D-i-Y RADIO

AN INTRODUCTION TO AMATEUR RADIO - FOR BEGINNERS OF ALL AGES

May-June 1995 Volume Five: No 3

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

COVER PICTURE:

Electronic equipment relies on plugs and sockets to connect with power sources, inputs and outputs. These need to make as good a connection as possible without affecting the signal voltage passing through them, and must protect against being connected wrongly. Some of the commonly used connectors are shown in our centre-page poster, together with how to wire them up.

comment

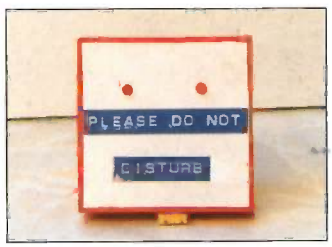
FIRSTLY, AN apology for the late delivery of the last two editions. This has been entirely due to staff changes here at RSGB Headquarters and you should get your *D-i-Y Radio* on time from now on.

Next, the good news: all subscribers will receive free with this edition a copy of the 42-page catalogue from JAB Electronic Components. Not only that, but JAB are offering *D-i-Y Radio* subscribers £1.50 off their first order worth £15 or more. Turn to page 23 for further details.

Every year, the Radio Society of Great Britain and the government's Radiocommunications Agency choose a Young Amateur of the Year and a runner up. The lucky pair receive many valuable prizes (see the photograph on this page) and the award itself is sure to impress schools, colleges and future employers. If you know of anyone under 18 who deserves to be nominated, contact me at RSGB HQ for further details (RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE).

Marcia Brimson, 2E1DAY
RSGB Marketing

CONTENTS



Steve Ortmayer's flashing sign.

CONSTRUCTION CODE

FOR THE COMPLETE BEGINNER . . . . . .

REQUIRES A LITTLE EXPERIENCE . . . . .

FOR THE MORE EXPERIENCED

The 1994 Young Amateur of the Year, Robert Aley, G7SRR, and runner-up Stephen Connor, GM0TET, with some of their prizes given by the RSGB, the RA and industry.

Managing Editor: Mike Dennison; Production Editor: Jennifer Preston; Technical Editor: Peter Dodd; Illustrator: Bob Ryan; Production Asst: Brione Meadows; News Ed: Steve Telenius-Lowe *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.

- CONGRATULATIONS to 2M0ABX who has achieved the RSGB 1.3GHz 600km Award.
- THE RADIO Amateur Association of Thailand (RAST) now has the King of Thailand as Patron.
- THE NEW address of the International Short Wave League awards manager is: Herbert Yeldham, Belle Fleurs, Wade Reach, Walton on the Naze, Essex CO14 8RG. Anyone wishing to obtain details of any of the ISWL awards should contact Herbert at this address.
- EUROPE'S LARGEST amateur radio exhibition is 20 years old this year. Ham Radio 95 will take place at the exhibition centre in Friedrichshafen, Germany, from 23 - 25 June, with over 20,000 radio amateurs from around the world expected to attend.

YOUNG AMATEUR '95 NOMINATE NOW!

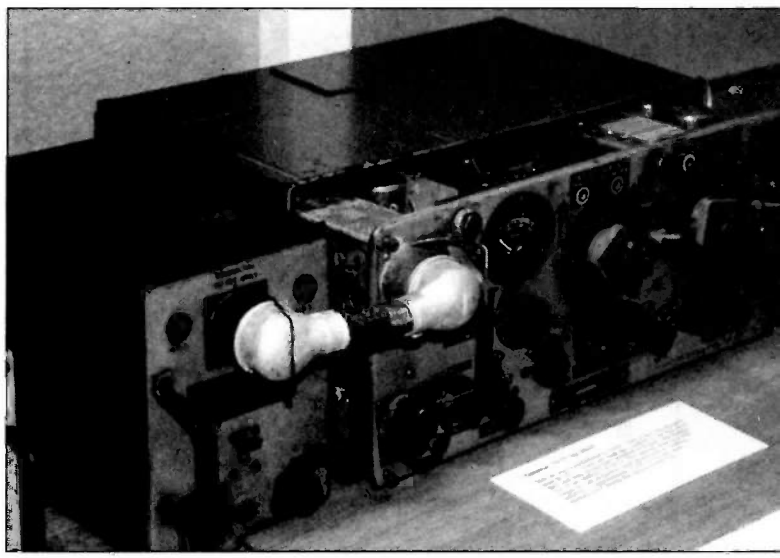
THE HUNT IS ON for the Young Amateur of the Year! Nominations are being sought for individuals under the age of 18 who have shown promise in radio construction, operating, community service, encouraging others (eg through the Novice licence scheme) or school projects (eg organising a school amateur radio club).

The radio communications industry has been very supportive of this award and have provided prizes of cash and radio equipment for the winner and runner-up. Last year's winner, Robert Aley, G7SRR, and runner-up, Stephen Conner, GM0TET, are shown opposite with their goodies. Nominations should be sent to: Young Amateur of the Year (Attn Marcia Brimson), RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE, to arrive not later than 31 July.

50th Anniversary of Peace in Europe

THE RSGB has been invited to participate in the massive Hyde Park VE Day National Celebration on 6/7/8 May. The Society will have a stand and RSGB representatives will be there to provide information on amateur radio and the Novice licence scheme. Over 1 million people are expected to visit the Hyde Park event over the course of the three days. Each day will have a specific theme: Saturday 6 May - 'Comradeship, Remembrance and Thanksgiving'; Sunday 7 May - 'The Youth of Today and Tomorrow; and Monday 8 May - the VET Day Party.

There will be over 50 special event stations celebrating the 50th anniversary of the cessation of hostilities in Europe. The Council of the RSGB has agreed to support the issue of the prefix GR (instead of the more usual GB) for special event stations which are marking this historic anniversary. The council felt strongly that the RSGB should support the issue of these callsigns not in an act of celebration, but in remembrance of all those who lost their lives, and to commemorate the start of peace.



A 19 set on display at the Imperial War Museum.

One such station will be GR0VEY in Yeovil, which will be part of a WWII display organised by Yeovil Amateur Radio Club and the town council on 8 May. The display will include a working B2 spy 'suitcase' transceiver, and AR88, HRO and Utility receivers.

Also on 8 May, GB2IWM will be operating from the Imperial War Museum at RAF Duxford in Cambridgeshire on 80, 40 and 20m CW and SSB. They hope to make contact with European groups with whom they commemorated the 50th anniversary of D Day last year.

WATERS AND STANTON OPEN DAY

FOR THE FIFTH successive year, Waters and Stanton will hold a free Open Day at their premises at 22 Main Rd, Hockley, Essex on Sunday 21 May from 10.00am to 5.00pm. There will be a vast quantity of special offer, end of line, cancelled order, second hand and reconditioned items for sale. Each year there has been a queue of customers at the door and this year each department will be making a special effort to clear stocks, so don't forget to get there early. As usual, refreshments will be provided free of charge. Phone 01702 206 835 for further details.

A year's free membership was given to the 200th, 400th and 600th visitor to the RSGB's stand at the London Amateur Radio and Computer Show in March. Ann Charles, 2E1DQT, was one of the lucky winners. In fact Ann had previously just joined the Society and so will have her dues paid for 1996 - 97 instead!

Flashing LED Sign

By S P Ortmayer, G4RAW

"OLD-TIMER BILL seems a bit grumpy this afternoon" said Nancy Novice. Norman and Nancy were visiting Bill's shack, "I think we disturbed his afternoon nap" replied Norman. "What he needs is a 'Do Not Disturb' sign; we could make him one with flashing lights".

We can make the flashing light part of the sign using LEDs (light emitting diodes). We can also use electronic NAND gates, described in Logic Gates on page 6, to make the LEDs flash. The NAND gate requires a '1' at both inputs to obtain a '0' out. Logic gates can be connected so that it will switch a light emitting diode on and off at regular intervals.

The type of switching waveform required to make the LEDs flash is known as a square wave and the best known circuit arrangement for producing square waves is the multivibrator.

The circuit works by the charging and discharging of capacitors C1 and C2, see

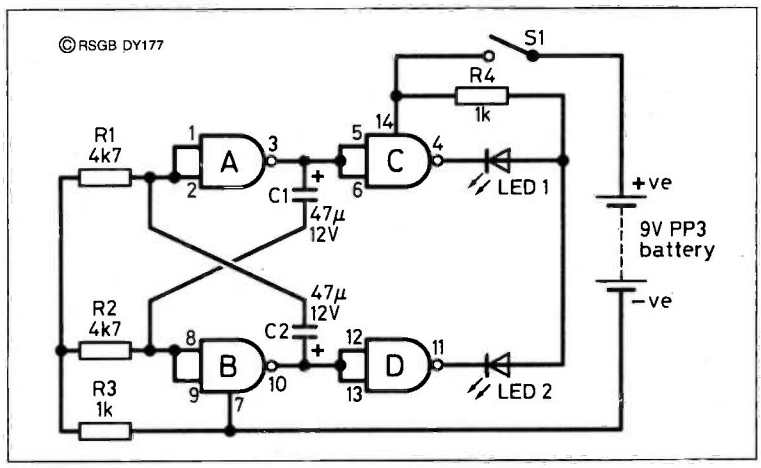


Fig 1: Flashing LEDs, circuit diagram.

Fig 1, which changes the inputs to gates A and B from '1' to '0'. The rate at which the circuit switches from '1' to '0' depends on the time constant (the time required for a capacitor to charge through a resistor) of C1/R1 and C2/R2. The output from the multivibrator is connected to the LEDs through gates C and D. When the multivibrator is running it switches the LEDs on and off alternately.

The circuit uses a CMOS IC 4011. (4 x 2 NAND gates in one package). It is constructed by mounting the components on Veroboard. Cut the gaps in the tracks with a 3mm twist drill or a special cutter, and solder the components. I used a holder for the IC. Carefully check for solder bridges across the tracks.

The board can be mounted in a small plastic box with the battery and the on/off switch. Stick-on letters can be used for the front to say 'PLEASE DO NOT DISTURB'; a length of cord can be fixed to the box in a loop so that the box can be hung onto a door knob.

"That should ensure Bill can have a nice nap" said Nancy when the project was complete.

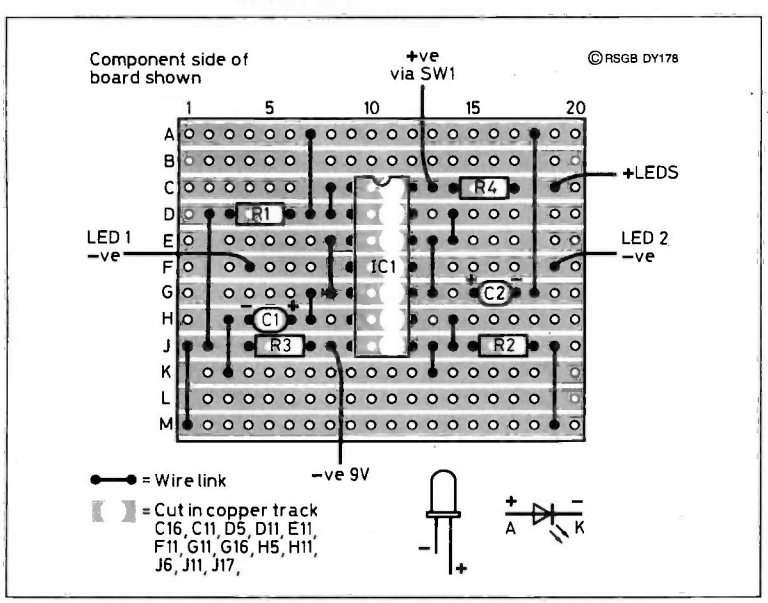


Fig 2: Flashing LEDs, component layout.

COMPONENTS

Resistors	
R1,R2,	4k7 1/4 watt carbon
R3,R4,	1k0 1/4 watt carbon
Capacitors	
C1,C2	47µF electrolytic 12v
Semiconductors	
IC1	CMOS 4011
Additional Items	
LED1, LED2	
SW1	on/off switch
Plastic Box	8.5x8.5x2.5cm

Components are available from JAB Electronics Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB.

Digital Logic Circuits

By S Thompson, G4RCH

THE BASIC counting circuits of even the most complex computer or logic control equipment can only count up to two. Their ability to perform complex calculations is achieved by using many thousands of them to make complex counting and storage circuits.

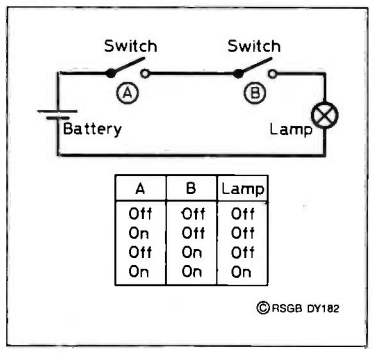
There are several of these basic types of logic circuits. Their operation can be shown using a couple of switches, a battery and a low voltage light bulb.

LOGIC CIRCUITS USING SWITCHES

NOTE THE CIRCUIT in **Fig 1**. The bulb will only light when both switches are in the ON position; in other words both switches A *and* B must be ON. For this reason such a circuit is called an AND gate.

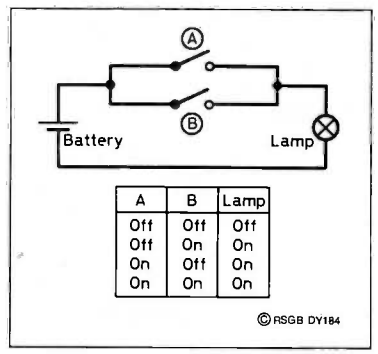
The actions of the switches and the bulb can be described in a table, called a **truth table**, see Fig 1.

Now look at the circuit in **Fig 2**. It uses the same number of components but the input switches are in parallel. The consequence of this arrangement is that the bulb will light if either of the switches are in the ON position; in other words if switches A *or* B are ON. For this reason such a circuit is called an OR gate.



A	B	Lamp
Off	Off	Off
On	Off	Off
Off	On	Off
On	On	On

Fig 1: Switches and lamp AND gate.



A	B	Lamp
Off	Off	Off
Off	On	On
On	Off	On
On	On	On

Fig 2: Switches and lamp OR gate.

The actions of the OR gate are described in the truth table of Fig 2.

Arrangements of switches and bulbs are totally impractical, even for the simplest of computers. Electronic circuits are constructed from logic 'chips', which are arrangements of transistors, diodes and resistors in an integrated 'package' (IC).

ELECTRONIC LOGIC CIRCUITS

THE CIRCUITS operate on voltage levels so that a positive voltage is '1' (ON) and zero volts is '0' (OFF). The output is not a light but a voltage level; where a 'light on' is replaced by '1' and 'light off is '0'.

The '0' and '1' voltage levels are, as already described, physically represented by voltages. These are typically represented as:

state '0' = 0V

state '1' = 5V

Since it is unrealistic to obtain these exact voltages, a more practical choice is in the range of values:

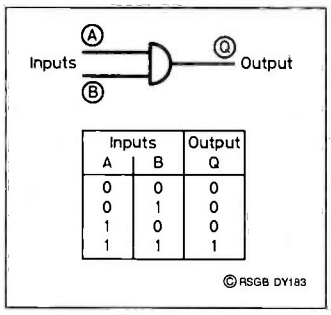
state '0' = 0.0 to 0.4V

state '1' = 2.4 to 5.0V

So our electronic AND gate, shown in **Fig 3**, operates in a similar way to the circuit in Fig 1; it requires a '1' at both inputs to obtain a '1' out. The electronic OR gate shown in **Fig 4** operates in a similar way to the circuit in Fig 2; it requires only a '1' at any one of the two inputs to obtain a '1' out.

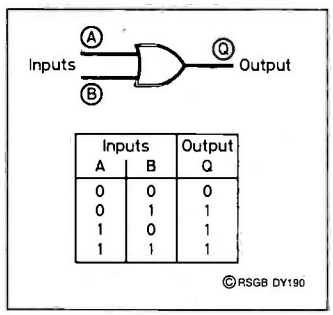
There is a further type of logic device known as a NOT gate; although it is more commonly known as an inverter, see **Fig 5**. It converts logic levels from one to the other; eg a '1' at the input results in a '0' at the output, and *vice versa*. In other words the signal is inverted.

A NOT can be added to an AND gate to produce a NAND



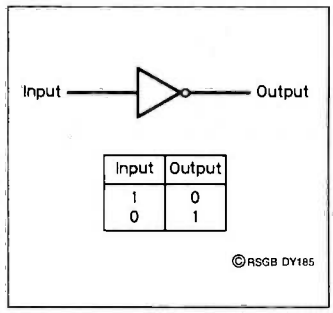
Inputs A	Inputs B	Output Q
0	0	0
0	1	0
1	0	0
1	1	1

Fig 3: Electronic AND gate.



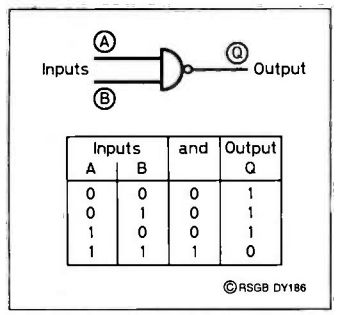
Inputs A	Inputs B	Output Q
0	0	0
0	1	1
1	0	1
1	1	1

Fig 4: Electronic OR gate.



Input	Output
1	0
0	1

Fig 5: Electronic NOT gate



Inputs A	Inputs B	and	Output Q
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

Fig 6: Electronic NAND gate

A PRACTICAL EXAMPLE

A SIMPLE LOGIC CIRCUIT is described below. The circuit provides a safety interlock on a turning machine (Lathe).

The circuit is designed so that the machine can be operated from either one of two operator positions; additionally the machine can only be started if the workpiece and guard are in place.

Operation of the circuit is controlled by four separate signals.

1 Signal from machine operator
2 Signal from a remote operating position
3 Signal to indicate workpiece is in place
4 Signal to indicate safety guard is in place.

Two versions are given, one using switches, shown in **Fig 8a**, and the other using logic gates, shown in **Fig 8b**.

A circuit using NAND gates is shown on page 5.

The first line is already filled in, how many lines will there need to be to cover all the combinations?

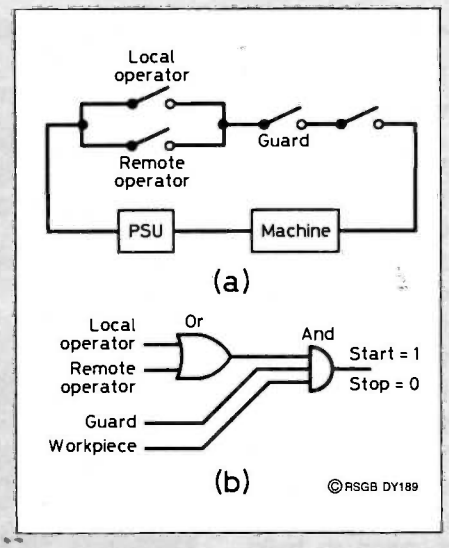
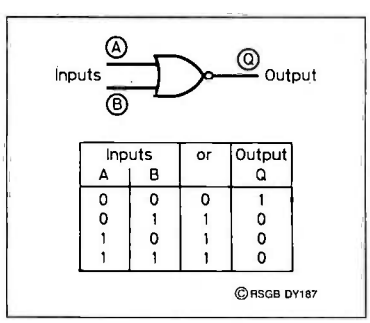


Fig 8: Control system using logic circuits.

Operator	Remote operator	Guard	Workpiece	Start machine
0	0	0	0	0

©RSGB DY191

gate, shown in **Fig 6**. A NOT can also be added to an OR gate to produce a NOR gate, shown in **Fig 7**. The reason for having these inversions is that it is easier to design logic circuits using NAND and NOR logic. The inversion in a logic diagram is defined as a small circle at the output of the gate.



Inputs A	Inputs B	or	Output Q
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

Fig 7: Electronic NOR gate.

Logic gates manipulate binary numbers, so it is useful to know the algebra of binary numbers to understand how the gates operate. Boolean algebra is a mathematical system to describe and design binary digital circuits. Standard algebra has a set of basic operations; addition, subtraction, multiplication and division. Similarly, Boolean algebra has a set of basic operations called logical operations: AND (symbol •), OR (symbol +) and NOT (symbol —). The equations for the AND, OR and NOT gates are:

AND $Q = A \cdot B$
OR $Q = A \cdot B$
NOT $Q = \overline{A}$
NAND $Q = \overline{A \cdot B}$
NOR $Q = \overline{A + B}$

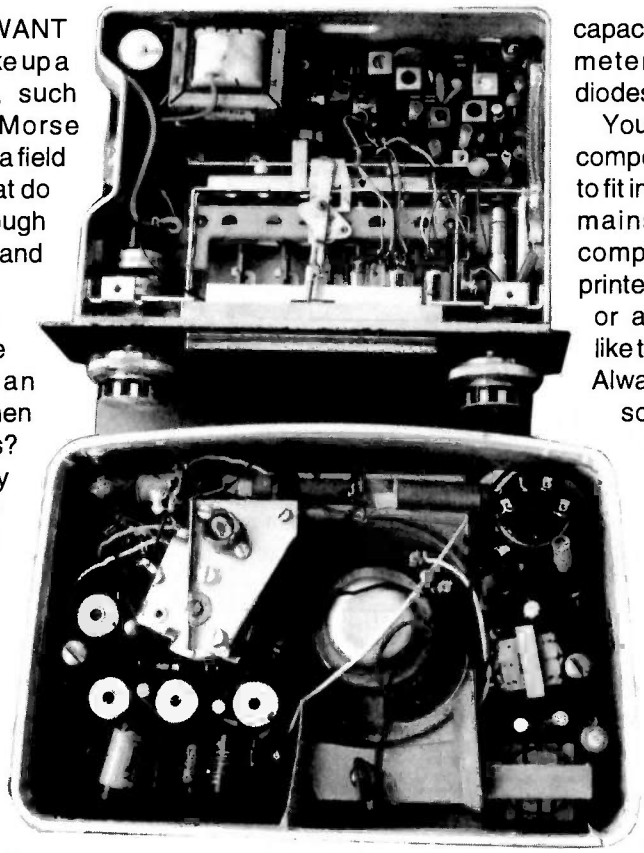
CORRECTION TO CHRISTMAS TREE PROJECT

If you built the Christmas tree project by Robert Snary, G4OBE, described in the Nov/Dec 1994 edition of *D-i-Y Radio*. and found that it didn't work check the Vero-board.

The track must be cut at location D17 for the circuit to work.

Creating a 'Junk Box'

How to build up a stock of components without breaking the bank



YOU WANT TO make up a project, such as a Morse practice oscillator or a field strength meter. What do you do? Look through the advertisements and find a suitable kit? Or look through radio magazine articles for an appropriate article then buy the components? This causes a delay between the inspiration to build something and producing a prototype of the project. It is really much better if you have at least some of the components to hand, then you can make up projects just when you want.

Buying all the components for a project that you *might* construct can be expensive, particularly with the harder-to-find RF components. A solution is to make a 'junk box'.

A junk box is often thought of as one huge cardboard or wooden box where you put all the radio junk that you can acquire. For the experienced constructor it is nothing of the sort.

Radio junk acquired over a period of time can result in several large heavy cardboard boxes of the stuff. This is not a good idea. Not only will large quantities of scrap radio equipment cause problems with the rest of the family; it does not serve its purpose as a source of radio components. When you have to search through many boxes to find some specific component it is hard and time-consuming work.

CLASSIFICATION SYSTEM

THE BEST WAY TO stock previously - used components is to have a sensible component categorizing method from the word go. Get hold of a number of small cardboard boxes; if you can find a source of boxes all the same size then you will finish up with a neater storage system. These boxes will be used to store the larger of the components that you remove from scrap equipment. Make a start by labelling the boxes as follows: Variable capacitors, electrolytic and large capacitors, inductors, wound components, plugs and sockets, speakers, small transformers, meters, switches, relays, knobs, ICs, capacitors, resistors, potentiometers, transistors and diodes.

You will finish up with some components that are too large to fit into small boxes, such as mains transformers or complete amplifiers on a printed circuit board (PCB), or a large speaker. Items like this can still be classified. Always label a box; it saves so much time and effort later when you are looking for a component.

SOURCE OF RADIO EQUIPMENT

A VISIT TO A CAR-BOOT sale produced a collection of radios at £1 each. Was this lot a bargain or just a collection of useless junk?

Let's have a look inside.

The radios shown in Photo 1 are a Waltham W152 (top) and a Bush TR122(below).

The Waltham radio covers the long wave, medium wave and VHF ranges. It also has a short wave covering 6 to 18MHz. It will work from 6V batteries (4 X SP11 batteries) or AC mains.

This radio uses modern construction with all the components, including the tuning mechanism, packed fairly tightly on one large PCB. The only items not fixed to the board are the speaker and the mains power transformer.

This radio has a label on the back which reads:

WARNING: When this unit is not in use, also before attempting any internal examination, pull the mains plug out of the wall socket.

This sort of warning must not be ignored.

While this radio will produce quite a few useful components, such as a speaker, ferrite antenna and a mains transformer; plus a few useful resistors and capacitors, the transistors types (eg GSD0022 and C784) are not very common and you will have difficulty finding the data for them.

Interestingly, this radio was not stripped for its components because it worked so well on the short wave bands so it was earmarked for a possible short wave radio project.

This sort of thing can happen with acquired items of equipment - they work so you are reluctant to take them apart. You will have to be ruthless and dispose of these items if you get too many of them.

The Bush TR122 is an older design covering the long and medium wave bands. It has a nice big loudspeaker and an air-spaced tuning capacitor. Now if you only paid £1 for a receiver like this you are on a winner. Air-spaced capacitors cost over £10 in most catalogues and are very useful for constructing an Antenna System Tuning Unit (ASTU, sometimes known as an ATU) or a receiver preselector. One nice item for the variable capacitor box.

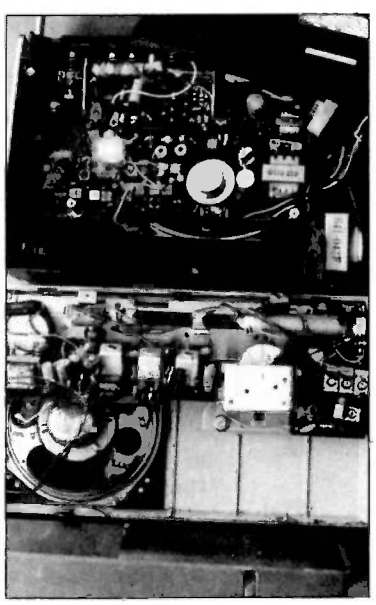
You may also notice that the AF amplifier is built at one end of the PCB. This item might be useful. Try fitting a battery to the radio. If the radio works, or if the audio alone amplifier works (tested by touching a screwdriver to the volume control potentiometer and listening for a buzzing noise in the loudspeaker) the board can be saved for the audio amplifier alone.

This radio also has a nice long ferrite antenna and ceramic trimmer capacitors. The transistors are obsolete types, eg AF117 (an old transistor data book had to be consulted to find that an AF117 is a PNP germanium transistor for mixer or IF amplifier applications), but they can be used for some projects.

Two other radios were also bought at the car boot sale and are shown in Photo 2. They are a Radiomobile car radio covering the long and medium wave bands (top) and an old Dansette transistor radio (below).

The construction of car radios is quite different from the other transistor radios shown in the photos. This one is constructed in a rugged manner in an aluminium box. Tuning is achieved using what is known as permeability tuning, ie the value of the inductor of the tuned circuit is altered, by moving an iron dust core into the coil. This changes the resonant frequency of the receiver tuned circuit. It uses high gain circuits in the RF stages, to overcome the use of a small antenna and has a high wattage audio stage to overcome car noise. This radio was not stripped for components but put aside for a further receiver project. It is powered from a 12V supply.

The Dansette radio has an excellent small air-spaced double tuning capacitor, which would be useful for quite a few radio projects. All the transistors are PNP germanium types (OC44, OC45) and there is a diode, type OA70.



The circuit board to the left contains just the audio amplifier that could be used as a complete circuit.

If you come across a transistor radio of this vintage (this one was date stamped Jan 1965) it may have value as an antique if in good condition and working.

COMPONENTS

A further source of components is bargain packs of components from some of the component dealers. For example JAB Electronic Components offer the following component packs to get you started:

75 assorted ceramic capacitors	£1.20
25 assorted tantalum or electrolytic capacitors	£1.20
20 assorted preset potentiometers	£1.20
10 assorted panel mounted potentiometers	£1.20
20 assorted diodes	£1.20
10 assorted variable capacitors	£2.50
15 assorted switches	£2.50
500 assorted resistors	£2.50
1 square ft PCB offcuts	£2.50
850 resistors, pack of 10 of different values in the range 1ohm to 10Mohms	£8.50

P&P £1.00

Orders over £15 free

Available from JAB Electronics Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB.

OTHER SOURCES OF COMPONENTS

OTHER SOURCES OF equipment for breaking down for components are club junk sales and radio rallies, see the RSGB Diary, page 22.

Do not be too tempted by computer boards for components. The components are packed together and the leads of the components are very short. Modern television sets are also not worth getting involved with for components; additionally there is the danger of implosion from the cathode ray tube if you remove the case from a television set.

Inside the Transistor

By John, GW4HWR, Chairman RSGB Training & Education Committee

THERE ARE MANY different types of transistor but they were all developed from research carried out in the 1920s. It will surprise many that the earliest types were basically 'Field Effect Transistors'. The type to be described here is known asa **bipolar** transistor which was not developed until 1949.

Bipolar indicates that the device makes use of two types of semiconductor which have already been discussed (*D-i-Y Radio*, Vol 5: No 2). **N-type** semiconductor is normally a piece of silicon crystal which has been **doped** with a material such as antimony which contributes five electrons to the crystal structure when only four are needed to complete the pattern. Each atom of antimony will therefore release an electron into the material and these will make the material conductive. In a similar way **P-type** semiconductor is produced by doping the silicon with a material which only contributes three electrons and **holes** are produced. Holes are spaces where electrons should be but they are missing. Holes also make the material conductive.

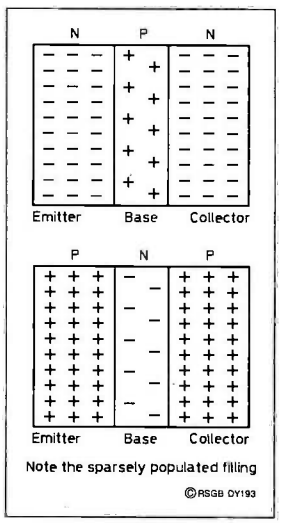


Fig 1: Silicon sandwiches. Note the sparsely populated filling.

MAKING A TRANSISTOR

A JUNCTION TRANSISTOR is produced by making a sandwich of N-type silicon and P-type silicon, with the P-type acting as the 'filling' (**Fig 1**). Two very important things are carried out in the manufacture: Firstly, the amount of doping is considerably more in the N-type material, at least 100 times greater than in the P-type and secondly, the P layer is made incredibly thin, almost a single layer of atoms! One of the N layers is called the **emitter** and the other N layer is called the **collector**. The 'filling' is called the **base**.

To investigate its behaviour the device is connected in a test circuit (**Fig 2**). If the switch 'C' is closed the meter marked Ic will continue to indicate zero current. This is because the junction is reversed biased and all that happens is a movement of current carriers away from the junction. That is, the electrons in the N region will move towards the positive of the 10V supply and the holes in the P region will move towards the negative, creating what is known as a **depletion region**. This has no current carriers in it and is therefore an insulator. Now close the switch marked E. The 1.5V supply is applied to the PN junction in a forward direction and current will flow across the junction. Because the resistance of a forward biased junction is very low the meter marked Ie will indicate just about 10mA (1.5 volts divided by 150 ohms equals 0.01 A). But the rather surprising result is that the other meter (Ic) is also indicating almost 10mA. Current is now flowing across the reversed biased junction! To make sure, open switch E and immediately the meter Ic falls to zero.

So what happens when switch E is closed? Think in terms of electrons. The 1.5V supply causes electrons to cross the forward biased junction formed by the emitter and base but remember that there are 100 times more electrons in the emitter material than there are holes in the base material so most of the electrons crossing into the base will not be able to find a hole to recombine with. Remember also that the base region has been made very thin so that most of the electrons crossing into the base go careering on and by sheer inertia enter the depletion zone between base and collector where they immediately become **current carriers** and collector current flows.

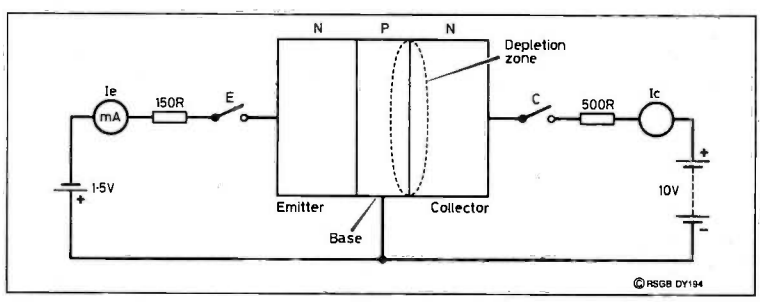


Fig 2: How a transistor works.

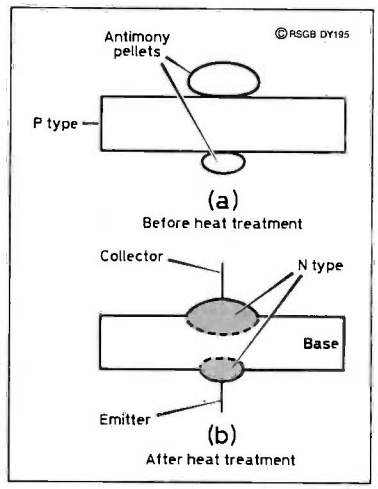


Fig3: Making a transistor.

NPN AND PNP

CURRENT FROM A low resistance circuit has been transferred to a high resistance circuit. In the early days the device was called a **trans**fer re**sistor** which was later shortened to **transistor**. The device just described is called an **NPN** transistor.

Sometimes a complementary transistor is made in which the sandwich made from two layers of P type material with a 'filling' of N type material and is known as a **PNP** transistor.

In practice the double junction is made by 'growing' the emitter and collector regions on a thin slice of P material (**Fig 3a**). Pellets of antimony, one large and the other smaller, are placed in contact with the P type slice and the temperature raised to almost melting point. The antimony diffuses into the slice and converts the P type material into N type. The process is continued until the two new regions almost touch one another, producing the very thin base region (**Fig 3b**). The larger pellet forms the collector and is bigger to enable the heat produced by current flowing through the high resistance to be dissipated more easily.

Young Radio Fans in Borneo

by Rev George Dobbs, G3RJV

Above: Gene Kiat being presented with G-QRP Club publications by G3RJV and HS1ASC.

ON A RECENT VISIT to Sarawak in East Malaysia, where I was a guest speaker at the First Asia-Pacific QRP Convention, I was pleased to see the number of young people who were being encouraged to join the amateur radio hobby.

THE CONVENTION

THE CONVENTION was not large, with around 50 delegates, but a real attempt was made to use it as a recruiting drive for amateur radio. Local students and science teachers were invited to attend, and in fact the venue was moved from outside the city to a local hotel so that young people would be able to reach the convention. In his opening address, Dr Yusoff Haji, the local mayor, spoke of the value of amateur radio as a hobby for young people. By request, one of my lectures was an introduction to amateur radio in the UK, with special reference to the Novice licence. There was a lot of interest in the UK style of Novice licence and its ability to introduce young people to amateur radio. Later I spoke to Toh Swee Hoe, the director of the licensing authority in Sarawak, who expressed great interest in the idea of a Novice licence.

Gene Kiat, at 10 years of age, was the youngest person to attend the convention and he was presented with copies of the G-QRP Club's *Circuit Handbook* and *Antenna Handbook* by Thida Denpruektham, HS1ASC, and me. Thida is the editor of *RadioLover* and she was another delegate at the convention.

While in Sarawak, I also met Dora Siong, 9M8DJ, a 16-year old radio amateur. She shares her impressive station with her father Joseph, 9M8ST, and her mother Belinda, 9M8BL. Joseph is a member of the G-QRP Club, an organisation dedicated to low-power (QRP) amateur radio communication.

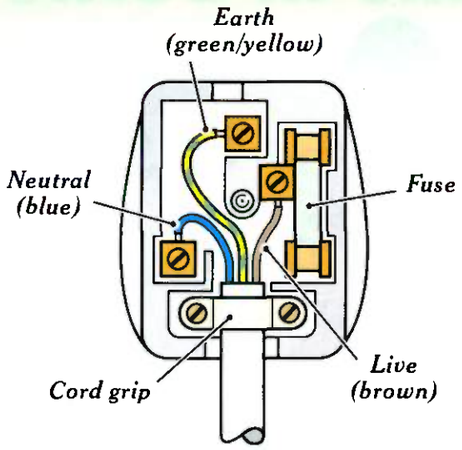
16 year-old Dora Siong, 9M8DJ, in her shack in Kuching.

SARAWAK

THE SIONG family live in Kuching, the capital city of Sarawak, which is situated on the island of Borneo. It has a tropical climate with a constant temperature of around 30°C the whole year round. Sarawak is largely covered with rain forest and is inhabited mainly by people descended from branches of the Dayak tribes, although most of the business is carried out by Chinese settlers and most of the radio amateurs are from the Chinese ethnic group. I was almost overwhelmed by the hospitality and spontaneous cheerfulness of the local radio amateurs and their families.

For more information on the G-QRP Club, write to Rev George Dobbs at St Aidan's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE.

Amateur Radio & Plugs and Sockets

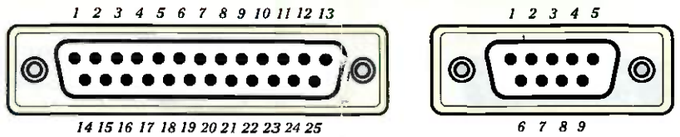


Mains Plug

All mains powered equipment must be fitted with a three-pin mains plug. It must be connected up as shown with an appropriate value of fuse for the equipment. In most cases a 2 or 3 amp fuse is suitable for radio equipment.

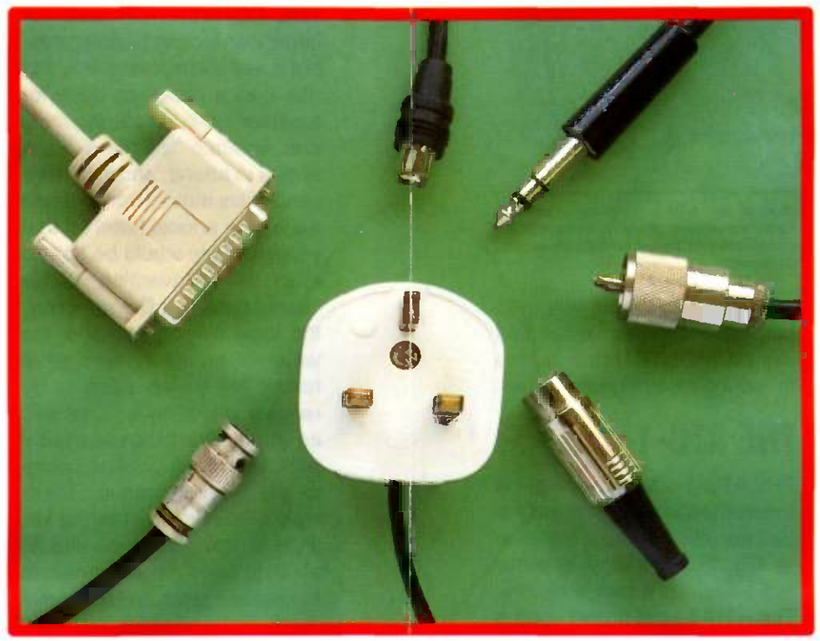
A mnemonic for connecting the plug:

Brown is live
Blue is not
Green and yellow earths the lot.



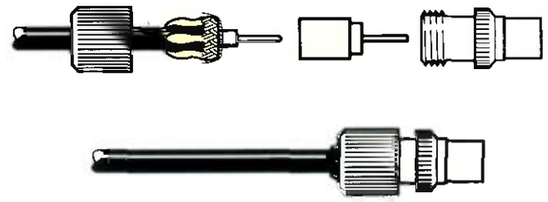
D-Connector

The D-Connectors are used for the communication ports on a computer. In data communications a cable with D-connectors provide the link between the computer and the TNC.



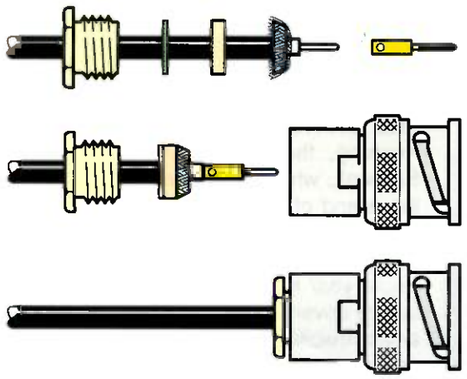
Jack Plug

This plug is used to connect earphones and morse keys to radio equipment



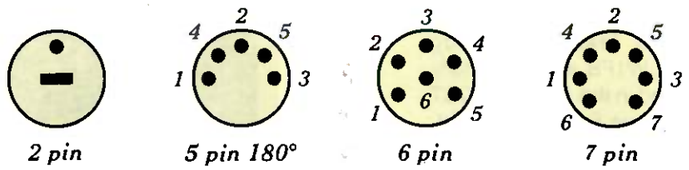
TV-Type

The TV antenna connector, is probably the best known of all coaxial cable connectors. It is useful as a cheap 50ohm connector for home made amateur radio low power equipment. It is assembled as shown above. For most reliable results the centre pin connection should be soldered.



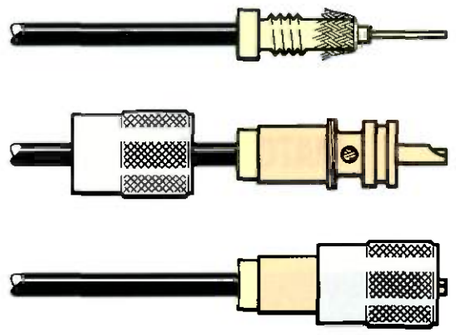
BNC

The BNC plug is used with small, low-power radios such as VHF/UHF handhelds. It is also used with RF test equipment. It is designed for use with thin 0.195in cable and is connected up as shown above and as described in The Novice Licence Students Notebook.



DIN

DIN connectors are a range of multi-pin plugs and sockets used mostly in audio and video applications. They are often used as accessory connections on the back of amateur radio equipment for supplying power and switching to transverters, converters and linears etc. They are also used as connectors between the radio and a TNC for packet.



PL259

PL259 plugs are the most commonly used coaxial cable plugs in amateur radio equipment. It is connected up as shown above and as described in The Novice Licence Students Notebook.

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

The Hands ATU-1 Kit

Reviewed by Rev George Dobbs, G3RJV

WHEN USING a low-powered transmitter or transceiver on the short-wave bands, the operator does not often have the convenience of a resonant antenna. That is, an antenna which is purpose-built to match the output of the transmitter at the required frequency. This is even more the case when a single antenna is used to operate on more than one band.

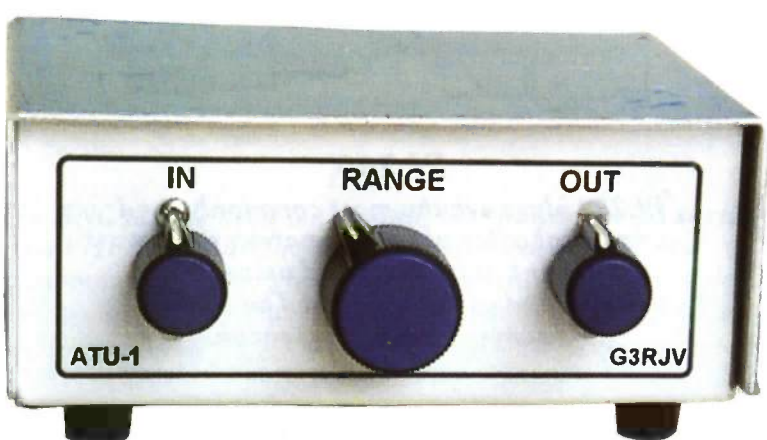
Most of us do not have the space, the means and probably not the wealth, to have antennas which will work instantly with our transceiver over the range of frequencies we wish to use. Very often radio amateurs use simple antennas, sometimes just a length of wire into which we inject our transmitted signal at one end and use it to radiate the radio frequency power against ground (or earth). The problem is impedance matching. Most amateur radio transmitters have an output impedance of 50Ω and our available antenna will probably not be resonant at the required frequency at 50Ω.

IMPEDANCE MATCHING

MAXIMUM POWER transfer from the transmitter to the antenna cannot occur unless the impedances between the two are matched. The greater the mismatch, the greater the power loss and at low power levels it is important to transfer as much of the signal as possible to the antenna. The usual answer is to use an antenna tuner, often called an ATU (Antenna Tuning Unit). These contain tuned circuits made up of inductors and capacitors which, when connected between the transmitter and the antenna, make the antenna 'see' an impedance of 50Ω.

Antenna tuners can have another advantage in that they can help eliminated unwanted signals from the transmission. Transmitters produce the wanted frequency but to this they add harmonics of that frequency: outputs at twice the frequency, three time the frequency and so on. A transmitter should have a low-pass filter on the output to help eliminate these unwanted signals. Many ATU circuits help to reduce these signals further.

Rear of the ATU-1, showing input and output connectors, the printed circuit board with switch and the two variable capacitors, C1 and C2.



THE ATU-1

THE ATU-1 is a simple antenna tuner offered in kit form by Hands Electronics. The circuit is shown in **Fig 1**. Like many amateur radio circuits, it has a history. The ATU-1 kit is based upon a circuit from Ken Ruiz, G4SGF, which appeared in *Radio Communication* in April 1992. That article, in turn, was based upon an idea from Doug DeMaw, W1FB, which originally appeared in the American *QST* magazine in September 1988. It is reproduced in a book, *QRP Classics,* published by the ARRL and available from the RSGB book sales department: a useful book full of good practical things to build.

Unlike many antenna tuners, this circuit is a resonant tuner. That is, it contains a tuned circuit at the actual operating

frequency. Many antenna tuners contain inductors and capacitors which are used to cancel inductive or capacitive elements in the antenna rather than tune the actual frequency. The resonant antenna tuner is not only simple but it also offers good harmonic reduction. The ATU-1 kit also has the advantage that commercial inductors are supplied ready for use.

HOW IT WORKS

THE SIGNAL from the transmitter is coupled by L1 into a tuned circuit formed by L2 and C1. L1 is a small winding which matches the low impedance output of the transmitter to the tuned circuit. L2 and C1 are tuned to the frequency of the transmitter - a resonant circuit at the required frequency. C2 couples the signal to the antenna and is variable to permit matching the transmitter to the antenna. A match should occur at some setting of C2 for most antennas.

The settings of C2 affect the capacitance of C1. This is usually called interaction. In simple terms, C2 adds to the capacitance of C1. Therefore C1 and C2 must be adjusted alternately when tuning-up an antenna. It would be very difficult to get practical values for L2 and C1 which cover several amateur bands. Very often antenna tuners have tapped inductors: the coils have places along their windings which can be switched. This circuit uses a simple method to vary the inductance by switching in other inductors in series or parallel.

When inductors are placed in parallel the total inductance becomes smaller, when they are placed in series the inductances add together to give a higher total (check it out in a radio theory book!) So in this circuit, L3, L4 and L5 which are switched in parallel with L2 reduce the inductance in the tuned circuit, and L6 which is switched in series with L2 increases the inductance. The higher inductances are required for the low-frequency bands and the lower inductances for the higher frequencies.

BUILDING THE KIT

THE ATU-1 is not difficult to build, the kit comes complete with all the required parts, including a case and knobs, and there are no coils to wind. Also included is a printed circuit board. The inductance switch (S1 A and B) is mounted on this board, with the inductors, so that no complex wiring between the pins of the switch is required. The kit also includes a pre-punched case and all the hardware.

The only slightly tricky process I encountered when building the kit was to saw a small metal tube in half to make an extender to the shafts of C1 and C2. But in truth it just requires careful use of a small hacksaw. For someone who builds a lot of amateur radio projects, my skill at simple metalworking is poor! The kit does require the careful insulation of C2 from the case. This is vital because C2 has radio frequency power present on both sides of the capacitor, including the metal shaft. It is even important to insulate the grub screw which holds the knob for C2 in place. I know, because in my rush to test the ATU-1, I forgot and got a 'tingle' from the shaft of C2!

HOW TO USE THE ATU-1

WHEN USING the ATU-1, remember that C1 and C2 interact and C1 must be re-adjusted whenever C2 is altered. Begin by setting C1 and the inductance to tune the required amateur band. The easiest way is to listen on the band with the ATU-1 in circuit and adjust the switched inductance and the setting of C1 for maximum received signal strength.

The ATU-1 can then be set for transmission using an SWR meter in line with the ATU and the antenna. Start with C2 at minimum capacitance (the moving vanes right out from the fixed vanes) and increase the capacitance of C2, re-adjusting C1 each time for minimum SWR. There may be more than one setting of C2 which produces a low SWR. Always use the maximum amount of capacitance at C2 (vanes furthest in) that can produce a low SWR in conjunction with C1.

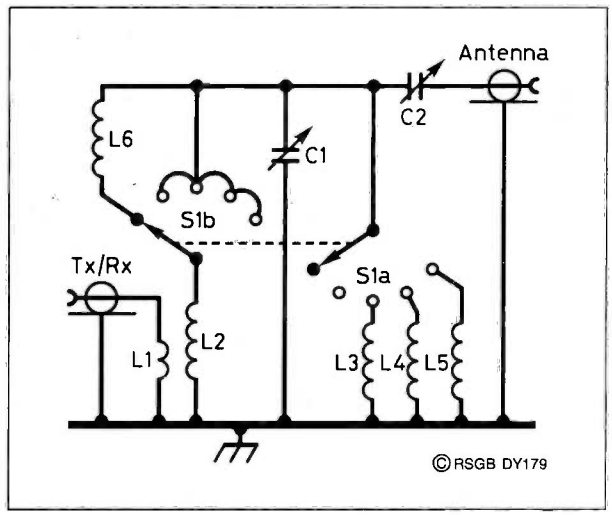


Fig 1: The circuit of the Hands ATU-1 antenna tuner.

DID IT WORK ?

I TRIED my ATU-1 with three antennas in my own shack and managed to get transmitters to match them all on several bands. It would make a useful ATU for any Novice HF station. It does require the use of an SWR (Standing Wave Ratio) meter or impedance bridge. Perhaps you already have one? They are also simple to build, and I am describing one elsewhere in this edition of *D-i-Y Radio*.

The Hands ATU-1 kit is available fully cased at £18.99 plus £2.50 P+P from Hands Electronics, Tegryn, Llanfyrnach, Dyfed SA35 0BL, tel: 01239 77427.

2's Company

News and Reports from Novice Licensees

OUR CONGRATULATIONS to Danielle Black, who at the age of ten has passed her 12WPM (yes, twelve words per minute!) Morse test. Her father, Jeff, G0UKA, an RSGB Morse Examiner has been put to shame because Danielle passed with no errors, a better result than Jeff's.

Father and son, Paul, 2E1DOJ, and Marc, 2E1DNM, in the shack of London's Senior Novice Instructor Robert Snary, G4OBE (see full story in our last edition).

According to the new RSGB *SkyCall* UK Call Book on Disk, there are 2072 Novice licensees, 187 Class As and 1885 Class Bs. Not bad for a scheme which started in 1990. The real number who have become Novice licensees is, of course, much higher than this because many Novices have gone on to take out Full Licences.

Sweden is to introduce a Novice licence but with regulations completely different from the UK one. Licensing is carried out by the SSA, the Swedish equivalent of the RSGB, and the 'training certificate' allows the use of 100 watts on the 3.5, 7, 21, 28, 144 and 432MHz bands (HF band operation requires a Morse test pass at 5WPM). As the licence is seen as the first step towards gaining a Full Licence, it will be issued for a limited time. Callsigns will use the prefix SH.

CONTEST RESULTS

NOVICE CALLS HAVE appeared in the recently published results of several RSGB Contests which took place in 1994. E P Williams, 2E1AFN/P, came 10th in the 'Single Operator' section of the 50MHz Trophy event. Paul Dennison, 2E1DBI/P, came 6th in the 'Others' section of the 432MHz FM Contest (his contest station was picture in *D-i-Y Radio*, Sep-Oct 94, p14), and 2E1CBI came 3rd in the 432MHz 'Single Operator' section of the 432MHz - 24GHz Contest.

On 3.5MHz CW, the RSGB QRS Cumulative Contest was won by Tom Cannon, 2E0ACY, with 900 points, a very creditable performance as 2nd place went to experienced contester G3MCK with 545 points. J P Wresdell, 2E0ADL, came equal 15th out of a total entry of 23 stations.

THE LOG BOOK

THE SIX METRE band is useful for local FM contacts but it has no repeaters. This could change as a paper has been presented by the RSGB requesting permission to have repeaters in the 51 - 52MHz part of the band. These things can take some time to discuss so you may have to wait a while before using the first 6m repeater. Meanwhile, G0RDI/P has been permitted to run a one watt FM beacon for the last six months from Amersham in Buckinghamshire. This experiment is expected to end shortly.

On the 144MHz band, an opening occurred on 6 February which led to recently licensed Ed Knight, G7UBB, staying up to 2.30 in the morning. He runs 45 watts of FM and was surprised to get contacts with 11 French stations, three in Holland, GU7TSI on Guernsey, four Swiss stations, IK2XYW (**Italy**) and **SP**1CAF (**Poland**). This shows just what can be worked using FM. Ed says that the DX "was worth being tired in the morning for!"

A rare card from the 1960s.

At the end of February, the RSGB 7MHz DX CW Contest proved disappointing with rather poor conditions, though only a week or two previously propagation had been excellent

There was plenty of activity on HF SSB over the weekend of 25/26 March, and as predicted in the last *Log Book* north-south paths were good. This was the WPX Contest run by the American *CQ* Magazine. The idea was to work as many stations as possible with a multiplier for each new prefix worked. The prefix is the first part of the

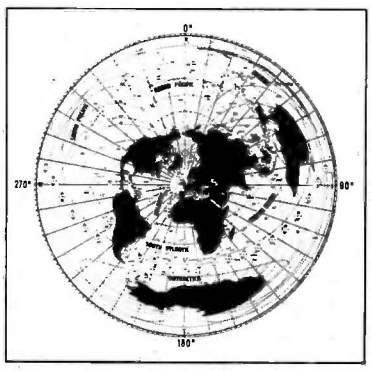
Band by Band

The Amateur Radio Spectrum: The 20 metre Band

TWENTY metres, 14MHz, is the most popular HF (short-wave) amateur band. It is capable of world-wide communication throughout the year and, in the summer and at times of sunspot maximum, round the clock. Antennas are relatively small and can be made quite efficient in the average garden. It is not, however, available for Novices to transmit, though a great deal of fun can be had from listening.

Almost all signals come via the **F Layer** of the ionosphere. This means that very long distances are achievable, but short-range contacts - say, up to 1,000 miles - are unlikely because of the **dead zone** (see Vol 5: No 1, page 15).

Propagation tends to be best when most of the path is in daylight or twilight, so the early morning will produce contacts with Australia(directional aerials should be pointed South-West - the **long path**). Later on, Asian stations appear, with the East Coast USA coming up around lunch-time, followed some time later by the West Coast and Africa. South America is available from late afternoon with Australia appearing again (but this time from a North-Easterly direction - the **short path**) mid-evening.



The Great Circle Map centred on the British Isles shows the short path distance and direction to DX (distant) stations. The outside of the map represents the opposite side of the world to us, hence New Zealand appears stretched out. An A4-size card version of this map is available from the RSGB (see the address on our cover) at £2.50 including postage.

There is a wide range of inexpensive receiver and transmitter kits available for 20m from advertisers in *D-i-Y Radio*. Most transistor radios with Short Wave cover 14MHz but in order to receive CW and SSB you'll need a Beat Frequency Oscillator (BFO) such as the one described in Vol 2: No 2. Alternatively, build the *D-i-Y Radio* Yearling (Vol 2: No 4).

As with the 7 and 10MHz bands, a dipole or a ground plane antenna will give good results. Each half of the dipole (or each part of the ground plane) should be 5.02m (16ft 6in) long. Many who operate on 20m use directional antennas (eg Yagi) but these are not recommended for the beginner as they are large and need a sturdy support such as a tower.

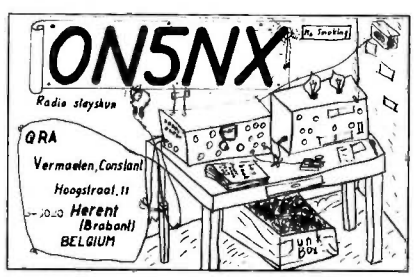
BAND FACTS

Allocation: (Full A Licence) 14.000 - 14.350MHz. No Novice allocation. Activity: CW 14.000 - 14.070MHz; Data 14.070 - 14.099MHz and 14.101 - 14.112MHz (14.099 - 14.101MHz is reserved for propagation beacons, do not use this part of the band for contacts); SSB phone 14.112MHz - 14.350MHz. Note: USA stations are not permitted to use SSB below 14.150MHz.

THE LOG BOOK

callsign including the number, eg **W4**ABC, or **4X2**ABC. Scoring involves totting up your points, then multiplying this by the number of prefixes worked. Since some of the leaders had well over 3,000 contacts, with more than a thousand prefixes, you can imagine the size of the scores!

DX heard and worked during February and March included: 1.8MHz **C31**OF (**Andorra**); 3.5MHz **HH**2PK (**Haiti**); 7MHz **J75**A (**Dominica**), **VK**3BG (**Australia**); 10MHz **ZL**3SF (**New Zealand**); 14MHz **6D**2X (special prefix for **Mexico**); 18MHz **9X5**EE (**Rwanda**); 21MHz **FR**5DX (**Reunion Island**), **LT**6E (special prefix for **Argentina**), **XO**5SF (special prefix for **Canada**), **P39**P (special prefix for **Cyprus**); 24MHz **5R**8EH (**Madagascar**); 28MHz **C49**C (another special prefix for **Cyprus**), **OD5**NJ (**Lebanon**).



A draw-it-yourself QSL card.

As we near the summer, the LF bands will go into decline because of the longer hours of sunlight. There should be plenty available on HF to compensate. Contests to look out for are the CW leg of the *CQ* WPX event (see above) on 26/27 May and HF National Field Day on 3/4 June when you can help your local radio club with their entry.

The VHF bands should perk up with more portables active. Notable contests are the RSGB 432MHz FM on 25 June - the only 70cm FM contest in the calendar - and VHF National Field Day which is a club portable contest and lots of fun.

The World of QRP

By Ian Poole, G3YWX

FOR MANY RADIO amateurs their aim is to have a large high powered station so that they can easily contact DX from all over the world. Yet there is a growing band of people who like to use low power, whether on the HF bands or at VHF and UHF. For these 'QRP' enthusiasts there is far more excitement and a greater sense of great achievement in trying to make contacts with low power.

WHAT IS QRP?

THERE IS A LOT of talk these days about QRP. The term comes from the Q code meaning 'please reduce power' and in amateur circles it has come to mean low power operation. Generally powers of 5 Watts or less are accepted as being QRP, and of course this means that all Novice transmissions fall into this category.

But QRP operation is often more than just a matter of low power operation. Many of today's QRP operators pride themselves in using homebrewed equipment. Being low powered it can be much simpler to construct. A number of designs exist for HF band transmitters which use only two or three transistors. Also there is a very good selection of kits available for receivers and transmitters. Many offer excellent value and enable the newcomer to get on the air at a modest cost. It is also a lot of fun to use a transmitter which you proudly announce you have built yourself.

The performance of an amateur radio station is determined by the effectiveness of the antenna. It is even more important with QRP operation where power must not be wasted.

For successful QRP operation the operator should be familar with the basics of how antennas work and to know how to

Above: The QRP Station of Robert Van Der Zaal, PA3BHK, a fine mix of commercial and home built equipment: (from left to right) an 80m DSB/ CW Transceiver on top of a built 2m 3W FM Transceiver, a T-Match ATU, the small box on the FRDX500 contains converters for 50, 144MHz, the large box underneath the Ten Tec Argonaut II is a home made 2m AM/FM/DSB/CW 4W transceiver, a transverter from this unit gives 3W on 10m, above the power supply on the right are a 15 W linear for 2m and a varactor tripler for the 432MHz band.

construct the best antenna within the limitations of his location.

Construction of antennas is described in *D-i-Y Radio*, January/February 1995.

SIGNAL LEVELS

A LOW POWER station will obviously be weaker than a high power one, but the difference is not as much as you might think. By reducing your power output from 300 Watts to 3 Watts you are going to reduce your signal by 20dB.

This will mean that your signal will be about 3 'S' points down, because an 'S' point is normally equal to 6dB. So a high power 300 Watt station at S9 would become an S6 signal if the power was reduced to 3 Watts. This means that it is quite possible to make some inter-esting contacts even with low power.

WHAT CAN BE ACHIEVED

GIVEN A GOOD antenna and some patience it is possible to make contacts all over the world on the HF bands. Admittedly it is easier to make QRP contacts on Morse. This is because it is easier to copy a weak Morse signal than a weak SSB or FM one. However, even on SSB it is possible to make long distance contacts.

Operation is not confined to the HF bands. It is possible to have a good number of contacts on the VHF and UHF bands as well. After all, most of the hand portables only run a Watt or so. But for those interested in long distance contacts it is relatively easy to set up a portable station on a local hill. By picking a good location this can more than make up for the low power. This can prove to be particularly fruitful when there is a lift in conditions.

DEVELOP OPERATING SKILLS

THE QRP operator soon learns how to make the best use of his signal, the best time to call, which pile-ups he can and cannot crack and so forth. The high power operator can often call CQ and let some of the DX call him back. The QRP operator has to use his cunning and seek out the interesting stations and call them. This is harder work, but at the end of the day many find it more rewarding.

A Resistive SWR Meter

By Rev. George Dobbs, G3RJV

WHEN AN AMATEUR radio transmitter produces a signal we want to ensure that as much of that signal as possible is radiated by the antenna.

Very often this requires the use of an Antenna System Tuning Unit (ASTU) to match the output impedance of the transmitter to the available antenna. The ASTU uses inductors and capacitors to match the antenna to the transmitter. These are variable, either by switching or a control knob, to allow the ASTU to match the transmitter and antenna over a range of frequencies.

Some sort of indicator is required to show the effect of using the ASTU controls - is the power being transferred from the transmitter to the antenna? In the grand old days of amateur radio, very often the operator simply put a light bulb in the antenna feed line and tuned for maximum brightness. The greater the current flowing, the brighter the bulb glowed.

These days most amateur radio stations use a Standing Wave Ratio (SWR) Meter for indicating the transmitter match to the antenna.

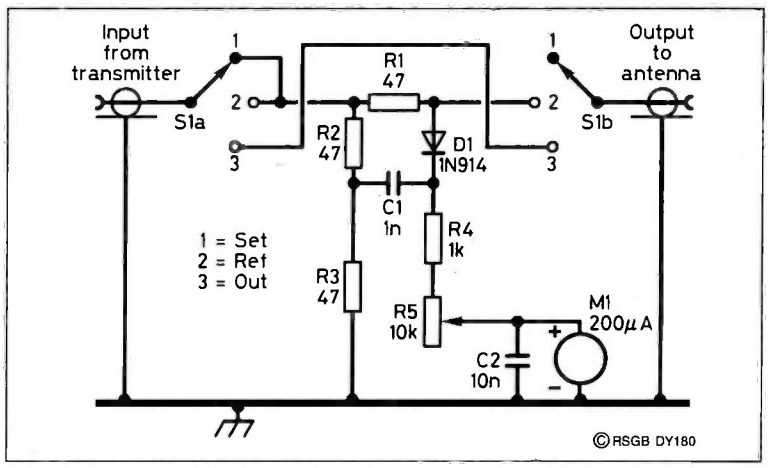


Fig 1: Resistive SWR Meter, circuit diagram.

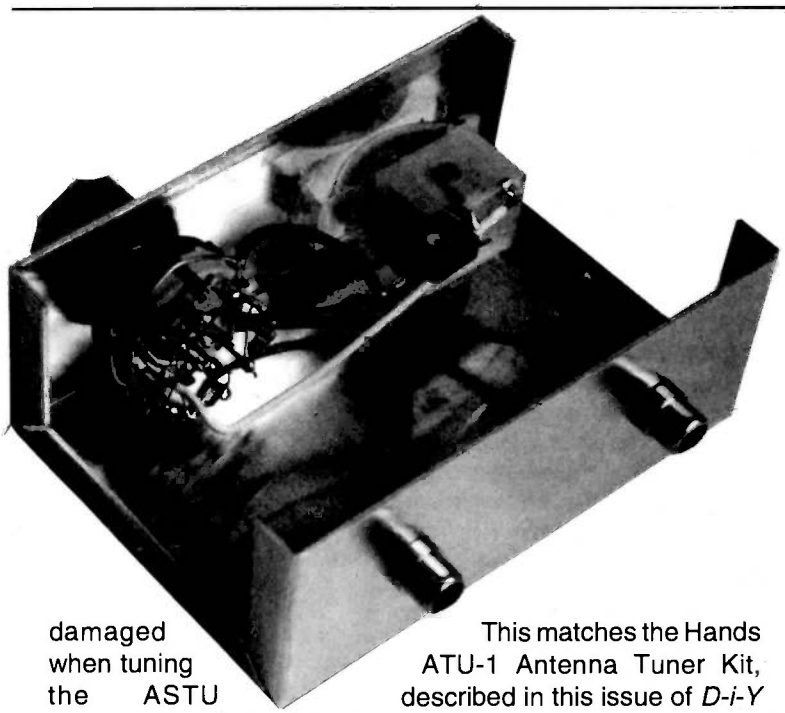
A good explanation of Standing Waves was given in *D-i-Y Radio* November/December 1994. Briefly what happens is, that if there is a mismatch between the transmitter and the antenna, some of the RF energy is reflected back along the feeder cable from the antenna to the transmitter. The forward waves and reflected waves set up in the feeder interact to make a stationary pattern of voltage and current called standing waves.

To put it simply, what an SWR meter does is indicate the RF current flowing from the transmitter to the antenna (Forward) and the RF current flowing from the antenna to the transmitter (Reverse). The object of the exercise is to get the maximum forward flow at the same time as the minimum reflected flow. Usually an SWR meter has a switch marked FWD and REV to indicate forward and reverse current on a single meter, or some of the more expensive ones have two meters. Most SWR Meters remain in line during the transmission and can monitor any possible faults.

Such SWR Meters require some kind of sampling circuit to pick up the forward and reverse flow. The circuit shown in **Fig 1** is much simpler in that it measures the voltage across resistors through which RF current is passing. It has two advantages:

1 It uses very cheap parts. Three resistors form the main part of the circuit and the whole circuit is very easy to build. The most expensive part is the meter but here a surplus tape recorder meter or VU meter may be used.

2 The transmitter has a resistive load connected to it during tune up. The power amplifier stage could be



damaged when tuning the ASTU because the transmitter is not connected to the correct 'load' or antenna resistance. This can apply especially to homebuilt low power transmitters. R1, R2 and R3 remain connected across the transmitter output during tune up operation so the transmitter is always connected to the correct 'load' when using this SWR meter.

The only disadvantage of this type of SWR meter is that it has to be switched out once the ASTU has been adjusted correctly and the transmitter is ready for use.

CONSTRUCTION

THE PROTOTYPE SWR Meter, shown in the photograph was built into a JAB Aluminium Box type JA20 (76 x 114 x 38mm).

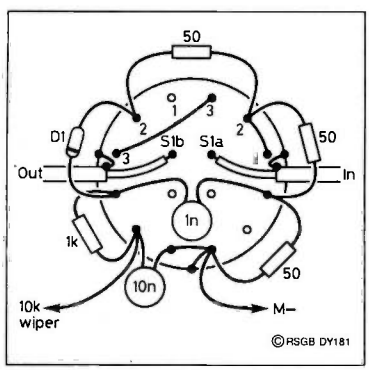


Fig 2: Layout of S1 Switch.

This matches the Hands ATU-1 Antenna Tuner Kit, described in this issue of *D-i-Y Radio* on page 14.

The SWR Meter is very simple to build. Most of the parts are mounted on the back of the 3 way switch (SW1). This is shown in **Fig 2**. The switch is a 4 pole, 3 way, wafer switch.

This type of switch is really four switches, each being a three way switch. Towards the centre of the back of the switch there are four contacts, which represent the inputs to each switch. Around the outside are 12 further contacts, marked 1, 2 and 3, these being the three switch positions from each centre contact.

The layout in Fig 2 shows how the parts are wired using these contacts. As only two sets of switches are required, spare contacts from the other switch sections are used as soldering points for some of the parts. The ground wires are all connected to the metal frame of the switch. In my case I had an all plastic switch, so I added a ring of stout copper wire around the outside of the switch for the ground connections. The pre-set potentiometer used for the meter sensitivity control is soldered to the positive connection on the meter.

The resistors R1, R2 and R3 have to handle the power of the transmitter for a short time during the tuning operation. If available, 1 watt resistors can be used for R1, R2 and R3. In my case I used half watt resistors wired in parallel. You will no doubt remember from Ohms Law, that if you wire two 100Ω resistors in parallel it will equal 50Ω. My meter was one of the cheap ex-tape recorder meters often found at amateur radio rallies but a great many mail order companies sell VU meters with a full scale deflection of some 200µA which will do the job well.

USING THE SWR METER

THE SWR METER is connected between the transmitter and the ATU.

The first stage is to set up the sensitivity of meter for a particular transmitter. Turn SW1 to the SET position. Keyboard the transmitter and adjust the pre-set control, R5, until the meter reads full scale. SW1 is then turned to the REF position and the transmitter is keyed again.

Adjust the ATU for the lowest possible reading of the meter. The transmitter is now matched to the antenna. Switch SW1 to the OUT position ready to use the transmitter.

COMPONENTS

Resistors	
R1, R2, R3	47R 1 watt (or 2 x 100 in parallel)
R4	1K
R5	10K Pre-set
Capacitors	
C1	1nF
C2	10nF
Semiconductors	
D1	1N914 (or similar) diode
Additional Items	
SW1	4 pole, 3 way, Wafer Switch
M1	200µA Meter
Case	JAB JA20 Aluminium Box

Components are available from JAB Electronics Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB. Telephone: 0121 366 6928

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.

A WONDERFUL DAY

WE WERE BOTH operators on the JASON Project, GB0JAS and GB6JAS. We feel we must write a few words of thanks to all the sponsors, to Alan, G7HZZ, and all of his station managers, for such a wonderful day.

The organisation was very good and 2E1s and G7s were given an opportunity to work the HF stations and also to use VHF and UHF. We hope there will be more projects in the near future.

Something like this goes to show what amateur radio is all about. Having been a 2E1 myself I know they well appreciate it. Thanks also to all the clubs who participated in the JASON project, not forgetting the British Geological Survey, Keyworth for being the hosts.

Sonia, G7TYF, and Roy, G7SMJ

[Glad you enjoyed yourselves. For those who don't know, the JASON Project is an annual scientific expedition which this year involved an exploration of the volcanic islands of Hawaii. Daily satellite broadcasts brought the project live to centres where schools and the public could see science in action. The amateur radio demonstrations were used to encourage a greater interest in communication - Ed]

IN THE DARK

The layout pictures in *D-i-Y Radio* would be easier to understand if they were not printed so dark. The photographs of the 80m transmitter (Vol 5: No 1, p16) and the filter (p18) were pretty useless for construction purposes.

C Stapleton

[Sorry you've had trouble. We are aware of the problem and are trying to improve the quality of the black and white photographs -Ed]

D-iar-Y MAY-JUNE

MAY

6	RSGB 10GHz Trophy Contest, 1400 -2200UTC
6	RSGB 70cm Trophy Contest, 1400 - 2200UTC.
6/7	RSGB 432MHz - 24GHz Contest, 1400 - 1400UTC.
6/7/8	VE Day Special Event Stations active.
8	Exhibition of Wartime Radio Equipment, Puckpool Park Wireless Museum, Seaview, Ryde, Isle of Wight.
14	Dunstable Downs National Amateur Radio Car Boot Sale, Stockwood Country Park, Luton, Beds.
21	Yeovil QRP Convention. Low power operators and Novices get-together. Details: 01935 813054.
27/28	*CQ* WPX CW. All HF bands except WARC bands, extra points for working unusual callsign prefixes, Sat 0001 to Sun 2359UTC.
28	Great Northern Rally, Greater Manchester Exhibition Centre.
28	Maidstone YMCA Mobile Rally, Loose nr Maidstone.

JUNE

3	RSGB 50MHz Trophy Contest, 1400 - 2200UTC.
3/4	RSGB 50MHz IARU Contest, 1400 - 1400UTC.
3/4	RSGB HF National Field Day (NFD). Club portables, 1500 - 1500UTC.
5	Novice Radio Amateur's Examination.
11	Elvaston Castle National Radio Rally, Elvaston Country Park near Derby.
11	Belfast Rally, Chimney Corner Hotel, Antrim Rd, Glengormley.
17/18	Bletchley Park Amateur Radio and Computer Rally, near Milton Keynes. Historic radios also on display.
25	Longleat Amateur Radio Rally, Wiltshire.
25	RSGB 432MHz FM Contest, 1800 - 2200UTC
11	Verulam Rally, Watford Leisure Centre, Horseshoe Lane, Garston, Watford, Herts. Details: Walter, G3PMF, 0923 262180.
13	432MHz Cumulative Contest (2030 - 2300 UTC)

JULY

1/2	RSGB VHF Field Day. Club portables, 1400 - 1400UTC.

DI-DI-DAH-DAH-DI-DIT

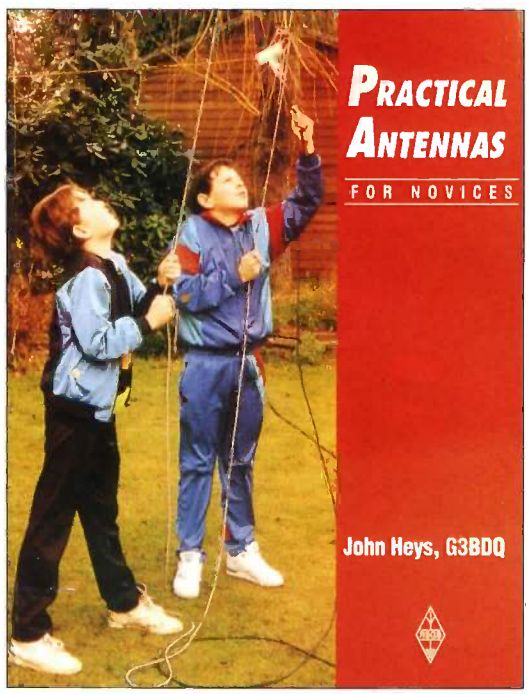
WIN: Practical Antennas for Novices

ALTHOUGH THIS BOOK is aimed at Novice licensees, it contains practical, down-to-earth information which will be of interest to the short-wave listener (SWL) and the holder of a full amateur radio licence as well. It covers the bands: 1.8, 3.5, 10, 21, 28, 50 and 432MHz, with the emphasis on inexpensive build-it-yourself antennas.

First Prize: A copy of the RSGB's *Practical Antennas for Novices*.

Second Prize: 1991 Collection of IoM stamps including album.

Third Prizes: Money boxes.



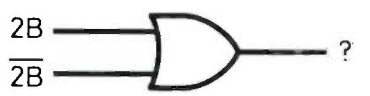
Special Offer

Every *D-i-Y Radio* includes a special offer, usually 50 pence off the price of a kit of parts for a construction project. This time, thanks to the generosity of JAB Electronic Components, we are able to increase the offer to £1.50. With this edition, all subscribers will have received absolutely free a JAB Components catalogue. The voucher on this page is worth £1.50 when you next order goods worth £15 or more from JAB.

WHAT YOU HAVE TO DO

Having read the article on page 6, you will be familiar with the sort of diagram shown below. This one is a little different as it spells out a quotation from Shakespeare! Be careful, though, it isn't *quite* as easy as it seems. We want to know the quotation, and the name of the play it comes from.

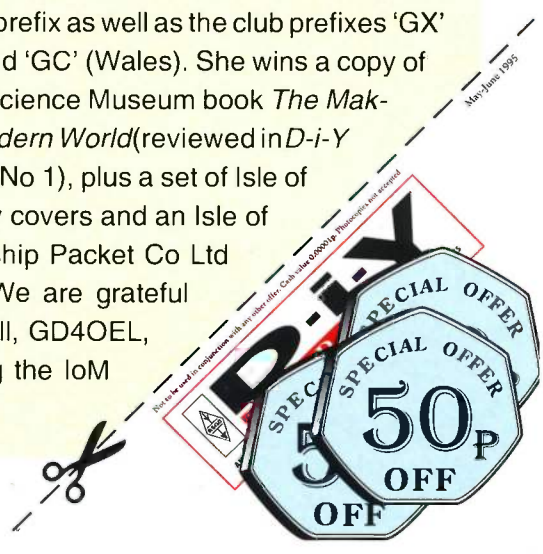
When you have deciphered the puzzle, write the answer on a QSL card, postcard or the back of an envelope and send it to: The Editor, D-i-Y Radio, RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE. All entries should arrive no later than **30 June** and the winners will be announced in the September-October 1995 edition of *D-i-Y Radio*.



WINNER

THE FIRST PRIZE WINNER of our Thinking Day On The Air Log competition, Jan-Feb 95 is Dawn Goodall, G7UEC, of Horsham, West Sussex.

Dawn's TDOTA log is for 80 metres on 18 February 1995, and includes stations using the special 'GB' prefix as well as the club prefixes 'GX' (England) and 'GC' (Wales). She wins a copy of the superb Science Museum book *The Making of the Modern World* (reviewed in *D-i-Y Radio* Vol 5: No 1), plus a set of Isle of Man first day covers and an Isle of Man Steamship Packet Co Ltd sweatshirt. We are grateful to Denys Hall, GD4OEL, for arranging the IoM prizes.



NEW
Dual Band HT

Dual Band Handheld FT-51R

Only one Dial/Volume knob required for easier use.

The First Dual Band HT with WINDOWS!

Three dual receive configurations VHF/VHF, UHF/UHF, or VHF/UHF with main band frequency on right or left side. Flexible programming allows transmit on main or sub band.

An 8 character alpha-numeric user help menu scrolls operation instructions in the bottom of the large, backlit display.

Digital battery voltage readout displays condition of battery in use. Scan skip function allows individual memory channel lock-out during scanning mode.

Spectrascope™ displays active adjacent frequencies in real time with relative signal strength.

MH-29A2B
LCD Display Mic with Remote Functions. (Optional)

FT-51R
2¼"W x 4¾"H x 1⅛"D
(2 Watt version shown.)

The new FT-51R Dual Band HT is state-of-the-art, and easy to use! So easy, you won't need an operating manual. Its exclusive, scrolling instruction menu located in the large, backlit display "window", guides you through total operation while simultaneously viewing the main display window.

You'll like some of the other new, exclusive features, too. Like Spectrascope.™ This unique feature displays real time, continuous scanning of activity on adjacent frequencies in VFO mode or 8 of your favourite memories. A cloning feature duplicates favourite channels to another FT-51R.

A digital battery voltage display, five power output levels, the largest backlit dual band HT keypad made, Smart Mute,™ two VFOs on both VHF and UHF, as well as available 2 Watt and 5 Watt versions, round out the exciting FT-51R. Plus, the optional MH-29A2B Display Microphone allows you to control volume and also access Memory, VFO, Call Channel, Band Selection and scanning functions. All of this in world's smallest dual band HT radio!

See the FT-51R with "windows" at your Yaesu dealer today!

"I can see two frequencies and alpha-numeric all at the same time."

"Scrolling instructions tell me what to do next!"

"I use the Spectrascope to find new contacts faster."

"Yaesu did it again!"

Specifications

- Frequency Coverage
  VHF RX: 110-180 MHz
  TX: 144-146 MHz
  UHF RX: 420-470 MHz
  TX: 430-440 MHz
- Spectrascope™ Display
- Scrolling User Help Menu
- Alpha-Numeric 8 Character Display
- Up/Down Volume/Squelch Controls & Display
- Selectable Sub-Band TX Mute
- Automatic Tone Search (ATS)
- Digital Battery Voltage Display
- AM Aircraft Receive
- Scanning Light System (SLS)
- 120 Memory Channels (80 w/Alpha-Numeric)
- Large Backlit Keypad & Display
- Automatic Repeater Shift (ARS)
- Multiple Scanning Modes
- 3 Selectable Scan Stop Modes with Scan Skip
- User selectable lock function w/15 combinations
- Automatic Power Off (APO)
- TX/RX Battery Savers Built-in
- Handy Cloning Feature
- 5 Selectable Power Output Levels
- Message system with CW ID
- Selectable RX Smart Mute™
- Cross-Band & One-Way Repeat Functions
- DTMF Paging/Coded Squelch Built-in

Accessories
Consult your local dealer.

YAESU
Performance without compromise.™

YAESU UK LTD. Unit 2, Maple Grove Business Centre, Lawrence Rd., Hounslow, Middlesex, TW4 6DR