that on/off switch SW1 is ganged to RV1, enabling the circuit to be turned fully off by turning the RV1 brilliance control fully anti-clockwise, and that R6-C2 protect IC1 against damage from supply-line transients, thus enabling the circuit to be powered via 12V motor vehicle supplies, etc.

The **Fig 13** circuit can be used to control the brilliance of any low-power (up to 24W) 12V filament lamp that has one side wired to the zero volt rail of the power supply. **Fig 14** shows how the design can be modified (by using an alternative output stage) for use with lamps that have one side wired to the positive rail of the power supply.

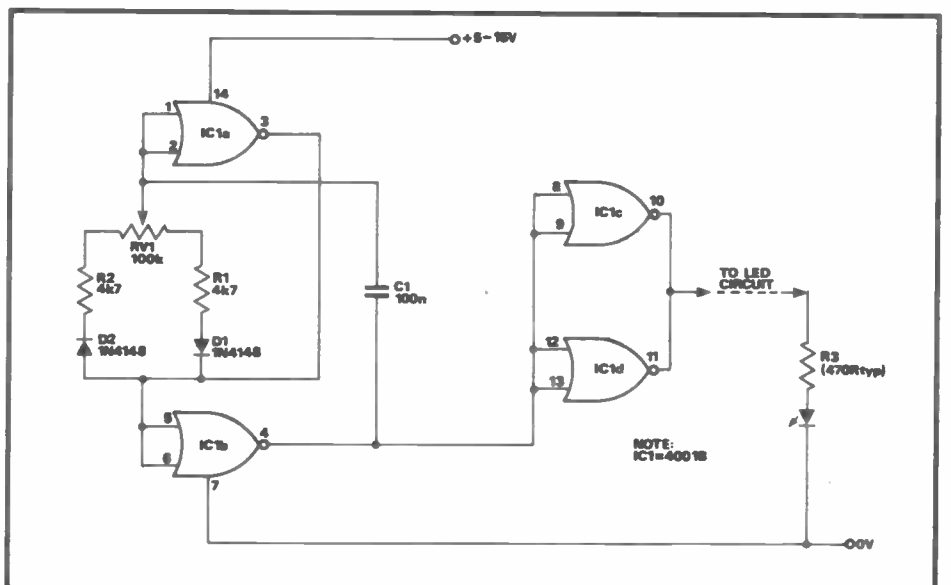
Finally, **Fig 15** shows how the basic switched-mode circuit can be used to efficiently control the brilliance of one (or more) LEDs, at maximum currents up to about 20mA. In this case the two spare gates of IC1 are wired as simple parallel-connected inverters and used to provide a medium-current buffered drive to the LED via current-limiter R3. This circuit can be powered from any dc supply in the range 5 to 15V.



**Fig 13:** Switched-mode dc lamp dimmer



**Fig 14:** Alternative switched-mode lamp dimmer circuit



**Fig 15:** Switched-mode LED brightness-control circuit

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# AN EXPERIMENTAL LF SPIRAL ANTENNA SYSTEM

by Richard Q Marris G2BZQ

This experimental antenna system started life as a prototype and was designed so that changes could be made to the system in the light of trials, and also for future use with a variety of receivers.

What is an LF loop antenna? It consists of a compacted spiral loop for long range LF reception. This system covers that much neglected range between 140 and 400kHz which is part of the LF spectrum and therefore covers all of the long wave band, with overlap at the ends. It can also be easily modified to cover a lower or higher frequency range. At first it was only intended to be an experimental antenna system, but because of its superb performance it is now a permanent fixture, with the wave-range adjusted for use with a PCR receiver converted for long range, long wave reception.

There is far more activity in this spectrum than first meets the eye, with entertainment and DX possibilities in the long wave section and a variety of interesting and occasionally strange signals sometimes of DX origin. With a good receiver and antenna the QRM can be unexpected and almost unbelievable. Until recently, I had neglected this part of the LF spectrum since childhood when a variety of crystal sets and one and two-valve wireless sets were made.

After a lot of experimental work on loops for various frequency ranges, it

became apparent that a spiral loop antenna gives better directional selectivity (nulling) than a conventional 'box' loop, though it is usually more difficult to construct.

Published information on LF loop design is difficult to find, but one fact is clear which is that a long wave box loop requires approximately 3½ times more wire than a medium wave loop. When it comes to LF loops, however, a standard box-style construction is rarely attempted or if it is, then details appear to be seldom published.

From personal experience the LF spiral is a difficult project for the faint-hearted to contemplate designing and making. In addition, the design of a compacted spiral LF loop can be difficult to fit on to a limited table space. For the medium or short wave bands, however, it is a comparatively simple project. The result is not beautiful to look at, but it works superbly and is far superior to a box loop of a similar size. The Spiral is 19½in high by 16in wide. It is not difficult to build providing you follow the instructions carefully and take your time.

## Description

The general view of the antenna in Fig 1 shows an 'X' boom holding the multi-turn spiral winding on a solid base unit, plus the tuning capacitor and a coaxial feedline socket. In Fig 2 the spiral L1 is

tuned by a two-gang, 350 + 180pF variable capacitor wired in parallel, ie 530pF in total. This VC came complete with an impressive-looking reduction drive gearing which unfortunately had backlash, so the gearing had to be removed. Remember that it is essential to use an insulated extension spindle on the VC to eliminate hand capacity effects.

Various means of coupling to the receiver were tried, including coupling directly to an FET amplifier. This worked well, except that the receiver already had a very high RF and IF gain. The most effective coupling loops were two pairs of turns in series (L2). Note that the pairs are spaced apart adjacent to L1. However, facilities were left to enable L1 to be tapped or used with an integral amplifier later if required.

L2 is coupled to the receiver via a 3750pF silver mica capacitor (C1) and a 50 ohm coaxial feedline. C1 was arrived at experimentally for best loop sensitivity-v-bandwidth. If a 75 ohm coaxial feedline is used then a smaller value of C1 should be tried. It should be noted that eliminating C1 widens the bandwidth, thus introducing poor selectivity.

## Construction

Figs 3a and 3b show the construction of the X boom comprising two lengths of sound, dry wood each measuring 24in long by ½in wide which have been

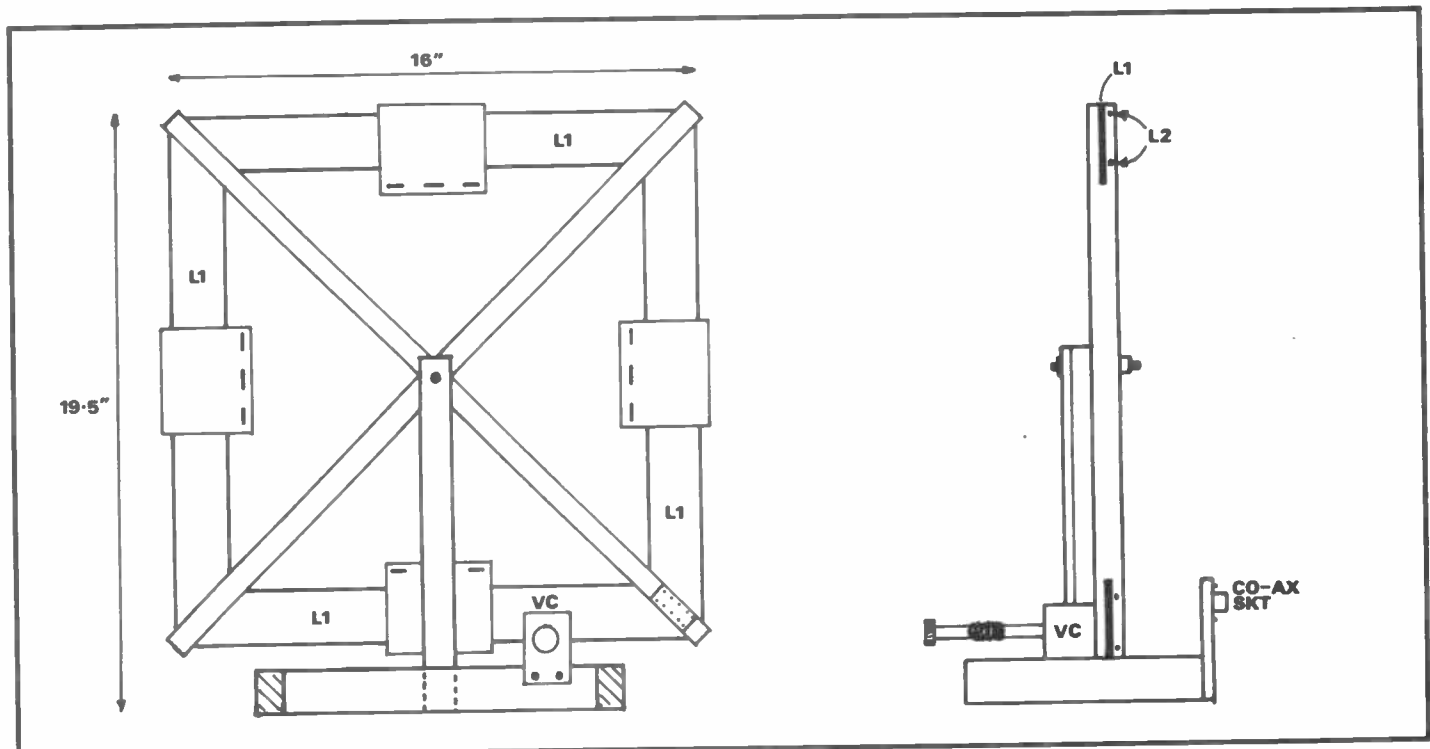


Fig 1: Compacted LF spiral loop antenna

# AN LF SPIRAL ANTENNA SYSTEM

dovetailed together at the centre and secured with a nut, bolt and washers. It should be noted that the two pieces are not at right angles (see Fig 3a).

At the end of each boom-arm a slot is

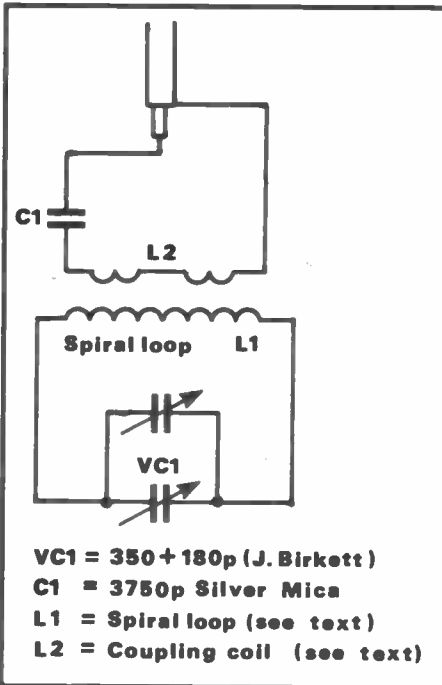


Fig 2: Spiral L1 and coupling loops L2

cut down the 'flat' side to accommodate the loop wire. Before cutting the slot a  $\frac{1}{16}$ in diameter hole should be drilled  $\frac{3}{4}$ in from the end as shown in Fig 3b (this prevents the wood from splitting when sawing the slot). Begin cutting each slot with a junior hacksaw until the saw-frame prevents further progress and then continue with a saw-blade. A small 'V' is filed at the end of each slot to guide the wire into place. Sandpapering the slot removes the saw marks and rounds the edges of the slot.

The base unit shown in Fig 4 is stable enough to prevent the finished assembly from tipping over or falling off a turntable. The vertical member holds the X boom (see Fig 1). After completing the winding it was found that the weight of the wire made the vertical member 'whippy', so a bracing strip was added. Both the X boom and base were finished with a quick-drying teak wood dye. A 5-way terminal block is fitted to the end of the bottom right-hand boom so that the loop can be connected to an amplifier, or to the variable capacitor (VC) if loop coupling turns are used. The block was cut from a standard 12-way block. Only the two outside terminals are used to anchor and space the loop ends, leaving the remaining three holes for possible loop taps later. At the rear of the base unit a coaxial socket is mounted on a

vertical bracket, with the VC fixed to the front of the centre piece and spaced out with a small block of wood to keep it clear of the winding. The exact mounting details of the VC will depend on the VC-type used. An insulated extension spindle should then be fitted to the VC spindle.

A 100m reel of 1/0.6mm PVC wire (1.2mm o/d) was used for winding the spiral L1, and the X boom was removed from the base unit. One end of the wire is anchored to the inner terminal of the block (see Fig 5) and the entire 100m is tightly wound anti-clockwise from one end slot to the other (see Fig 3b). It is necessary to force the wire down the end slots one by one. After three turns the  $\frac{1}{16}$ in diameter holes are filled and then you continue, turn by turn, until all of the wire has been completely wound. This will probably take at least one hour. The wire end is cut and terminated at the outer terminal of the 5-way terminal block. This produces a spiral loop which, if resonated by the VC, will have an LF resonance of well below 140kHz. This is not important at this stage and will be covered later under 'Pruning and tuning'.

With so many turns the wire has a nasty habit of catching everything, so collars should be fitted (see Fig 1) comprising several pieces of glossy card 3in wide by  $4\frac{1}{2}$ in long, folded over sharply from the middle and slipped over each side of the winding then secured with staples (see Fig 5). This is preferable to using insulating tape which makes it difficult to remove the turns later.

The coupling coil L2 is wound by passing two turns through each of the two holes drilled behind the slots (Fig 3b). After bolting the X boom to the vertical member of the base unit, the lead ends of L2 are connected to the coaxial socket via the 3750pF capacitor. The VC is connected to the ends of L1 at the terminal block.

An initial test can be made by connecting the loop to the receiver's input antenna socket with 3 or 4ft of 50 ohm coaxial feedline. Long wave BC stations should be received and a check made of the frequency range. Finally, adjust the loop from 140 to 400kHz (or the required range).

## Pruning and tuning

When the spiral has been completed it will perform over most of the long wave band (BC) with a low frequency of 150kHz (2000m). The initial resonating and nulling tests are done at this stage, and a note should be taken of the frequency range.

The procedure for pruning and tuning the spiral L2 to the required frequency range of 140 to 400kHz (2142 to 750m) is simple. The immediate task is to resonate 140kHz with the VC rotar plates nearly fully meshed. This was done by disconnecting the outer turn of L1 from

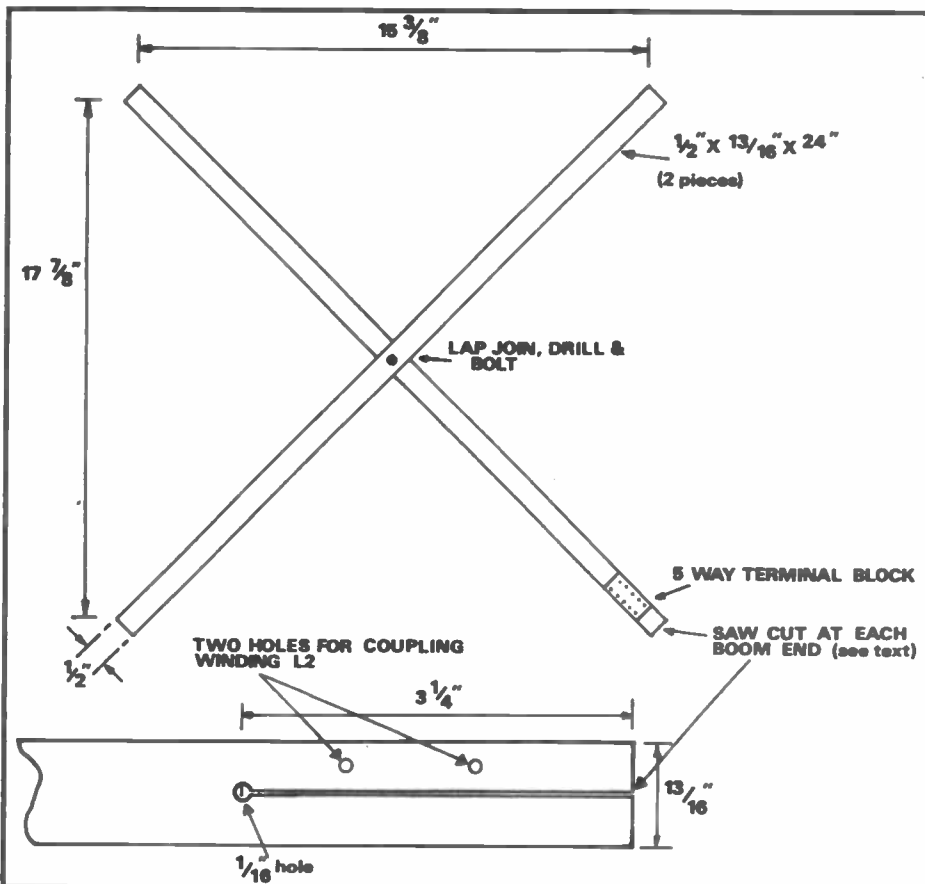


Fig 3a and b: Construction of the X boom

# AN LF SPIRAL ANTENNA SYSTEM

the boom-arm's terminal block (see Fig 3), cutting off one turn, reconnecting, checking and recording the tuning range and then removing each turn until 140kHz can just be resonated while the VC is fully meshed. With the VC plates fully open it peaks at just over 400kHz. Approximately 18m of wire should be removed, leaving 82m of wire in the spiral L1.

## Options

Although this is an experimental project, the LF spiral offers various interesting options to the potential builder:

1. Make the prototype and enjoy using the 140 to 400kHz range (2142 to 750m).
2. Leave the full 100m of wire on the spiral intact to give a low frequency of below 140kHz, thus clipping off the HF end of the long wave band. To obtain further LF a silver mica capacitor of 300pF should be wired across the VC or, alternatively, a  $2 \times 500\text{pF}$ , 2 gang, VC could be used.
3. Remove more wire to get into the HF end of the medium wave band while leaving the VC plates open. This will lose part of the LF end of the long wave band, but should nearly tune to BBC 4 on 200kHz (it's moving to 198kHz).
4. The more adventurous constructor might use the complete 100m of wire and fit a couple of taps on L1 to obtain the facilities of 1, 2 and 3 above.

Whichever option you decide to follow, only remove the turns *one at a time* and keep a running log of 'turns off' and the 'frequency range'. Remember, it is easier to cut wire off the winding than to add it on, and that any variation in construction or winding, however slight, may vary the initial frequency range, although pruning and tuning will cover this.

Constructing a large spiral loop for LF differs from the more usual 40in medium wave box loop which has, perhaps, seven turns of wire, because if you make a mistake the wire can be removed and replaced or rewound. On a compacted spiral loop with a large number of turns wound into slots you are firmly committed, since it would be necessary to start again because of being too hasty with the pruning and tuning operation. Rotation of the loop will either peak-up signals which are wanted, or reduce QRM/QRN and electrical interference from domestic appliances and house wiring.

## Conclusion

The original purpose of this experiment was achieved. In the case of compacted spiral LF antennas, textbook information was unavailable and the result was achieved by proceeding cautiously, step by step, while thoroughly checking the frequency range. The antenna system is sufficiently versatile to enable future ideas to be developed with modifications, rather than having to start from the beginning.

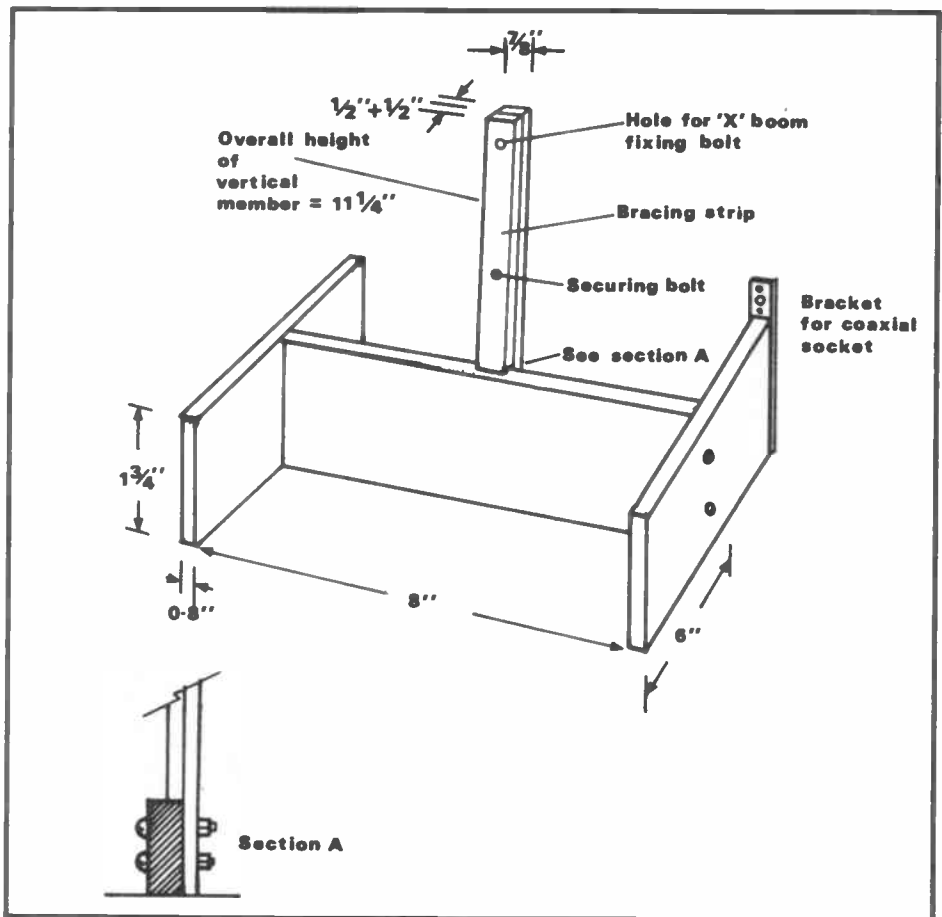


Fig 4: The base unit

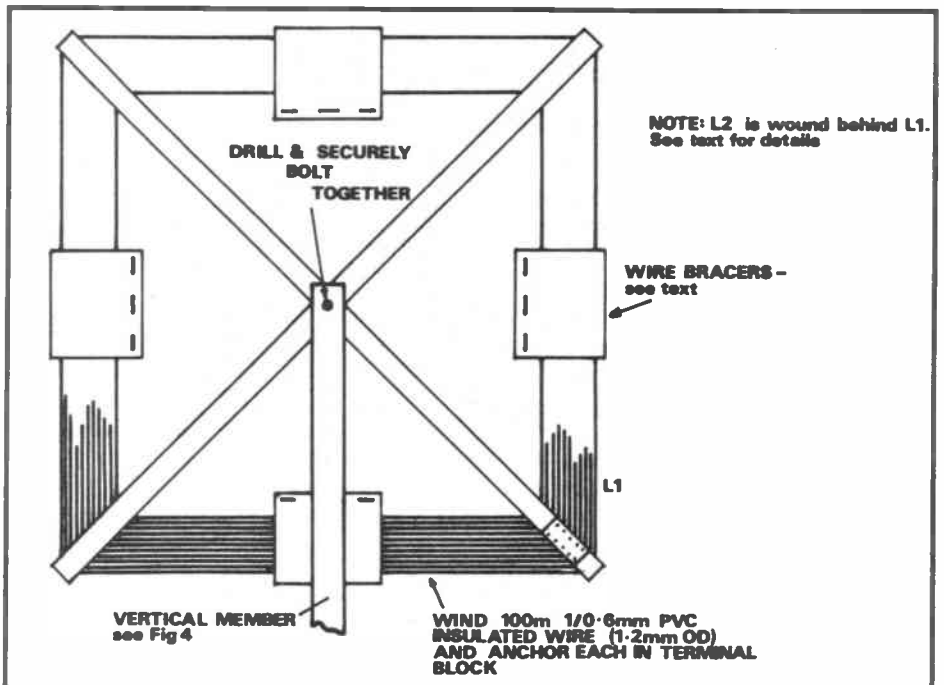
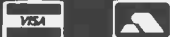


Fig 5: Spiral loop winding details

Although antenna coupling turns are used, they can be ignored when the spiral is used with an amplifier. This loop can be 'tapped' as required by routing the tap(s) to one of the spare connec-

tions on the boom-arm's terminal block. The performance of the LF compacted spiral far exceeded expectations and proved to be a reliable and compact system to use.



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AN362L	2.95	MC1307P	1.00	STK032	7.95	TBA480Q	1.95	TD10129	1.95	UPC1182H	1.95
AN612	2.15	MC1310P	1.95	STK078	11.95	TBA510Q	2.80	TD10131	2.55	UPC1185H	2.95
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AN7150	2.95	MC1358	1.45	STK437	7.95	TBA530Q	1.10	TD10137	2.95		
AN7151	2.95	MC1496	1.75	STK439	7.95	TBA540Q	1.25	TD10138	2.95		
EAS21	1.95	MC1723	0.90	STK463	4.50	TBA550C	1.95	TD10139	2.95		
EA1352E	1.75	MC2037	2.75	STK463	4.50	TBA550C	1.95	TD10140	2.95		
CA3086	0.45	MC3141	2.95	STK0015	7.95	TBA560Q	1.49	TD10141	2.95		
CA3123E	1.95	MC31408P	2.95	STK0029	7.95	TBA560Q	1.49	TD10142	2.95		
CA3131M	2.95	MC14518PC	7.50	STK0309	7.95	TBA570	1.00	TD10143	2.95		
CA3140A	2.95			TA7061AP	1.50	TBA651R	2.80	TD10144	2.95		
CA3140T	2.95	ML231B	1.75	TA7072	1.50	TBA673	1.95	TD10145	2.95		
ETT8010	1.15	ML232B	2.95	TA7073	3.50	TBA750	1.95	TD10146	2.95		
HA1137W	1.95	ML239	2.95	TA7106P	1.50	TBA750	1.95	TD10147	2.95		
HA1156W	1.95	MSM5807	7.75	TA7120P	1.65	TBA800	0.80	TD10148	2.95		
HA1306	1.50	SAA500A	2.95	TA7120P	2.50	TBA810AS		TD10149	2.95		
HA1322	1.95	SAA1025	2.50	TA7130P	1.50	TBA810P	1.95	TD10150	2.95		
HA1336A	1.95	SAA1146P	4.95	TA7137P	1.00	TBA820M	0.75	TD10151	2.95		
HA1366W	2.75	SAA1251	4.95	TA7146P	1.50	TBA820M	0.75	TD10152	2.95		
HA1406	1.95	SAA5020	6.75	TA7176AP	2.95	TBA880	0.80	TD10153	2.95		
HA1551	2.95	SAB3210	3.50	TA7193P	3.95	TBA920	1.95	TD10154	2.95		
LA1201	0.95	SAB8506L	1.75	TA7203	2.95	TBA950ZX		TD10155	2.95		
LA1230	1.95	SAS5708	1.15	TA7204P	2.15	TBA950ZX		TD10156	2.95		
LA201	0.95	SA580	2.95	TA7208	1.95	TBA990	1.40	TD10157	2.95		
LA4101	0.95	SAN990	2.75	TA7222AP	1.95	TBA990Q	1.50	TD10158	2.95		
LA4102	1.95	SL901B	7.95	TA7227P	4.25	TC4270	2.95	TD10159	2.95		
LA4140	2.95	SL917B	8.95	TA7228P	1.95	TC4270SQ		TD10160	2.95		
LA4031P	1.95	SL1310	1.95	TA7310P	1.95	TC4850	2.95	TD10161	2.95		
LA4400	1.95	SL1327	1.10	TA7313AP	2.95			TD10162	2.95		
LA4420	1.95	TA7314P		TA7314P				TD10163	2.95		
LA4422	1.50	TA7321P		TA7321P				TD10164	2.95		
		TA7321P		TA7321P				TD10165	2.95		

### SEMICONDUCTORS

AC126	0.45	BC182B	0.10	BD237	0.40	BF493	0.35	MRF453	17.50	TV106	1.80
AC218	0.30	BC183	0.10	BD242	0.85	BF595	0.35	MRF454	26.50	TV106/2	1.80
AC128K	0.35	BC184LB	0.09	BD246	0.75	BF597	0.25	MRF455	17.50	ZRF0112	16.90
AC141	0.85	BC184C	0.09	BD378	0.35	BRF39	0.35	MRF475	2.95	2N1100	6.50
AC141K	0.35	BC207B	0.25	BD400	0.85	BRF40	0.35	MRF477	14.95	2N1308	1.35
AC142K	0.45	BC208B	0.30	BD434	0.65	BRF89	0.25	OC169V	2.50	2N1711	0.30
AC176	0.22	BC212	0.09	BD436	0.80	BRF90	1.50	OC25	1.50	2N2219	0.25
AC176K	0.31	BC212L	0.09	BD437	0.80	BRF91	1.75	OC26	1.50	2N2626	0.55
AC187	0.25	BC213	0.09	BD438	0.75	BRF42	0.35	OC28	6.50	2N3053	0.40
AC187K	0.25	BC213L	0.09	BD510	0.95	BRF43	0.35	OC29	4.50	2N3054	0.59
AC198	0.25	BC214	0.09	BD518	0.75	BFW10	0.75	OC32	6.50	2N3055	0.82
AC198K	0.37	BC214L	0.09	BD520	0.65	BFW11	0.75	OC42	1.80	2N2702	0.12
AD142	2.50	BC259	0.25	BD534	0.65	BFW16A	1.15	OC44	1.25	2N3703	0.12
AD149	0.70	BC237B	0.15	BD535	0.45	BFW18	1.35	OC45	1.00	2N3705	0.12
AD181	0.50	BC238	0.18	BD575	0.65	BFW92	0.85	OC70	1.00	2N3704	0.12
AD182	0.50	BC239	0.18	BD587	0.95	BFX29	0.30	OC71	2.75	2N3705	0.12
AF106	0.80	BC251A	0.15	BD588	0.95	BFX84	0.25	OC72	8.00	2N3708	0.20
AF114	1.95	BC252A	0.15	BD698	1.50	BFX85	0.32	OC75	1.50	2N3733	0.80
AF129	0.95	BC258	0.25	BD701	1.25	BFX96	0.30	OC81	1.00	2N3773	2.75
AF124	0.65	BC259A	0.30	BD702	1.25	BFX98	0.25	OC94	1.50	2N3792	1.35
AF125	0.65	BC284	0.30	BD707	0.90	BFY18	1.35	OC139	12.90	2N4445	1.15
AF126	0.65	BC300	0.30	BDX30	1.50	BFY50	0.32	OC171	4.50	2N4444	1.15
AF127	0.65	BC301	0.30	BDX53B	1.65	BFY51	0.32	OC200	4.50	2N5294	0.42
AF139	0.40	BC303	0.25	BF115	0.35	BFY90	0.77	OC201	5.80	2N5296	0.45
AF150	0.60	BC307B	0.05	BF119	0.65	BLY48	1.75	CC205	10.00	2N5296	0.45
AF178	1.95	BC327	0.10	BF127	0.39	BR100	4.85	R2000B	1.45	2N5485	0.45
AF239	0.45	BC328	0.10	BF154	0.20	BR101	0.80	R2009	2.80	2N5496	0.95
AU108	0.95	BC336	0.10	BF177	0.25	BR103	0.85	R2101B	1.45	2N54329	0.95
AY102	0.60	BC338	0.09	BF160	0.27	BR200	0.85	R2325	0.60	2SA715	0.85
BC107A	0.11	BC347A	0.15	BF173	0.32	BRCA443	1.15	R2325	0.65	2SA715	0.85
BC107B	0.11	BC461	0.35	BF158	0.22	BRY39	0.45	R2540	2.45	2SC495	0.80
BC108	0.10	BC478	0.20	BF178	0.25	BSW64	0.95	RCA16029	0.85	2SC496	0.80
BC108B	0.12	BC527	0.20	BF179	0.34	BSX60	1.25	RCA16039	0.85	2SC784	0.75
BC109	0.10	BC547	0.10	BF180	0.29	BT100A/02	0.85	RCA16181	0.95	2SC785	0.75
BC109B	0.12	BC548	0.10	BF182	0.29	BT106	1.40	RCA16335	0.85	2SC931D	0.95
BC109C	0.12	BC549A	0.10	BF183	0.29	BT116	1.20	RCA16572	0.85	2SC937	1.95
BC114A	0.60	BC550	0.14	BF184	0.35	BT119	3.15	S2060D	0.95	2SC1034	4.50
BC115	0.65	BC557	0.06	BF185	0.25	BT120	1.65	SKE5F	1.45	2SC1096	0.80
BC116A	0.55	BC558	0.10	BF185	0.25	BT120	1.65	SKE5F	1.45	2SC1106	2.50
BC116B	0.55	BC639/10	0.30	BF194	0.11	BU105	0.95	T6021V	0.45	2SC1124	0.50
BC117	0.19	BCY33A	18.50	BF195	0.11	BU108	1.65	T6027V	0.45	2SC1162	0.95
BC119	0.25	BD115	0.30	BF197	0.11	BU124	1.25	T6299V	0.45	2SC1172Y	2.20
BC125	0.35	BD124P	0.45	BF198	0.15	BU125	1.25	T6366V	0.85	2SC1209	1.15
BC139BC	0.20	BD131	0.45	BF200	0.40	BU204	1.85	T9011V	0.75	2SC1364	5.50
BC140	0.31	BD132	0.42	BF200	0.40	BU204	1.85	T9011V	0.75	2SC1413A	2.50
BC141	0.25	BD133	0.50	BF240	0.30	BU205	1.30	T9015V	2.15	2SC1449	2.50
BC142	0.21	BD135	0.30	BF241	0.15	BU208	0.95	T9034V	2.15	2SC1628	0.75
BC143	0.35	BD136	0.30	BF245	0.30	BU208A	1.15	T9038V	3.95	2SC1678	1.95
BC147B	0.12	BD137	0.32	BF256LC	0.35	BU208D	1.35	THY15/80	2.25	2SC1945	2.75
BC148A	0.60	BD138	0.30	BF257	0.28	BU326	1.20	THY15/85	2.25	2SC1953	0.95
BC149	0.30	BD140	0.30	BF259	0.28	BU326S	1.50	TIP225	0.40	2SC1957	0.80
BC153	0.60	BD140	0.30	BF271	0.28	BU407	1.25	TIP29C	0.42	2SC1969	2.95
BC157	0.12										



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# Short Wave News for DX Listeners

by Frank A Baldwin

All titles in UTC, bold figures indicate the frequency in kHz

Now is the time for listening on and around the 60m band (**4750** to **5060**kHz) for those elusive signals emanating from the Spice Islands – Indonesia.

The prime times for Indonesian station reception are from 1515 to 1800 and 2200 to 2400.

Listed below are some of the Indonesian stations that I have logged here, except where stated, during the past two months.

RRI (Radio Republik Indonesia) located at Ujung Pandang in Sulawesi (Celebes) operates on **4719.3** from 0855 to 1605 or 1625 but sometimes from 2055 to 0030 on, or around, **4753**. The power is 50kW.

On or around the frequency of **4753** with the power of 25kW, RRI Ujung Pandang is on the air from 2055 to 0030 but sometimes only from 0855 to 1605 or 1625. The actual frequency can vary from **4753.1** to **4753.5**. This alternate channel working must be very confusing for the local populace!

Adjusting the receiver to **4774.8** may result in the signals of RRI Jakarta in Jawa (Java) being heard. Programa Nasional is timed from 2158 to 0100 and irregularly from 0958 to 171 with Programa Khusus being on the air from 0100 to 0200 on Sunday and from 0800 to 0958 (irregularly to 1500). The frequency can vary to **4774.5** on occasions.

All RRI transmitters are obliged by law to relay the Jakarta originated news bulletins every hour, on the hour, from 2300 to 0800 and from 1200 to 1700 inclusive. Newscasts are usually preceded by the interval signal, a distinctive repeated musical theme entitled Love Ambon, sometimes termed 'Song of the Coconut Islands'.

RRI Fakfak in Irian Jaya (West Irian) represents perhaps the greatest Indonesian DX achievement realistically possible on the 60m band. I have not heard it so far this season – or during the last one for that matter! The frequency varies from **4789.7** to **4791.1**, the power being varied at will from 0.25 to 1kW. The schedule is from 2000 to 0100 (1kW), from 0100 to 0300

(0.5kW), from 0700 to 1400 (1kW) and from 1400 to 2000 (0.25kW). Around midnight would therefore appear to provide the best chance of providing RRI Fakfak for us DXers located in the UK.

RRI Ambon, Maluku (Moluccas), is reportedly now on **4845.2** (ex-**4863.9**) and parallel **3241.4**. At 10kW, it is scheduled from 2000 or 2100 to 0015, from 0330 to 0600 and from around 0800 to 1400. This station is noted for frequently changing channels, and for this reason is rated as elusive.

RRI Palembang in Sumatera (Sumatra) is another Indonesian station not heard up to the time of writing, and is only rarely logged here in the UK. It operates on **4855.8** with a power of 10kW from 2200 to 0300 and from 0900 to 1600.

Another Irian Jaya transmitter is that located at Sorong. RRI Sorong has a power of 10kW and is active on, or around **4874.9** from 0800 to 1500 and from 2000 to 2200 but has been reported as being active from 2000 to 2200 on **4870** and is therefore thought to alternate these two channels. It has lately been reported by Asian DXers as being on the air at 1330 and 2000. This is another Indonesian station rarely heard here in the UK.

One that has been heard on many occasions during this present season is the 1kW RRI Bukittinggi located in Sumatra. It transmits from 2300 to 2400, from 0800 to 1200 and from 1440 to 1715 but has also been reported as being on the air from 0000 to 0135. It has also been heard signing off at 2135, the schedule obviously varying to quite a degree. The frequency is also variable, from **4910.1** to **4911** in fact.

The frequency of **4927** is that of RRI Jambi in Sumatra. This 7.5kW transmitter operates from 2200 to 0100 (Sunday until 0700) and from 1000 to 1400. This one has been logged here during the first time period, and it is during these times that UK DXers have their best chance of logging the station.

Another Indonesian station recorded in the logbook during this present season is RRI

Surakarta, in Java. When located, this one was found to be on a measured **4931.6**kHz. It operates from 1100 to 1705, the power being 10kW.

RRI Banda Aceh in Sumatra on **4954.7** appears to operate irregularly from 2200 to 0100 (Sunday until 0500), regularly from 0500 to 0800 and from 1000 to 1600, 1700 or 1805 sign-off. However, it alternates with the **3904.8**kHz channel and irregularly is on both frequencies in parallel.

Another frequently heard Indonesian is RRI Yogyakarta in Java. At 20kW, it is on the air from 0930 to 1800 varying in frequency from **5045.8** to **5046.5**kHz. Success with this one sometimes provides a good indication of possible Indonesian reception during that particular operating session.

The out of band channel of **5256.4** provides an opportunity of logging the signals from the 1kW RRI Sibolga in Sumatra. Heard on several occasions recently during our late afternoons in the current season, RRI Sibolga is scheduled from 0900 through to 1900 but has been reported as being on the air from 2230 to 2330.

Lastly, it is worth trying to log the signals of RRI Pekanbaru in Sumatra, on **5894**, during our afternoon period. At 1kW it operates from 0200 to 0830 and from around 1600 sign-on to close at 2200. During this season it has been heard here on several occasions but would seem to be irregular in operation.

## ON THE AIR

We start with some recently heard African stations, but the salient feature of the month has been the logging of several Chinese regional transmitters which, together with reception of some Indonesian originated signals, has resulted in many entries in the logbook.

## AFRICA

### Benin

Cotonou on **4870** at 0545, chants in the African manner followed by a talk in vernacular. The Home Service in French and vernaculars is on this channel from 0500 to 0800 (Saturday and Sunday from

0600 to 2300), from 1100 to 1400 and from 1600 to 2300 with a power of 30kW. An English news bulletin is broadcast irregularly around 2000.

### Cameroon

Garoua on **5010** at 2004, OM with a talk in vernacular. Radio Garoua transmits the Home Service in French and vernaculars from 0425 to 0805 and from 1630 to 2315 but does relay the Yaounde newscasts in English timed at 0530, 1800 and at 2100. The power is 100kW.

### Chad

Radio Mondou on a measured **5287.1** at 0538, ann and songs in vernacular. This station was also heard some days later on **5286.9** at 0457 when it opened with the National Anthem, a choral song, 'Bonjour Madame' then a news bulletin in French. Radio Mondou operates the Home Service in French and vernaculars from 0500 to 0800 and from 1400 to 1830, the frequency sometimes varying to **5290.1**. The power is 5kW and the best opportunity of logging this African station is from 0500 to 0530.

### Kenya

The Voice of Kenya, Nairobi, on **4934** at 0300, OM with the station identification followed by a newscast in English. The General Service in English is radiated from 0200 (Sunday from 0230) to 0630 and from 1300 to 2010 (Saturday and Sunday until 2110). The power is unknown.

### Nigeria

Kaduna on **4770** at 0511, OM with a news bulletin in English. Also heard a few days later at 0432, OM with the station identification, the date (Islamic Year) followed by a religious talk in English. The Home Service 2 in vernaculars and English is carried on this channel, timed from 0430 (sometimes from 0530) to 2305, the power being 50kW.

### Senegal

Dakar on **4890** at 0547, pop music and songs, announcements in French. The National Service in French and vernaculars from Dakar is

around this frequency, varying a few kHz on occasions, from 0600 (Sunday from 0700) to 0830 and from 1515 to 2400. The power is 100kW.

## SOUTH AMERICA

### Colombia

Radio Caracol, Bogota, on **4755** at 0240, OM with the local news, the various place names preceding items but mostly about events in Bogota, this being followed by the station identification, all in Spanish. At 10kW, Radio Caracol on this frequency works around the clock.

### Guatemala

Radio Tezulutlan, Coban, on **4835** at 0120, folk music and songs in Spanish then a talk in Quechua, a few days later being heard at 0017 when radiating some marimba music, a talk in Quechua, followed by some more marimba music, then OM with the station identification in Spanish. This Guatemalan station is on the air in Quechua and Spanish from 1100 or sometimes 1200 to 1830 and from 2100 to around 0230, the power being 1kW.

### Venezuela

Radio Mundial, Caracas, on **5049.9** at 0558, Latin American dance music then OM with the station identification in Spanish. Also heard as late as 0648 when radiating a programme of local pops ending with the station identification in Spanish. The schedule is unknown at the time of writing.

## ASIA

### China

Voice of the Strait, Fuzhou, on **3300** at 1516, YL with a talk in Chinese. The schedule, as far as known, is from 1120 to 1625 with a power of 10kW.

Jilin PBS on **3310** at 2216, YL with a talk in Chinese. This one is difficult to receive owing to co-channel utility interference for much of the transmission period. Just occasionally, however, the channel is clear, this providing an opportunity to hear signals from the transmitter location at Changchun. The Home Service in Chinese is on the channel from 2050 to 0630 and from 0820 to 1505 with an English language lesson timed from 1340 to 1410. The power is 10kW.

CPBS Beijing on **4250** at 2233, an English language lesson ending with 'Goodbye

everyone', an announcement in Chinese, six pips and then the station identification in Chinese at 2300. The Home Service 2 in Chinese, except for the English language lesson, is from 2058 to 2330 and from 1100 to 1600, the power being 50kW.

Heilongjiang PBS, Harbin, on **4840** at 2154, Chinese songs and music, five pips at 2200, the station identification and a newscast. The Home Service 1 in Chinese on this frequency is timed from 2050 to 0610 and from 0855 to a closing between 1200 and 1500. The power is 50kW.

Hunan PBS, Changsha, on **4990** at 1507, YL with songs in Chinese, some orchestral music followed by announcements. The Home Service 1 in Chinese is scheduled here from 2100 to 0100, from 0320 to 0515 and from 0920 to 1610 which includes an English language lesson from 1330 to 1400. The power is 10kW.

### India

AIR Lucknow on **3205** at 1517, YL with a talk in vernacular, also heard in parallel on **3235** and **3355**. Lucknow is on the air from 0025 to 0215 and from 1100 to 1741 with the news in English timed at 1530 and 1730. The power is 10kW.

AIR Gahauti on **3375** at 1525, YL with a talk in vernacular, also heard in parallel as above and additionally on **3905** and **4800**. Gahauti operates from 0025 to 0145 and from 1230 to 1741 and features an English newscast at 1530. The power is 10kW.

### Mongolia

Ulgii, Bayan-Ulgii Province, on **4750** at 0140, Mongolian songs and mandolin music, YL with announcements. The Home Service 1 is carried on this channel from 2200 to 1600, the schedule including relays of the Moscow Foreign Service in Mongolian from 0600 to 0630, from 0930 to 1000 and from 1200 to 1245, in Russian (Tuesday and Friday only) from 1130 to 1200 and in Kazakh from 1330 to 1500. The power is 12kW.

### Nepal

Kathmandu on **3230** at 1511, local style music with songs in Nepali, also heard in parallel on **5005**. The Home Service in Nepali is scheduled from 0015 to 0445, from 0715 to 1015 and from 1145 to 1715 with English news bulletins at 0215 and 1415. The power is 100kW.

### Pakistan

Islamabad on **4780** at 1458, songs and music in the local manner, OM with the station identification, three pips at 1500 then a newscast with several mentions of Ms Bhutto, all in Urdu, this being a relay of the Peshwar Home Service timed from 1300 to 1600. The power is 100kW.

Azad Kashmir, on **4790** at 1505, OM with an Urdu newscast in parallel with the above Islamabad transmission. Azad Kashmir radiates the Home Service in Urdu and Kashmiri from 1145 to 1804, this schedule including a relay of the Radio Pakistan English newscast timed from 1600 to 1610. The power is 100kW.

Azad Kashmir was also heard on **4980** at 0056, a talk with several mentions of Pakistan, OM with the station identification at 0100 followed by a news bulletin, all in Urdu. Azad Kashmir on this rarely heard channel operates the Home Service in Urdu and Kashmiri from 0045 to 0430 at 100kW.

## SOUTH EAST ASIA

### Indonesia

RRI Padang, Sumatra, on **4002.7** at 1536, OM with a talk in Indonesian. At 10kW, Padang is on the air from 2200 to 0100 and again from 0900 to 1600.

RRI Surakarta, Java, on **4931.6** at 1528, songs and kronchong music. The schedule is from 1000, 1100 or 1330 to 1705 with a power of 10kW.

RRI Sibolga, Sumatra, on **5256.3** at 1530, Love Ambon interval signal, OM with the announcement 'warta berita' (news) and many mentions of Indonesia, this being followed by a choral song, all in Indonesian. Sibolga is on the air from 0900 to 1900 with a power of 1kW.

### North Korea

Shinuiju, North Pyongyang Province, on **3919.6** at 2344, sombre orchestral music, OM with a talk in Korean, some songs and then an announcement. The Home Service 1 schedule is from 1958 to 1800 which includes regional originated programmes from 2230 to 2300, 0430 to 0520 and from 1110 to 1800. The power is 10kW.

### Malaysia

Kuala Lumpur on **4845** at 1449, OM and YL with a duet, OM with a talk in Tamil, choral rendition of the National

Anthem and off at 1500. The power is 50kW and the schedule of this Tamil Service is from 2100 to 0100 (Saturday until 0300, Sunday until 1500), from 0200 to 0300, from 0515 to 0600 (Saturday to 1500) and from 0700 to 1500 with newscasts in Bahasa Malaysia timed at 2230 and 1230. The power is 50kW.

### Sri Lanka

Colombo on **4870** at 0019, religious chants in Sinhala, drums, OM with a talk then some orchestral music. This transmitter was also logged at 1556 on a later occasion, OM with a song, some announcements, the station identification at 1600 followed by some promotions in Sinhala. On this frequency Colombo irregularly transmits the Commercial Service in Sinhala from 0000 to 0230 and from 1030 to 1730. An Educational Service in English is radiated from 0235 to 0628. The power is 10kW.

## NOW HEAR THESE

Bukuvu, Zaire, on **4843.7** at 0346, YL with some announcements, African xylophone music, OM with announcements and a talk, all in French. Recently reactivated after an absence of just over a year, the present schedule of the 4kW Bukuvu is unknown at the time of writing.

Parakou, Benin, on **5025** at 0553, OM with a talk in French. This 20kW transmitter operates irregularly from 0500 to 0800 (Saturday and Sunday from 0600 to 2300), from 1100 to 1400 and from 1600 to 2300. The power is 20kW.

## NOW LOG THESE

ABC Brisbane on **4920** at 1928, OM with English announcements amid a programme of recorded Country and Western songs and music. At 10kW, Brisbane operates around the clock.

Radio Kek'chi, Las Casas, Guatemala, on **4844.4** at 0150, OMs with a talk in Kek'chi, some orchestral music, announcements and the station identification at 0200 then off without the National Anthem at 0203. This station reportedly opens between 1030 and 1200 and closes at 1250, opens again at 0000 and closes at 0230, which differs from the sign-off time observed here. The languages used are Kek'chi, a local vernacular and Spanish.

# AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

## Morse code

The BBC's Radio 4 programme 'Today' recently carried a piece on the future of Morse code, basing their commentary on the fact that Portishead Radio, which handles much of the long distance marine traffic, was phasing out the use of Morse code in favour of computer data systems for message handling. There would, they suggested, be few marine radio operators in the future who could handle such traffic via the old, long established Morse code.

One cannot argue against the introduction of the new systems of communication, which are faster and often more efficient than the old Morse code. However, as the BBC's commentator remarked, there are still times when Morse code has its uses, for example, for long distance, lone sailors, such as Chay Blyth and Clare Francis, and sailors whose small craft would be quite unsuitable for more sophisticated equipment.

From our point of view, it seems unlikely that Morse will cease to play a very useful part in amateur radio communications. There are so many occasions where Morse is the best mode to use. In a survey recently carried out by the RSGB on the current feeling amongst their membership about matters relating to the future of amateur radio, the majority of members answering the consultative questionnaire regarded CW as a necessary requirement for the amateur radio transmitting licence. They also pointed out that 'many young people particularly enjoy the fun and experience of learning Morse code'. I firmly believe in this view. The beginner will be much more capable of building or acquiring Morse code transmitters, both technically and financially. Then there are the specialist interests such as EME, meteor scatter and DX working where very weak signals are the order of the day.

Even if Morse code is ultimately erased as a requirement for full amateur radio transmitting licences, it will be worthwhile for the radio amateur who wants to get the best out of his hobby, to learn to use CW properly. There is nothing so enjoyable as being able to 'converse' in CW. Fluency in this type of Morse gives as much pleasure as being able to speak a foreign language.

## 'Glasnost' for amateur radio

Some months ago we mentioned in these columns a 'Space Future Forum' held in Moscow. It was sponsored by the Space Research Institute of the USSR and was timed to coincide with the thirtieth anniversary of the launch of the first artificial earth satellite **Sputnik**. AMSAT was invited to participate at this meeting and took the opportunity of exploring the possibility of future cooperation on amateur satellite projects between American, European and Soviet teams.

The meetings were very useful, took place in a friendly atmosphere and, it was felt, augured well for cooperation between Soviet and American radio amateurs.

It seems that 'Glasnost' is having an effect on the amateur radio scene. Tony Smith G4FAI, in his feature 'Morse Report' in the September 1988 issue of our sister journal **Amateur Radio**, commented on the new-found freedom of Russian amateurs to QSL direct: 'Like everyone else, I know that QSLs with USSR stations must be sent via Box 88 Moscow. Imagine my surprise, therefore, when a UB5 recently sent "QSL DIRECT" to me. Thinking it was a mistake, I replied "QSL VIA BURO"? Back he came with "NO. QSL DIRECT, MY ADDRESS IS... PSE UR ADDRESS"? I sent my card straight away, expecting that if I got one back at all it would be via Box 88. Amazingly, and by return, I received direct, a QSL, a calendar, two postcards and a car windscreen sticker, the latter, of course, in Russian... Is this the new order of things? Has anyone else had the same experience?'

Yes, I have just had a similar experience. I received a QSL card from a Russian SWL, reporting a satellite QSO he had heard me having with a Russian station on the satellite RS11. His letter contained a QSL card and one from the station I had worked. It seems they must have been friends or at least known each other. The letter also contained two self-addressed labels, on one of which was written in English 'I am a collector of stamps'. So things are certainly changing!

There have been reports from short wave listeners that many of the jamming stations operated by the USSR have disappeared during the past few months.

This has been welcomed as it is now possible to hear some of the more choice DX stations which have hitherto been almost completely blocked out by these jammers. Furthermore, it is reported that President Gorbachev specifically mentioned in this New Year's message that he hoped more Soviet and British people would get to know each other, and that wireless jamming of each other's SW broadcasts would cease.

## Amateur radio from MIR

Amateur radio is now well established on the Russian spacecraft MIR. The first amateur radio activities from MIR took place last November, when the astronauts Manarov and Titov made a four-hour spacewalk to repair the Dutch-British telescope mounted outside the spacecraft. This they did successfully, at the same time fixing a quarter-wave antenna for 2m on the outside of MIR. This was for use with a 2m amateur bands transceiver which had earlier been installed in MIR. Manarov had had no experience of making amateur radio QSOs, so to begin with he limited his activities to the times when MIR was over the USSR, so amateur stations in Moscow could help him if necessary. Since then he has been making QSOs with amateur radio stations throughout the world. Some language difficulties have been experienced as no one on the spacecraft at that time spoke English. However, a change of crew towards the end of the year resulted in an English speaking astronaut joining the crew, and since then amateur radio QSOs have been much more frequent.

A number of different frequencies are being used in the band 145.500 to 145.600MHz using FM. The call signs being used are in the series U2MIR through to U0MIR. QSL cards and reports can be sent to: B Stepanov, UW3AX, POB 679, Moscow 107207, Moscow, USSR.

## MIR interview

Whilst there are reports of successful amateur radio contacts with MIR from around the world, few have been confirmed from British amateurs at the time of writing. However, I received a very interesting letter from my daughter in Hamilton, Canada, saying that they had heard an excellent programme on their broadcast radio of a QSO made by a



Canadian amateur with MIR. She writes: 'I heard a fascinating interview on the radio some weeks ago about a Canadian (Albertian) radio amateur who had managed to contact the Russians in that satellite that's been circling the earth for a year. He had taped some of the call and it was so interesting to hear them talk together. It was after midnight when they made contact - his English was not very good but they had a good conversation. The Canadian amateur said he did not want to hog the airwaves and let others talk as well. There was only an eight-minute time span before his signal got too weak - but it was all very exciting. Was wondering if anyone in Britain had managed to speak to him?'

### Ward Hunt Island expedition

Last month we gave some preliminary details of the forthcoming expedition by Sir Ranulph Fiennes to the North Pole. More details are now available about this, the third expedition to the North Pole for an 'unsupported' journey to the geographical North Pole. The intention of the expedition is for two people pulling sledges without any mechanical support, to make the journey on foot as did earlier explorers. No help from aircraft or other mechanical aids will be provided. The expedition will start from Ward Hunt Island in the north-west territories of Canada and will travel 450 miles in temperatures averaging -45° Celcius.

Previous attempts have had to be called off because of the weather and dreadful travelling conditions. The ground is not flat and smooth as might be expected from our experience of heavy snow, but is rough ice with pressure ridges over which sledging is at times almost impossible. Lawrence Howell GM4DMA and his wife Morag GM1ILL joined the last expedition as radio operators and they will be going this time to carry out radio observations and scientific experiments.

### Base camp

The base camp consists of a canvas hut about 15ft by 10ft. The Howells' tasks will include maintaining a round-the-clock radio watch for the sledging party and carrying out a number of scientific observations including providing meteorological data for the World Meteorological Organisation, some ice core drilling sampling and investigating the local flora and fauna. They will carry out propagation experiments on 50 and 144MHz and satellite communication using the Russian amateur radio satellite RS11. The very high geographic and magnetic latitudes will add an interesting dimension to these observations.

They expect to arrive at Ward Hunt Island on 3 March. Listeners should look for their signals on 50.110 and 144.123MHz and on 14.345MHz in the 20m band. Callsigns to be used are GM4DMA/VE8 and GM1ILL/VE8.

### UoSAT-2

UoSAT-2 is five years old on 1 March. It was launched by NASA as a 'piggy-back' secondary payload accompanying the spacecraft LANDSAT-5 into a 700km, polar, sun-synchronous orbit on 1 March 1984. The spacecraft had been built within a very short period of six months by the UoSAT Spacecraft Engineering Research Unit at the University of Surrey. Throughout its five-year operation in a low-earth orbit, UoSAT-2 has supported many wide-ranging experiments, among the most recent being communications with members of the Transpolar Skiing Expedition using the digtalker.

UoSAT-2 is tracked by thousands of radio amateurs, school children, students and amateur scientists world-wide in addition to numerous professional establishments. The spacecraft has provided a wealth of information on cost-effective spacecraft-engineering techniques, whilst also stimulating a great interest in the direct use of satellites in space education.

The University of Surrey has signed an agreement with Arianespace for the launch of two more similar satellites into an 800km, polar, sun-synchronous orbit on the Ariane launcher which will be launching the SPOT-2 primary payload during the coming year. Progress on building these two satellites at Kovrov, French Guyana, is progressing satisfactorily.

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

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

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

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The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.

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



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# ATV ON THE AIR

## Andy Emmerson G8PTH puts you in the picture

### Unique airing for ATV on satellite

This year's ATV coverage of the Pasadena Rose Parade was uplinked to Galaxy 2 transponder 5! OK, I'll explain...

The Rose Parade is one of the USA's largest pageants, a bit like the Lord Mayor's Procession in London. For several years ATVers have provided video cameras along the route plus motorcycle mobile and even helicopter cameras, all linked back to 'movements control' to assist the police and ambulance services during this three-hour event. It's like a giant Raynet exercise, only with live video as well. It's a superb public service event and gains amateur radio a lot of favourable mentions.

This year, however, the video went out on a commercial satellite, so that anyone with a home TVRO could watch the proceedings! This was broadcast for two hours between 0800 and 1000hrs PST on Monday 2 January. The idea to uplink the video coverage came from Dave Steinfeld WA6ZVE, who works for Hughes. He wanted to do something that was unique and also portray ATV to the public in a favourable light; fortunately he was able to buy some unwanted satellite time from his company at a token cost (\$150 an hour).

The video was live and raw, just as it was put out by the portable repeaters (built by Ernie Williams WB6BAP) to the receivers at the Tournament of the Roses command centre, parade starting line and law enforcement headquarters. Inputs on 434.0MHz from at least six portable and fixed ATV stations along the parade route went out on 1265.0MHz and 10.28GHz to the respective communications centres. Tom W6ORG was up in his Enstrom helicopter to give a birdseye view of any incident back to ground to augment the ground-level signals. The 2m audio used to direct video transmissions was also repeated on the output sound subcarrier.

The resultant signal was then relayed on 10GHz to the satellite earth station for uplinking and was also transmitted on the K6KMN ATV repeater on 1241.5MHz (at an altitude of 6,000 feet on Mount Wilson). Wow!

### New 70cm bandplan

Interference between established TV amateurs and the growing band of packet radio operators in Germany has reached chaotic proportions, and the situation in the Netherlands is not much better. Accordingly a new bandplan has been proposed by the German and Swiss ATV clubs which should alleviate the problem.

This is what they are proposing:

1. ATV vision carrier to be shifted to 434.100MHz.
2. ATV sound carrier thus becomes 439.600MHz.
3. This leaves room for twelve duplex digipeater inputs above the ATV sound carrier, viz from 439.675 (DD1) to 439.975MHz (DD12).
4. With a 9MHz shift, this gives digipeater outputs on 430.675 (DD1) to 430.975MHz (DD12).
5. Simplex digipeaters should use from 430.600 (D1) to 430.650MHz (D3).
6. Individual packet radio traffic should use only the bands from 438.025-438.175MHz and 433.625-433.775MHz, avoiding interference with ATV traffic.

Shifting the ATV vision carrier 150kHz lower may cause some occupancy of the upper part of the beacon band due to the lower vestigial sideband, but this should be minimal. Though not perfect, this bandplan should achieve the best compromise between the various modes on 70cm and the minimum QRM. Note that ATVers in Germany virtually all put out sound on the 5.5MHz sound carrier and (try to) filter out one sideband. We seem to have more flexibility here as well as no PR interference, since thankfully (for us at least) the Ministry of Defence has effectively banned digipeater operation on 70cm. We should be grateful for small mercies...

### Dragon computer

A little while ago I was trying to get hold of the circuit diagram for this computer, which is still used in many ham shacks. In case you too can make use of this, you can get one for the princely sum of £1.00 from Mike Stott, 10 Mellor Close, Prescot, Merseyside L35 1RL. Mike runs NDUG, the National Dragon User Group, which provides a lot of support for users of this well-made machine.

### Computer-video links

Many people have the dream of using their computer to produce attractive graphics, captions and titles to transmit over the air or to graft on to their video films. In the past I have covered captioning programs and ideas for genlocking in this column, but there is a new generation of computers which I haven't mentioned.

Most variants of the IBM PC (and its clones) are a dead loss, since they use a 60 or 70Hz frame refresh rate and you will never get a PAL VCR to lock-up to that. The Atari ST and Amiga computers seem to offer more hope, so the next few words are devoted to these machines.

If you intend to superimpose computer graphics on existing video signals you need to be able to 'genlock' or slave the

computer to the other video signal – or vice versa. Normal home video cameras cannot be slaved or locked to an external video source, so that means you must get the computer to accept external control signals. This of course is easier said than done and not the province of the rank amateur.

The choice between the Amiga and the ST is a difficult one, simplified for many people by the £100.00 price difference between the basic models. Apparently Amigas have been used to generate graphics on both BBC2 and Channel Four, on shows such as Network 7, Def II and The Chart Show. There is a superb video graphics software package for the Amiga called VideoStudio, costing £79.95 but apparently worth every penny. Details from Probe Marketing on (0621) 783504. On the hardware side, I understand there is an official genlock version of the Amiga but it is rather expensive, and a lower-cost add-on device would be a more attractive course. The 'Minigen', from Applied Systems and Peripherals on (0724) 280222, is said to be the lowest cost genlock unit for the Amiga; it costs £115.00 and simply plugs into the back of the computer. I saw a review of this gadget in the issue dated 15 December of **Popular Computing Weekly**, and the author seemed reasonably satisfied with it, if not ecstatic.

For the ST the picture is less clear; I have heard rumours of genlock units but most of these seem to be vapourware. The only name which has appeared in print is the unit made by Rendale and sold by SCC Mail Order, 29 Crowtree Road, Sunderland SR1 3JU (091-565 5756). This may be vapourware as well, since a request for information brought no response. If any of you have firm details please write in and tell me, because I have had several requests for information on this subject. Not having either of these computers I am not as well-informed as I'd like to be.

### Letter from America

W1REQ of the IVCA writes not to say thanks for the mention but that his address is 101 Oenoke Lane, New Canaan, Conn 06840 (not number 99 as I accidentally stated in the November article). Apparently sending mail to number 99 causes problems, so perhaps he doesn't get on with his neighbours!

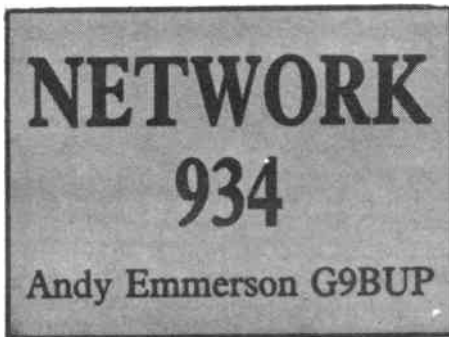
### X-band enquiry

Are you on 10GHz ATV? I shall be featuring this up-and-coming mode in a future article and I'd like to compile a register of who's already active on the band. Please drop me a line – thanks!

### On-air news

A detailed letter from Terry HC62/UK845 at Hersham starts us off. He writes, 'the usual Christmas day morning Essex-Middlesex-Surrey network took place and was, I am sure, enjoyed by all of the stations who participated. It is good to know that there is a great number of stations "out there", but regretfully they are infrequent users of the 934.

'The old year went out and 1989 started with good working conditions on New Year's Eve and Day. My contacts included UK476/CL117, Phyl at Ventnor, Isle of Wight (110km). Brian (believed to be SH07) at Gosport, Hampshire, was heard prior to my break call. No Phyl, I was not mobile on the Isle of Wight but speaking from Walton-on-Thames! Ralph GR587 and Ken ID01 were logged in Biggleswade, Bedfordshire (100km), also Dory DT01 in March, Cambridgeshire and Fred KS04 at Peterborough (120km)'.  
Terry continues, 'it was interesting to learn at the DTI meeting on 5 December 1988, at Waterloo Bridge House, that it costs the DTI £450,000 a year to have the Post Office collect licence fees for them; so I anticipate licences will be renewable at Chesterfield. Nice to learn too that 934 is "a well-balanced frequency", but even so, they were not able to make a commitment as to antenna relaxation. Pleased to hear, however, that apart from the withdrawal of specification MPT 1321, it was accepted that the useful life of our transceivers could extend to twenty years.



'Would you please be good enough to mention in your column that subscriptions to the 934MHz Club are due in April for 1989/90?'

Consider it done, Terry, and many thanks for such an informative letter. We could do with more news of this kind. And if our sets have another twenty years of life in them, will I still be writing this column in twenty years' time? It already feels as if I have been writing it for twenty years!

### Here and there

From the frozen north came Christmas greetings, courtesy of Stevie and the Black Diamond Circle. She says, 'please give our best 73s to all radio enthusiasts'. I am delighted to do so, and hope our 934 readers manage a few contacts up to Yorkshire where most of the Black Diamond folk reside. The mild weather at the time of writing was certainly helping DX contacts.

### 902MHz

From time to time, I have mentioned the 902MHz band in the USA which is so similar to our own. More commercial equipment is now appearing for the 33cm band. In the **73 Amateur Radio** magazine, Pete Putman KT2B recently reviewed products by VHF Communications and SSB Electronics. The former offering is a 902MHz transceiver and attenuator/post-amp board which bolts on to a 2m rig to give full transmit and receive facilities on 902MHz. Power output is 2W which is adequate for QRP contacts, or can be used to drive a 'blue brick' amplifier gain block to 20W output. Since the unit is linear, SSB and CW can be used as well as the 'normal' FM mode. The price is \$348.00.

Whereas the former products are PCBs which are ready to put inside the cabinet of your choice, the SSB Electronics linear transverter LT-33S is a fully finished unit in a smart instrument case and comes complete with panel lights and power meter. Output is in excess of 20W. KT2B used it with a 33-element loop yagi to achieve several DX contacts (distance not specified). Send me a self addressed envelope if you want any further information on these products.

### Blast from the past

No more news this month (why didn't you send some?), but stand-by next month for a round-up of some classic products from the past.

# MEDIUM WAVE



by Steve Whitt

### Round the clock

It is possible to DX on the medium wave band twenty-four hours a day (provided you don't need to sleep) but the band has two distinctly different 'personalities' according to the time of day. During daylight hours MW radio signals are absorbed in the lower layers of the ionosphere and only ground-wave signals propagate; these signals radiate away from the transmitter rather like ripples in a pond and allow reception at distances up to about 500km. Daytime is a good time to listen for low-power local radio stations in the UK, since very few

distant signals are audible and therefore interference is at a minimum.

At night the ionosphere tends to reflect, rather than absorb, MW signals and thus energy radiated upwards from a transmitter is reflected back down to earth at some point far away from the transmitter. It is quite possible for night-time signals to undergo multiple hops with alternate reflections occurring in the ionosphere and off the earth's surface. This mechanism allows reception to take place many thousands of kilometres away from a transmitter. For example, Radio Globo (1220kHz) in Rio

de Janeiro, Brazil, is regularly heard in the UK, its signal having to cross 9500km of ocean on the way. You will, of course, notice that night-time sky-wave propagation fills your radio dial with hundreds of powerful European signals, so how is it possible to hear the weak DX signals?

Over the years, international broadcasting organisations have agreed a bandplan arrangement on the MW band which entails all stations in one area operating on fixed frequency channels. This has been arranged to maximise the number of broadcasters who can operate and to minimise the degree of interference affecting the listener. Fortunately for the DXer, international agreement is not perfect and as a result different MW bandplans are operated in different continents; most European, African and Asian stations use channels that are exact multiples of 9kHz, whereas in the Americas channels are assigned as multiples of 10kHz. This means that by tuning between the European broadcasters, reception of transatlantic stations becomes possible. For example: 1008kHz (112 × 9kHz) – NOS Hilversum, Holland; 1010kHz (101 × 10kHz) – WINS New York, USA; 1017kHz (113 × 9kHz) – SWF Baden Baden, Germany.

This particular example also illustrates the value of knowing a station's timetable. Although reception of WINS is technically possible as soon as a path of darkness exists between New York and the UK, NOS is a pretty powerful signal

and will cause interference. However, the Dutch station signs off for the night at the unusually early time of 2100 or 2200hrs (GMT) and, knowing this, it is possible to tune a virtually interference-free signal from WINS before midnight. If you've yet to hear your first American station, WINS is a pretty good bet; try any time after 2300 and listen for an all-news/talk station with the slogan 'Give us twenty minutes and we'll give you the world'.

### Out of town stations

Amongst the North American stations heard fairly regularly by DXers in the UK and Europe, are several 50kW clear channel stations on the eastern seaboard of the USA. For the listener trying to catch as many stations from different states, there can be some confusion.

The Federal Communications Commission always defines a particular city or town as a station's authorised city of licence, but this does not define the physical location of the transmitter and antennas. To illustrate this point let's take a closer look at New York City stations in the table (bottom right).

As you'll notice, several of these stations are in fact located in New Jersey which, normally, is not one of the easiest states to log and verify if one goes by listings of stations and their city of licence. In addition, the easiest station to log from Philadelphia, WCAU on 1210kHz, is not in fact located in Pennsylvania at all, since its transmitter facility is located at Moorestown in New Jersey. There are, of course, many other examples of this sort of anomaly throughout the world (including here in the UK) and unless the DXer has accurate information to hand, it is common practice to use the city of licence as the guide to a station's location.

### World Radio TV Handbook

Undoubtedly the most vital reference book for any DX shack (for either the MW or the SW listener) is the **World Radio TV Handbook** published by Billboard. You might still find the 1988 edition in the shops but at the time of writing, the new 1989 version is just being printed to be ready for distribution from February onwards. This year, as for the previous two, the cover price is £17.95 in the UK. The 1989 edition includes the following features: WRTH Radio Industry Awards, a review of radio-related computer software, a separate section called 'Listen to the World', satellite TV, MW in Asia and the regular equipment test-bench. This year much of the publication has been computerised and this should have shortened the lead-time between compilation and publication, potentially increasing the accuracy of the information.

### Channel check – DX tip

**1350kHz:** In Europe this frequency is dominated twenty-four hours a day by two transmitters at Nice and Nancy in France, carrying France-Inter program-

ming. On the same frequency but by no means as strong as the French signals are four transmitters in the USSR plus local transmitters of 10kW or less in Greece, Hungary and Yugoslavia. The last one, Studio B in Belgrade, is easily heard when France is off the air.

Meanwhile, on the other side of the Atlantic 1350kHz is designated as a regional channel with around seventy stations in North America on the frequency. Another dozen or so stations in Central America use the frequency along with thirty-five in South America.

The best time to DX this frequency is when France-Inter is off-air for maintenance, which happens for four hours every Tuesday morning between 0100 and 0500hrs French local time.

Generally speaking, the best times to DX 1350kHz are between 2305 and 0258UTC in the summer and between 0005 and 0358UTC in the winter.

DX possibilities are: WLRQ, Cocoa Beach, Florida – 1kW (formerly WEZY); WNIS, Norfolk, Virginia – 5kW; CKAR, Oshawa, Ontario – 5kW.

I wouldn't want to raise your hopes too far since this channel has always been a difficult one; in fact, nothing has been reported in the UK from Central or South America in the last decade!

### Newsdesk

This month the newsdesk is dominated by the confused goings-on in the Irish Republic. On 31 December 1988 new tough legislation came into effect to outlaw the unlicensed Irish broadcasters who have flaunted the law for many years. Most stations decided that £20,000 fines were too great a risk to bear and duly closed down. In fact, many stations did not wait till the midnight deadline on the 31st but signed off around midday in order to maximise audience impact; bearing in mind the New Year celebrations, most stations would not have had many listeners if they had staged their farewells at midnight.

Of about sixty or so stations operating before the new law took effect, a handful decided to press on regardless. At the forefront was a defiant Radio Dublin (still on 1188kHz and 6910kHz SW) who went to court to challenge the new laws on constitutional grounds. It is also known that Radio Star Country on 891kHz continued past the deadline, and that several stations which had closed down either played continuous taped music instead of normal programmes or, in fact, returned early in January.

So far no raids have taken place but in a round-about way the Irish government


appears to be implementing the law. They have instructed the Electricity Supply Board and Telecom Eirrean to write to illegal stations asking them for a good reason why their electricity supply and phone lines should not be cut off. The situation seems to be rather volatile and much could have happened by the time you read this column.

Briefly returning to these shores, the latest news on the local radio front comes from Radio Brunel in Bristol. This is the first station in Britain to be targeted at the over-forties. The music is provided by Frank Sinatra, Ella Fitzgerald, Cole Porter and others of that ilk. In addition, classical music is featured every evening. This mix of programming is aimed at the 'glammie' market (greying, leisured, middle-aged spenders). If successful in Bristol, I could imagine further success in typical retirement areas such as Devon and Cornwall and the Sussex coast. Of course, Radio Brunel is not new but merely a relaunched MW service (1260kHz) from GWR which now carries separate VHF-FM programming.

### DX file

Since I returned from my November DXpedition it has seemed that medium wave radio conditions have been less than spectacular; then again, maybe I've been spoiled by the benefits of listening in Scotland with all the right gear! A few regular stations (VOCM-590, CJYQ-930, WINS-1010, etc) have been making the trip across the Atlantic, but the only station that made my ears prick up was from Italy. Try looking for Radio International from Verona just outside the top end of the band; they are nominally listed on 1620 but I heard them on 1619.15kHz. Strangely enough, this is the first time I've logged the station (at around midnight) so either they were on an extended schedule or operating much more power than usual, since their signal was quite good. If you do hear this station you can send your reception reports to the Station Director, Flavio Mischi, at the following address: Corso Porta Palio 36, 37122 Verona, Italy.

### Sign-off

I'm afraid that rounds up the column for yet another month. So until we meet again don't forget to send in (care of **R&EW** in Brentwood) any queries you may have or any information you can offer about medium wave radio. Details of the stations you've been hearing recently would also be very welcome for the DX file. Good listening. 

Frequency	Station	Transmitter Location
660kHz	WFAN	High Island, New York State
710kHz	WOR	Lyndhurst, New Jersey
770kHz	WABC	Lodi, New Jersey
880kHz	WCBS	High Island, New York State
1010kHz	WINS	Lyndhurst, New Jersey
1050kHz	WUKQ	East Rutherford, New Jersey
1560kHz	WQXR	Maspeth, Queens County, New York City

# DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

The excitement created by the F2 layer propagation didn't exactly spill over into November. Past experience with this mode of propagation shows a recurrence in activity about twenty-seven days later but at the time of writing, no further signals of similar impact have been experienced here in Derby. However, Chris Howles of Lichfield reported a brief F2 encounter on the 6th.

Sporadic E reception established itself on various dates throughout the month. There was widespread reception of Spain and Italy on the 13th, and a longer opening lasting for much of the morning was present on the 17th. Simon Hamer of New Radnor in Powys noted several unidentified signals on channels E2 and R1.

Reception via enhanced tropospheric conditions prevailed for much of the month, although activity was at a very low level on some days.

## Eleven-year sunspot cycle

At roughly eleven-year intervals, solar activity reaches a peak. The activity is

created by severe magnetic storms within the sun's photosphere. These storms are visible from the earth and appear as dark areas known as sunspots. A high number of sunspots generates an enormous amount of energy which ionises the F2 layer some 350km above the surface of the earth. The actual height of this layer is not constant. It depends upon various factors such as the time of day, the amount of solar activity and the time of the year. During daytime in winter, ionisation is at its highest and television reception via this mode of propagation is more likely to occur between October and March in the northern hemisphere.

## First encounters

Most enthusiasts first encountered TV signals via the F2 layer towards the end of 1978 during cycle 21. Signals were also noted throughout November and December. In 1979/80/81 the bulk of the reception occurred during October, November and December with peaks noticed around the middle of each

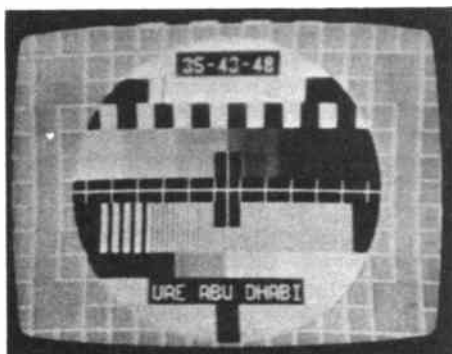
month. Activity during the first three months of each year was very low compared with the autumn months.

Thursday 19 October, 1978 was a date to remember. At lunchtime an intense opening brought in strong F2 signals from the USSR, when the 0249 test card and a 'blockboard' pattern were deciphered among the severe multiple images present on the screen. Below channel E2 there were various communication networks that could be heard, some of which sounded like Russian. When the aerials were directed to the west, American voices could be heard with occasional snatches of Indian music breaking through. At first, TV DXers didn't really know what to expect from this novel mode of propagation. Would signals like this be few and far between? Fortunately the answer was no, and during the next few winters, Bank 1 transmitters were received at phenomenal distances.

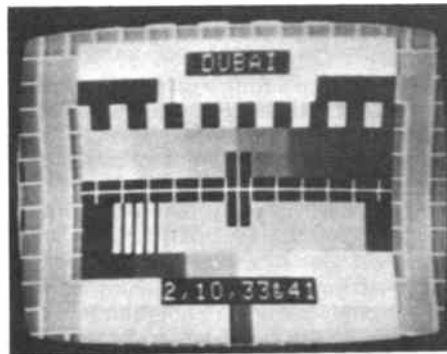
## DX-TV log for November

The following DX-TV reception was

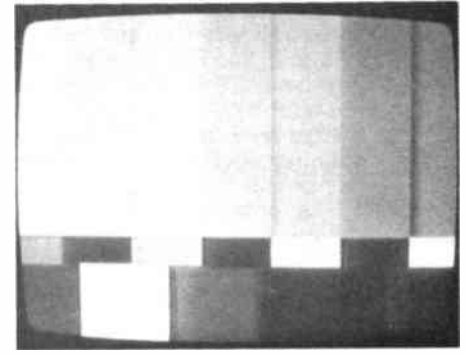
# PHOTO FILE ● PHOTO FILE ● PHOTO



**Fig 1:** The PM5544 as used by Abu Dhabi. The channel numbers are shown at the top



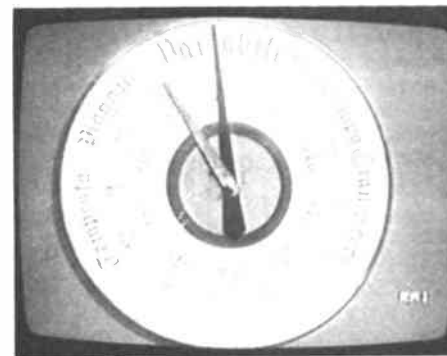
**Fig 2:** Modified PM5544 test card used by Dubai with channel details at the bottom



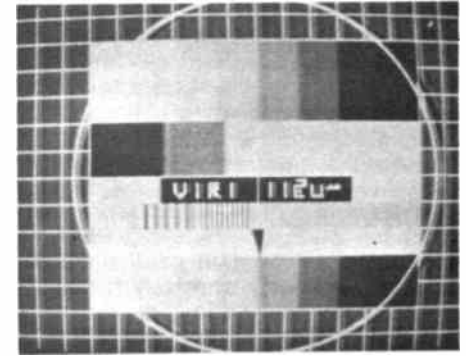
**Fig 3:** Electronic test pattern used by the Canadian Forces Network



**Fig 4:** Italian clock caption radiated by the first network of RAI



**Fig 5:** Caption used at the end of the Italian weather forecast



**Fig 6:** Iranian FuBK test card. Note the graduated band at the bottom

# DX-TV RECEPTION REPORTS

logged by Garry Smith of Derby during November:

**02/11/88:** NRK (Norway) on channel E2.  
**04/11/88:** Dutch, French and Belgian tropospheric signals in Band III.

**06/11/88:** F2 communications below channel E2; RTL PLUS (German-language service from Luxembourg) on channel E7 via enhanced tropospheric conditions.

**07/11/88:** SVT-1 (Sweden) on channel E10 with the 'KANAL 1 SVERIGE' PM5534 via meteor-shower (MS) propagation! Also noted on channel E4 slightly later.

**13/11/88:** JRT (Yugoslavia) on E3 with subtitled programme; TVE-1 (Spain) E2; RAI (Italy) on channel IA - all via Sporadic E between 1000 and 1040GMT.  
**14/11/88:** TSS (Russia) on R2 with the UEIT test card via Sporadic E.

**15/11/88:** CST (Czechoslovakia) on channel R2 radiating the EZO test card; TSS on R2 with the UEIT test card.

**17/11/88:** TVE-1 on channels E2, E3 and E4; RTP (Portugal) on E3 via Sporadic E.

## Reception reports

A mid-morning Sporadic E opening on 2 November produced a variety of European stations for Bob Brooks of South Wirral. Among them was Bantiger (Switzerland) on channel E2 showing the '+PTT SRG 1' FuBK test pattern. He also logged programmes from Italy on channels IA and IB. The last signal to be received was Canal Plus on channel L3 showing cartoons at 1245. Other good days were the 3rd when Spanish programmes, including *Dynasty* in colour, were resolved between 1030 and 1100 on channels E3 and E4. The Russian test card was resolved on the 14th on channel R2 followed later by Czechoslovakia on R1 and Switzerland on E2. The most intense opening occurred on the 17th with signals present between 0835 and 1145GMT. The opening was from the south with high-level Spanish signals on channels E2, E3 and E4 showing Breakfast TV, *Dynasty* and a programme on hairdressing. The same opening also brought in Portugal on E3 and Italy on IA and IB.

'The 14th was a strange day', writes Kevin Jackson of Leeds. 'I had RTE at really high levels on Ch H and a few Irish radio stations at FM. Also present were NRK from Bokn on E5 and Switzerland on E34, with nothing else at all. It must have been some form of ducting effect associated with the foggy weather that day'. Kevin logged a new country at UHF on the 16th when test patterns from the new Danish outlets at Aabenraa and Videbaek emerged. A surprise Sporadic E opening on the 17th gave sustained signals from Spain and Italy for nearly three hours. In addition to the state channel RAI on channel IA, an Italian private station was detected. An advertisement for a fur coat was being shown accompanied by a telephone

number in the lower corner of the screen. Some form of symbol or logo appeared on the left. Unfortunately, the co-channelling was so bad that the writing could not be made out. The station seemed to be a more upmarket version of another private station called Telemarket, which shows masses of low-budget adverts - a sort of armchair shopping channel.

Dalibor Frkovic of northern Yugoslavia has been experiencing signals on channel E3 from the south-west during the late afternoon and early evening period, but sometimes as late as 2100 local time. The sound channel has never been resolved but at times the pictures are fairly distinct. Once he saw Negro people in traditional African dress and also a test pattern composed of vertical stripes. There are also many breakdowns in the transmission! So far there have been no real clues as to its origin.

David Glenday of Arbroath has once again received the new Danish TV2 PM5534 test card. The most recent reception took place on channel E30 at 0950 on 17 November from the Hedensted transmitter. Sporadic E signals from Spain were observed later in the morning on E2 and E4. The serial *Dynasty* was being broadcast.

## Low-power success

According to Joop Prosée in the Netherlands, the 1kW WDR-1 (West Germany) outlet at Ibbenbüren/Tecklenburg on channel E8 relays the 'WDR1 Mü 32' FuBK from Münster. WDR-3 is relayed on E5 from the same site. This means the mystery WDR-1 reception of 14 June, seen by Garry Smith, Kevin Jackson and Mark Dent was the genuine thing rather than a switching error!

Joop has also commented that Simon Hamer's Icelandic reception in Band III via Sporadic E early last June was a remarkable achievement, considering the great distance involved and the fact that both the E6 and E7 transmitters have directional aerials. Vadlaheidi E6 is situated in the north-west of the island and is totally shielded by mountains in the direction of the UK and the Netherlands. The main radiation directions are 108° and 317°. The Hafell transmitter on channel E7 is situated on Iceland's south coast with 1100kW ERP. Radiation direction is 62°, (47° to 77°). Joop has estimated that the power directed towards the United Kingdom from both transmitters would not be more than between 1kW and 5kW.

## Not a world-wide record!

The '6m Record' heading in a recent issue of *R&EW* and Joop Prosée's reference to an 'absolute record' were, of course, referring to record reception conditions noted in the Netherlands and were not a world-wide event! The Netherlands-Texas opening was not via

F2 layer propagation - this mode of propagation could not provide reception distances far in excess of 7500km. Duncan Fraser in New Zealand has commented that the NZ record is Wellington-VE1 (New Brunswick?) which is approximately 14,000km.

## Malaysian reception

Lt Col Rana Roy is experiencing spectacular openings from Malaysia at his location in northern India. The propagation is thought to be either F2 or a form of TEP (Trans-Equatorial Propagation). Reception has occurred as early as 0730 local time but much of the reception was noted from late afternoon onwards, mainly on channel E2 but signals on E4 have also been encountered. Rana writes, 'They have programmes in Malay, Mandarin and at times I have seen script which is similar to the Malayalam script used in southern India. The main identification is a number "3" which is present in the lower right-hand corner of the screen for most of the time. For much of the time the signals are strong and in colour, although due to smearing the colours are not very good. As I write this letter, I am watching a movie from Malaysia. Their sound channels are also available on FM at 103.75, 105.5 and 107MHz. Signals from Thailand on E3 are still coming in but on a less regular basis'.

## Sensation from down-under

Duncan Fraser noticed the first Sporadic E opening on 2 November. There were six days of Australian Sporadic E. The signals were weak at first but the openings are gradually improving. On the 8th, a Tasmanian FM station '7 ABC' was received at good strength on a telescopic rod aerial. Duncan reports a lack of signals on channel R1.

Both Duncan (and Roger Bunney of Romsey in the UK) have sent details of some rather encouraging reception experienced by Anthony Mann in Western Australia by a combination of TEP and Sporadic E. The 6m band was open most days during October, but on the 15th Chinese channel 1 (49.75MHz vision and 56.25MHz sound) was received during the mid-afternoon at high strength. The best was yet to come. On 29 October, Chinese channel 4 video (77.25MHz) was present for most of the evening but at a fairly low level. However, for about ten minutes around 1940 local time (UTC+8h) it peaked to levels normally reached by channel C2 video (57.25MHz). During this opening, signals on channels C1 (49.75MHz) and C2 were also present at very high strengths. By 2300 the C4 signals had finally faded, some four hours after they were first noticed. Also noted were signals on channels E2 (48.25MHz), E3/A2 (55.25MHz), E2 sound at 53.75MHz, C1 sound at 56.25MHz, A2 sound at



# DX-TV RECEPTION REPORTS

59.75MHz, A3 vision at 61.25MHz, and E4 vision at 62.25MHz (there were two stations present). There were no signs of any Russian stations. The C1 signals from China had been present for most of the afternoon. The 6m band was open to Hawaii during the morning.

## Beware – OSPJ!

A growing contagious disease among the presentation departments in television broadcasting is now about to hit the BBC in a big way. Its medical name is On-Screen Plastic Junk (OSPJ) and it can be diagnosed as a colourful switchback of flying balls, parts of letters and other shapes which swirl about and lunge out towards the unsuspecting viewer before finally descending in a heap on the living-room carpet – the last thing you'd want to experience after a night out down the pub! However, the presentation department is about to turf out the traditional captions of the BBC and take the network into an age of hi-tech television graphics. Impressive and colourful as they are, many people, and not just DX-TV enthusiasts, have a deep interest in this particular technical side of television broadcasting and have developed a soft spot for the traditional captions.

This hi-tech presentation seems to be growing in use throughout the world. Duncan Fraser thought it was just an awful idea confined to television in New Zealand, and Simon Hamer in Wales wonders what HRH Prince Charles thinks about all this appalling technical architecture!

## Service information

**Australia:** Western Australian amateur VK6RO has been granted an experimental licence to carry out tests on propagation and MUFs between 30 and 50MHz. He will be transmitting on 35.81 and 41.75MHz using FM with 83W and a 6-element log periodic array. He will also monitor 28.385 and 28.885MHz. No further details are available.

TVQ-0 (Universal Telecasters Qld Ltd),

the Australian commercial TV station in Queensland, has swapped channels with DDQ-10 (Darling Downs TV Ltd, Toowoomba). TVQ now uses channel 10 and DDQ channel 0.

**Malaysia:** The PM5544 test pattern carries the identification 'RTM-WARNA'.

**India:** Two new transmitters were commissioned at Delhi to replace the old ones. They are: Delhi 1 E4 20kW (old transmitter was 10kW), and Delhi 2 E7 10kW (previously 1kW).

The new TV tower is 235m high. It carries all the TV transmitting antennas for Delhi 1 and 2 and the FM sound transmitting aerials for AIR. The TV tower incorporates several futuristic features including an observation gallery for the public and a revolving restaurant just below its microwave platform.

The TV set-up in India is mainly a national service with regional variations. The regional service operates from 1700 and 2040. The national network from Delhi is then relayed by all TV transmitters until closedown at 2330. Regional transmissions take place in the various regional languages. All test transmissions are regional with their identification superimposed over the test card along with the channel, date and time.

Educational TV is relayed by all centres. The University Grants Commission has programmes for university students from 1245 to 1345 with a repeat from 1600 to 1700, six days a week. These consist of educational programmes made in India, USA, UK, USSR and West Germany. The Russian and German programmes are dubbed into English. School TV is regional and is screened everyday between 0930 and 1030. Some regions also have programmes for schools in the afternoon.

**United Kingdom:** Around 25% of households in the UK now have teletext which amounts to some 5.5 million receivers. The service is paid for by advertising which accounts for no more than 30% of the pages. The advertising is mainly national but local classified advertising

is now being introduced in each ITV region. Apart from the normal IBA Oracle service, additional teletext services are available by subscription. These services are encoded and the payment covers equipment needed for extra decoding.

The IBA is making regular D-MAC test transmissions from the Intelsat V F4 satellite which covers much of Europe. These take place between 0745 and 1145 on weekdays and are intended for receiver manufacturers. The satellite is located at 34.5°W with an 11GHz downlink frequency.

**France:** The fifth Television network in France is called LA5 (La Cinq) and is relayed to the various terrestrial transmitting sites via the TELECOM 1A (8°W) satellite which is also used for the distribution of M6 (Métropole Télévision). Eventually it is intended to transfer the broadcasts to a new satellite, TELECOM 1C.

La Cinq broadcasts take place at UHF. Tables showing the transmitters in operation at the end of last summer are on pages 26 and 27.

**Yugoslavia:** There are plans to extend the third television network in Yugoslavia. Future transmitters in the order of 10kW ERP are planned at Belje (near Osijek), Labistica (near Split) and Ucka (near Rijeka). Zagreb-3, which is already in operation, has been showing only satellite material since early November. From 1-6 November: RAI UNO; 7-13 November: CNN; 14th-20th: 3-SAT; 21st-27th: TV5. Initially, Zagreb-3 radiated a mixture of SKY and SUPER CHANNEL music programmes to supplement their own local programmes.

This month's service information was kindly supplied by Gösta van der Linden (Rotterdam, Netherlands), the Benelux DX Club (Netherlands), Dalibor Frkovic (Yugoslavia), Bertrand Prince (France), Duncan Fraser (New Zealand) and the IBA (Winchester, United Kingdom). Photographs were supplied by Fred Pilkington, Keith Hamer and Garry Smith. 

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TOWN	SITE	CH L	POL	ERP (kW)	SERVICE DATE	TOWN	SITE	CH L	POL	ERP (kW)	SERVICE DATE
BOURGES	Neuvy	21	H	130	30/09/86	ARCACHON	Foret Pirailan	35	H	0.5	24/06/88
BRIVE	Lissac	21	H	2	30/11/87	BAR-LE-DUC	Cote Ste Catherine	35	H	0.18	29/06/88
NANTES	Haute Soulaire	21	H	50	30/06/86	BRIVE	Roc de Mioule	35	H	0.1	30/11/87
LONS-LE-SAUNIER	Route de Valagna	22	H	0.1	28/03/88	CHERBOURG	Digosville	35	H	20	23/12/86
CHARTRES	Les Hauts Saumons	23	H	0.45	30/01/88	ALBERTVILLE	Fort du Mont	36	H	0.095	29/04/88
RIBERAC	Puy de Beaumont	24	V	250	04/02/88	SAINT RAPHAEL	Pic de L'Ours	36	H	80	30/09/87
LYON	Fourviere	28	H	5	20/02/86	SAVIGNY SUR ORGE	Rue Bords de l'Orge	36	H	0.03	20/11/87
LE PUY	Mont Denise	29	H	0.45	27/07/88	VESOUL	Chapelle de la Motte	36	H	0.07	28/03/88
MAROMME	Houpeville	29	H	0.06	04/06/88	COULOMMIERS	Mouroux	37	H	0.06	31/12/87
TOULOUSE	Pic du Midi	29	H	60	07/07/88	BOURG-EN-BRESSE	Ramasse	38	V	0.3	30/06/86
TROYES	Les Riceys	29	H	250	15/12/86	CAEN	CHU	38	H	0.6	11/07/86
BELFORT	Valdoie	30	V	0.25	12/09/87	LA BAULE	Saint Clair	38	H	0.15	30/09/86
BORDEAUX	Cauderan	30	H	0.055	29/06/88	LE CREUSOT	Mont Saint Vincent	38	H	2.5	30/06/86
CLERMONT-FERRAND	Puy de Dome	30	H	100	24/12/87	LIMOGES	Puy Las Rodas	38	H	1.4	30/09/86
PARIS	Tour Eiffel	30	H	100	20/02/86	NIORT	Maisonnais	38	H	200	01/11/86
SAINT LO	Agneaux	30	H	0.065	18/02/88	PERPIGNAN	Neoulous	38	H	2	16/12/87
SAINT QUENTIN	Gauchy	30	H	0.5	28/03/86	DREUX	Plateau des Bates	39	H	0.1	29/02/88
ANGOULEME	Saint Saturnin	31	H	5	30/09/86	FOIX	Roc du Prat de Redon	39	H	0.075	31/12/87
NIMES	Immeuble Bas Rhone	31	H	0.2	20/02/86	MAZAMET	Pont de l'Arn	39	H	0.075	03/03/88
DRAGUIGNAN	Les Fourches	32	H	0.1	18/05/88	METZ	Luttange	39	H	200	31/10/87
LE MANS	Mayet	32	H	150	30/11/87	VILLERS COTTERETS	Fleury	39	V	25	31/12/87
MARSEILLE	Grande Etoile	32	H	160	20/02/86	QUIMPER	Lycée Brizieux	40	H	0.07	03/12/87
MAUBEUGE	Roussies	32	H	3.5	28/03/86	JARRIE	Rocher de la Bourg	41	H	0.2	04/05/88
MEYMAC	Les Gardes	32	H	0.02	30/05/88	NEVERS	Challuy	41	H	0.4	20/02/86
SAINT DIZIER	Tour de Gigny	32	H	0.03	03/12/87	POITIERS	Hopital des Champs	41	H	1	30/06/86
SOISSONS-LEURY	Meunier Noir	32	H	0.06	31/12/87	MORET SUR LOING	Le Calvaire	42	H	0.05	06/01/88
TOULOUSE	Bonheure	32	H	5	17/02/86	AURILLAC	Caussac	43	H	0.03	18/02/88
DIGNE 1	Saumon	33	H	0.05	18/02/88	LE PLESSIS ROBINSON	La Terrasse	44	H	0.05	19/09/87
LAVAL	Montrochard	33	H	20	28/03/88	LILLEBONNE	St Jeanne Folleville	44	H	0.03	04/06/88
BREST	Roc Tredudon	34	H	100	15/12/86	MEZIERES	Sury	44	H	4.5	29/06/88
CHEZY SUR MARNE	Troncet	34	H	0.05	31/12/87	VIERZON	Rue du Chateau d'Eau	44	H	0.125	02/08/88
FECAMP	Cote de la Vierge	34	H	0.02	04/06/88	ANNECY	Belvédère de Jeanne	45	H	0.05	31/12/87
LISIEUX	Saint Desir	34	H	0.15	18/05/88	AUXERRE	Blegny le carreau	45	H	0.1	16/12/87
RENNES	Saint Pern	34	H	75	15/12/86	BESANCON	Breguille	45	H	1	30/04/86
ROANNE	Les Hauts Vavres	34	H	0.45	29/06/88	ROUEN	Bois du Roule	45	H	0.04	04/05/88

# DX-TV RECEPTION REPORTS

TOWN	SITE	CH L	POL	ERP (kW)	SERVICE DATE	TOWN	SITE	CH L	POL	ERP (kW)	SERVICE DATE
DIJON	Général Ruffey	46	V	1	28/03/86	CHAMBERY	Les Monts	55	H	4	13/04/88
LE MANS	La Forérierie	46	H	0.3	30/11/87	EVREUX	Netreville	55	H	0.19	31/12/87
SAINTES	Vélodrome	46	H	0.01	31/12/87	MANTES	Maudetour en Vexin	55	H	2.7	30/06/86
STRASBOURG	Pont du Rhin	46	V	0.5	26/05/88	NANCY	Malzeville	55	H	7	20/02/86
AVIGNON	Le Pontet	47	H	1	30/06/86	SAINT NAZAIRE	Etoile du matin	55	H	4	27/03/86
CHARTRES	Montlandon	47	H	50	15/12/86	VILLENEUVE SUR LOT	Pech de Montfabes	55	H	0.2	31/12/87
IGNY-PALAISEAU	Les Marnières	47	H	0.075	16/10/87	BAYONNE	La Rhune	56	H	40	30/06/86
LAVAL	Stade Jean Mace	47	H	0.025	19/04/88	OYONNAX 2	La Grande Roche	56	H	0.1	09/08/88
SENS	Gisy les Nobles	47	H	40	06/01/88	TOULON	Cap Sicie	57	H	100	20/02/86
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VENDOME	La Poterie	48	H	0.05	18/06/88	VANNES	Moustoir'ac	58	H	75	30/09/86
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BEAUVAIS	Saint Just	49	H	100	15/12/86	GRENOBLE	Tour-sans-Venin	59	H	0.6	20/02/86
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# AN AUDIO DIGITISER FOR THE COMMODORE AMIGA 500

by Terry Weatherley

This project shows how to build an audio digitiser for the Commodore Amiga A500 computer. The digitiser uses easily obtainable components and derives its power from the A500. Although the circuit can be constructed on a piece of stripboard, a PCB design is given. Also described are two other circuits which, although not essential, enhance the performance of the digitiser.

The Commodore Amiga A500 is one of the new generation 16 bit micros. It contains a 68000 microprocessor chip and has 500K of memory fitted as a standard feature which can be easily upgraded to 1 megabyte. The working environment makes extensive use of the mouse, and the machine is almost entirely icon driven. Software with any new machine is always difficult to obtain at first, but the Amiga is well supported by a wealth of public domain software which is readily available from user groups or elsewhere at a modest cost.

Public domain software is developed by enthusiasts and shared by posting on bulletin boards world-wide.

## Shareware

Shareware, on the other hand, is sometimes supplied free of charge, except for the manual which can be purchased from the author of the program, thus giving some return on their time. Again, you are encouraged to pass on the program.

A great deal of public domain software is collected together by Fred Fish which is available on the aptly named 'Fish discs'. Another collection of useful program material is collected and issued on Amicus discs by **Amazing Computing Magazine**. User groups sometimes collate software under different titles for their members.

This digitiser is the direct result of the author's browsing through some of the Amicus discs. In one collection there was a program entitled PSOUND, written by Anthony Wood of Sunrize Industries. This program offered a way of replaying digitised sound samples and gave some routines for manipulating them. The sample could be replayed faster or slower, and the sound could be inverted or altered in frequency. A graphical representation of the sound could be displayed and the sample fragmented and reconstituted in the same, or different order. All in all, a very useful set of programs. In the public domain there are some digitised sounds, of which the most well-known are

extracts from 2001 or Startrek. The program allows the user to sample their own sounds, and the text accompanying the program indicated that a digitiser can be purchased from the software writer cheaply. This tempting offer came from the United States, so it was decided to see if a digitiser to complement the program could be built.

## Warning

I think it is important to add a word of caution at this stage. Poking about the ports of a computer can be hazardous to the computer's health. Similarly, plugging in homebrew add-ons can also cause problems if the add-ons are faulty. Neither **R&EW** or the author are responsible for any damage you might inadvertently cause to your computer. Always check and re-check the circuit and test with an external supply first.

I decided first to investigate how digitised information was put into the computer. Was the choice between the

serial or the parallel (printer) ports? The parallel port was thought most likely and the pin-outs were investigated with a 'scope probe (see warning). The A500 manual shows excellent circuit and pin-out diagrams, and the pin-out diagram for the printer port was easily located. When the program called for a digitised input, a strobe signal was shown on the relevant pin (pin 1). Pins 2 to 9 of the pin-out diagram were data pins and pins 17 to 25 were ground. Pin 14 was the only non-standard pin and supplied 5V at 100mA to power the external add-ons.

## Digital data

The next step was to discover if the program would accept digital data through the parallel port. One option on the relevant program menu was to monitor the digital levels being received by the computer. Numbers from 0 to 255 (the full 8 bit range) were displayed as received. Number 128 was set up by grounding the relevant pin through a 1k

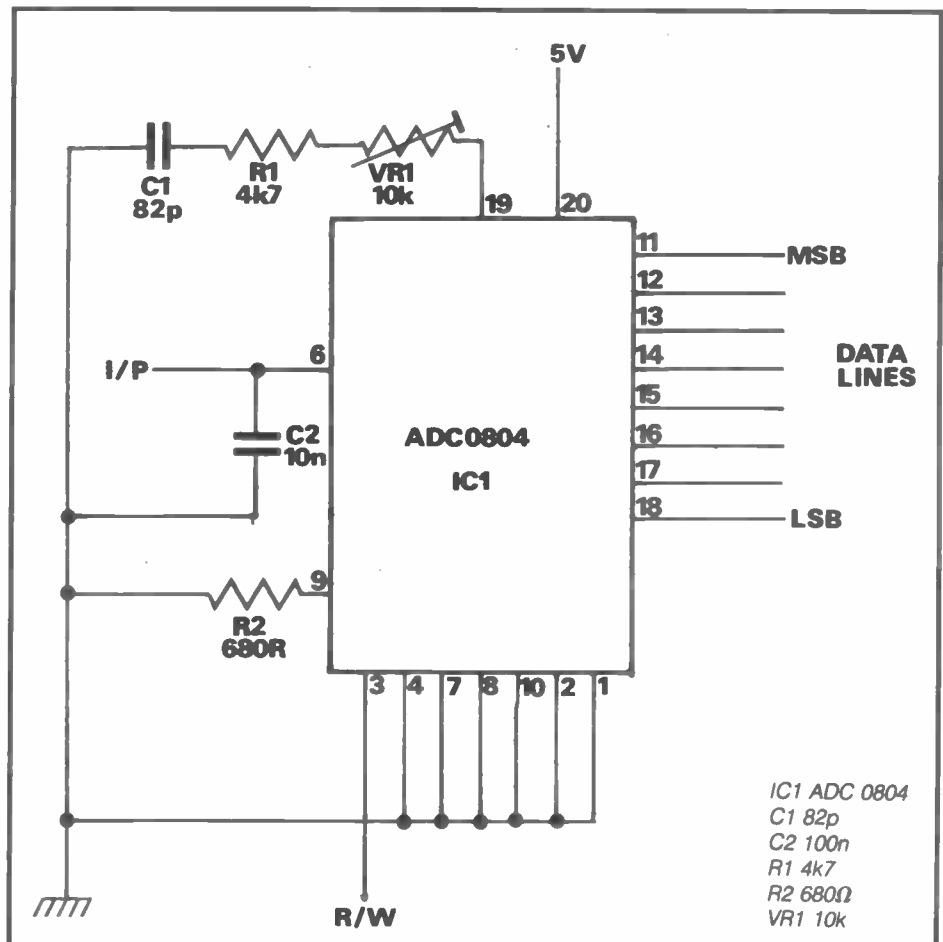


Fig 1: AD circuit

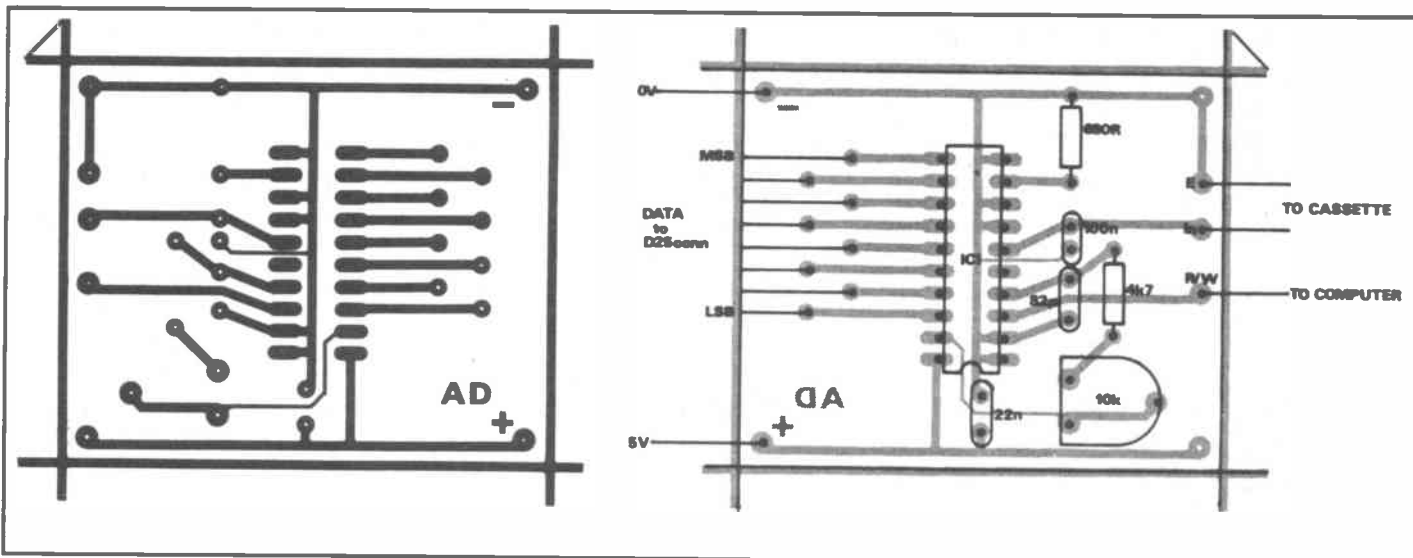


Fig 2 Left: PCB component overlay diagram. Right: PCB track layout with the component overlay diagram in position

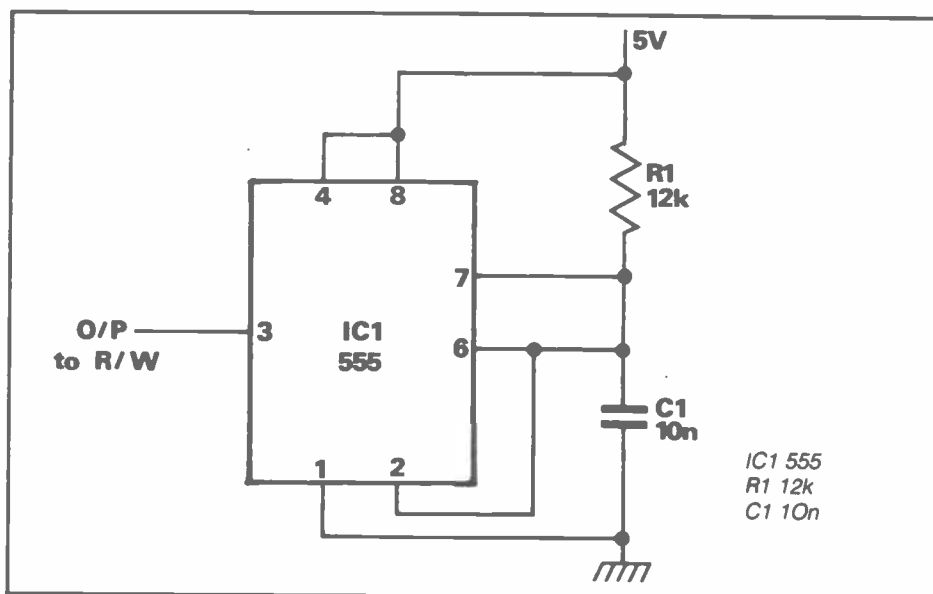


Fig 3: Timer CD

resistor. The computer displayed this number, together with the rest in a similar way. This showed, therefore, that the receive portion of the program was active. All that was needed now was an audio digitiser.

The A/D chip is the heart of any digitiser. The ADC 0804 chip was used because it was readily available and reasonably fast. The datasheet describes it as 'a CMOS 8 bit analogue-to-digital converter with output latches that directly drive a microprocessor data bus. The IC looks like a memory location or I/O port to the microprocessor, so interfacing logic is not required. The analogue input voltage range is 0-5V with a single 5V supply and 2.5V supplied to pin 9. Any voltage span can be converted to full 8 bit resolution by connecting half the span voltage to the reference pin (pin 9). The conversion rate was given as 8770 per second and the current needed as 1.3mA.

An A/D converter works by comparing the incoming voltage to the reference voltage. At the start of each conversion the most significant bit (MSB) is set to 1

and all the other bits are set to 0. This produces a voltage from an internal D/A converter of half the reference voltage. This is compared with the input voltage ( $V_{in} < V_{ref}/2$ ) if the MSB is set to 0, otherwise it is held high. This process is repeated for all of the 8 bits on successive clock cycles, until a valid digital representation of  $V_{in}$  appears at the outputs. This method of A/D conversion is known as 'successive approximation', and it can be seen that this type of conversion will always take nine clock cycles whatever the value of  $V_{in}$ .

The external circuitry of the AD 0804 shown in the circuit diagram is not complex (see Fig 1). Additional amplification is not required since the input's impedance is sufficient. For the holding function, a 100nF capacitor is used across the input. The 680 ohm resistor from pin 9 ( $V_{ref}$ ) to ground defines the dynamic range of the A/D. This gives 1V on pin 9 and, consequently, the range is set to 2V. The A/D has an external clock oscillator which is provided with external components via pins 19 and 4. The clock is set to about 1000kHz. The

conversion starts at the leading edge of the conversion command signal and when it is completed, the data is transferred to the output storage of the AD 0804.

### PCB track layout

The circuit could be made up on a piece of stripboard, but making a PCB with an etch resist pen is quite easy and probably as quick. A suitable track layout is shown with the component overlay diagram (see Fig 2).

When completed, it is connected to ribbon cable and then to a 25-way D plug to interface with the computer. Before connecting, it is wise to re-check the circuitry and test with an external supply to ensure there are no short circuits. The 'scope should show the clock oscillator on pin 4, and all the output's pins (11 to 18) should be high. Pin 20 should have 5V and pins 8, 10, 1, 2 and 7, 0V. Pin 9 ( $V_{ref}$ ) should have about 1V, and pin 1 should be connected from the computer to the read/write pin (pin 3). The data lines should be connected to the relevant pins and the 5V and 0V connections will complete the circuit. Audio from a cassette recorder should be connected to the input via pins 6 and 7.

With the computer off, connect the unit to the printer port. After switching on the computer it should kickstart in the usual way. The PSOUND program should be used and the signal levels monitored. If the displayed numbers are very low (< 50), increase the input from the cassette. If they are too high (> 230), decrease the volume. If they show 255 it is worth unplugging the audio and waiting for them to decrease. A test sample can be digitised, although it was here that the results proved unreliable. Sometimes the unit would digitise well and on other occasions not at all. The problem appeared to be connected with the R/W pulses from the computer. I felt matters could be improved.

I decided to build an external oscillator to furnish the A/D with R/W pulses. After experimenting with a 555 timer IC the circuit shown in Fig 3 evolved and was

built on a small piece of stripboard. After checking with an external supply and a 'scope the circuit was ready to use. After the power was re-generated from the computer, the connection from pin 1 of the computer printer port was disconnected and the new circuit connected. The effect was two-fold. Firstly, the program digitised reliably and secondly, the other menu options could be used. These were 'monitor digitiser' and 'monitoring', prior to recording a sample.

The PSOUND program was accompanied by useful notes and a full manual and can be obtained from the address shown in the program.

I added an indicator to my digitiser (see Fig 4) to show when the full range of the A/D was in use. Each data line was connected to one input of an eight input NAND gate. When all the inputs to this gate were low the output was high. This occurred when the output from the A/D was 255 and indicated by an LED (a 74LS30 was used.)

The circuit shown in Fig 4 was built on a piece of stripboard and interfaced to the main board with ribbon cable. The volume of the cassette recorder was set so that the LED flickered, indicating that the full range of the A/D was in use. This was a useful addition to the main circuit. It should be possible to redraw the PCB to accommodate all of these additions without too much difficulty. The audio digitiser can be housed in any suitably sized box—a small plastic one will do. It is necessary to keep the ribbon

cable as short as possible when you use RFI (Radio Frequency Interference) spray to prevent the PCB from shorting out because of the conductive coating.

This project was simple to build and certainly enhanced the use of a quite remarkable computer. Components are easy to obtain from many advertisers in R&EW.

The software is available on an Amicus disc. I can supply a copy of the software with some digitised samples on receipt

of a disc and a self-addressed label and postage (19p is enough for one disc in a padded envelope). No charge is made for the software, but each disc should be accompanied by £1.00 for copying, etc. Discs should be sent to: Terry Weatherley, 16 Beverley Court, Carlton Colville, Lowestoft, Suffolk NR33 P8JZ. Ready-made audio digitisers, together with program enhancements and a manual, are available from the address given in the program.

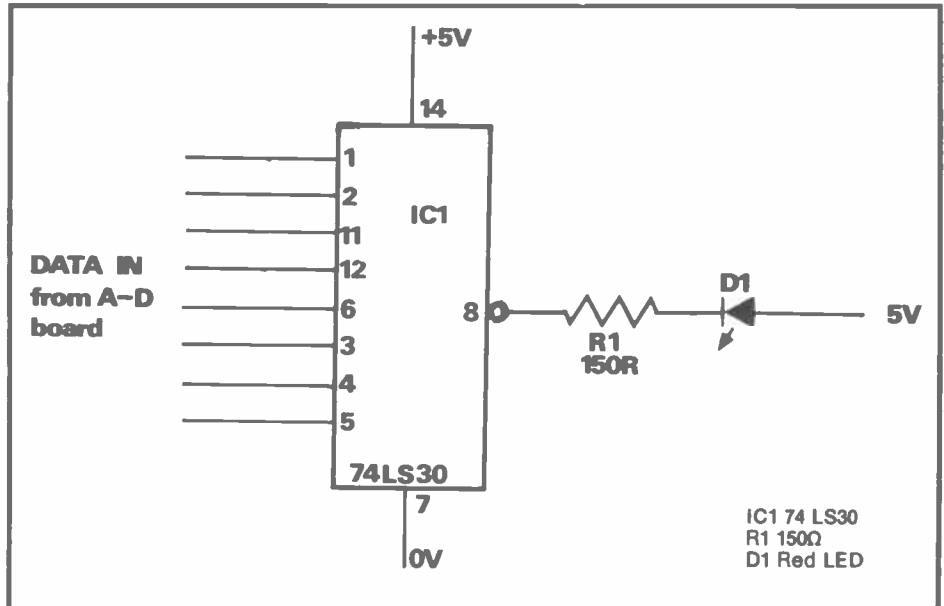


Fig 4: Peak indicator

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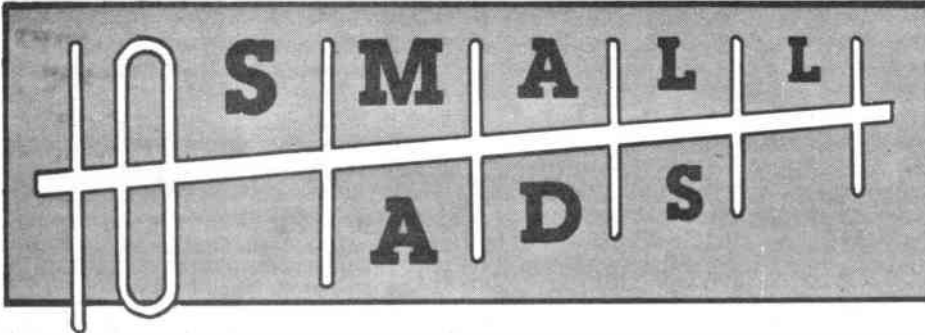
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AN7178 £2.95, BA5408 £2.20, HA1377 £2.20, HA1392 £2.50, HA1394 £2.85, HA1397 £2.75, HA1398 £2.75, HA13001 £2.95, LA4460 £1.80, LA4461 £1.80, LA4607 £4.25, LC7137 £4.50, M81617 £2.80, MB3705 £1.80, MB3712 £1.50, MB3722 £3.50, MB3730 £2.50, MB3731 £3.50, STK461 £7.50, STK463 £8.40, TA7205AP £1.00, TA7222AP £1.30, TA7240 £2.95, TA7241 £2.95, TA7270 £2.75, TA7271 £2.75, TA7274 £2.85, TA7280 £3.50, TA7281 £2.95, TA7282 £2.95, TA7283 £2.85, TA7288 £2.95, TA7811 £3.20, UPC575 £1.00, UPC1188 £2.95, UPC1181 £1.10, UPC1182 £1.10, UPC1185 £2.50, UPC1188 £2.75, UPC1230 £2.50, UPC1263 £2.50, UP1277 £2.75, UPC1278 £2.75, UPC1368 £3.00, UPC1384 £1.95

ADD 60p POST AND PACKING AND THEN ADD 15% VAT TO TOTAL

T POWELL 16 PADDINGTON GREEN LONDON W2 1LG

OPEN MON-FRI 10AM-5PM, SAT 9AM-12 NOON.

TELEPHONE: 01 733 8348

ACCESS/VISA. TELEPHONE ORDERS ACCEPTED OVER £5.00

**TURN YOUR SURPLUS**

IC'S TRANSISTORS etc, into cash, immediate settlement. We also welcome the opportunity to quote for complete factory clearance.

**CONTACT:**

**COLES-HARDING & CO**

103 South Brink, Wisbech, Cambs

TEL: 0945 584188/Fax. No. 0945-588844

Est Over 10 years

**COUNTY GUIDE**

RATES

BOXES ad sizes

20mm x 59mm single

40mm x 59mm double

Total prepayment rates	Ad space	3 issues	6 issues	12 issues
single	single	£47.00	£88.00	£158.00
double	double	£94.00	£176.00	£316.00

**RADIO & ELECTRONICS WORLD COUNTY GUIDE ORDER FORM**

TO: Radio & Electronics World · Sovereign House · Brentwood · Essex  
CM14 4SE · England · (0277) 219876

print your copy here .....

.....  
.....  
.....

**NUMBER OF INSERTIONS REQUIRED**

Single County Guide 3 ..... £47.00  6 ..... £88.00  12 ..... £158.00   
Double County Guide 3 ..... £94.00  6 ..... £176.00  12 ..... £316.00

**PAYMENT ENCLOSED**

£

Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

Conditions — Payment must be sent with order form. No copy changes allowed. Ads accepted subject to our standard conditions, available on request.

Registered No 2307667 (England)

C P I

## ADVERTISING RATES & INFORMATION

DISPLAY AD RATES		series rates for consecutive insertions			
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
61 x 90	1/8 page	£91.00	£86.00	£82.00	£73.00
126 x 90 or 61 x 186	1/4 page	£160.00	£150.00	£145.00	£125.00
126 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£560.00	£530.00	£475.00
263 x 304	double page	£1140.00	£1070.00	£1020.00	£910.00

COLOUR AD RATES		colour rates exclude cost of separations	series rates for consecutive insertions		
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
126 x 186 or 263 x 90	1/2 page	£420.00	£395.00	£375.00	£335.00
297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS	Covers:	Outside back cover 20% extra, inside covers 10% extra
	Bleed:	10% extra [Bleed area = 307 x 220]
	Facing Matter:	15% extra

DEADLINES		*Dates affected by public holidays				
issue	colour ad	mono proof ad	mono no proof & small ad	mono artwork	on sale thru	
Apr 89	8 Feb 89	9 Feb 89	15 Feb 89	17 Feb 89	9 Mar 89	
May 89	*14 Mar 89	*15 Mar 89	*21 Mar 89	*23 Mar 89	13 Apr 89	
Jun 89	12 Apr 89	13 Apr 89	19 Apr 89	21 Apr 89	11 May 89	
Jul 89	10 May 89	11 May 89	17 May 89	19 May 89	8 Jun 89	

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.</p> <p><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.</p>

Printed — web-offset.  
**PAYMENTS**  
Above rates exclude VAT. All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by publication date.

**FOR FURTHER INFORMATION CONTACT**  
Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4BE.  
(0277) 218676

Overseas payments by International Money Order. Commission to approved advertising agencies is 10%.

**CONDITIONS**  
10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request.

# THE COMMUNICATIONS AND ELECTRONICS MAGAZINE



- Regular well-informed columns on various aspects of amateur communication
- Simple and useful constructional projects, plus clear explanations of the theory behind them
- Delivery to your door by publication date each month

**On sale NOW at your newsagent and at equipment dealers**

RADIO & ELECTRONICS WORLD SUBSCRIPTION ORDER FORM			
<b>To:</b> Subscription Department • Radio & Electronics World • 45 Union Road • Croydon • Surrey • CR0 2XU		Tel: 01-684 9542	
NAME.....		<b>PLEASE SUPPLY: (tick box) for 12 issues, all rates include P &amp; P</b> Inland <input type="checkbox"/> World-Surface <input type="checkbox"/> Europe-Air <input type="checkbox"/> World-Air <input type="checkbox"/> £26.00..... £27.50..... £30.10..... £34.10.....	
ADDRESS.....		<b>PAYMENT ENCLOSED:</b> £ <input type="text"/> Cheques should be made payable to Radio & Electronics World. Overseas payment by International Money Order, or credit card.	
.....		<b>CREDIT CARD PAYMENT</b> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>EXPIRY</b> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
..... Postcode.....		Signature.....	



**SONY**

Large range of shortwave receivers normally in stock

Limited stocks of Christmas Boxes still available

**Scanner Package Challenger BJ200 Mk2 HF/VHF Scanning Receiver**

- ★ 26-520MHz (with gaps)
  - ★ 16 memory channels, search scan priority, function and delay
  - ★ Includes civil and most of military bands
  - ★ C/W Free Raycom air band antenna
- £189.00 + p&p £10.00**



**CTE 1600 Hand-held (same as IC2E)**

- ★ Inc Free 2m magmount ant
  - ★ 144-148MHz, c/w Ni-Cad charger
  - ★ 2.5W output
  - ★ Ideal mobile portable use
- £149.00 + p&p £10.00** (While present stocks last)

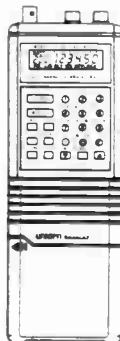


(authorised UK distributor)

**Bearcat BC 200XLT**

**Bearcat UBC200XLT The Super New Scanning Receiver**

- ★ C/W Free mobile antenna
  - ★ 29-956MHz (with gaps)
  - ★ 200 memory channels
  - ★ Detachable Ni-Cads
  - ★ C/w Ni-Cad/charger
- £239.00 + p&p £10.00**



**Raycom Communications Systems Ltd**  
International House, 963 Wolverhampton Road  
Oldbury, West Midlands B69 4RJ

Telephone 021 544 6767 Fax 544 7124 Telex 336483 Identi-G

**Raycom gives you more purchasing power!**

For fast service phone in your order with any major credit card or in most cases we can offer you instant credit of up to £1,000 (subject to status). Raycom are licensed credit brokers. APR 29.8% subject to variation. Free credit on certain products at MRP prices. 50% deposit and six monthly payments. Please telephone for more details and application forms.

**Tel: 021 544 6767**  
9.00AM - 5.30PM, 5 Days,  
Late Night Friday (until 7.00pm)

**Dual-Band Mobile Package Icom IC3200 144/430 Transceiver**

- ★ C/W Free dual band mobile ant
  - ★ 25W on both bands, 10 memories
  - ★ Built-in duplexer
- £399.00 + p&p £10.00** (While stocks last)



**The Ultimate Receiving Stations Icom ICR7000 VHF/UHF Cont Coverage Receiver**

- ★ Inc Free Royal 1300 discone ant (AH7000)
  - ★ All modes
  - ★ 25-1300MHz (2GHz)
- £925.00 Carr £10.00** (Limited stocks)



**Icom ICR71 SW Receiver**

- ★ Free long wire receiving antenna
  - ★ Covers all short wave bands
- £825.00 Carr £10.00** (Limited stocks)



**HF Station Package Yaesu FT747GX All Band/Mode Transceiver**

- ★ C/W Free 20A regulated PSU
  - ★ Inc Raycom Mk2 RX mod for better RX performance
  - ★ 120W RF output
  - ★ Continuous coverage receiver
- £725.00 Carr £12.50** (Limited supplies)



**Our Famous Yaesu FRG9600 Packages**

- ★ Free Royal 1300 25-1300MHz discone
  - ★ Supplied with free mains PSU
  - ★ Improved receiver specification
  - ★ Wide choice of options
- Mk2 60-950MHz @ £545.00**  
**Mk5 100kHz-950MHz @ £699.00 + p&p £10.00**



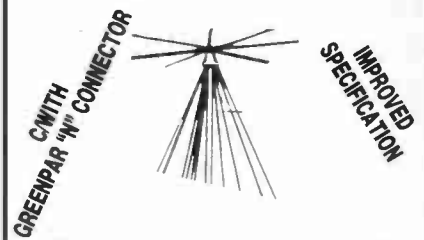
Call in easy to get to, easy parking

**"STOP PRESS"**  
**NEW YAESU HANDHELDS INC DUAL BANDER - PHONE FOR DETAILS**

**Raycom News Box**

**Royal 1300**

(same as Icom AH7000 Diamond D109)



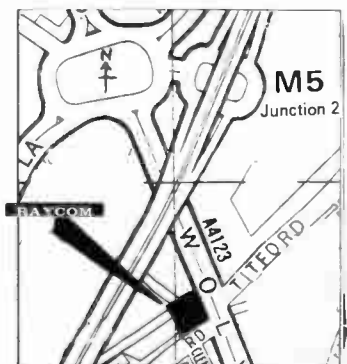
Raycom is saving you money again

**£65 £59.50**  
p&p £5.00

**New Icom Super Rigs**

- ★ Icom IC2GE..... **£265.00**
- ★ Icom IC32E..... **£399.00**
- ★ Icom IC3210E..... **£499.00**

**Expandable RX. POA**  
Call us for the best deal around  
Call in, easy to get to, easy parking



**Ordering information**

All products we advertise are normal stock items. Our new mail order department can now dispatch many items same day, but please allow up to 14 days. Delivery time is subject to carriage method. If ordering by mail please include carriage and state your daytime telephone number. All products over £750.00 carriage free. Please allow time for personal cheques to clear. Please call **before ordering** and for more information.

**New Infoline 0836 282228 available 5-9pm (weekdays only)**



**FOR THE BEST IN AMATEUR RADIO**  
Raycom are authorised dealer/distributors for all of the products we sell.

Full range of Icom, Yaesu, Bearcat-Uniden, MFJ, Butternut, Jaybeam, Tonna, Welz in stock. Most products available in this magazine available at Raycom, plus our special package deals. Call us now for details.