

MAGNETO TIMING TOOL

Nov 2014

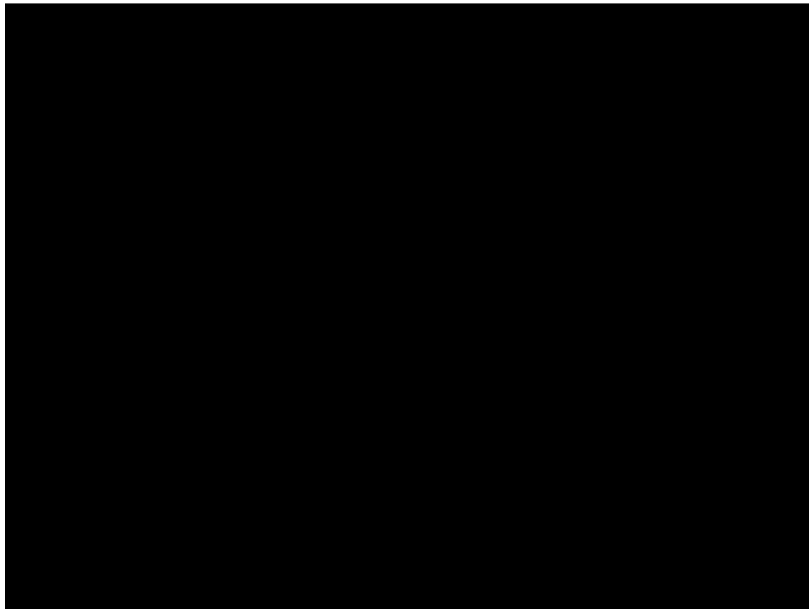
Your magneto produces a spark at the instant that the points open. In order to adjust the ignition timing you need some method to indicate exactly when the points open.

Electrically, the difference in resistance between points open and points closed is equal to the resistance of the magneto primary winding – around 0.5 ohms – almost impossible to indicate with a multimeter.

Traditionally you either test the points with a thin feeler gauge or you pull a wire off (or a screw out of) the points inside the magneto so that you are metering the points in isolation.

Professional indicator tools are available but they can be expensive.

Here is a method to make yourself a tester for less than \$30 and the bits are readily available. The bonus is that at the end you receive a Diploma of Electrical Engineering. This could be of value when you go back to work till you are 70.



Here is the list of parts – take it and your wallet to any Jaycar store in Australia or New Zealand. You don't need to purchase the instructions for the kit from Jaycar – all you need is in this document.

S. C. 2 kit #3 Hee-Haw siren	KJ8204	\$9.95
Grey case UB3	HB6023	\$3.95
PNP transistor BC558	ZT2168	0.26c
Toggle switch	ST0335	\$2.95
Small roll of hook-up wire	WH3001	\$4.95
One pair of crocodile clips	HM3022	\$1.95
9 volt battery *	SB2423	\$3.95

*Better still, buy a 6 pack of batteries (SB2417) for \$13.95 and replace all your smoke alarm batteries when you get home and save yourself ten bucks.

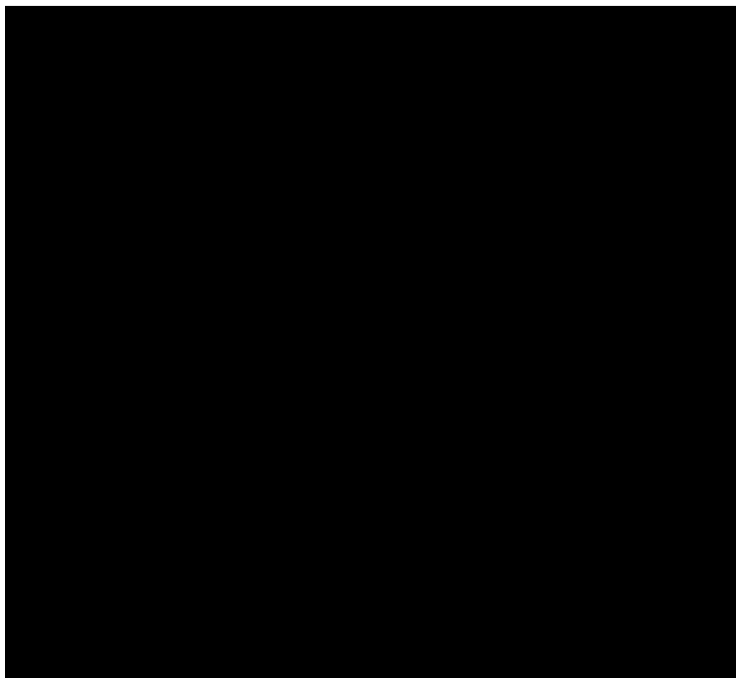
If you're smart, you'll give your purchase to one of your grand kids. They learn how to do this stuff in Grade 6 Science. If your pride won't allow this, or you're in a hurry, open the kit of parts and prepare to build the Hee-Haw Siren using the instructions below. You will need a soldering iron, a pair of wire cutters, your reading spectacles and a glass of medicinal liquid to steady your trembling hands.

Unpack all the parts. Inspect them. Get to know them. They are now your friends. In particular, check the words and pictures on the face of the circuit board. The copper printed circuit patterns where you do the soldering are on the back of the board.

How to CONVERT the HEE HAW CIRCUIT BOARD for use as a MAGNETO TESTER:

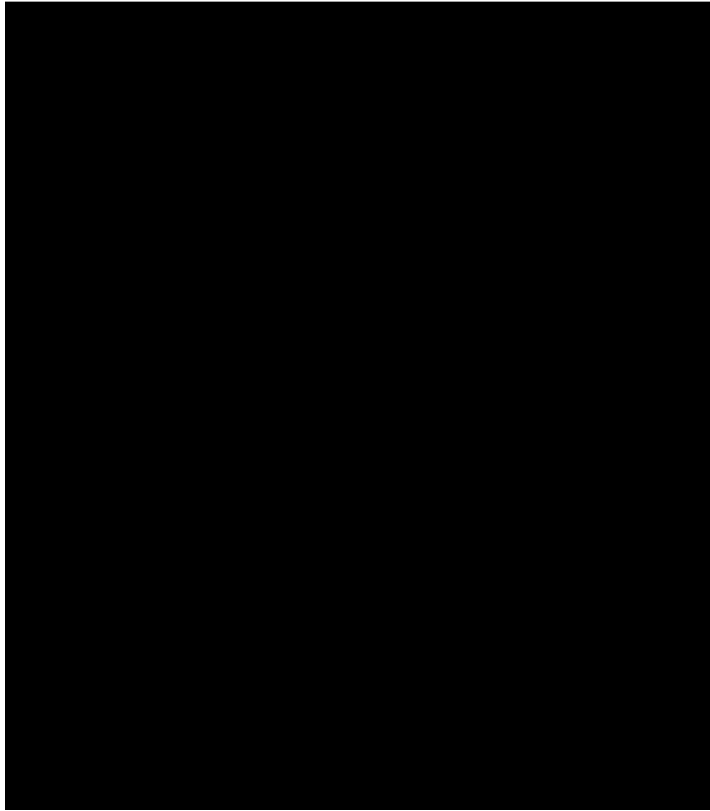
The printed copper patterns may be cut by either drilling a shallow crater into the middle of a copper track until there remains no continuity, or by carving a 0.5mm wide, shallow trench across the pattern with a modelling knife held at 45 degrees from either side of the trench.

Cut one circuit pattern as shown by the short red line in the following picture. This picture is of the silk-screened face of the board. Hold your board up to the light and you can see the copper pattern that is to be cut.

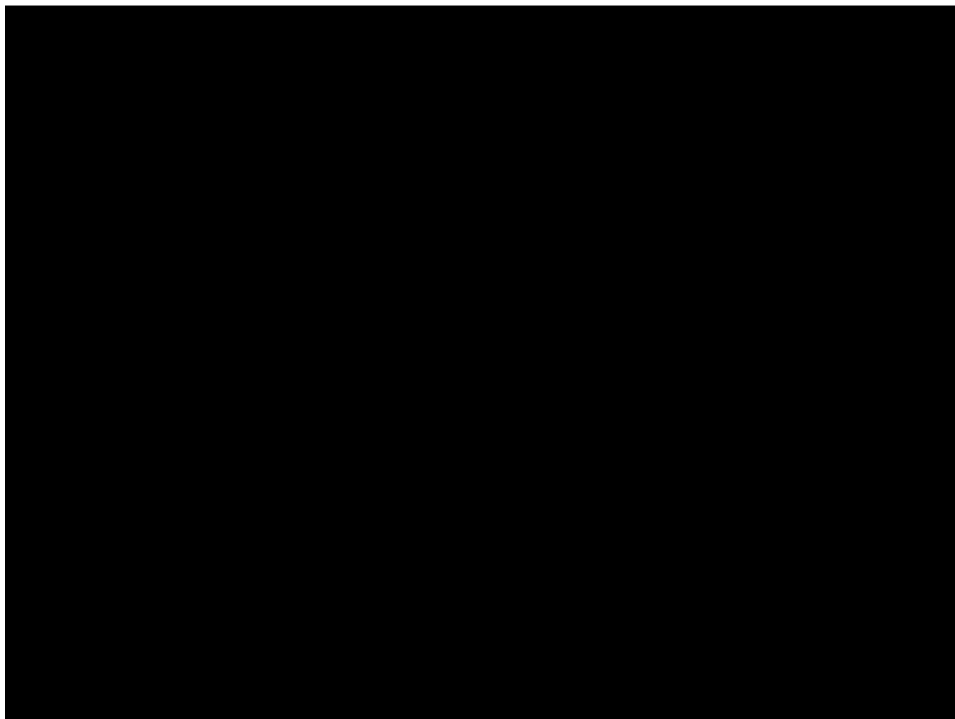


Drill three 5mm holes into the end of the plastic case – one for the ON/OFF switch – one for the test leads – and one for the LED – in a triangular pattern. The upper pair of holes should be on the centre line of the side of the box and about an inch apart. Now increase the size of the right hand hole to ¼ inch (refer to the next picture). Lightly chamfer the lower hole to prevent chaffing of the test lead wires.

Drill a shallow dimple about 10mm beneath the 6mm hole. We can put a dab of red paint into the dimple later to indicate the ON position of the switch.



Now we drill a few small holes in the lid. Place the speaker inside, and up one end of, the lid of the box and run a pencil around the outside edge. There is a grid of dots moulded inside the lid. Using the grid dots, drill 9 or 16 holes in the centre of the pencilled circle using a 1.0 mm twist drill (or 1/32" if it's for a British bike). Using hot-melt glue, fasten the speaker in place with a few dollops around the speaker edge.



CONSTRUCTION

The Jaycar kit supplies a few bits that we won't be using. Withdraw the following bits and put them aside (the resistors have 5 coloured stripes as shown):

One 150 Ω resistor (brown-green-black-black-brown)

One 470 Ω resistor (yellow-purple-black-black-brown)

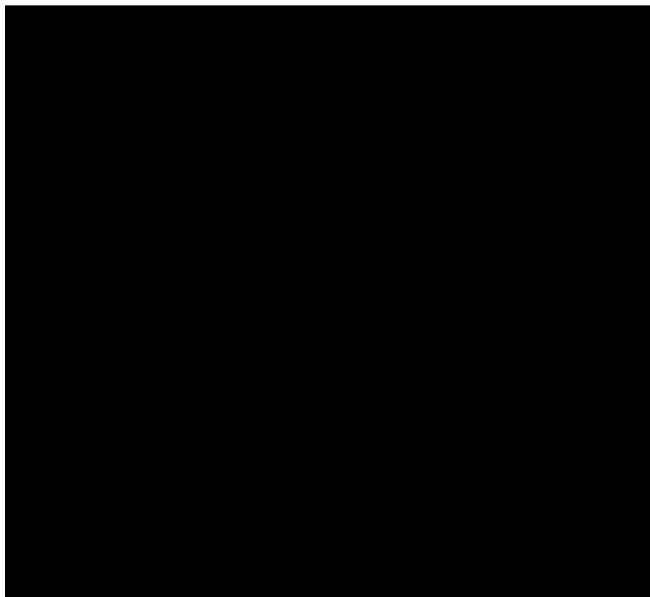
One 100k ohm resistor (brown-black-black-orange-brown)

The green Light Emitting Diode – use the red one, it is brighter,
and one PN100 transistor (it has 3 legs)

Some of the silk-screened info on the face of the printed circuit board is to be ignored. Remember that the circuit board was meant for a different application. We have to pretend that different info is printed on the board. Use the pictures shown in these instructions.

Now we will begin soldering bits onto the circuit board.

Start by inserting the resistors in place as shown in the next diagram (ignore some of the resistor information printed on your circuit board):-



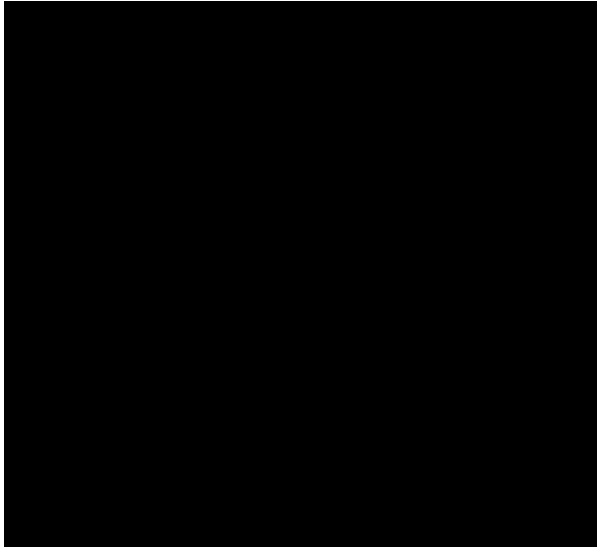
There are five resistors :-
150 Ω = brown-green-black-black-brown
470 Ω = yellow-purple-black-black-brown

10k = brown-black-black-red-brown
and two of 100k = brown-black-black-orange-brown

The resistors lie on the silk-screened side, or face, of the board. They can be mounted either way round. For four of the resistors, bend the leads at right angles the correct distance apart and insert the leads into the holes. Push the resistors down flush with the board. The 10k resistor (near the centre of the board) is mounted on its end so will need only one wire folded back on itself - it will stand tall.

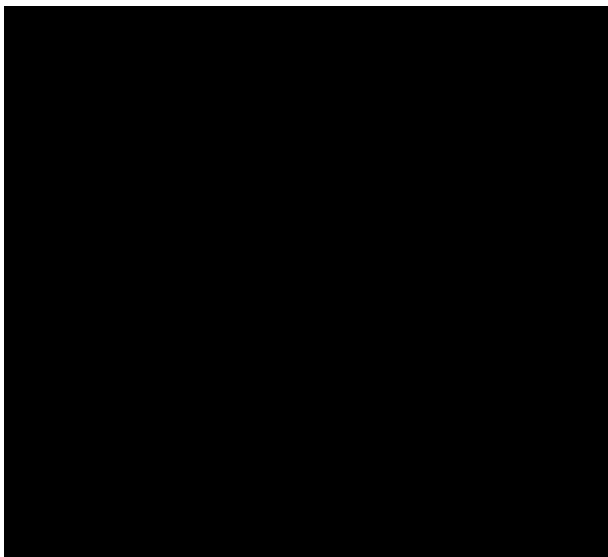
Solder the resistor leads to the copper patterns on the back of the board and snip the excess wire from the resistors.

Cut one piece of thin insulated wire about 50mm long. Strip about 5mm of insulation from each end. **Insert the ends** into the face of the board as shown in **blue** in the following picture, and solder it in place:



Next, **insert the little green pillow** (it's called a greencap capacitor) into the 10nF holes and **solder then snip** the excess wire. It will be branded something like 103K. It can be inserted either way round into the holes that best fit its size. Let this component stand tall.

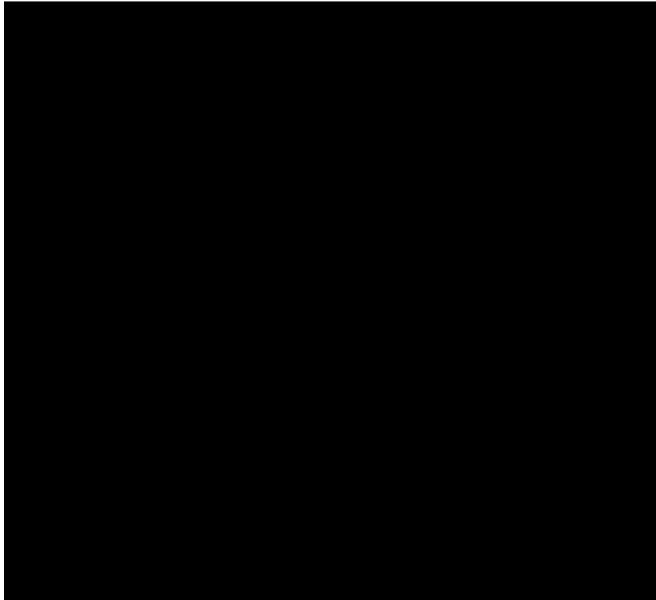
Now **fit the 3 little black cans** that have a pair of wires coming from one end – they are called electrolytics. The fat one is 1000uF, the two smaller ones are 22uF. The electrolytics must be installed the right way round. Note that one wire is identified by a grey stripe on the body marked with minus(-) signs. The unmarked wire is therefore plus(+). The location of this (+) wire is marked on the circuit board. Choose the holes that are the correct distance apart. Notice that one electrolytic is installed into the holes marked "SPKR" on your board. The electrolytics are shown with **light blue spots** in the following picture:



Pull them down flush or nearly so and solder and snip the excess wire on each.

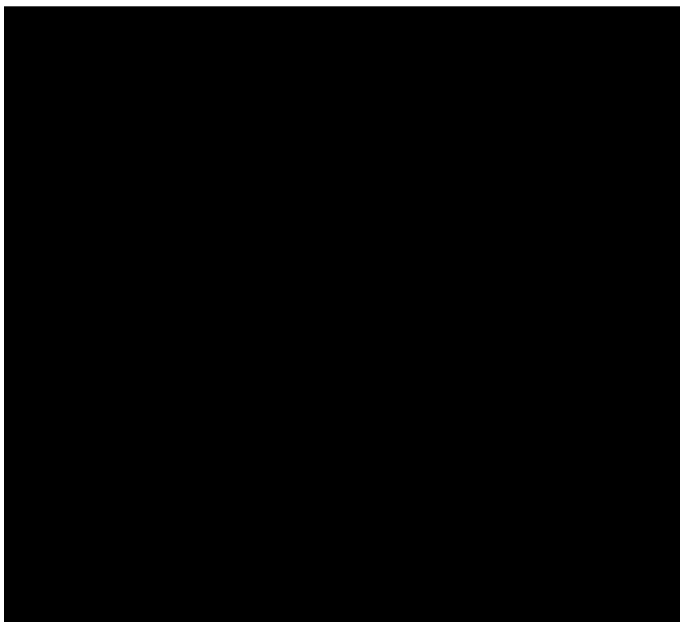
Next **insert D1 - 1N4004**. It is a small black bead with a white band around one end. This is a diode and must be placed the right way round. The banded end is marked on the board. Solder and snip.

Now **add a short piece of “hook up wire”** as shown in the next diagram in **maroon**. Strip a couple of millimetres of insulation from both ends of the wire. Melt a little solder onto both ends and then solder the wire in place on the copper pattern side of the circuit board. Be careful not to short out any solder patterns.



Next **insert a three legged NPN transistor (type PN100)** into the Q2 location. Notice that one face of the transistor is flat. This should align with the circuit board image. Don't pull this component down onto the board. Leave its legs at the original length. Solder the transistor promptly – they don't like too much heat.

Next **insert the special PNP transistor BC558** into Q1. Use the picture below for reference - Solder it promptly:

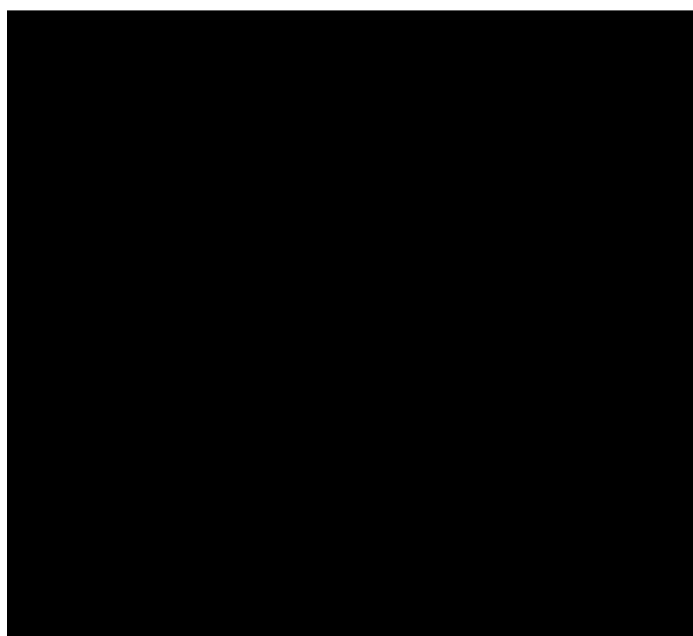


Fit the red LED into the LED2 GRN holes. Notice that the rim of the LED has a flat side. This should align with the circuit board image. Mount the LED so that it is the maximum distance above the board (one leg is slightly longer – snip off the excess piece of wire after soldering).

The last component is **the 8 legged caterpillar** marked **IC1 555**. It's called a triple 5 timer chip. Notice that one end of its body has a notch, or a dimple in one corner of the face. This must align with the circuit board image. Solder it in place – all 8 legs.

Cut one piece of wire about 100mm long - the colour is not important. Strip about 5mm of insulation from each end and insert and **solder one end** into the 9V (plus) hole (shown in **red**).

Take the 200mm length of grey 'figure 8 flex' supplied in the kit. Split the wires apart at both ends for about 25mm. Strip about 5mm of insulation from each end of both wires. **Solder to the board** (shown below as **purple**) – into the LED 1 holes on your board (shown below as SPKR). Melt a bit of solder onto the other end of both wires.



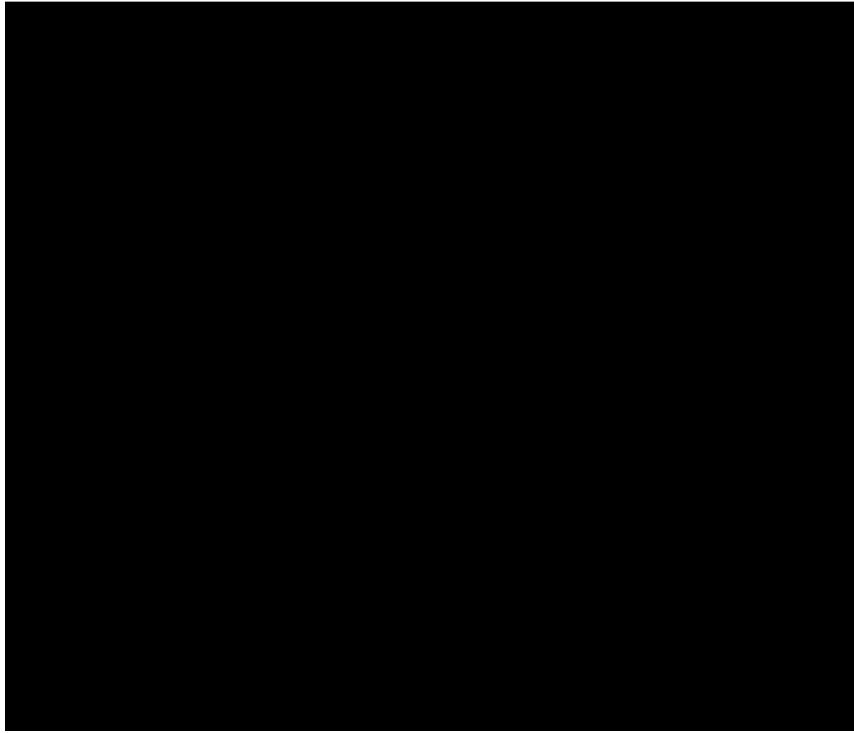
Solder the BLACK wire of the nine volt battery clip into the 9V (minus) hole. Melt a bit of solder onto the RED wire of the nine volt battery clip.

Melt a bit of solder onto any 2 adjacent terminals of the toggle switch. **Solder the battery clip RED lead to one terminal of the toggle switch** and **solder the short length of wire going to the 9V + hole to the other toggle switch terminal**. Refer to the picture below.

Your new Magneto Test box will have 2 test leads with crocodile clips on the ends.

Cut 2 good lengths (at least 2 feet long) of wire – any colour – **solder one crocodile clip to each wire**. Thread the two crocodile test leads through one hole in the end of the case, and **solder them to the circuit board** as shown in the next diagram in **dark green**.

Solder the short pair of grey wires coming from the SPKR holes (marked LED1 on your board) **to the little speaker** (shown in purple in the picture)

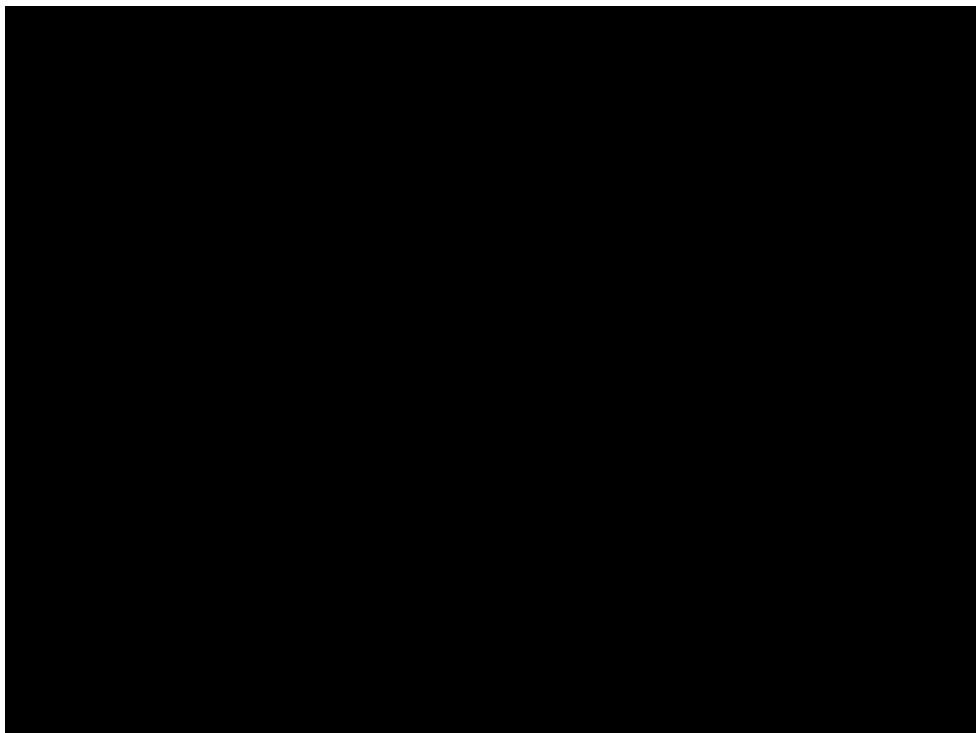


Mount the toggle switch into the $\frac{1}{4}$ inch hole in the end of the case beside the crocodile test leads. You may have to turn the switch through 180 degrees later so that the dab of red paint on the case indicates the ON position.

Inspect your work and ensure there are no wires or components touching.

TESTING

Insert a fresh nine volt battery into the battery clip. **Switch ON** the toggle switch. The LED should be lit. The speaker will be squarking. Touch the crocodile clips together. The noise should stop and the LED should be extinguished.



ASSEMBLY

If all is well, bend the LED leads so that the body of the LED can poke its nose through the hole in the end of the box. Slide the circuit board and LED into place. Put a couple of dollops of hot- melt glue on the corners of the board and to the back of the LED body - to anchor them in place.

If it does not squeal or light the LED, **stare** at your work for ten minutes, **then ring** or email your Webmaster for help.

When stuffing everything into the case, put the battery into a small plastic bag so as to not short out anything. Maybe use a little foam to wedge the battery firmly in place.

If the speaker isn't loud enough for your liking, solder the spare 150 ohm resistor (brown-green-black-black-brown) across the 150 ohm resistor on the board near the speaker leads.

Operating Instructions:

The toggle switch switches the battery OFF and ON. If the leads are not connected, the LED will come ON to indicate that the battery is ON.

DON'T leave the leads connected and battery turned ON or you'll kill the battery in no time.

Connect the tester across the breaker points of any bike. Switch ON. The LED will light and the speaker will growl if the points are open. The LED will extinguish and the growl will stop when the points are making contact.

NOTE: If all this appears just a bit too difficult, go onto eBay and search LCR METER. For a bit over \$20 you can get one from China postage free. The LCR meter is just like a multimeter except that it can indicate the difference between a zero inductance (ignition points touching) and around 3.5 millihenrys of inductance (ignition points open). This indication is visual only - not audible like the above kit.

PS - in case you're interested, here is the schematic diagram:

