

Build A SIMPLE Radio

IN the early days of radio the construction of a receiver rarely called for a soldering iron since components such as capacitors, resistors, coils and valveholders, etc., were fitted with small terminals to which connections could be made. With the event of the transistor, radio components have become much smaller and screw connecting terminals have been completely abandoned. This means that all connections have to be soldered, but I hasten to add that with a little practice the soldering together of two wires or a wire to a solder tag can be carried out very quickly indeed.

First you must use the right kind of soldering iron, a 'pencil bit' type like the one I mentioned last month and resin-cored solder. Ask for 'multi-core' solder which can be obtained from most electrical shops and ironmongers.

Being electrically heated, a pencil-bit soldering iron will maintain constant heat; just the right amount for melting the solder, but it is most important to keep the tip of the iron well 'tinned' and clean. Very light filing will take care of this.

Soldering

The rule for successful soldering is simple—bring the iron and solder together on the work at the same time—the moment the solder runs remove the iron and the solder together, leaving the joint to set. Take care not to move the work until the solder sets or you may end up with a dry joint which will make poor contact.

First practice soldering with odd bits of wire and take the precaution of 'tinning' each wire before you make the join. Tinning means giving the wire a thin coat of solder before the join is made and to do this you run molten solder on to the wire. If a solder tag or wire is dirty or oxidised, clean it by scraping until the metal shows bright and then tin it before making an actual join. The art of soldering is not difficult but do practice before you attempt connecting up radio components, especially transistors.

Radio and electronic circuits are not difficult to read once you are familiar with the 'symbols'. Therefore, each month, I will introduce some radio components and their circuit

To solder, simply touch the flux-cored solder against the part to be soldered with the hot soldering iron. Remove both and allow join to cool.

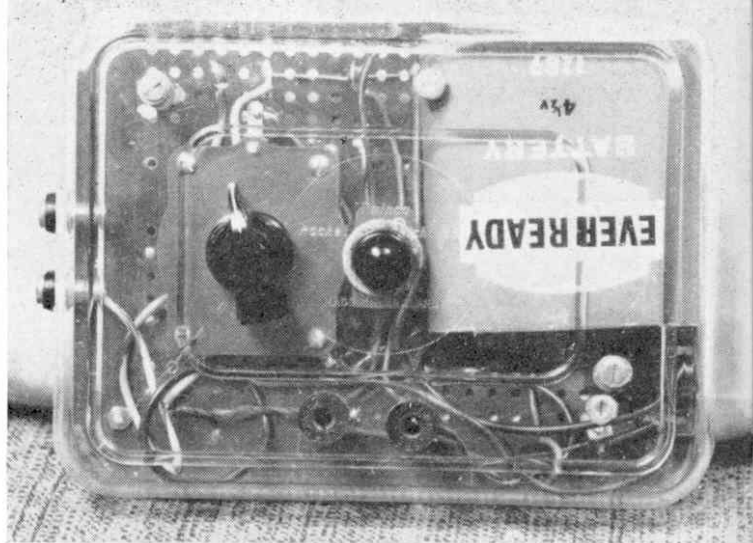
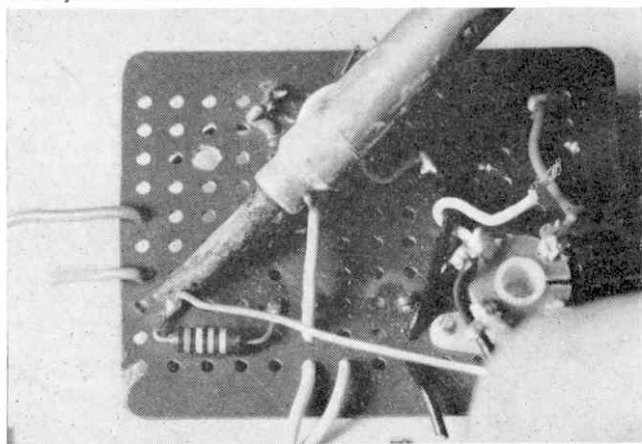


Fig. 6. The completed two transistor radio receiver seen clearly inside the plastic lunch box.

symbols. The symbolised or theoretical circuit for a two transistor radio is shown in Fig. 1. Study this and see if you can identify the components with the pictorial wiring diagram in Fig. 2. It is important to understand these diagrams for they are a standardised way of presenting circuits and the symbols are always the same.

A Two Transistor Radio

The two transistor radio can be built into a small plastic lunch box (from Woolworths), about 5½ by 4½ in., or can be a little larger if you wish. As these plastic boxes are brittle, be careful about drilling holes. The 'chassis' on to which the components are assembled is a 'paxolin' eyelet board, which is an insulating material, punched all over with evenly spaced small holes. These are now used a good deal for assembling transistor circuits.

Before assembly, carefully check and identify each component and become familiar with the connections to the transistors which are shown separately in Fig. 5. This is most important as a wrong connection can destroy a transistor instantly. Make absolutely sure you identify the *collector connection* (C) which is adjacent to the 'red spot'. All transistors are marked this way.

Note also the 'polarity' of the 8mFd. electrolytic capacitors. One end will be marked + or coloured red to identify the positive connection. Last but not least comes the connections to the 4½ volt battery. Make sure these are correct, as shown in Fig. 4. You can solder the battery leads direct to the brass strips—long strip negative—short strip positive. *Remember that if the battery is connected the wrong way round, accidentally or otherwise, you may instantly destroy the transistors.*

The paxolin eyelet board can be obtained from R. E. Lamb, 17 Queen's Road, Leytonstone, London, E.11. You need a large board which is about 6 by 5 in. and can be trimmed down to fit into the plastic box as shown in Fig. 7. The tuning capacitor and the push button on/off switch are mounted directly on the base of the plastic box. The lid of the box becomes the back or underside. The headphones and aerial and earth sockets are mounted on the sides of the box. The headphone sockets may be mounted beneath the on/off switch on the front as shown in Fig. 6 if desired.

The Ferrite Tuning Coil

This component has to be wound and consists of a ¼ in. diameter ferrite rod about 4½ in. long. These vary slightly in length, but should not be larger than 5 in. First make a thin cardboard tube that will fit snugly over the rod, leaving about ½ in. of the rod protruding at each end. The coils L1 and L2 are wound on this tube with both windings in the same direction, i.e. if you start L1 in a clockwise direction, L2 must also be wound in the same direction. The turns of wire should be fairly tight and close up to each other. Leave about ½ in. of space between the end of L1 and the beginning of L2. Each coil is wound with 30 standard gauge enamelled wire. Leave about three or four inches of wire each end for connection and carefully scrape off the enamel at the ends ready for

soldering. If you feel that winding a coil like this is too difficult, although it is not really, you can obtain a coil ready wound from Stern-Clyne Radio (see components list). The connections for it are shown in Fig. 8. The coil and its ferrite rod are mounted on two tinplate clips, one each end which are bolted to the paxolin eyelet board (see photographs).

Testing the Receiver

Before connecting the battery, check most carefully every connection and each component, especially the transistors. When you are satisfied that there are no errors in the wiring etc., connect up the battery and switch on. You will, of course, need an aerial so this should be ready too. It may consist of about 20 ft. of thin, plastic-covered wire hung round the picture rail or temporarily suspended across the room. You should be able to receive the local, medium-wave B.B.C. Home and Light programmes at comfortable headphone strength.

If reception seems weak, you may need an earth connection which should be made to the nearest copper or lead water pipe or to a copper earth spike in the ground. *Do not under any circumstances connect to the electric light mains earthing system.*

Remember that reception will depend entirely on the distance you are from the nearest B.B.C. transmitter and the receiver may not work satisfactorily in remote parts of the country, especially where it is very hilly. After all, it is just about the most simple radio receiver you could build and naturally it cannot compete with a highly sensitive superhet radio.

Current consumption is only 5 milli-amps so the battery should give many hours of life before having to be renewed.

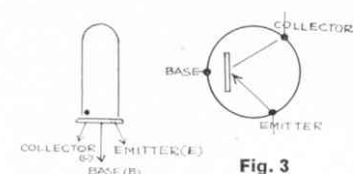


Fig. 3

Connections and circuit symbol of a transistor.

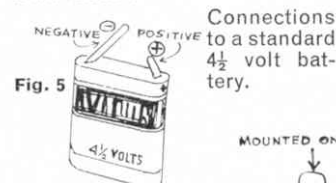


Fig. 5

Connections to a standard 4 1/2 volt battery.

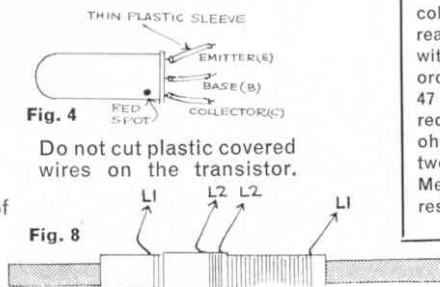


Fig. 4
Do not cut plastic covered wires on the transistor.

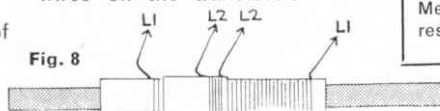


Fig. 8
Stern-Clyne ferrite coil ready wound. If this is used the tuning capacitor must be 100pFd.

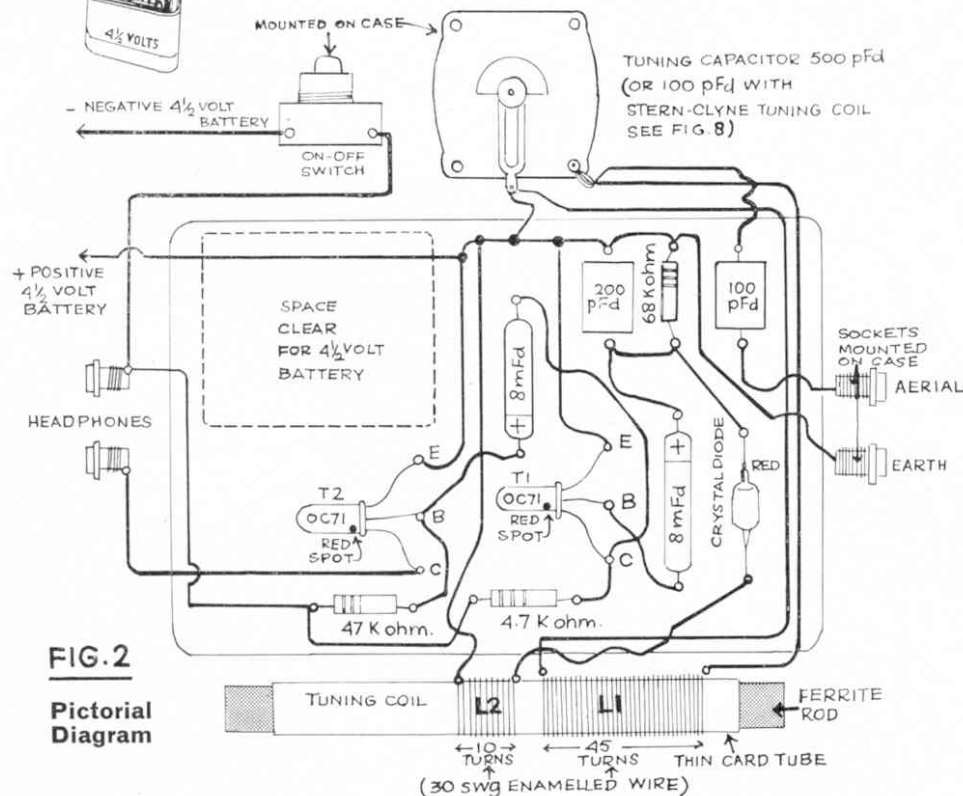


FIG. 2

Pictorial Diagram

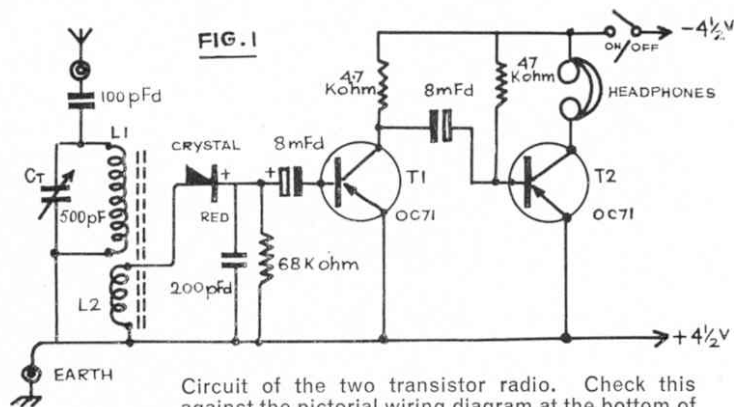
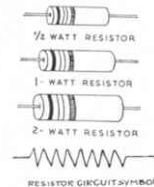


FIG. 1
Circuit of the two transistor radio. Check this against the pictorial wiring diagram at the bottom of the page to learn the meaning of the symbols.

Radio Components—The Resistor

The ability of a conductor to restrict the flow of electric current is called its *resistance*. Resistors are used in all radio and electronic circuits to control current flowing in different parts of a circuit. The most commonly used types are made from special carbon and are colour coded to denote the value. Resistors come in all values from one ohm to ten million ohms or more. Prefixes are used to abbreviate the larger values for example, a 1,000 ohm resistor would be designated 'one Kilo-ohm' or 1 K.ohm'. A 1,000,000 ohm resistor would be 1 Megohm or 1 M.ohm. Resistors are also rated as to the power they can dissipate and those used in radio are commonly 1/4-watt, 1/2-watt and 1-watt rating.

The colour code used to denote the value usually consists of three coloured rings at one end. Like those shown in the diagram they are read from left to right. For example a resistor with yellow, mauve and orange rings, in that order would have a value of 47,000 ohms or 47 K.ohms. If the rings were yellow, mauve and red, the value would be 4700 ohms or 4.7 K. ohms. Both these values will be found in the two transistor radio circuit in this issue of Meccano Magazine. Next month, the full resistor colour code.



Components List

All the components can be obtained from the various branches of Stern-Clyne Radio Limited or by post from their main branch at 3/5 Eden Grove, Holloway, London, N.7.

Transistors—2 Mullard OC71

Crystal Diode.

Ferrite Rod.

4 sockets—(Headphones, Aerial and Earth).

1 100pFd (pico-Farad) mica capacitor.

1 200pFd ditto.

2 8mFd (micro-Farad) electrolytic capacitors 6-12v. wkg.

1 4.7 K.ohm (kilo-ohms) resistor 1/4-watt.

1 47 K.ohm resistor 1/4-watt.

1 68 K.ohm resistor 1/4-watt.

4 1/2 volt battery—Vidor V5 or Ever-Ready 1298 (any electrical shop).

ON/OFF switch, table lamp, press-button type (any electrical shop).

Plastic box, Woolworth's lunch box. Headphones, 2000 ohm type (Stern-Clyne Radio) 14s. 6d.

The approximate cost of the components will be about 30s. (not including the headphones). The tuning coil ready wound complete with ferrite rod can be obtained from Stern-Clyne Limited, address as above (Price 5s.).

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Two Speed and Reverse Gear Box

IN order to provide variable speeds for working Meccano Models, below are given details of a gearbox which, besides giving one reverse and two forward speeds, also incorporates a simple clutch. However, a glance at the photograph will show that no gear-change or clutch lever is fitted. I have purposely omitted these as I should like builders to design these features themselves. I will be glad to receive details of suitable arrangements from readers, and will try to include one or two of them in a future issue. No prizes are offered as this is an exercise rather than a competition. The framework is built up from two 3½ in. by ½ in. Double Angle Strips 1, connected at one end by an eight-hole Wheel Disc 2 and, at the other end, by a 1½ in. Flat Girder 3, overlaid by a 1½ in. Strip 4. The Flat Girder is spaced from the lugs of the Double Angle Strips by three Washers on one of the Bolts and by three Washers and a Fishplate 5 on the other Bolt. Through the centre holes of the Double Angle Strips a 1½ in. by ½ in. Double Angle Strip 6 is secured, being spaced by a Washer on each Bolt. Another 1½ in. Flat Girder is bolted to this Double Angle Strip.

A 2 in. Rod carrying a ¾ in. Pinion 7, a ½ in. Pinion 8, a Compression Spring 9 and a 1½ in. Flanged Wheel 10 is passed through the centre hole of Double Angle Strip 6.

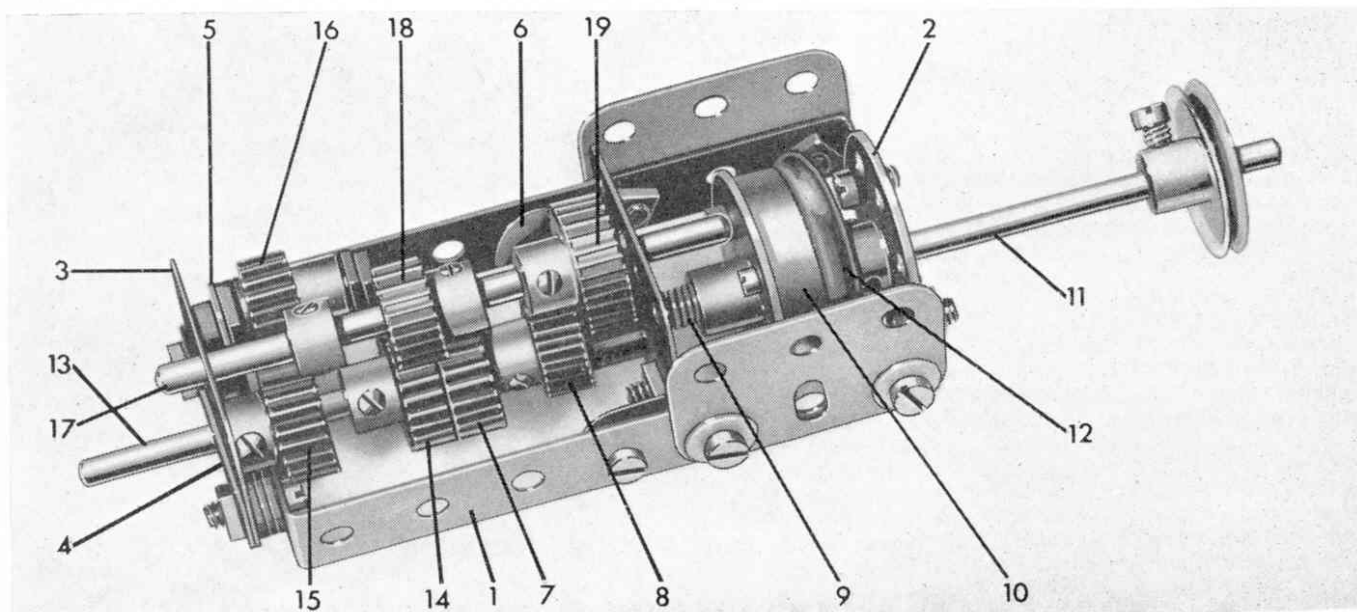
The Rod extends only approximately half-way into the boss of Pinion 7, and the Flanged Wheel is free, being held in place by a Collar hidden inside the Flanged Wheel. In this case also the Rod fits only half-way into the Collar. Bolts in the transversed tapped bores of the Collar engage with Bolts secured through the Flanged Wheel. Another 2½ in. Rod 11, carrying a 1 in. Pulley and a 1 in. Pulley with Rubber Ring 12, fits into the other side of the Collar.

Movable Lay-shaft

The 2 in. Rod 13 that serves as the output shaft fits into the other side of Pinion 7. Mounted on this Rod are a further two ¾ in. Pinions 14 and 15. Care should be taken to see that Pinion 14 is almost touching Pinion 7, and that the two sets of teeth are in line. Pinion 15 is in constant mesh with Pinion 14 give first gear, and second gear is mounted in Fishplate 5.

A 3 in. Rod 17, carrying a Collar, a ½ in. Pinion 18 and a ¾ in. Pinion 19, forms the movable lay-shaft. Neutral is obtained when Pinion 18 is out of mesh with all other gears. When Pinion 18 is in mesh with Pinion 16, reverse is engaged. Pinion 19 in mesh with Pinion 8 and Pinion 18 in mesh with Pinion 14 give first gear, and second gear is obtained when Pinion 18 is in mesh with both Pinions 7 and 14, provided that Pinion 19 is out of mesh. Finally, clutch guards are provided by two 1½ in. Flat Girders.

Parts required:—1 of No. 6a; 1 of No. 10; 1 or No. 16; 1 of No. 16a; 2 of No. 17; 1 of No. 20; 2 of No. 22; 1 of No. 24a; 4 of No. 25; 3 of No. 26; 15 of No. 37a; 10 of No. 37b; 9 of No. 38; 1 of No. 48; 2 of No. 48b; 1 of No. 59; 4 of No. 103h; 1 of No. 111; 2 of No. 111c; 1 of No. 120b; 1 of No. 155.





Michael Brookfield, of Newcastle, won first prize in the 1963-64 season Meccano Building Competition with this excellent concrete mixer, incorporating a Scammell Routeman cab.

Meccano Model Building Contest

Andrew Hill of Watford, operating the computer with which he won a prize in Section A of the last contest. The model will add or subtract positive or negative numbers ranging from -10 to +10 with an accuracy of 0.1.

It is our custom to hold at least one model-building competition every season and 1964-65 is no exception, therefore, intending entrants should now settle down to some serious designing. As usual the contest is open to every owner of a Meccano Outfit living anywhere in the world and no limit, maximum or minimum, is set on the number of parts which may be used. Cash prizes are offered for the best-built models of any kind, but remember also that originality counts. Models taken straight from Instruction Manuals will not, of course, be acceptable.

All entries will be divided into two separate sections, A and B. Section A is for competitors under 14 years of age on January 31 next, and Section B for competitors aged 14 or over on that date. Prizes in these sections are as follows: Section A, 1st. £5 5s. 0d.; 2nd. £3 3s. 0d.; 3rd. £2 2s. 0d.; ten prizes of 10s. 6d. Section B, 1st. £7 7s. 0d.; 2nd. £5 5s. 0d.; 3rd. £3 3s. 0d.; ten prizes of £1 1s. 0d.

Picture or Sketch

Having built the model, obtain a good, clear photograph of it or, failing this, a reasonably-detailed sketch. If art is not your strong-point, then it is quite permissible to have a friend sketch it for you, but the model itself must be your own unaided work. It is also advisable to submit a short description of the main features, mentioning any points of interest you would like brought to the attention of the judges. *Under no circumstances, however, must the actual model be sent.*

To enter the contest, write your name and address on the back of each photograph or drawing, together with the letter A or B, according to the section in which you fall, and forward to: Winter Model-Building Contest, Meccano Ltd., Binns Rd., Liverpool 13. Prize-winning entries are not returnable, but unsuccessful entries will be returned if accompanied by a suitable stamped addressed envelope. Meccano Ltd. will not be responsible for any entry damaged or lost, and the judges' decisions are final.

A splendid model of a Clark fork-lift truck built by H. J. van Wijngaarden, of Amsterdam, Holland. This machine also netted a prize in the last contest.

