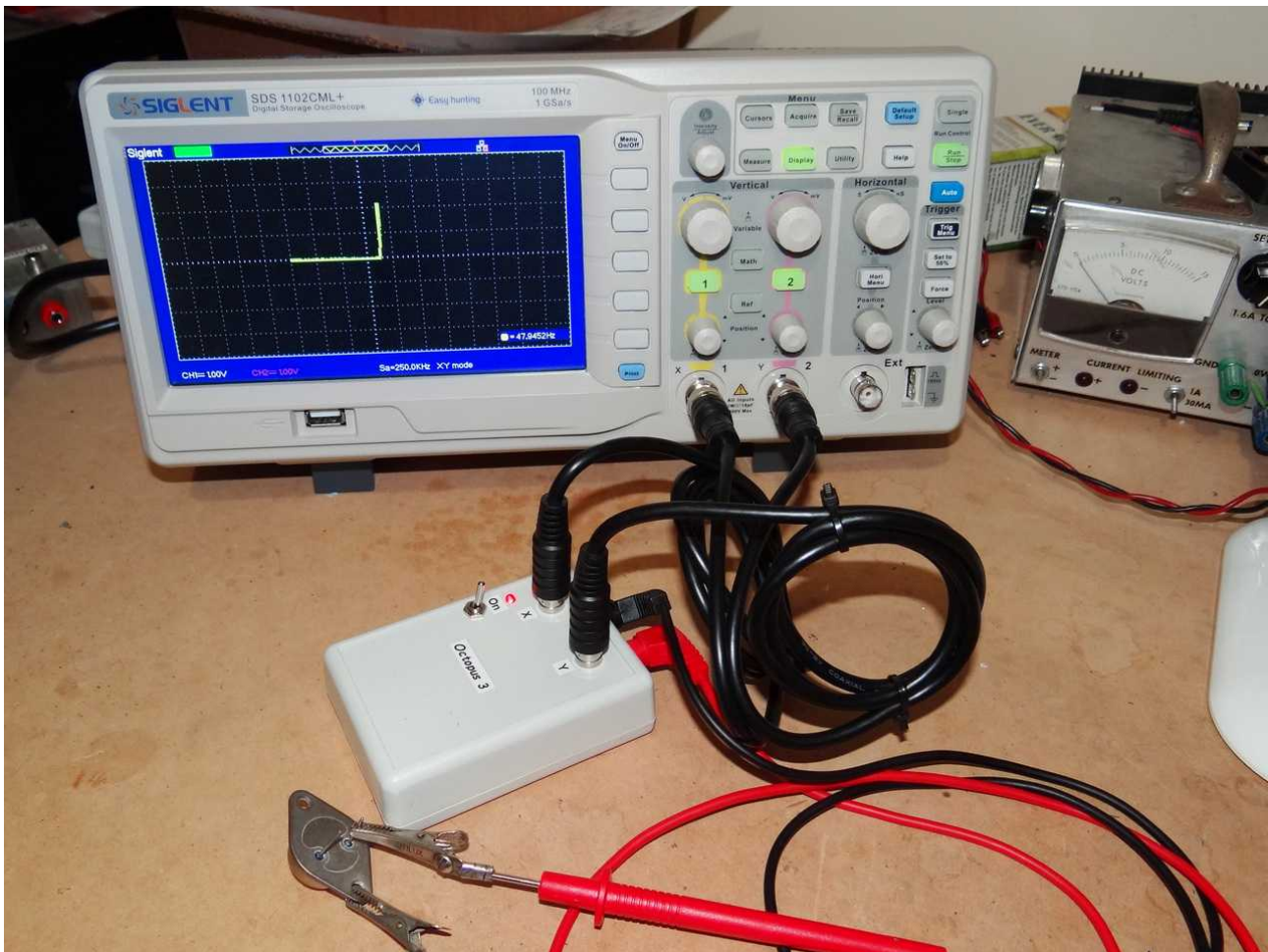


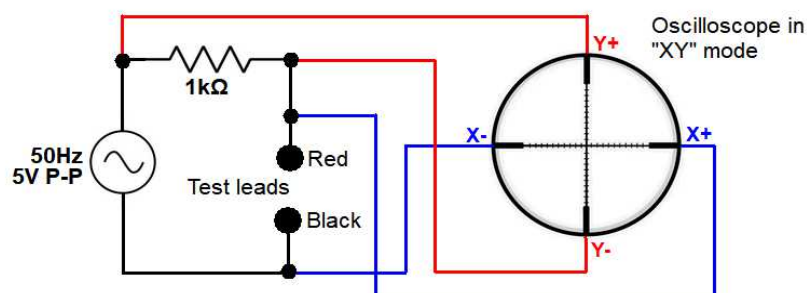
"Octopus3" component tester/curve tracer adaptor



What the hell is an "octopus" tester? As you can see in the photo, it got its name from all the cables connected to it. The basic design goes back decades into the tube era when someone realised that applying a low voltage derived from a mains "filament" transformer to an unknown component or points in a circuit through a resistor could produce patterns on an oscilloscope screen which reveal a lot of information.

This version of that idea dispenses with the transformer by using a battery powered 50Hz sine wave oscillator (the actual frequency isn't very important) with an output voltage of about 5V P-P like so:

"Octopus3" block diagram

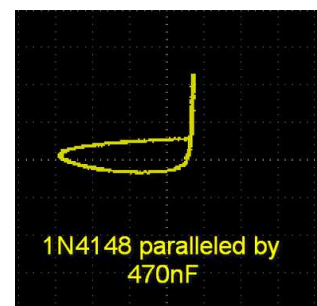
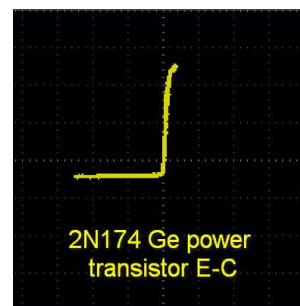
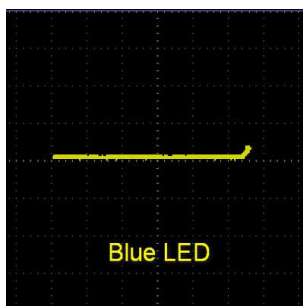
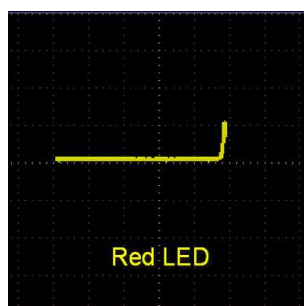
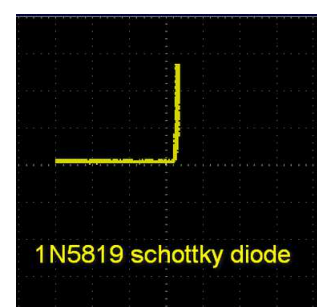
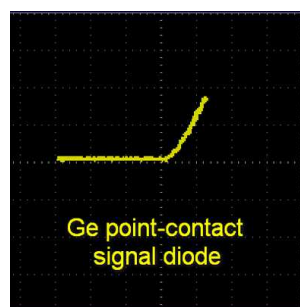
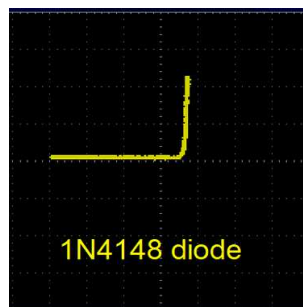
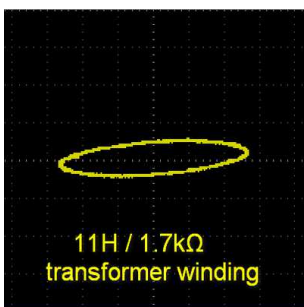
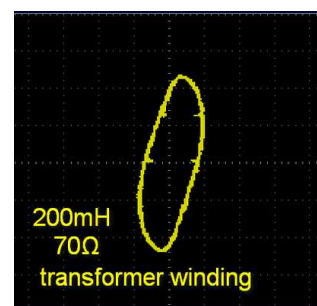
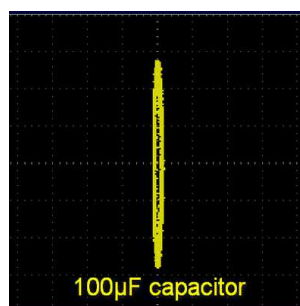
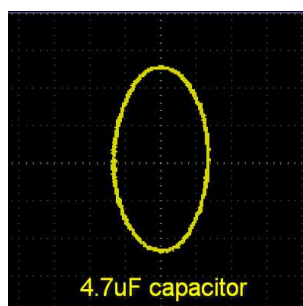
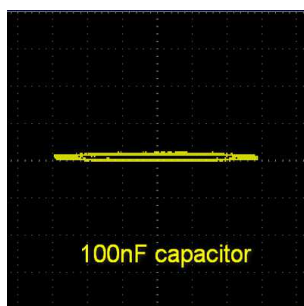
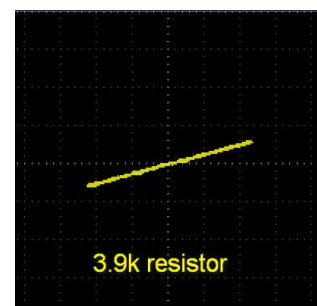
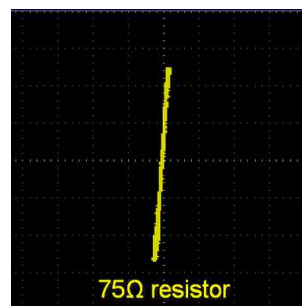
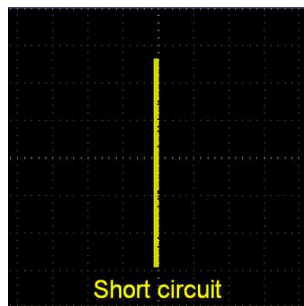
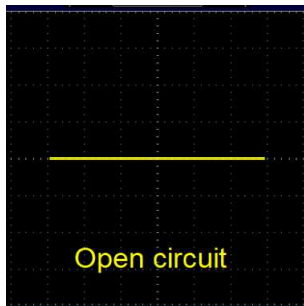


How to use it

There are basically two ways to use this gadget. The first is to connect it to an unknown component and interpret the pattern on the oscilloscope screen to help figure out what it is.

The second method is useful when you've got a working version of a circuit you are fault-finding (e.g. in a stereo amplifier). You can compare the “signatures” at various points in the two circuits. When you find a significant difference, that's probably the area where the problem is.

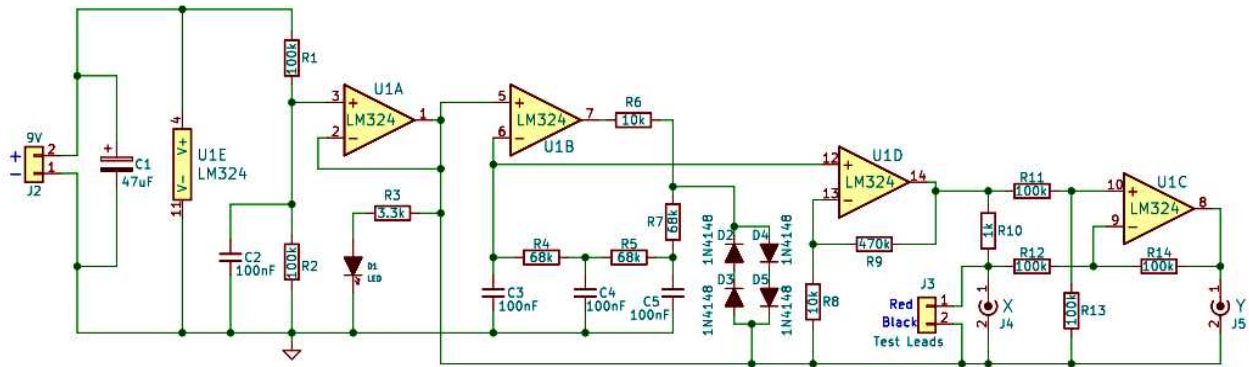
Here are some “signatures” of typical assorted components at **1V/division**:



NB: An analog CRT oscilloscope gives sharper and much nicer looking patterns, but who (apart from me) owns one of those these days?

Under the hood (aka “bonnet”)

The PCB schematic



This isn't a terribly complicated circuit. The LM324 is a fairly low current consumption quad op-amp. The 9V supply is halved by R1 and R2 and applied to U1A as a voltage follower. Its output becomes a “pseudo ground” for the rest of the circuit to allow both positive and negative signals. U1A needs a small load to battery negative to function properly, so the LED provides it as well as being a power-on indicator.

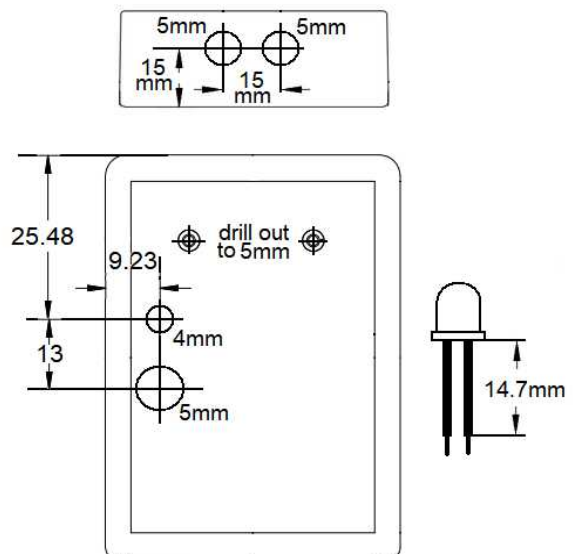
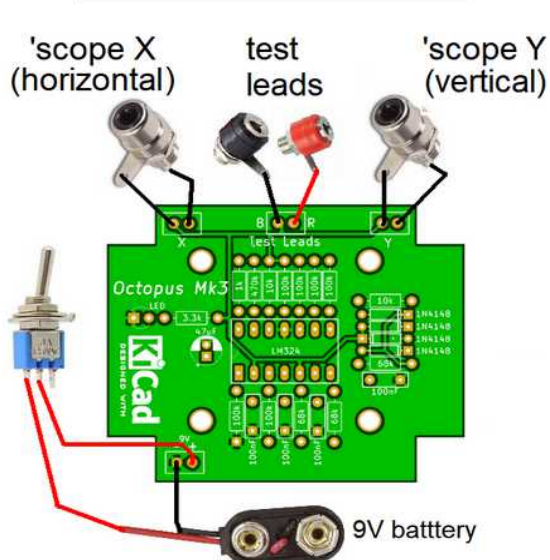
U1B and its associated RC networks function as a phase-shift oscillator with D2-5 stabilising its output level. The signal at U1B pin 6 is a pretty reasonable sine wave, which is amplified up to about 5V P-P by U1D. Its output goes to the test leads paralleled with the oscilloscope's “X” input, through R10.

U1C is a differential amplifier which ensures that the oscilloscope's “Y” input sees the voltage drop across R10 with the correct polarity. That way, “up” and “right” on the screen represent positive values while “down” and “left” represent negative values to make the patterns more intuitive.

All the components live on a small double sided PCB which fits into a Hammond 1593PBK (black) or 1593PGY (grey) plastic enclosure. The gerber files for the PCB are included in the zip file.

Wiring diagram and dimensions

Connections to the PCB



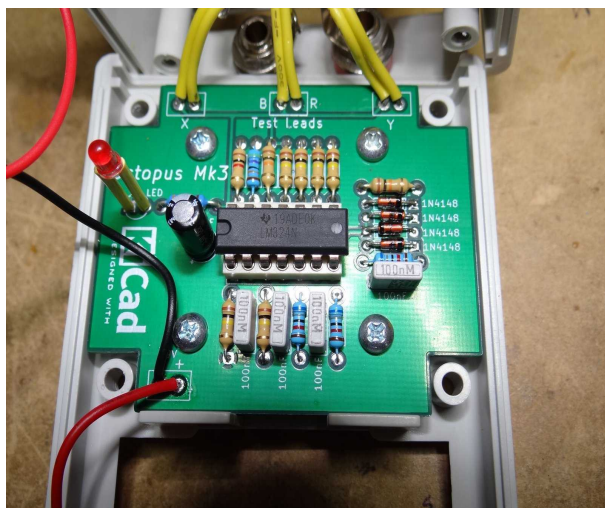
Putting it together

The PCB has all the component values marked on it. Start by installing the 1N4148 diodes first, followed by the resistors, MKT capacitors, IC socket and 47 μ F capacitor.

On the inside of the top of the box are two moulded “pillars” towards the front. Drill 2mm or so holes from the inside of the pillars through to the outside of the box. Then drill those holes out to 5mm from the outside. Install RCA phono jacks in the holes which might need to be enlarged to 6mm.

Drill 5mm holes in the front panel as shown and install the banana sockets as seen in the photos.

The 3mm red LED needs to stand off the PCB by 14.7mm. Cut a piece of suitable plastic tube or two pieces of wire insulation to that length to achieve it. Connect everything together with ordinary hookup wire.



Parts list

<u>Quantity</u>	<u>Value</u>
4	100nF 5mm pitch MKT capacitors
1	47uF 16V radial 2mm pitch electrolytic capacitor
1	1k 0.25W resistor
1	3.3k 0.25W resistor
2	10k 0.25W resistors
3	68k 0.25W resistors
6	100k 0.25W resistors
1	470k 0.25W resistor
4	1N4148 signal diodes
1	3mm red LED
1	LM324N IC
1	Sub-mini SPDT toggle switch
1	9V battery connector
1	Red 4mm banana socket
1	Black 4mm banana socket
2	Chassis mount RCA phono sockets
1	DIP 14 pin IC socket
1	Hammond 1593PBK (black) or PGY (grey) enclosure
4	14G 6mm self tapping screws
1	9V battery

All the gerber files for manufacturing the PCB are in the Octopus3.zip file. The PCB in the photos came from **JLC.PCB** (<https://jlcpcb.com/>) in China. They are very cheap and very fast.