DIY Curve Tracer (Tracker)

Instructions

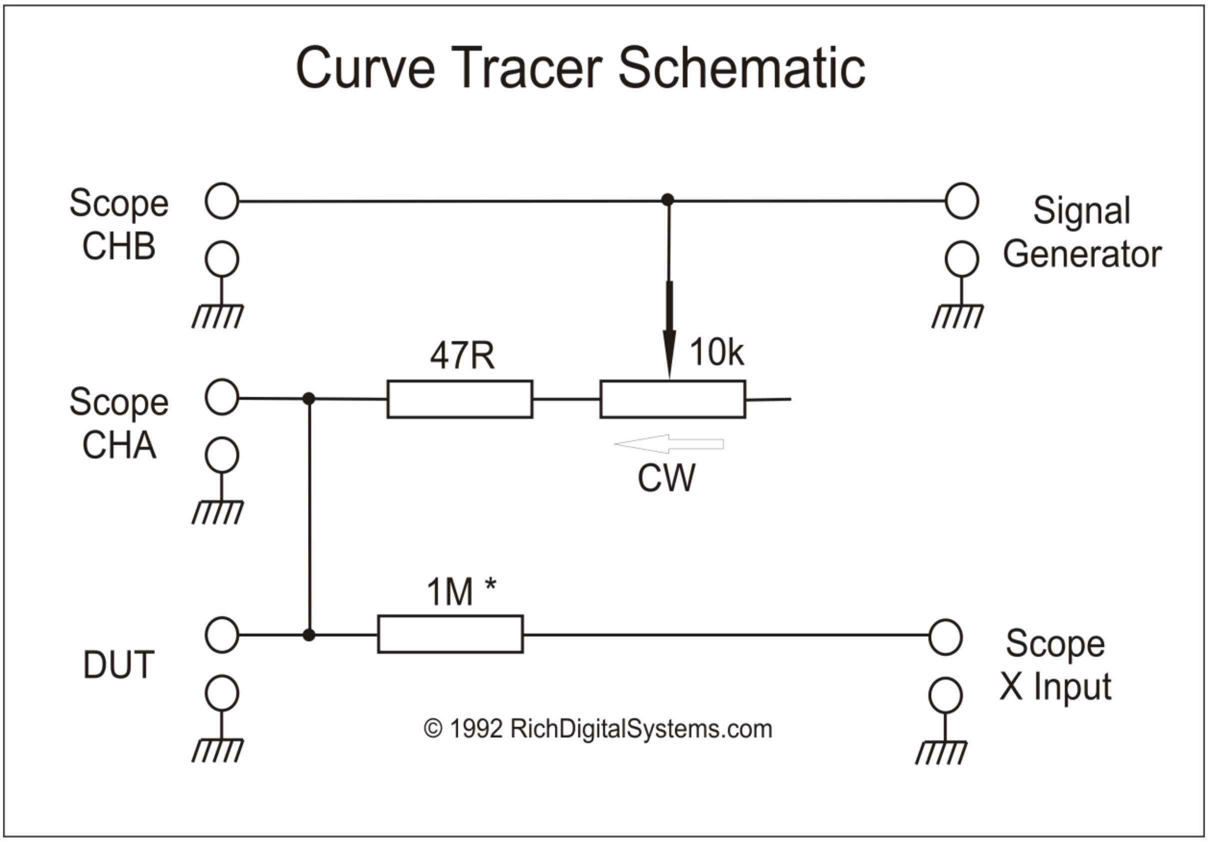
Introduction

While you could buy a dedicated curve tracer, they are essentially just a dual channel oscilloscope, a low output impedance signal generator and some resistors along with a switch or potentiometer to make it convenient to use.

Many people build the so called "Octopus" circuit based on a transformer but it is far easier to use the existing equipment above that most home labs now have.

Curve tracers can be invaluable for checking all types of active and passive electronic components, particularly semiconductors like the diode, transistor and thyristor etc.

Comparison with a known good device is the best way to check a component particularly when probing the pins of an integrated circuit.



The circuit above was built in to a small metal adaptor box (see photo) that has 2 flying BNC leads that connect to channels A & B of the scope, a chassis mounted BNC plug that connects to the scope X input and 2 chassis BNC sockets, one for the generator input and one for the DUT probes.

The 1MΩ* resistor on the X input may require minor adjustment to suit your scope to achieve a full width horizontal line when the DUT probes are open circuit.

The nice thing about this setup is that there are only three connections to the scope so when you need to use the scope for other mesurements you only need to remove the A & B inputs.

I also use a cheap basic signal generator as the 50Ω sine wave source.

Parts List

Qty	Description	Cost	
1	RS 456-201 Adaptor Box		
1	50Ω Chassis BNC Socket		
2	50Ω Cable BNC Plug (or cut ready made lead)		
1	Small know for Potentiometer		
1	50Ω Cable BNC to BNC Plugs (Sig Gen Lead)		
1	50Ω Cable BNC Plug to Crocodile Clips (DUT Lead)		
1	Miniature 10kΩ Linear Potentiometer		
1	47Ω Resistor		
1	*1MΩ Resistor		
1	Dual Channel Oscilloscope with External Sweep		
1	50Ω Sine Wave Signal Generator <10Hz to 1kHz		

Equipment Setup

Signal Generator

Output Z - *50R*
Function – *Sine wave*
Amplitude - *20Vpp*
Frequency – *100Hz*

Oscilloscope

Timebase
Sweep - *External X Input*
Magnification - *x1*
Position - Midway

Vertical Mode - *A+B*

Channel A
Coupling - *DC*
Volts/Div - *1V*
Vernier - *Detent or off*
Channel – *Inverted*
Position - Midway

Channel B
Coupling - *DC*
Volts/Div - *1V*
Vernier - Used to adjust skew or tilt.
Position - Midway

Curve Tracer Adaptor

Control – *Fully CCW*

Calibrate Before Use

- With the probes open circuit adjust channel A vertical position control to set the horizontal line on the centre graticule line.

- Use the Channel A or B vernier to adjust skew or tilt, i.e. set for horizontal line against the graticule, some minor re-adjustment of position may be required.

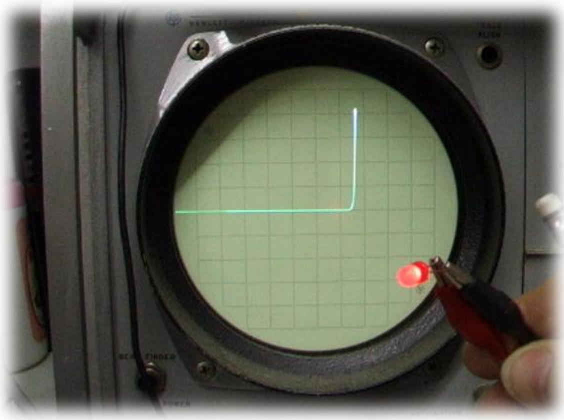
- Now short the probes and adjust the sweep horizontal position control to set the vertical line on the centre graticule line.

- You are now ready for use.

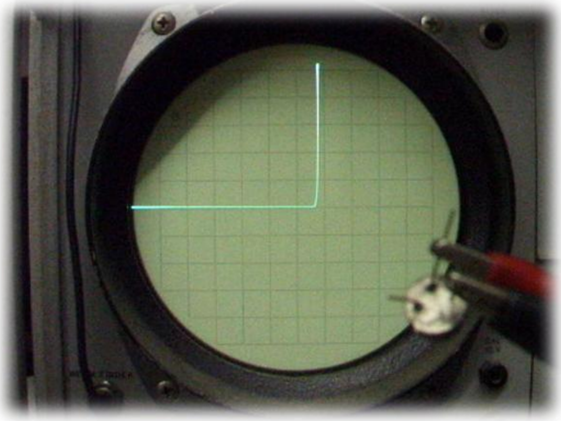
Operation

- Reduce the signal generator amplitude to a level suitable for the DUT (if you are not sure then set it to around 100mV then slowly increase).
- Set a frequency on the generator suitable for the DUT.
- You may now need to slowly turn the curve tracer control CW to inject more current in to the DUT while also increasing the generator amplitude.
- After some experimentation this will become second nature.
- Voltage is shown on the horizontal scale and current on the vertical with the centre equal to zero voltage and zero current.
- So positive voltage & current will be to the right of centre line and above the centre line respectively and negative will be left and below respectively and can clearly be seen from the pictures below.

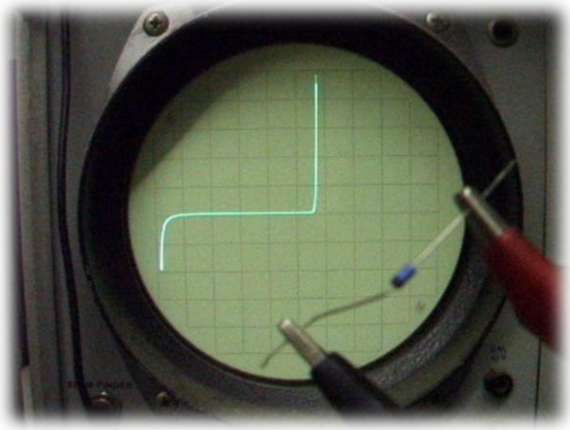
Light Emitting Diode – Forward Voltage is 1.5V



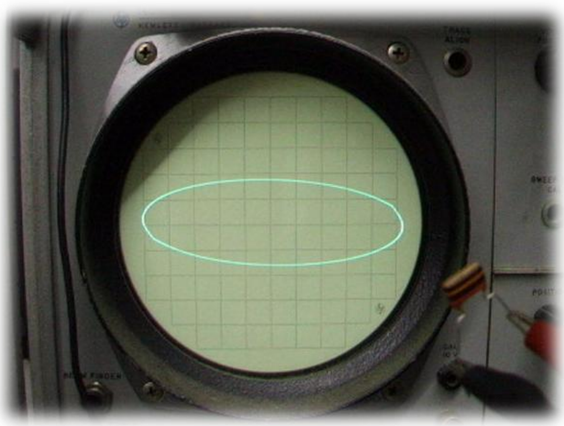
Silicone Transistor - 0.7V Base to Collector



Zener Diode – 0.7V Vf and 4.7V Knee



Polyester Capacitor – 100nF



I have successfully used the curve tracer to check the windings on a motor and found one with shorted turns as compared to the other windings on the same armature, and can also check small capacitor values using a higher frequency which is a severe limitation of the “Octopus” circiut.