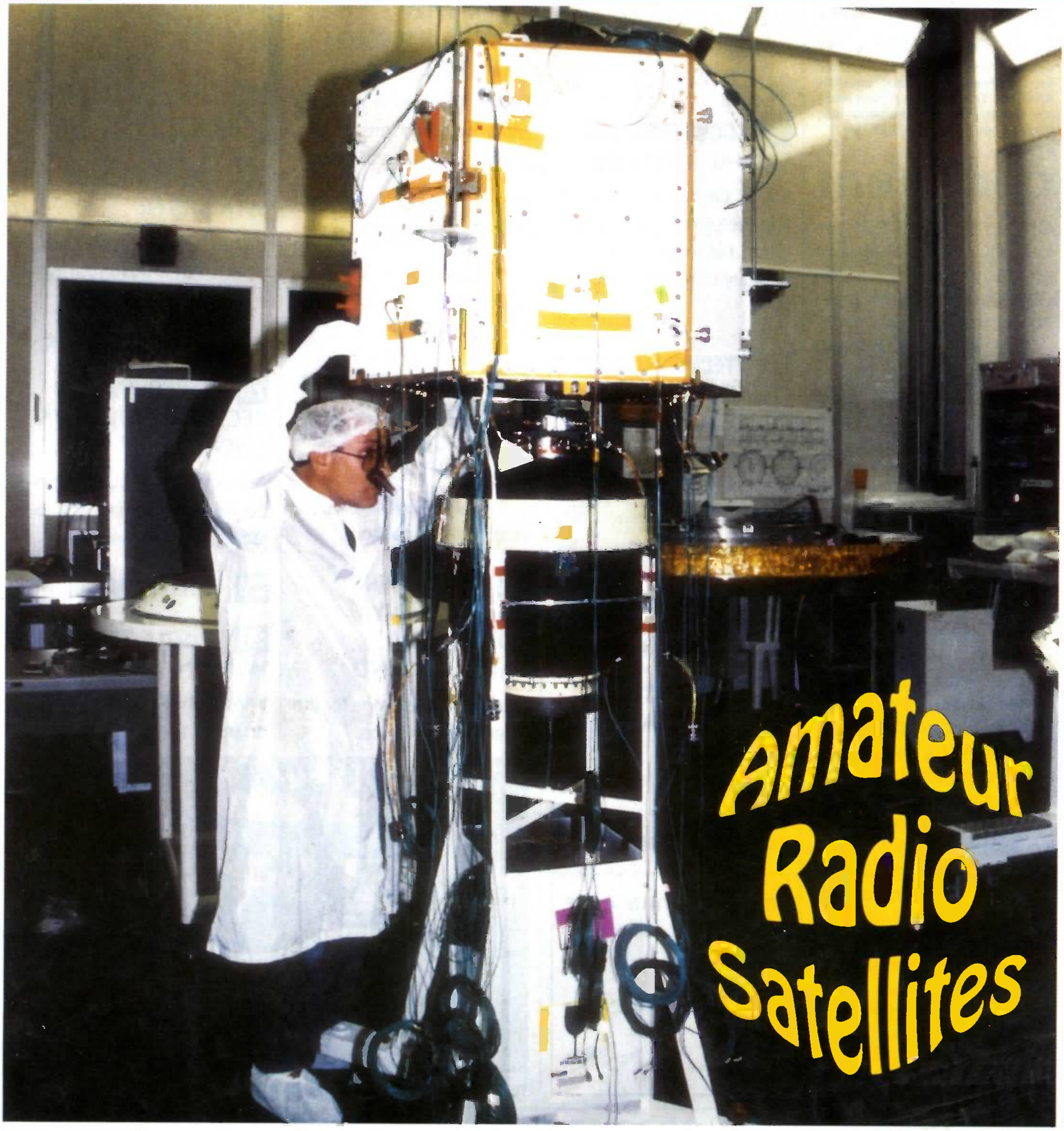
RSGB

D-i-Y RADIO

AN INTRODUCTION TO AMATEUR RADIO - FOR BEGINNERS OF ALL AGES

November-December 1994 Volume Four: No 6



Amateur Radio Satellites

Available only by subscription from RSGB, Lambda House, Cranborne Road, Potters Bar, Herts. EN6 3JE

COVER PICTURE:
Development work being carried out on the French amateur satellite ARSENE. This satellite is now sadly lost due to a fault on the aerial lead [Picture courtesy of AMSAT-UK].

comment

ON 7 NOVEMBER the London Science Museum's amateur radio station, GB2SM, will close down after 40 years of operation.

This was an unpopular decision as many of today's radio amateurs first learnt about the hobby through a visit to the museum in their youth, and then decided to take a Radio Amateurs Examination Course to become licensed.

The RSGB's General Manager, Peter Kirby, G0TWW, has had a meeting with Sir Neil Cossens, Director of the Museum, and negotiations are now taking place to install a new amateur radio exhibit, which will take the form of a hands-on, state-of-the-art project which visitors will be able to use. While the new exhibit is being planned and installed, preparations are in hand to keep the GB2SM callsign on the air, so keep listening out for this very special callsign.

As more information is available I will keep you informed. We all look forward to seeing this exciting project develop.

Marcia Brimson, 2E1DAY.

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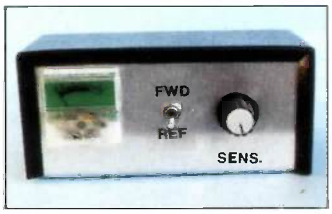


Robert Snary's D-i-Y SWR Meter.

CONSTRUCTION CODE

FOR THE COMPLETE BEGINNER

REQUIRES A LITTLE EXPERIENCE

FOR THE MORE EXPERIENCED

The aerial for GB4ATC at RAF Hendon's Flight Activities Week.

The Amateur Radio Village at the LIVE '94 Show at Earl's Court.

Managing Editor: Mike Dennison; Editor: Marcia Brimson; Prod Ed: Jennifer Preston; Tech Ed: Peter Dodd; Draughtsman: Bob Ryan; Ed Asst: John Davies; Prod Asst: Brione Meadows; Secretary: Erica Fry. *D-i-Y RADIO* is published six times a year by the Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts. Filmset by JJ Typographics Ltd. Printed by Southernprint (Web Offset) Ltd. ISSN No: 0959-843X.

- THE COLLISIONS BETWEEN fragments of Comet Shoemaker-Levy 9 and the planet Jupiter last July were monitored by many amateurs who listened to the 'noise' from Jupiter on short-wave radios. Their observations are now being closely checked by scientists.
- DURING AUGUST, BBC Television repeated the children's programme "Why Don't You .. ?", in which Emma Constantine, 2E1BVJ, describes her enjoyment of radio, both at home and at the school radio club.
- NINE YEAR OLD Casey Haley, callsign AB5RG, from Houston, Texas, is believed to be the youngest person ever to qualify for the DX Century Club Award (DXCC) for receiving QSL cards for contacts with 100 different countries.
- A BOOKLET *Table of Artificial Satellites Launched in 1993*, published by the International Telecommunications Union, lists no less than 124 satellites put into orbit last year!
- THE CITY AND GUILDS report on the September Novice RAE shows a 76.9% pass rate.
- 1995 WILL BE the year of Marconi, 100 years since he demonstrated the first wireless telegraph.

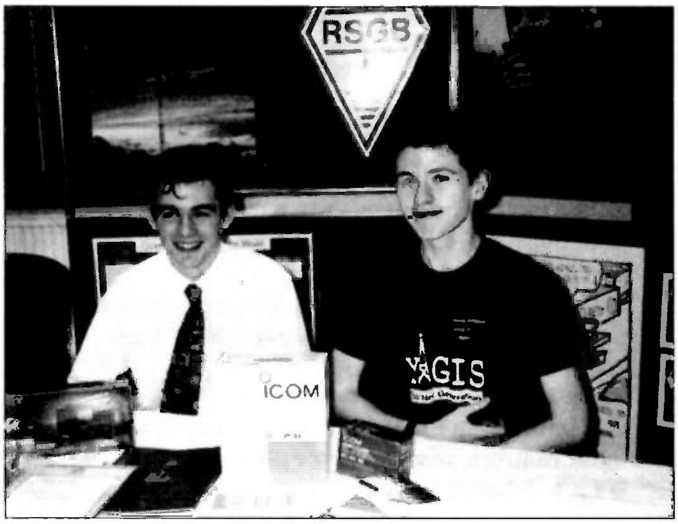
FULL LICENCE AT TEN

THE QUALIFICATION FOR the Full Amateur Radio Licence is a Pass in the Radio Amateurs Examination. But until now anyone under the age of 14 has had to wait until his or her 14th birthday before they could be issued with a licence, even though they had passed the exam.

The RSGB has been discussing this for some time with the licensing authority, the Radiocommunications Agency. This resulted in an announcement by the RA in October that a Full Licence is available to anyone over the age of 10 who has passed the RAE, provided they have also held a Novice Licence for at least one year.

Young Amateur of 1994

THIS YEAR'S YOUNG Amateur of the Year is Robert Aley (17), G7SRR/2E1AXZ of March, Cambridgeshire. He was chosen by a panel from the Radio Society of Great Britain (RSGB) and the Radiocommunications Agency (RA).



Robert Aley, G7SRR (left) and Stephen Conner, GM0TET, with some of the prizes presented to them to mark their amateur radio success.

Robert has been an RSGB Novice Instructor since September 1993 and has recruited several more Instructors. In July, he received his Full Licence and has already booked a date for his 12 words per minute Morse test. His RAE fee was earned by writing questions for the Novice RAE.

Other activities have included running a special event station, designing his own QSL cards and helping the Amiga Amateur Radio User Group. An active packet radio operator, Robert has written software for a Mailbox System.

Robert has built VHF/UHF aerials, an 80m SSB transceiver, a dummy load and power meter, a field strength meter and a hands-free mobile microphone.

This year's runner-up is Stephen Conner (16), GM0TET, who gained his Novice licence, 2M1ARO, in July 1992. He passed the 12WPM Morse test in October of that year and became 2M0ADS. By December he was GM0TET.

Stephen's activities have included contest operating for his club, helping to teach a Novice course and repairing radios for other club members. He has built his own packet radio modem, and designed and built an antenna tuner and two power supplies.

Prizes worth hudreds of pounds were donated by the RSGB, the RA and Industry and were presented to Robert and Stephen at a ceremony held at the RSGB HF Convention held on 7-9 October.

RON'S 'OWLING SUCCESS

RON PLANT, G6HZV, caused quite a stir when he tried to protect his VHF aerials by putting a plastic eagle owl on the top of his mast. It succeeded in keeping off the birds which had damaged his aerials but neighbours thought it was real and called the police. Ron's plastic owl has also attracted birdwatchers and the RSPCA (who had been called to rescue the 'cat').

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Amateur Radio and the RSGB

RADIO AMATEURS are qualified radio operators who are licensed to talk to other operators, often in distant countries, from their own homes. Amateur radio is a hobby for all ages but it is different from CB radio because a very wide variety of frequencies (wavelengths) can be used, and contacts can be in different 'modes'; by Morse code or teleprinter, between computers or even television. Many amateurs build all or part of their station equipment.

The **Radio Society of Great Britain** (RSGB) is the national society for all radio amateurs (transmitters and listeners) in this country. It has over 30,000 members, including many in overseas countries.

The Society looks after the interests of radio amateurs throughout the UK. Talks between the RSGB and the Government's Radiocommunications Agency have resulted in the popular amateur radio Novice Licence.

In particular the RSGB is keen to encourage the experimental side of electronics and radio, and the Society's monthly magazine *RadioCommunication* is sent free to all members. We're having lots of fun with our hobby, so why not join us?

If you would like more information on the RSGB or the Novice Licence, write for an Information Pack to Sylvia Manco (enclosing a large stamped self-addressed envelope), at:

RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

Christmas Tree

By Robert Snary, G4OBE

THIS CIRCUIT causes one LED at a time to light up and to 'step' round a cardbourd Christmas tree (**Fig 1**) causing a flashing effect. The circuit (**Fig 2**) uses two commonly available Integrated Circuits which deal with all the hard work: A '4011' provides timing pulses; resistor R1 and capacitor C1 determine how fast the clock runs. The '4017' is a 'divide by 10' counter where the IC has one input and up to ten outputs.

The outputs are light emitting diodes (LEDs) and you can use red, orange, yellow or green.

The circuit is built on a piece of Veroboard and several tracks need to be cut; these are shown in Fig 1. A 3/8in drill bit can be used as a track cutting tool provided it is hand held and only light pressure is used.

The first things that should be soldered are the IC holders; the next step is to carefully solder in all the wire links and the veropins for all the off-board connections.

Once this is complete the resistors and the capacitor should be soldered in and the Christmas tree assembled. The LEDs are connected with their anodes being wired to the output pins of the counter and their cathodes interconnected, and then one wire is taken from all of the cathodes to resistor R4. Note that the anode is the longest lead of the LED.

COMPONENTS

Resistors
- R1 680k
- R2, R3 10k
- R4 470R

Capacitor
- C1 0.47μF Miniature Metallised Polyester Film

Semiconductors
- IC1 4011
- IC2 4017

Additional Items
- D1,D2,D3,D4,D5,D6,D7 5mm Light Emitting Diodes in your choice of colours
- 14 Pin DIL IC Holder
- 16 Pin DIL IC Holder
- PP3 Battery Clip, Veroboard, Veropins, Insulated wire to make links

A kit is available from JAB Components (See page 7) at £6.70 inc P&P. Use the voucher on page 23 to get 50p off this kit.

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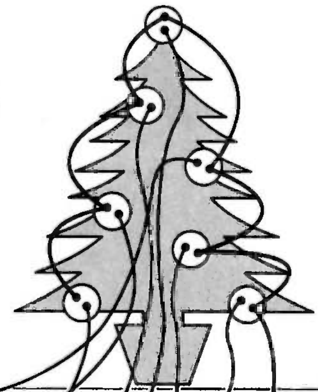
TESTING

ONCE YOU HAVE finished the soldering you should carefully check that you have no solder 'bridges' linking adjacent tracks on the Veroboard. Ensure that the supply is correctly wired and confirm that the rest of the wiring is correct. You can then place the ICs in their holders. The ICs must be positioned correctly: Pin 1 can be identified by either a notch or a spot at the end of the IC. Now power-up the circuit and the LEDs will light up in sequence.

If the circuit does not work first time check that all the cuts on the back of the Veroboard have been made, all the wire links are in the correct place and that there are no 'dry joints' or solder bridges.



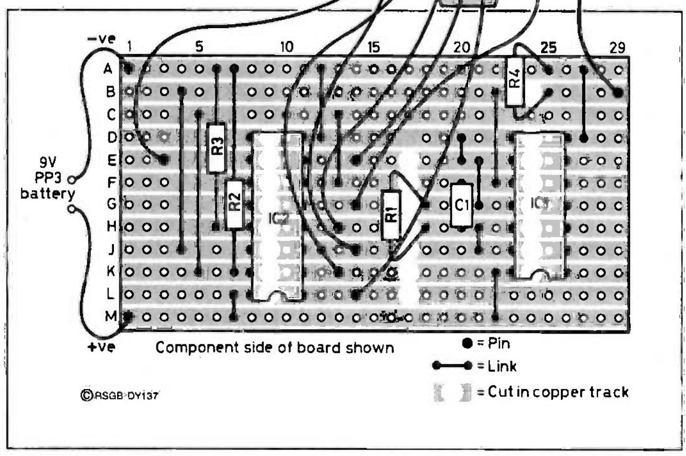


Fig1: Christmas tree, component layout

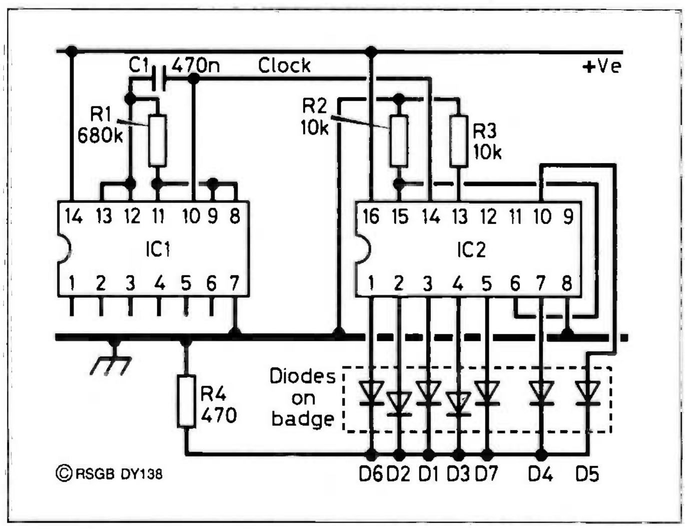


Fig 2: Christmas tree, circuit diagram.

A Signal Injector Circuit Tester

By Steve Ortmayer, G4RAW

"IT'S NOT WORTH FIXING", said Norman Novice to Nancy. Nancy had been given a broken transistor radio. "Keep it if you can get it going" said Mrs Jones from down the road.

When friends and neighbours know you are interested in radio you are often given items of radio to fix. But when you are confronted with a radio that doesn't work it is often difficult to know where to start.

One useful item of test equipment is the signal injector. It operates by injecting a wide-band signal at different parts of the circuit to enable you to find out which part of the circuit is faulty.

Signal injector being used to test a transistor

BUILDING THE INJECTOR

THE CIRCUIT **(Fig 1)** is an astable multivibrator (see *D-i-Y Radio* Vol 4: No1), the two transistors switch on and off to make a buzz at about 500Hz, but the harmonics can be heard on the RF (radio frequency) part of a receiver. The project is constructed on plain perforated board, that is without the copper strips, as shown in **Fig 2**. The component wires are bent under the board and soldered together. I used two surplus BC108 type transistors from a rally (£1.00 for 50 untested).

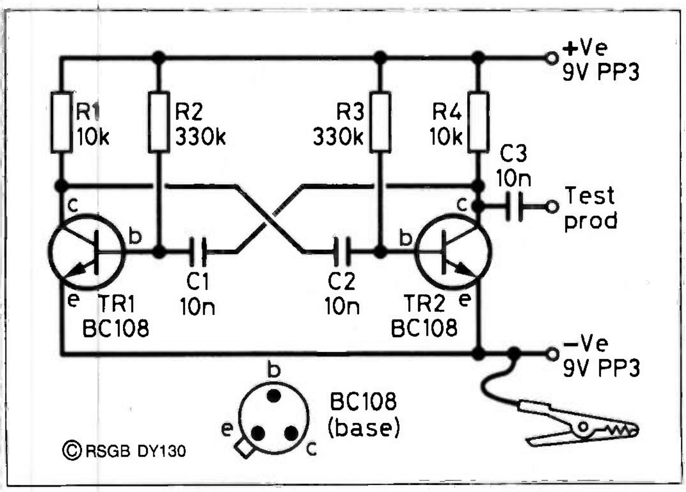


Fig 1: Circuit diagram of the signal injector

I did not bother with an off/switch but just pulled off the battery snap when the injector was not in use. The battery is held to the board with insulation tape. A solder tag is bolted to the board to take a probe formed from a short length of stiff wire with an insulated sleeve. Solder an earth lead to the board, and at the other end of the lead connect a crocodile clip.

USING THE INJECTOR

NOW YOU ARE READY to check your newly constructed signal injector. Carefully check the wiring with the diagrams on these pages, and when you are satisfied that it is correct connect the battery. The signal injector can be tested using a battery radio that is known to work. Connect the earth lead crocodile clip to the negative battery lead of the radio. Switch on the radio and touch the probe onto the centre connector of the volume control. If all is in order with the probe then a loud buzz should be heard from the radio's loudspeaker. Now try using the probe on other parts of the radio, but take care not to short-circuit anything with the probe.

In a future *D-i-Y Radio* article we will be looking at fault location methods using the signal injector and other types of radio servicing equipment.

A SOURCE OF COMPONENTS

EVEN IF FAULTY radios cannot be repaired they are a good source of parts. For instance, the two-gang air-spaced tuning capacitor normally found in older radios can cost over £8 if you try to buy them new but they are available at little or no cost if salvaged from faulty equipment. I have just used a transformer from an old radio have hoarded for 30 years!

And there's another advantage of being able to fix electronic equipment. When I was at school in 1959 a girl in my class asked me to fix her record player; it just needed a bit of soldering on the pick-up. We tested it by playing 'Dream Lover' by Bobby Darren . . .

WARNING

DO NOT WORK ON radio or electronic equipment connected to the mains. Most of this equipment is battery/mains so play safe and only work with equipment powered by batteries.

COMPONENTS

Resistors	
R1, R4	10k, 1/4 watt
R2, R3	330k
Capacitors	
C1, C2, C3	10n ceramic
Semiconductors	
TR1, TR2	BC108
Additional Items	
PP3 Battery and snap connector	
Perforated board 10cmx3cm	
6BA solder tags	
Thick wire for probe	
Crocodile clip	

A kit for this project costs £3.00 inc P&P from JAB Electronic Components, The Industrial Estate, 1180 Aldridge Road, Great Barr, Birmingham B44 8PE. Use our special Voucher on page 23 to get 50p off this kit.

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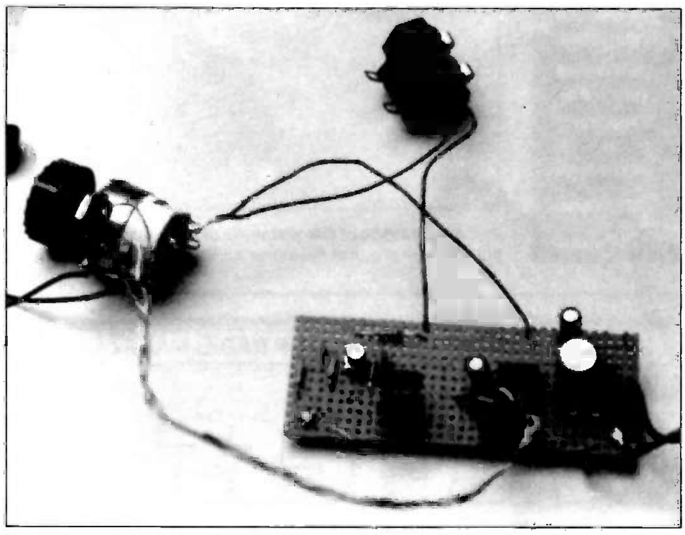


The components placed on the PCB.

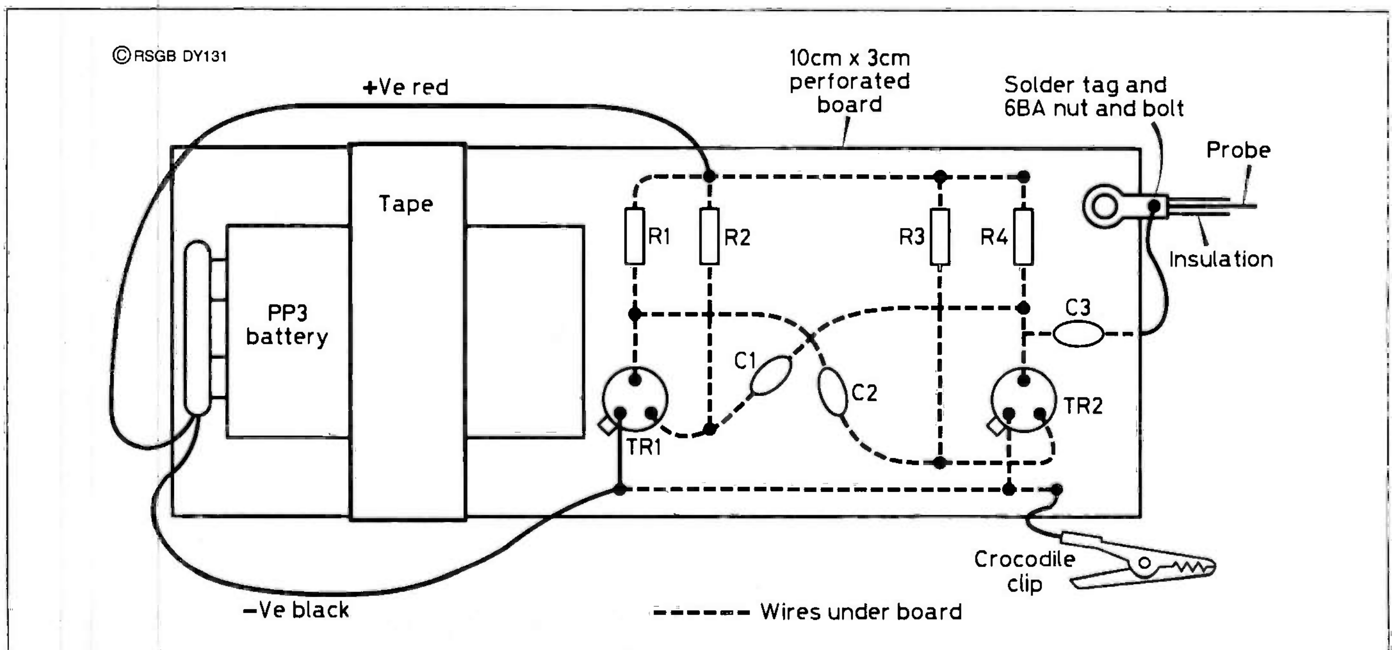
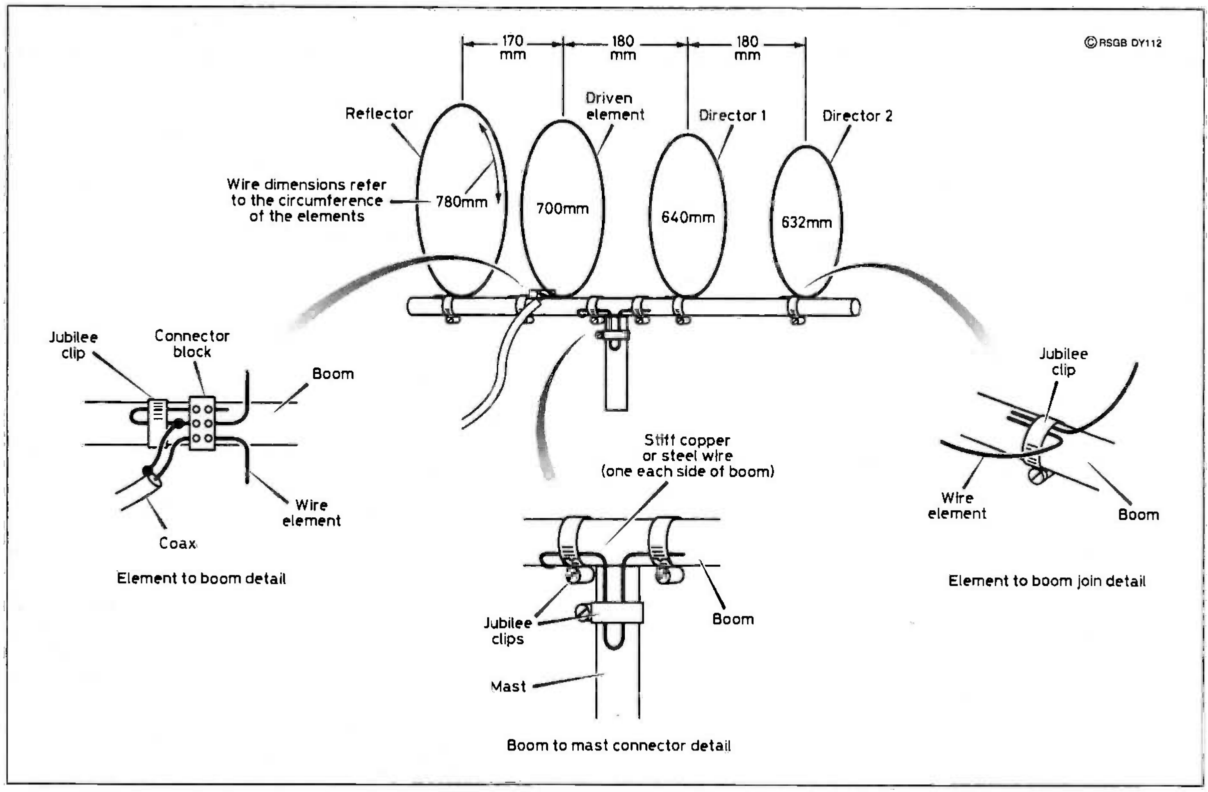


Fig 2 Component layout of the signal injector

TECHNICAL UPDATE



The dimensions of the elements of the four element 70cm quad, shown in the last issue of *D-i-Y Radio* referred to the circumference ie total element length, not diameter as stated. Apologies for this error. The diagram shown above is the correct one.

Standing Waves Explained

Why an SWR brigde is useful

THE STANDING WAVE RATIO (SWR) meter is probably the best known of all antenna instruments around today. Nearly everyone who is interested in amateur radio possesses an SWR meter and has some idea of how to use it. But just what does it do?

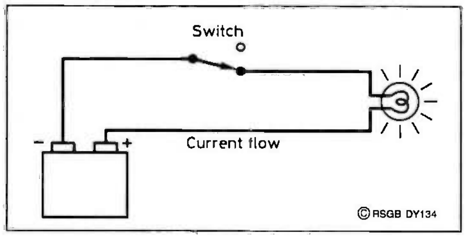


Fig 1: The light bulb converts electrical energy to electomagnetic light energy.

Before describing how the SWR meter works let's have a look at antenna basics. An antenna is a **transducer**. That is a device that changes one sort of energy for another. An example of a transducer is a light bulb which converts electrical current into light, **Fig 1**.

An antenna is also a transducer, it changes radio frequency current into electromagnetic energy, **Fig 2.** The antenna has 'resistance' just like the light bulb. If this resistance did not exist then current would not flow if electrical energy were connected to it.

To connect a light bulb to a battery we require two wires. To connect a transmitter to an antenna we also need a couple of wires, however these wires have to be constructed in such a way as to prevent the energy being lost before it arrives at the antenna. This type of RF low loss wire is known as **transmission line** and a common type of transmission line is coax cable.

Ideally all the signal power generated at the transmitter should arrive at the antenna, in other words there should be no loss of power.

Coax cable also has an AC resistance, which is made up from the capacity created by the close proximity of the centre conductor and the braid of the cable; and also by the inductance of the wire itself. This AC resistance of the coax cable is called its **Characteristic Impedance** and for communication and ham radio equipment it is usually 50Ω (Ohms).

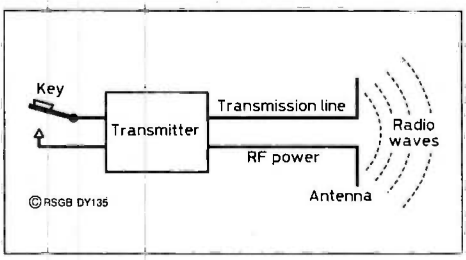


Fig 2: The antenna converts RF current to electromagnetic radio waves.

If this impedance can be arranged so that it is the same as the impedance of the coax cable then the transfer of power from the transmitter to the antenna will occur with the minimum loss. If the antenna impedance is not the same as the cable impedance then there is a **mismatch**, which causes some of the RF energy to be reflected back down the coax from the antenna. A situation where a transmitted signal travelling down the coax towards the antenna (**incident wave**) and a travelling the other way at the same time (**reflected wave**) causes an interaction, creating a stationary pattern of voltage and current on the coax. This is known as a **standing wave, Fig 3**. The ratio of the maximum points of the stationary pattern to the minimum ones is called the **Standing Wave Ratio (SWR)**.

The SWR meter is simple to use. It is connected in the transmission line between the transmitter and the antenna. Transmitter power is applied and the forward reference adjusted to a preset level (usually full scale deflection of the meter). The switch is then set to reverse and the SWR read directly from the meter scale.

Although an SWR meter can be used to set up and optimize an antenna it doesn't necessarily indicate how good the antenna is. For instance, if you were to connect the transmitter to a dummy load via an SWR meter, the meter would give a 1:1 (perfect) SWR but a dummy load is hardly a good antenna.

Because an SWR meter can remain in the transmission line while the station is operating the antenna system can be constantly monitored, and the presence of any fault that may occur on the antenna system will be detected.

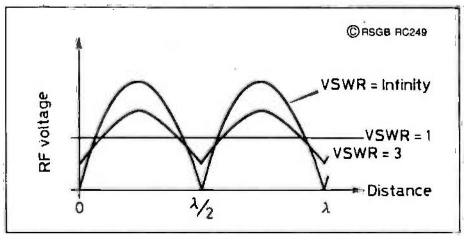


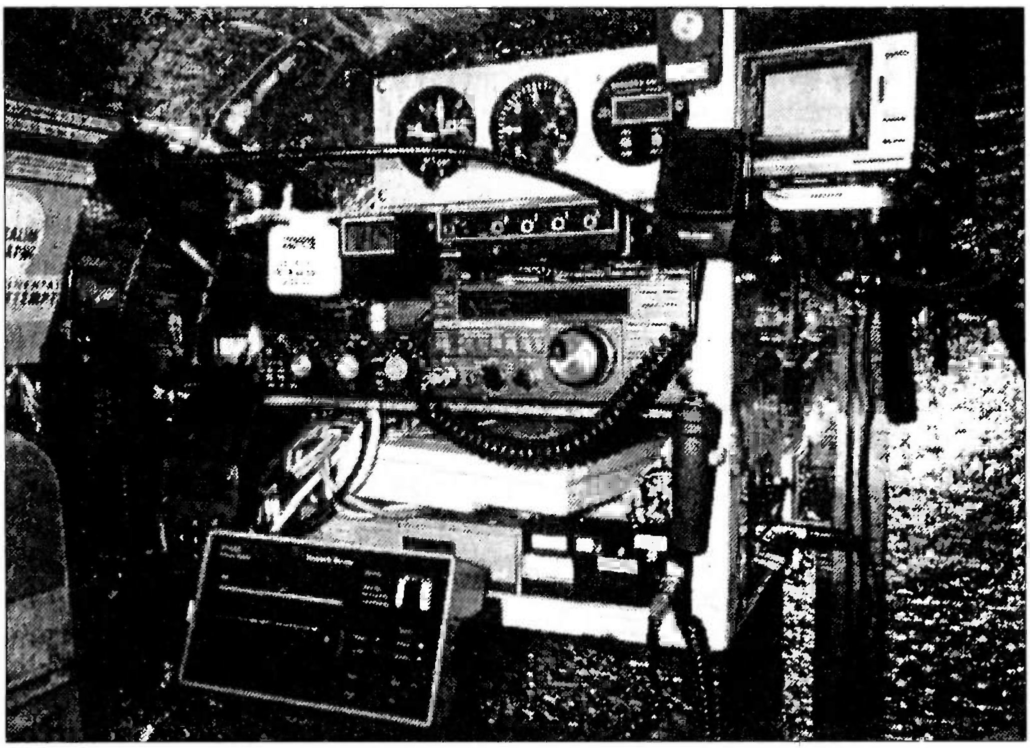
Fig 3: Standing waves on a transmission line.

Ballooning Across Australia

How Dick Smith, VK2DIK, took amateur radio up in a hot air balloon

IN JUNE 1993, Dick Smith, callsign VK2DIK, set out on a journey across Australia in a hot air balloon. He took with him a Yaesu HF transceiver. His antenna was a dipole with one half sewn into the balloon canopy and the other half trailing below the gondola.

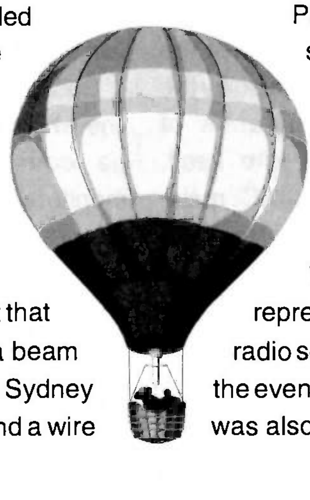
Six previous attempts to complete this crossing by balloon had been tried by other people - none of them Australian - so Dick intended to set the record straight *and* have a grand adventure at the same time.



The control console in VK2DIK's gondola showing the amateur radio installation.

SETTING UP 'MISSION CONTROL'

DICK WORKED IN the Terrey Hills headquarters of the publishing company Australian Geographic, hence the logo on the balloon! The radio equipment was loaned by Dick's electronic company (DSE) which he sold off to Woolworths in the 1980s, and they supplied all he required to keep in contact with the Australian Geographic offices who were monitoring the journey. Sponsors included Telecom, the Bureau of Meteorology and the Divisional Headquarters (the Australian equivalent of the UK's Radiocommunications Agency) and, with their help, he set up a Mission Control Room open to visitors 24 hours a day - with a continuously operational amateur radio station.



During the planning stage it became apparent that they would need to use the 14MHz band and a beam antenna to achieve good quality signals between Sydney and Western Australia. They could use 7MHz and a wire antenna when the balloon approached the eastern states of Australia.

The control station was set up and equipped for following the journey and keeping communication links with the balloon. The equipment included two Yaesu HF transceivers, an FT-1000 and an FT-990, loaned by DSE, and a beam and support tower for 14MHz operation loaned by Emtronics.

Plenty of publicity material was then prepared so that the many visitors, from schools and the general public, would go away with a pack of information regarding amateur radio and the expedition. All was now ready for the Press Conference prior to take-off and the arrival of the visitors.

Ten days before the scheduled start, representatives from WIA, the Australian national radio society, and press and television came to cover the event and to provide maximum publicity. The event was also publicised on the New South Wales WIA

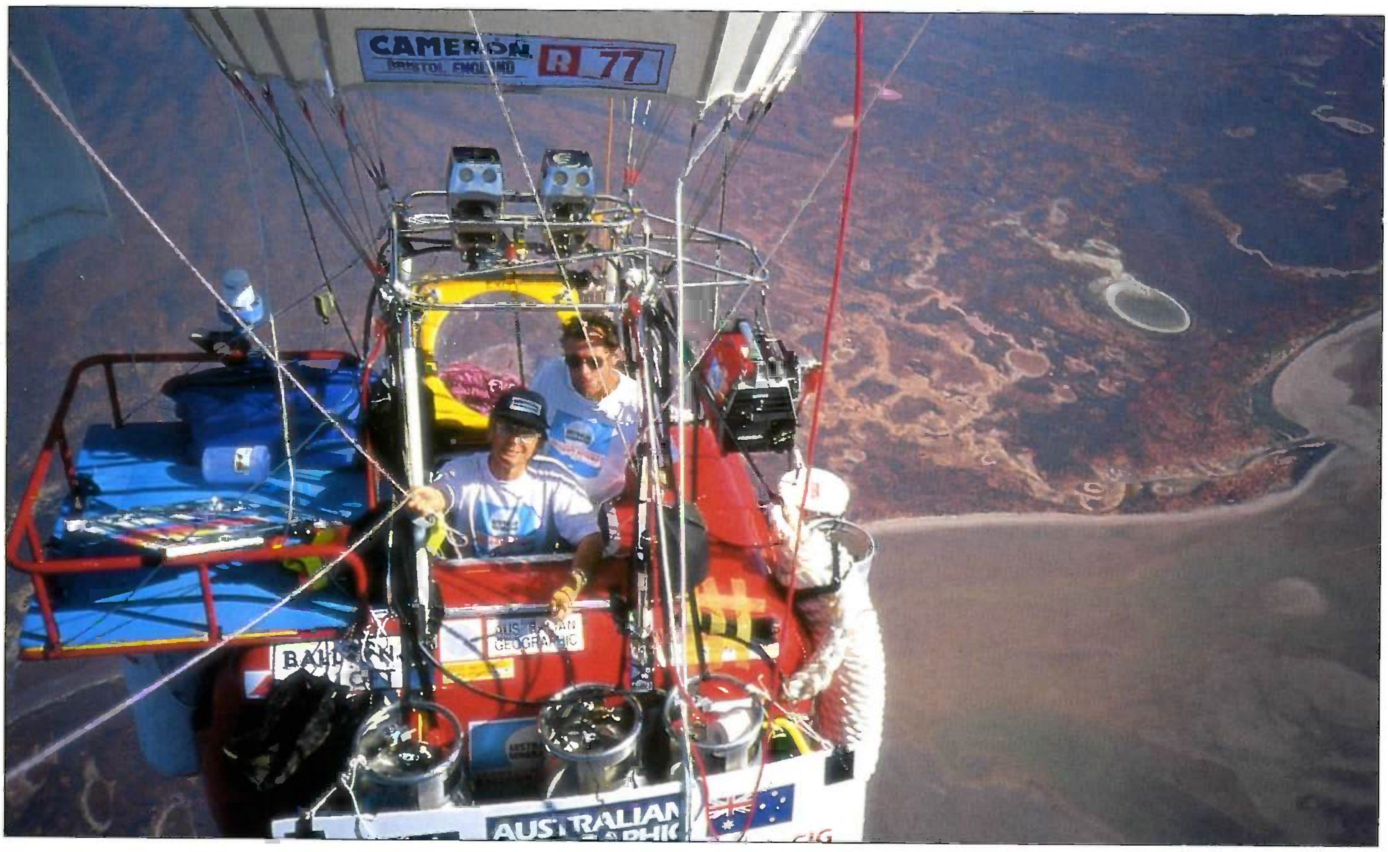
Division's Sunday news broadcasts during May (these are similar to the RSGB's GB2RS news broadcasts). The 15 volunteers who were to man the base radio station were briefed during the weekend before the launch to familiarise themselves with the equipment and the operation - all was now ready. School children were invited to sample the delights of amateur radio and listen to a real action-packed adventure taking place.

THE JOURNEY

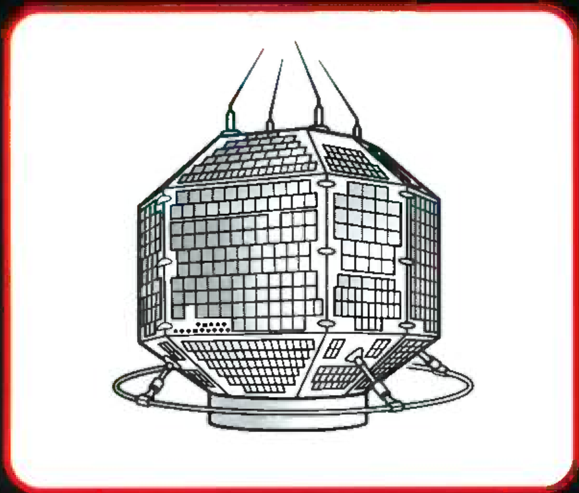
DICK AND HIS co-pilot John Wallington set off from Caernarvon, in Western Australia, on 16 June, and immediately the special event station at mission control (VK2AWI) became active and operated continuously over the 40 hours of the flight. Eight volunteers operated over the two days, using 14MHz and 7MHz, to make a total of 230 contacts. Radio amateurs from every state and territory across Australia gave tremendous support - with many of them acting as relay stations. The amateur radio operation also gained valuable coverage on television.

Dick landed at Tabulam, a village 40km west of Casino in NSW, on 18 June, and the special event callsign VI2AUS was then activated. This clocked up a further 1500 contacts in thirteen days on CW, SSB, FM and packet.

All in all this was a highly successful achievement - a new record and lots of amateur radio publicity. [*Our thanks to WIA, Australian Geographic and to Dick Smith, VK2DIK, for the story and the photos for this feature* - Marcia].

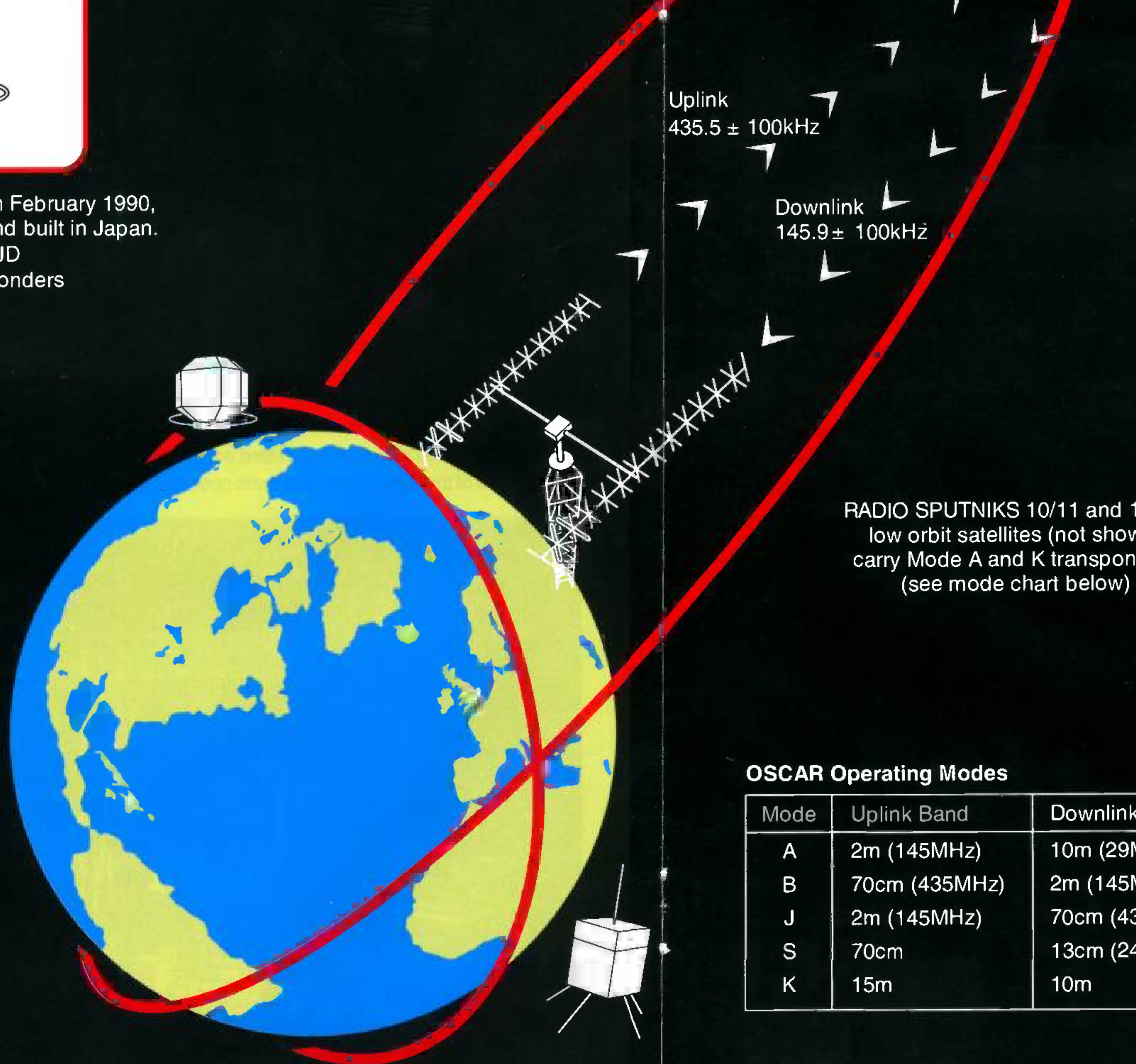


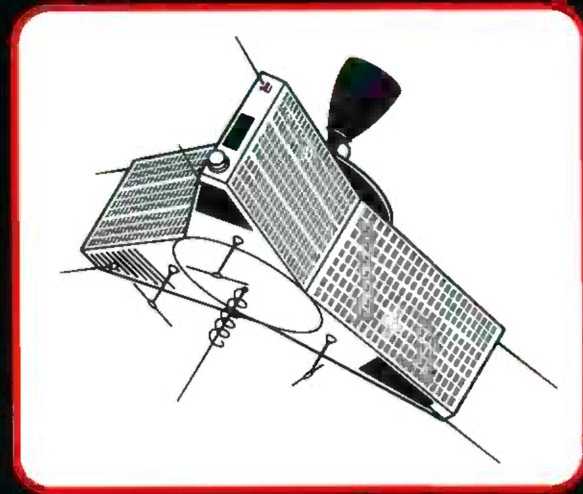
AMATEUR RADIO SATELLITES



OSCAR 20, launched into low Earth orbit in February 1990, is the second amateur satellite designed and built in Japan. It carries Mode J and Mode JD (digital store-and-forward) transponders

MOST AMATEUR RADIO satellites operate as transponders; they receive a signal from earth on one frequency and re-transmit it on another. The range of a satellite depends on its height above the earth: The low orbiting satellite has less range but you can listen to it using an HF receiver or a hand-held transceiver. The high orbiting satellite has long range but you need high gain steerable antennas.

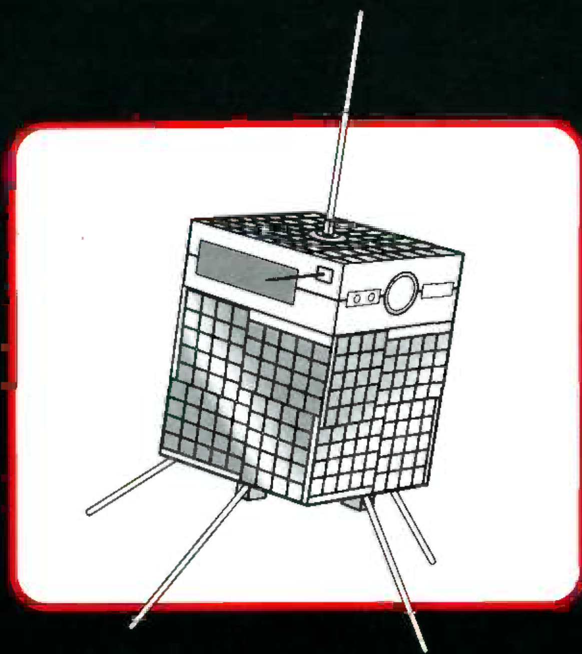




OSCAR 10 and 13 carry transponders for Mode B and also have experimental Mode S transponders. They orbit the earth twice a day

PHASE 3-D is the next amateur radio satellite due for launch in 1996

RADIO SPUTNIKS 10/11 and 12/13, low orbit satellites (not shown) carry Mode A and K transponders (see mode chart below)



OSCAR 17, also known as DOVE (Digital Orbiting Voice Encoder)

OSCAR Operating Modes

Mode	Uplink Band	Downlink Band
A	2m (145MHz)	10m (29MHz)
B	70cm (435MHz)	2m (145MHz)
J	2m (145MHz)	70cm (435MHz)
S	70cm	13cm (2401MHz)
K	15m	10m

INTERNATIONAL SATELLITE P3-D AMSAT

AMSAT 25 Years In Space 1969 - 1994

CAUTION

Please note: Do not transmit on any satellite unless you know the band up/down parameters and mode sections, ie FM, CW, SSB, DATA

For further information send a stamped addressed envelope (9" x 6") and 36p UK stamp to: AMSAT-UK, LONDON E12 5EQ

D-i-Y RADIO RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE

Standing Wave Meters Reviewed

A look at the different types of SWR meter

STANDING WAVE RATIO (SWR) METERS are useful for checking the 'matching'of your aerial and transmitter (see *Ham Facts* on page 9). But it is important that an SWR meter inserted into a transmission line, such as open wire feeder or coax cable, causes the minimum disturbance to the impedance of the transmission line. This is achieved by careful construction inside the SWR meter.

The forward and reflected travelling waves are received using coupled parallel lines. There are many variations of the construction of these lines. Sometimes the lines are mounted in an enclosed metal trough rather than a true coaxial configuration. Another popular option is to use transmission lines printed on a circuit board. There is also a method of measuring SWR using a ferrite transformer as described in the article by Robert Snary, G4OBE, on page 18.

NETSET 21-523 SWR METER

WE TRIED VARIOUS SWR CB SWR meters to see how they worked out for amateur radio use, especially on the VHF and UHF bands because the performance of low-priced SWR meters cannot be gauged from their external appearance. We bought a new SWR meter from Tandy (the Netset 21-523, priced £12.99, see photo on page 23) and compared it with a collection of older meters (pictured on this page). A 118.5Ω dummy load was plugged into the meter's antenna socket, which should have given an SWR reading of just over 2:1. The results are shown below in **Table 1**.

The G4OBE meter using the transformer gave slightly optimistic readings in the HF band but this could be improved with calibration. However this meter gave no reading at VHF and UHF.

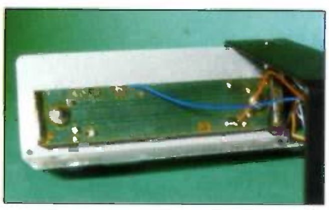
A couple of SWR meters sold for CB use.

The SWR3 meter used an enclosed metal trough line and gave better readings at VHF than HF. The Altai SWR-2t and Netset 21-523 meters used printed circuit transmission lines. The accuracy of these instruments tended to be better on the higher HF and lower VHF bands. The results show that the Netset gave reasonable accuracy on 144MHz so it should work well on the 50MHz band, though this was not tested. The meter is designed to be used between 3 and 30MHz.

The best method of checking SWR meters is to build a set of dummy loads using carbon or metal film resistors inside an antenna plug. A resistor of 50Ω should give an SWR of 1:1, a 25Ω or 100Ω resistor will give a SWR of 2:1. Be careful not to use too much power when checking the SWR or you will burn the resistors out.

New SWR meters for sale cheaply all appear to use transmission lines printed on PC board. The older SWR meters using an enclosed metal trough lines gave the best results for VHF/UHF and the best places to buy these are radio rallies or surplus radio shops. If you can take the back off and inspect the inside, look for a metal trough line as illustrated below.

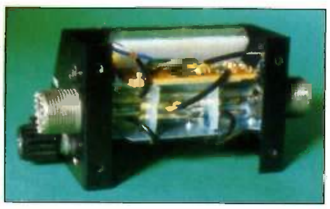
The inside of the Netset 21-523 meter, with the transmission line printed on PC board, is shown in the photograph on the left.



Inside an SWR meter showing the transmission line printed on the PCB.

Frequency	G4OBE	SWR3	Altai SWR-2t	Netset 21-523
21.3MHz	1.5:1	1.2:1	1.1:1	1.1:1
145MHz	-	2.2:1	1.8:1	2.05:1
433MHz	-	2.6:1	1.45:1	3:1

Table 1: Results of SWR meter tests at low power using a 118.5Ω dummy load.



Inside an SWR meter showing a metal trough line.

Capacitors - The Strange Conductors

By John, GW4HWR, Chairman RSGB Training & Education Committee

OF COURSE CAPACITORS can't conduct! Everyone knows that a capacitor consists of two conductors separated by an *insulator* which is called the **dielectric**, but connect a capacitor in series with a torch bulb across a low voltage AC supply (*not the mains*) as shown in **Fig 1** and see what happens. The reason for the use of two capacitors in series will be explained later.

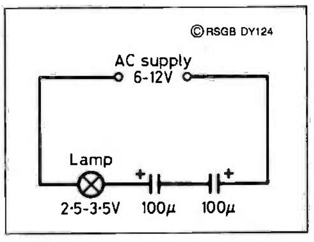


Fig 1: Alternating current appears to pass through a capacitor.

The lamp needs current to make it light so how does the current get through the capacitor? It doesn't, it's all an illusion. Because the supply is alternating the voltage is either rising or falling and the capacitor must either charge or discharge and it is this current which lights the lamp. The amount of current depends on the supply voltage and frequency and the 'size' (capacity) of the capacitor, this in turn depends on the area of the 'plates' facing one another, the distance between them and the material used as the dielectric.

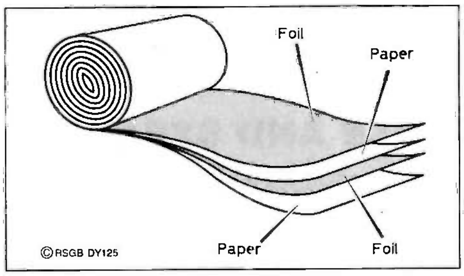


Fig 2: A rolled foil capacitor partly rolled up.

$$C = KA / d$$

Where C = Capacitance, A = area of plates, K = the effectiveness of the dielectric compared to air and d = the distance between the plates.

A number of 'tricks' are used to get higher capacities. The surface area is increased by using long strips of metal foil interleaved with very thin waxed paper - foil, paper, foil, paper. One foil is allowed to stick out on one side and the other on the other side. The strips are then rolled up to make a more compact component and the action of rolling actually doubles the capacity because the backs of the foils are brought close together. **Fig 2** shows the arrangement.

WHICH ONE?

THE CONNECTIONS are made to the two ends of the roll where the foils stick out. Capacitors having capacities up to 1 microfarad (µF) are often made this way. Waxed paper is a good insulator and is about six times better than air as a dielectric (K = 6). The type can be used on quite high voltage, up to about 500V.

Smaller capacitors are made by having a 'stack' of flat plates interleaved with insulating material **(Fig 3)**. Alternate plates are allowed to stick out at opposite ends, these are connected together to form the connections.

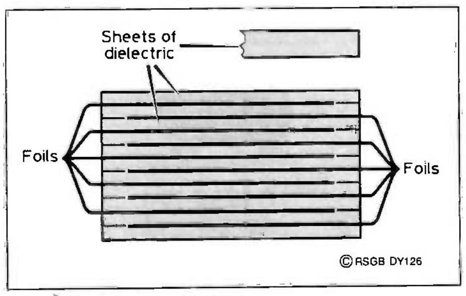


Fig 3: Flat plate capacitors.

This type of construction, using a variety of dielectric and conductor materials, is used to produce very small components with capacities from 1pF (picoforad) to 1µF.

One disadvantage of the rolled foil capacitor is its 'self inductance' which makes it unsuitable for use in many high frequency (RF) circuits. The action of rolling introduces some inductance in series with the capacitor **(Fig 4)**. The flat plate capacitor does not have much inductance built in and is, therefore, most often used in RF circuits.

ELECTROLYTIC

WHEN HIGH CAPACITIES are required a different technique is used. The dielectric is a microscopically thin layer of an aluminium oxide created and maintained by a process of electrolysis. The extreme thinness of the dielectric and its very high permitivity (K = 1000 to 2000 times higher than air) allows very big capacities to be built into a very small component but the dielectric must be maintained by a small current flowing in the correct direction. Electrolytic capacitors must always be connected the correct way to a supply, reversal will destroy the dielectric and the 'capacitor' becomes a short circuit and can sometimes explode.

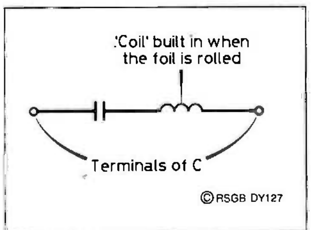


Fig 4: The effective circuit of a rolled foil capacitor.

A DODGE

ELECTROLYTIC capacitors and a very similar type - tantalum - are not usually used when the applied voltage sometimes reverses as with AC. However there is a dodge which allows them to be used on AC. In Fig 1 electrolytic capacitors are used because of the high capacity required and two are used in series with their polarities reversed. In this way one capacitor must always be connected correctly and will prevent reverse current flowing through the other. Sometimes the two are made into one package when it is known as a reversible electrolytic.

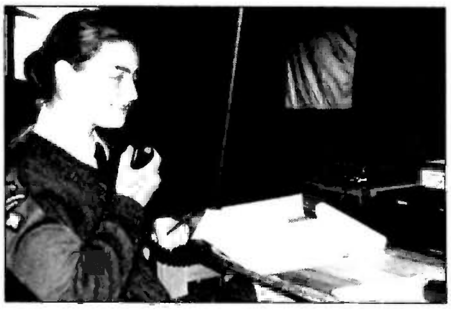
2's Company

News and Reports from Novice Licensees

CONGRATULATIONS TO Robert, G7SRR (ex-2E1AXZ), the new Young Amateur of the Year and to the runner-up Stephen, GM0TET (ex 2M1ARO and 2M0ADS). Their stories are featured on page 3.

Congratulations also go to Aaron, 2E0AGC, mentioned last time, who now has the Full Class A callsign G0VDC. And to George, 2E0AHI, who has passed his 12WPM Morse test, presumably in readiness for passing the RAE. These are fine examples of Novices who have gone on to get Full licences - which is what the Novice scheme was intended to do.

Still a Novice licensee, but just as worthy of congratulations is Karl, 2E1AHB, who has received a certificate from the RSGB for having successfully trained at least twenty other Novices!



Air Cadet Samantha West (13) operating GB4ATC at RAF Hendon. She is awaiting her Novice callsign.

SLOW AND STEADY

ANOTHER Novice to Full licence story comes from Ken Toop who wrote in the newsletter of the South Dorset Radio Society on how he became a radio amateur. As a boy he was attracted by advertisements for radio equipment, but spent his money on motorbikes. Later, as a married man, he signed up for a Radio Amateurs Exam course but then started shift work which meant he could no longer attend the classes. Eight years later, he was looking at a Maplin catalogue and came upon a radio advertised as 'suitable for the Novice licence'. Having had two strokes Ken was not sure he would be able to cope with the study but at a meeting of the Flight Refuelling Amateur Radio Society he met G2BDV who helped get him on the club's first Novice course, run by G1LHW in May 1991. By October, Ken was 2E1AFU.

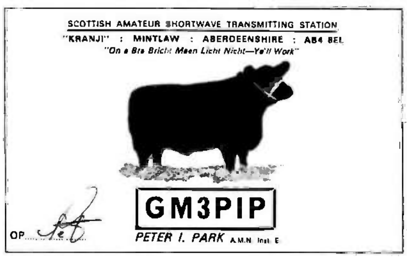
He was feeling nervous when he put out his first call on the local repeater, GB3SD, but was quickly put at his ease by his first contact, G0EVW.

Joining the South Dorset Radio Society, he discovered that nobody looks how you image them from listening on the air. He made many friends, went out on some VHF contests, and found himself being nagged to take the RAE. Ken is now G7PCE and he enjoys operating through satellites.

THE LOG BOOK

THE RESULTS OF the February 1994 RSGB 432MHz Fixed Contest ('Fixed' means that no portable operation is allowed) show that 2E1AGJ came 27th out of 42 entries with his furthest contact at 226km. And running only one watt into a dipole, Ruth, 2E1BZR, made 11 contacts to come 40th. 2E0ACY was one of two operators manning Reading and District Amateur Radio Club's 'B' station in the January 1994 RSGB Affiliated Societies Contest, an 80m CW (Morse) event. Well done all.

Paul, 2E1DBI, uses an IC4E hand-held to work through his local repeater GB3VH in Hertfordshire. Even with this basic station, life isn't dull. He chatted to G1JDM/P who was up on the South Downs above Worthing, he was fascinated to work G7SOO who had been licensed just two weeks, and swapped stories with G7RDE who was nearly 70 years older than Paul. When there was a 'lift' in conditions, he called through GB3SV on channel RB0, less than 30km (20 miles) away and was amazed to be getting through GB3CK over 100km (60 miles) away in central Kent, also on RB0. These co-channel repeaters are far enough apart to avoid interference under 'flat' conditions.



A beefy QSL from Aberdeenshire . . .

Whilst on holiday in South-West Wales, Paul (as 2W1DBI/P) was able to talk to some of the locals on GB3WG (West Glamorgan) and GB3SP (South Pembrokeshire) and managed to raise GB3ND, 70km (45 miles) away on the north coast of Devon, though there was no-one to talk to.

Band by Band

The Amateur Radio Spectrum: The 80 metre Band

EIGHTY METRES, 3.5MHz, is the most popular band for daytime contacts within the UK. On Sundays you can hear many special event stations using 'GB' prefixes and the RSGB's news broadcast GB2RS (check around 3.650MHz between 0900 and 1130).

Simple receivers, such as the 'Colt' (*D-i-Y Radio*, Vol 3: Nos 1 - 4), or the 'Yearling', (Vol 2: Nos 4 & 5) will perform well on 80m, and a low power transmitter is easy to build (eg 'Crystal Transmitter for 80m CW', (Vol 4: No 1). Simple receiver and transmitter kits can be bought from Lake Electronics, C M Howes Communications and Kanga Products, all of whom advertise in *D-i-Y Radio*.

A long-wire aerial similar to that described for 160m (Vol 4: No 5) will work fine on eighty, but a dipole is particularly effective if you have room (**Fig 1**).

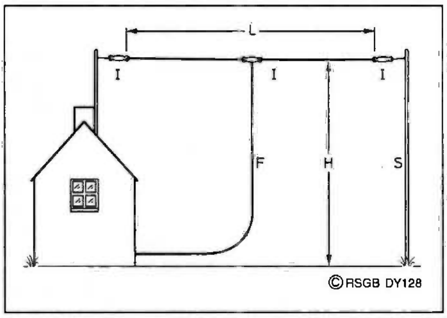


Fig 1: A dipole for 3.5MHz. L is two 20m lengths of wire fed by coax cable (F) and tied to supports (S) via insulators (I). Height (H) should be 5-20m.

Daylight contacts can usually be made up to about 800km as **high angle** signals pass through the ionosphere's **D Layer** and are returned to earth by the **E Layer** (**Fig 2**). As with 160m, the D Layer absorbs **low angle sky-wave** signals on 80m during the day preventing long distance (DX) contacts. At night, however, these signals pass through the D Layer and are bent back to the earth by the E Layer allowing night time contacts up to 3000km at very good strength. During the autumn, winter and spring, world-wide contacts are available but you will often need to search carefully for these weak DX signals.

Check the top and bottom 50kHz of the band for DX stations.

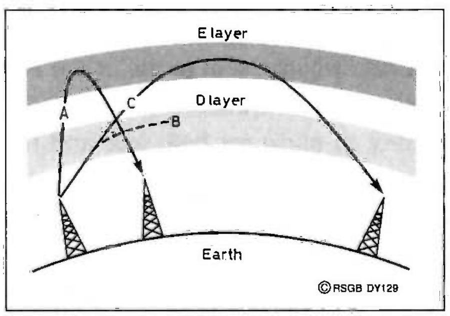


Fig 2: 80m propagation: Daytime (A and B) and night time (C), see text.

BAND FACTS

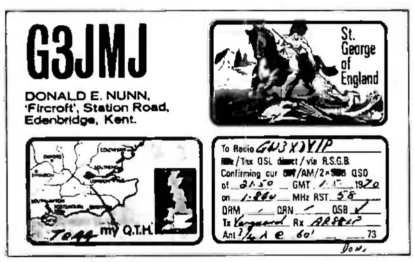
Allocation: (Full A) 3.5 - 4.0MHz, (Novice A) 3.560 - 3.585MHz. Activity: CW 3.5 - 3.58MHz, Data 3.58 - 3.62MHz, SSB 3.62- 3.8MHz.

THE LOG BOOK

LF and HF Band conditions were still poor in September. However, life is never dull in amateur radio and on one day Sporadic E propagation produced a very good path between the north and south of England on 20m. It is very unusual to hear stations at such short distances because high angle (short range) signals pass through the ionosphere, rather than being reflected, at this frequency.

The best of a poor log were: 1.8MHz **VQ9QM** (**Chagos Is**); 7MHz - **UN8PYL** (a new prefix for **Kazakhstan**); 10MHz -**T77C** (**San Marino**), **TA7**/KU0J (an American operating from **Turkey**); and on 14MHz - **9A900PAX** (a special call from **Croatia**).

Now that winter is on us, conditions on the LF and HF bands should improve considerably, particularly for contacts within the Northern Hemisphere. 160 and 80m will be free from the static noise which makes for uncomfortable listening in the summer. The absence of Sporadic E will mean there won't be many stations audible on the 10m band, but there are openings from time to time so it's worth listening on the band.



. . . and a patriotic QSL from Kent

Look out for the special prefix 'OS' which Belgian stations are using (instead of 'ON') until the end of 1994 to commemorate the liberation of Belgium 50 years ago.

Forthcoming contests include 432MHz Cumulatives on 11 and 28 November and 13 December, and the massive *CQ* Worldwide HF CW contest over the 48 hours of 26 and 27 November.

Build an HF-Band SWR Meter

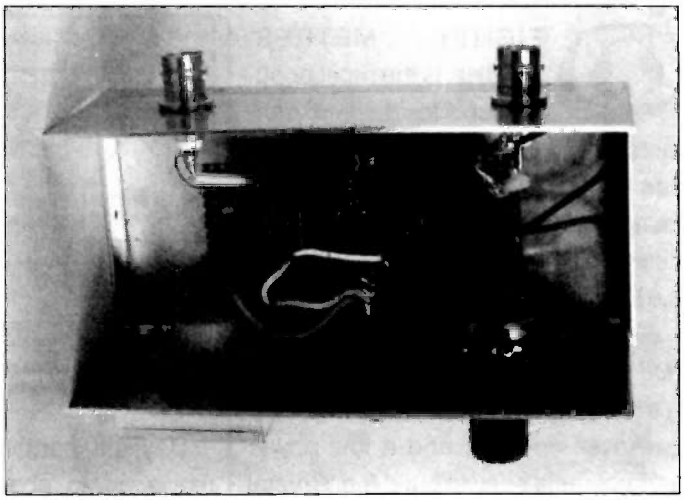
By Robert Snary, G4OBE

THE STANDING WAVE RATIO (SWR) meter gives an indication of how well the antenna system is matched to the transmission line connecting the transmitter to the antenna system (see page 9). Although designed for use on the HF bands from 1.8MHz to 28MHz the prototype was found to be usable at 50MHz with reduced sensitivity.

The circuit works by detecting the forward and reflected power in the coaxial cable to the antenna system so that you can adjust the antenna or the antenna system tuning unit for minimum reflected power. The meter has a sensitivity control to allow for both low and high power operation. Because of this it is impractical to calibrate the meter to indicate true power levels but it can be used as a comparative power meter.

The signal is sampled by the transformer T1 and capacitors VC1 and C1 and rectified by germanium diodes D1 and D2 to give **forward** and **reflected** power indications that can be displayed on the meter. Switch S1 is used to select either forward or reflected power. The variable resistor (RV1) acts as the sensitivity control.

The meter used could be the most expensive part of the circuit if you were to purchase a new one. However, cheap meters are available that may have come from surplus equipment or are the small type used in tape recorders or Hi-Fi equipment. These are available from about 50p each. The more sensitive the meter used the more sensitive the final SWR meter will be. The sensitivity of meters is given by the current that gives full scale deflection (FSD). A meter with a FSD of between 50 and 200μA (microamps) is ideal for this circuit. The higher the FSD current the less sensitive the SWR meter.



General view of the construction of the SWR meter.

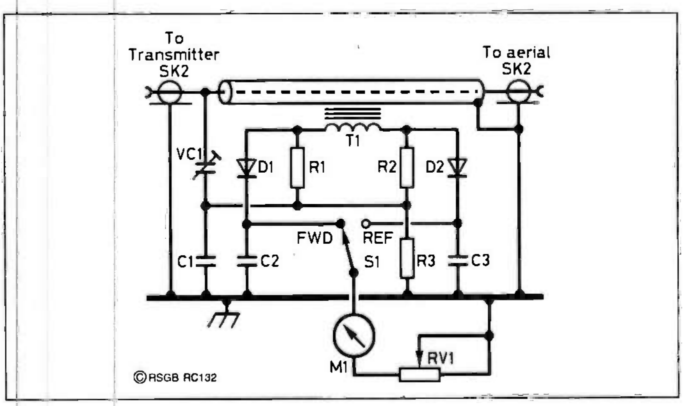


Fig 1: Circuit diagram of the SWR meter.

CONSTRUCTION

THE SWR METER circuit, see **Fig 1**, and the sampling transformer are built and mounted on Veroboard. This has the advantage of construction convenience but limits the use of the meter to below 30MHz because of coupling between the tracks. The Veroboard has 13 strips by 30 holes (the board can be made smaller if needed to fit inside a smaller case). There are three track cuts to be made and this should be done before any soldering is started. The veropins are then inserted to make the connections to the switch, variable resistor and meter.

The next step is to solder in the various components which are mounted on the veroboard in the following order: Resistors, capacitors and finally the diodes, as shown in **Fig 2**. Ensure that the diodes are soldered in with the correct polarity (the bands which indicate the cathode on the diodes should be positioned as shown in Fig 2). Once this part of the board is completed you can then wind the transformer which is used to sample the current flowing through the coaxial cable to the antenna. This is wound on

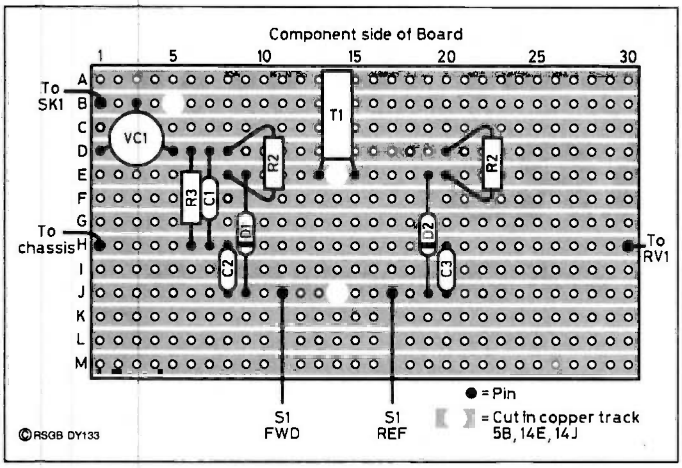


Fig 2: Component layout of the SWR meter.

a small ferrite toroid core.

The secondary of the transformer is wound first and consists of fifteen turns of 36SWG enamelled copper wire, which is evenly spaced over approximately two thirds of the former. These turns should not overlap and care must be taken when winding because the wire is very thin and will break if you apply too much tension.

The primary of the transformer, which has the main signal passing through, is an 8cm length of 50Ω coaxial cable. The braid is connected only to the case at one of the coaxial connectors, this is to prevent the screen and the metal case between the two sockets forming a short circuited single winding. When the transformer is completed it should be fixed to the veroboard and the windings to the transformer secondary soldered to the appropriate veropins. The toroid should be fixed to the veroboard so that it is vertical (see photograph) and this can be done with either cotton or nylon fishing line; on no account must wire be used as it would form a short circuited turn on the transformer.

The case used in the prototype was a vinyl-effect aluminium box type WB1 (Maplin LF02C) but any suitable box could be used. The case should be metal for screening purposes and an aluminium box is ideal as it is easy to drill the required holes with a minimum of effort and tools. No drilling guide for the case has been given as this depends on both the case and antenna connector used.

Ensure that when the circuit board is placed in the metal case there is easy access to the trimmer capacitor VC1 for setting up the circuit. The leads to the off board components and from the input coaxial socket to the trimmer capacitor VC1 should then be soldered. The lead from socket SK1 to VC1 should be as short as possible. Once this has been completed and you are absolutely sure that there are no short circuits you can now start setting up the SWR meter circuit.

SETTING UP

YOU WILL NEED a 50Ω (ohm) dummy load and a transmitter to set up the SWR meter. With the transmitter connected to the coaxial socket SK1 and the dummy load to SK2 and the switch set to FORWARD, you should adjust the SENSITIVITY control for maximum reading on the meter. Once this has been done you then change the switch to read the REFLECTED power and the meter indication should be less, the trimmer VC1 should be adjusted with a non-metallic trimming tool for minimum indication on the meter.

This is all the adjustment that you need to do for the SWR meter.

THE METER IN USE

FIRST SELECT the FORWARD position on SW1 and adjust the SENSITIVITY control for an indication while transmitting. Turn off the transmitter and then change to REFLECTED and adjust the antenna tuning unit for minimum reflected power. All on-air adjustment of the ATU should be as done as quickly as possible and with low power to avoid causing interference to other stations. And never adjust your antenna with the transmitter switched on.

COMPONENTS

Resistors - All fixed resistors are 1/4Watt carbon 5% tolerance or Maplin 0.6W metal film.

R1, R2	27R
R3	2.2k
RV1	10k Linear Variable Resistor

Capacitors

VC1	0 - 20pF Trimmer
C1	220pF Disc Ceramic Capacitor 50V DC (or higher)
C2, C3	100nF Disc Ceramic Capacitors 50V DC

Semiconductors

D1, D2	OA91

Additional Items

S1	Single Pole Change-over Switch
SK1, SK2	Coaxial Sockets to suit station
Veroboard	13 strips by 30 holes

7 Veropins
Amidon FT 50-43 Ferrite Toroidal Former
Meter, any meter from 50 to 200μA Full Scale Deflection
36SWG Enamelled Copper Wire
Short length of 50Ω UR43 or RG58 Coaxial Cable
Insulated stranded wire for off board connections
Aluminium box
Stand-off insulators (to mount the circuit board in the case)
Knob for the variable resistor

A kit is available from JAB Electronic Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB. This costs £21.10 inc P&P. Use our special voucher on page 23 to get 50p off this kit.

Receive Your Own OSCARs

From an article submitted by Arthur Gee, G2UK, Chairman of AMSAT-UK

THERE ARE MANY HUNDREDS of artificial satellites orbiting our earth. They are used for relaying television, communications, weather, navigation, scientific exploration and astronomy. There are also satellites built for amateur radio use.

Amateur radio satellites are known as OSCARs (Orbiting Satellite Carrying Amateur Radio). The first amateur radio satellite to be placed in orbit was OSCAR 1 launched on 12 December 1961. Over the last 30 years there have been 28 amateur satellites placed in orbit, some to replace those whose life-span has expired and others to take advantage of new technology.

These satellites are equipped with receivers, transmitters and antennas. They are powered by batteries, charged using solar cells which take their power from sunlight. The satellites are controlled from ground stations through computers and control electronics on the satellite.

Most amateur satellites behave rather like a repeater in space except that you can receive and transmit at the same time (known as full duplex). This is made possible by having the transmitter and receiver operating on different frequency bands.

RECEIVING SIGNALS ON HF

FOR EXAMPLE, SOME OF the Russian satellites use the HF bands. The radio amateur transmits on part of the 21MHz band (**uplink**). The satellite receives this signal and simultaneously re-transmits it back on the **downlink** band between 29.410 and 29.454MHz. If you have a short wave SSB communications receiver covering the HF amateur bands you should be able to hear the satellites transmitting between 29.410 and 29.454MHz. You will hear them more clearly if you use an outside 10m dipole. But, unlike the satellites used for television, OSCARs are not found at a fixed point above the earth (geostationary). In order to be useful to amateurs worldwide they move relative to the earth. The disadvantage is that they are available for only short periods.

The range covered by a satellite (known as its footprint) is determined by its height. However, the higher a satellite the weaker the signal (for a given satellite transmitter power). Some satellites, such as OSCAR 13 (see poster) are placed in a highly elliptical orbit to give much greater range. However, to be able to hear these satellites you will need high-gain steerable antennas. These satellites use the VHF/UHF bands; the radio amateur transmits on the 435MHz band. The satellite re-transmits it on the145MHz band.

RECEIVING SIGNALS ON VHF

YOU MAY ALSO HEAR RS14 (rechristened AO21), which transmits signals that can be received on a 2-metre handheld radio: There is a Morse beacon on 145.822MHz and some pre-recorded signals on 145.895MHz. Microsat DOVE transmits digitized voice signals on 145.825MHz.

Note that it is the downlink frequencies you are interested in. Provided you have a receiver that will tune the downlink frequency all that you have to do is tune to a satellite and listen to the radio contacts. Unfortunately most of the time you won't hear a thing. The reason is that the Low Earth Orbitors (LEOs) complete a full orbit of the world in about 90 minutes so it isn't in the range of your receiver for very long.

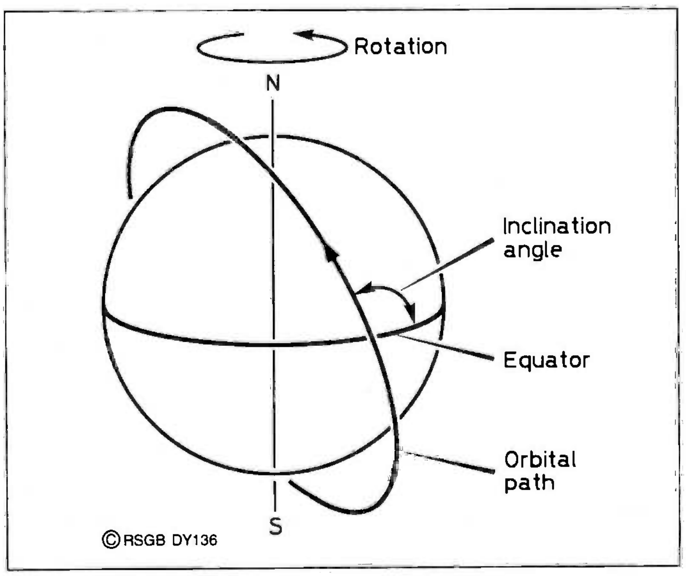


Fig 1: Satellite orbits.

SATELLITE ORBITS

THE EASIEST WAY TO understand satellite orbits is to imagine you are out in space observing the earth, rotating on its axis from west to east, with the north pole at the top as shown on **Fig 1**.

If it were possible to see an object as small as a satellite on the scale of Fig 1 you would see it coming from behind the earth over the Antarctic region, proceeding northwards towards the equator, then disappearing over the North Polar region.

The time taken for one orbit is known as the **period**; the higher a circular orbit the longer the period. An orbit is said to commence when the satellite crosses the equator (equatorial plane), northbound. An abbreviation for this event is EQX.

While the satellite revolves around the earth, this planet of ours is also rotating. If the EQX of the satellite is over Africa on one orbit the earth will have rotated so that Africa will have 'moved' by the next EQX. In practice you should hear at least three orbits during a 24 hour period. A list of dates and times that satellites can be heard are given in **Table 2**.

AO21 145.822MHz 145.948MHz	RS12/13 29.410-29.454MHz	DOVE 17 145.825MHz FM
1 Nov		
0052	0210	1110
0100	0355	1250
0244	1545	2235
0957	1732	
1000		
1144		
2333		
2 Nov		
0120	0016	1220
0128	1456	2205
1028	1640	2345
1212		
3 Nov		
0004	0144	1150
0152	0332	2135
0912	1340	2315
1056	1524	
1240	1712	
2248		
4 Nov		
0032	0145	1125
0221	0335	1305
0940	1525	2110
1120		2245
2312		
23207		
5 Nov		
0100	0030	1055
1004	0215	1235
1148	1410	2220
2340	1550	
6 Nov		
0128	0100	1205
0848	0245	2150
1032	1435	2330
1212	1620	
2224		
7 Nov		
0008	0124	1135
0200	0312	1315
0916	1320	2120
1100	1500	2300
2252	1652	
8 Nov		
0036	0010	1105
0040	0155	1110
0940	1350	2230
1128	1530	
2320		
9 Nov		
0104	0040	1215
1008	0225	1220
1156	1415	2200
2204	1600	2340
2348	1605	
10 Nov		
0136	0105	1145
0852	0250	1150
1036	1440	2135
2228	1630	2310
2350		
11 Nov		
0016	0135	1120
0920	1325	1300
1104	1330	2105
2256	1515	2240
12 Nov	0044	0016
1050	0804	0200
1230	0948	1355
2215	1132	1544
2355	2140	
2324		
13 Nov		
1012	0045	1200
0832	0230	2145
1016	1240	2325
2208	1428	
2352	1612	
14 Nov		
0856	0115	1130
1044	1305	1310
2223	1450	2115
1455	2255	
2355		
15 Nov		
0020	0000	1100
0924	0140	1240
1112	1335	2225
2300	1520	
16 Nov		
0047	0025	1210
0052	0210	2155
0808	1400	2335
0952	1550	
1140	2308	
2244		
17 Nov		
0836	0050	1145
1020	1245	2130
2212	1430	2305
2335		
18 Nov		
0001	0120	1115
0904	1310	1255
1048	1456	2235
2056		
2237		
19 Nov		
0028	0001	1045
0744	0150	1225
0928	1340	2210
2124	1530	2350
2308	2244	
20 Nov		
0812	0030	1155
0956	1225	1335
20 Nov		
2148	1410	2140
2336	2315	2320
21 Nov		
0840	0100	1125
1028	1250	1305
2036	1440	2250
2216	2340	
22 Nov		
0004	0130	1100
0724	1320	1235
0908	2225	2220
1056		
2244		
23 Nov		
0752	0010	1205
0936	1205	2150
2128	1350	2330
2312	2255	
24 Nov		
0816	0040	1140
1004	1230	1320
2012	1415	2125
2156	2320	2300
2344		
25 Nov		
0700	0110	1110
0844	1300	1250
1032	2205	2235
2036	2350	
2224		
26 Nov		
0728	1145	1040
0912	1325	1220
2104	2235	2205
2252		2345
27 Nov		
0756	0020	1150
0940	1210	1330
1952	1355	2135
2132	2300	2315
2320		
28 Nov		
0640	0045	1120
0824	1240	1300
1012	1425	2245
2200	2145	
2330		
29 Nov		
0704	1120	1055
0852	1305	1230
2044	2210	2215
2228	2355	
30 Nov		
0732	0000	1205
0920	1150	2150
1928	1335	2325
2108	2240	
2300		

Table 1. Satellite predictions for November 1994. Times in UTC (local time in UK).

AMSAT-UK

AMSAT-UK is the UK national society specialising in amateur satellites. It produces a bi-monthly magazine, *Oscar News* for members. Membership is by donation and the funds raised are used to build satellites. Enquiries and application forms should be sent to Ron Broadbent, G3AAJ, 94 Herongate Road London E12 5EQ. Tel: 0181 989 6741.

Readers' Letters

Keep sending your letters and photographs to the Editor, D-i-Y Radio, RSGB, Lambda House, Cranborne Road, Potters Bar, Herts, EN6 3JE, and we will send a pen to the sender of each letter published.

ISLE OF MAN PRIZES

I HAVE ORGANISED the following prizes for you to give away in the *D-i-Y Radio* JOTA competition mentioned in the September-October issue.

I contacted various organisations and companies in the Isle of Man and they agreed to supply the following: 20 various mint First Day covers, complete with various stamps; the 1991 collection of Isle of Man Stamps in a presentation folder; two Isle of Man travel passes to allow three days unlimited railway travel; Isle of Man Steam Packet Company (IOMSPC) sweatshirt and two tee shirts and, last but not least, a model plane from Manx Airlines!

May your aerial never blow down in the wind.

Denys P Hall, GD4OEL, Ramsey, IOM

[Well done Denys, and a very big thank you to all the generous organisations who supplied prizes for this competition. I understand that some of them are to be allocated to Isle of Man winners - such as the train vouchers and the special Isle of Man 1991 Stamp issue book - but the rest of the prizes can be distributed to any of the other winners - Marcia]

WELSH NEWS

GREETINGS, AS EVER, from 'them thar hills'. As the RSGB Backpackers 2m Contest is still on I'm monitoring the band.

A couple of Sundays ago, our vicar organised a Three-Churches Eucharist and then a conducted walk around the village, with a couple of dozen adults, umpteen chattering children and Eileen, 2W1BPS, hugging her 'new' transceiver, with me in the van acting as car-park attendant and Net controller - an exercise that both provided some 'cover' (for I had a map of their route) and a bit of field-radio experience for Eileen.

Wyn Mainwaring, GW8AWT, Dyfed

SHORT WAVE LISTENER

I AM A LISTENER to HF/VHF/UHF, I would like to purchase back copies of the magazine and enclose a cheque so as to start my collection from the first issue.

Although I am 53, I do find the subject of radio very interesting and *D-i-Y Radio* makes it easy to understand about radio. One day I hope to make a late start into taking a radio course at the local club.

R C Butcher, Cardiff

SPECIAL THANKS

I WOULD LIKE to thank you for a very excellent magazine for comments, views, news and construction projects. Thank you.

'Not so Young' F L Baldwin, RS93734

GREAT HELP

I LIKE *D-i-Y Radio* very much. I have been a subscriber for two months now but with all the past editions I have already built the Morse Trainer. The magazine helps me a lot with my lessons for the exam in August. Thanks for your work.

Simone Homann, Germany

D-iar-Y
NOV - DEC

NOVEMBER

5/6 North Wales Radio Rally, Aberconwy Centre, Llandudno. Under 14s free. Details: Tony, GW0NSR, on 0492 513246.

11 432MHz Cumulative Contest (2030 -2300 UTC)

12 Club Calls Contest (2000 - 2300 UTC).
The All Micro Show, Bingley Hall, Staffordshire Showground, Weston Road, Stafford. Starts 10am. Details: 0473 272002.

20 Bishop Auckland Radio & Computer Rally, Leisure Centre, Beveridge Arcade, Newton Aycliffe, Co Durham. Starts at 11am. Details: Mike, G0PRQ, on 0388 766264.

26/27 *CQ* WW HF CW Contest (0000 on 26th - 2400 on 27th).

27 Bridgend & District Rally, Bridgend Recreation Centre, Bridgend, Mid-Glamorgan. Starts at 11am. Details: Mike, GW7NIS, on 0656 722199.

28 432MHz Cumulative Contest (2030 - 2300 UTC)

DECEMBER

4 Leeds and District ARS Radio Rally, Allerton High School, Kings Lane, Leeds 17. Starts at 11am. Details: Phil, G6HGT, 0532 680006.

11 Verulam Rally, Watford Leisure Centre, Horseshoe Lane, Garston, Watford, Herts. Details: Walter, G3PMF, 0923 262180.

13 432MHz Cumulative Contest (2030 - 2300 UTC)

DI-DI-DAH-DAH-DI-DIT

Win an SWR Meter

WIN THE STANDING WAVE RATIO METER reviewed on page 14. This will make an ideal addition to your new radio station.

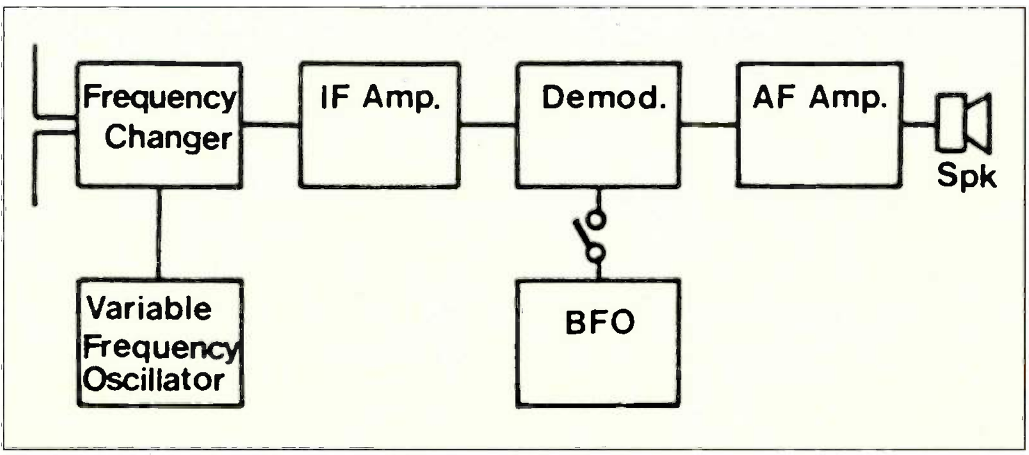
1st Prize: SWR Meter

2nd Prize: RSGB Call Book

3rd Prizes: RSGB 1995 Diary

WHAT YOU HAVE TO DO

WE HAVE AN AMATEUR radio circuit poser this issue. Below we have drawn a block diagram. When you have worked out what it is for, write the answer on a postcard and send it to the Editor, D-i-Y Radio, Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE. All entries should arrive no later than 31 December 1994.



WINNERS!

WINNERS OF THE D-I-Y Radio Straight Morse Key Competition (July-August issue):

1st Prize: Mr H W Phillips of Ilford wins the G4ZPY Morse Key.

2nd Prize: Mr E Kirkham of Stoke on Trent, and John Sutton from Helston each win a 5WPM Morse Practice Cassette.

3rd Prize: Ian Harkness from London, and Brian Read from the Isle of Wight each win a World Prefix Map.

[The answers to the competition were: 1(b), 2(d), 3(c), 4(c) and 5(d)].

Special Offers

Every *D-i-Y Radio* includes a special offer, indicated by the 50p coin symbol. This issue's offer applies to any **one** of the three construction projects in this issue. To save 50p off the price shown, send in this corner token with your order. Please remember - just one coupon per order.

ALINCO

Where in the World will you find Better?