

Theory

The Logic Probe Kit uses a LM393 comparator to detect TTL signals. The TTL logic family inputs and outputs have two states high or low signals. Inputs have V_{IH} (High) and V_{IL} (Low) signals and Outputs have V_{OH} (high) and V_{OL} (low) signals. Referring to FIG 0.1 we can see that $V_{IH} = 2.0$ to 5.0 volts and $V_{IL} = 0$ to 0.8 volts and $V_{OH} = 2.4$ to 5.0 volts and $V_{OL} = 0$ to 0.4 volts.

The LM393 has a dual 2 input comparator which compares voltage level with the “+” and “-” inputs. If the - input is set to a reference voltage and the + input voltage is lower then the reference voltage the output signal is low. When the + input level is greater then the reference voltage the output signal is high (FIG 0.2).

To detect the high level signal (V_{IH}) and turn on the high LED the “+” input is referenced to 2.0 V by a resistor divider ($R5$ and $R6$). The “-” input is used as the Logic Probe input. When the signal is lower then 2.0 V the comparator output is high which turns off the LED. When the “-” is higher than reference voltage the comparator output goes low and turns on the high LED.

The second comparator is used to detect the low level signal V_{IL} and turn on the low LED. The “-” input is used as the reference voltage of 0.80 V by a resistor divider ($R3$ and $R4$) and the “+” is the Logic Probe input. When “+” is higher than the reference voltage the comparator output is high and turns off the low LED. When the “+” input is lower than reference voltage the output goes low and turns on the low LED.

The logic probe input voltage is 1.66 V via a resistor divider ($R1$ and $R2$). This is to prevent the inputs to the comparator from floating (Unknown voltage level). The circuit detects the V_{IH} and V_{IL} inputs and turns on the appropriate LED. If the voltage is between V_{IL} (0.8 V) and V_{IH} (2.0) this is referred to as DEAD BAND and turns off the high and low LEDs.

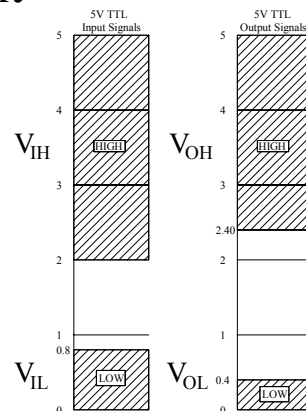


FIG 0.1

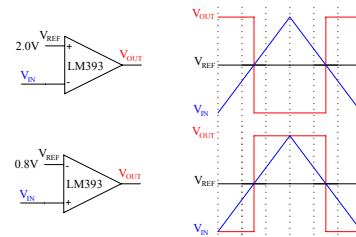


FIG 0.2

Logic Probe Kit Instructions

1. Verify you have all components.
If you are missing parts please contact us at sales.dept@meerkatsystems.net
2. Step 1 - Insert the Integrated Circuit (IC) LM393 as shown in FIG 1.0.
3. Step 3 - Insert the resistor by values as shown in FIG 2.0.
4. Step 3 - Insert the jumper wires as shown in FIG 3.0
5. Step 4 - Insert the Low (RED) and High (YEL) LEDs as shown in FIG 4.0.
6. Step 5 - Insert the Logic Probe into the marked location.

Step 1

Insert the IC (LM393 Comparator) into breadboard as shown in FIG 1.0
Note: Pin 1 as shown in FIG 1.1

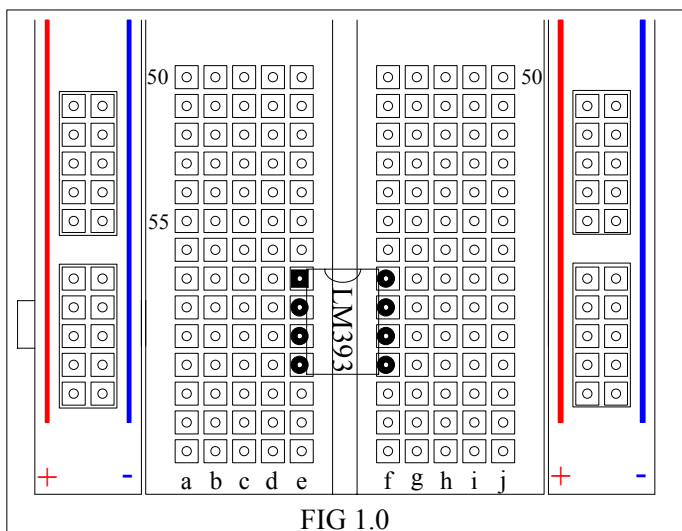


FIG 1.0

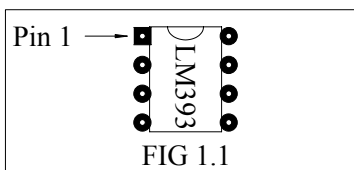


FIG 1.1

Step 2

Insert resistors as shown in FIG 2.0
Use FIG 2.1 to bend and cut resistor leads.
Resistor shown is actual size.

- R1 = 2M Ohm RED,BLK,GRN,GOLD
- R2 = 1M Ohm BRN, BLK,GRN,GOLD
- R3 = 27K Ohm RED,VIO,ORG,GOLD
- R4 = 5.1K Ohm GRN,BRN,RED,GOL
- R5 = 30K Ohm ORG,BLK,ORG,GOLD
- R6 = 20K Ohm RED,BLK,ORG,GOLD
- R7 = 5.1K Ohm GRN,BRN,RED,GOLD
- R8 = 5.1K Ohm GRN,BRN,RED,GOLD

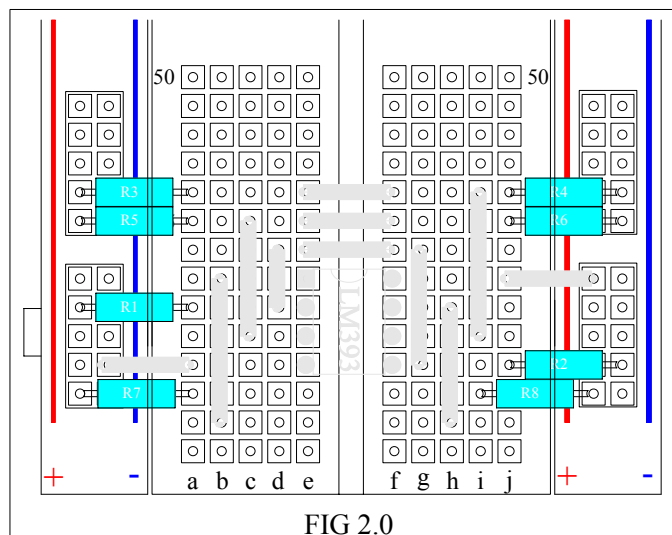


FIG 2.0

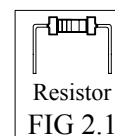


FIG 2.1

Step 3

Insert jumper wire as shown in FIG 3.0
 Use FIG 3.1 to bend jumper wires.
 Jumper wires shown is actual size.

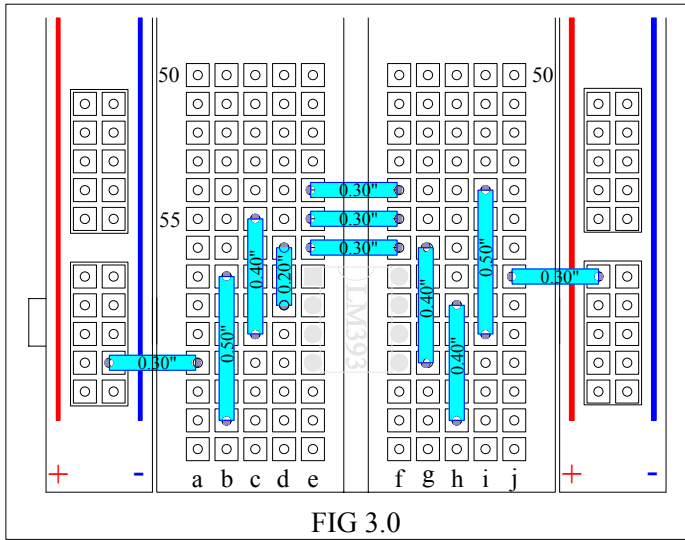


FIG 3.0

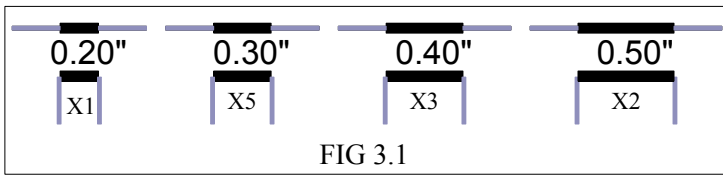


FIG 3.1

Step 4

Insert Light Emitting Diode (LED) as shown in FIG 4.0.

Note: + lead of the LED
 Use FIG 4.1 to cut LED.
 LED shown is actual size.

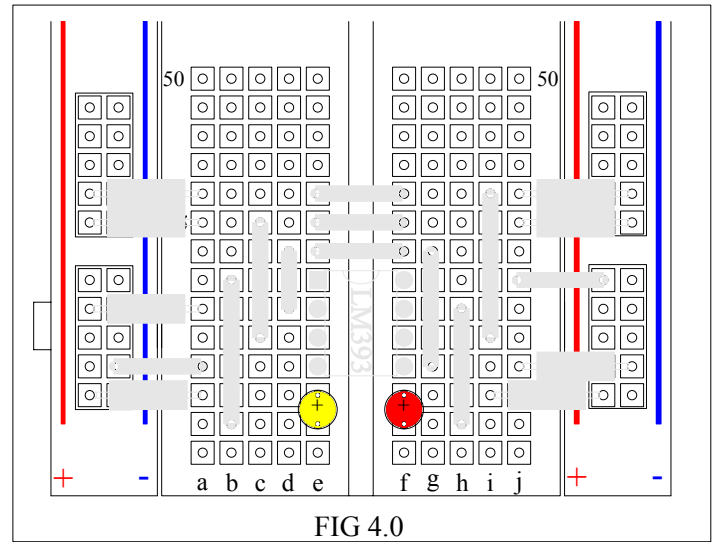


FIG 4.0

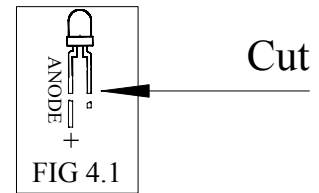


FIG 4.1

Step 5

Insert the Logic Probe Wand as show in FIG 5.0.
 The short terminal plugs into the solderless breadboard
 as shown in FIG 5.1.

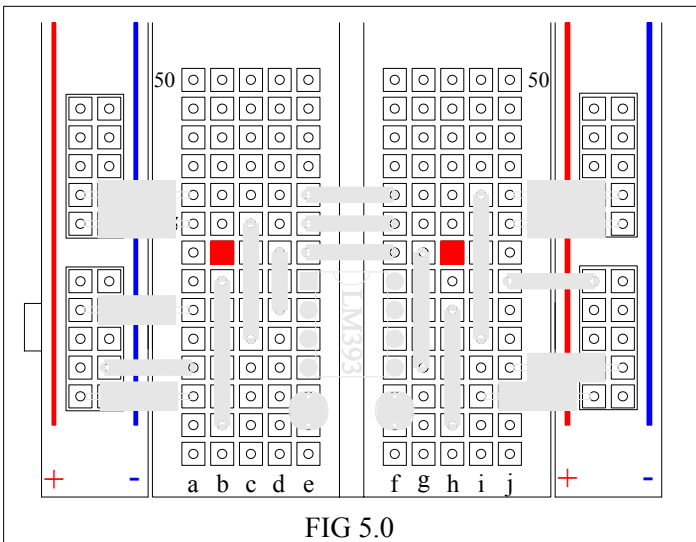


FIG 5.0

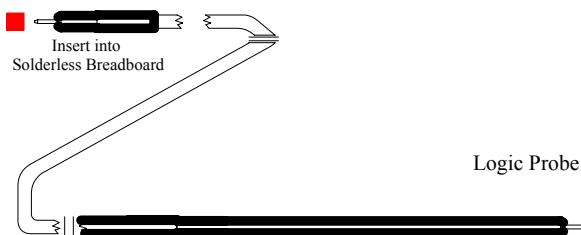
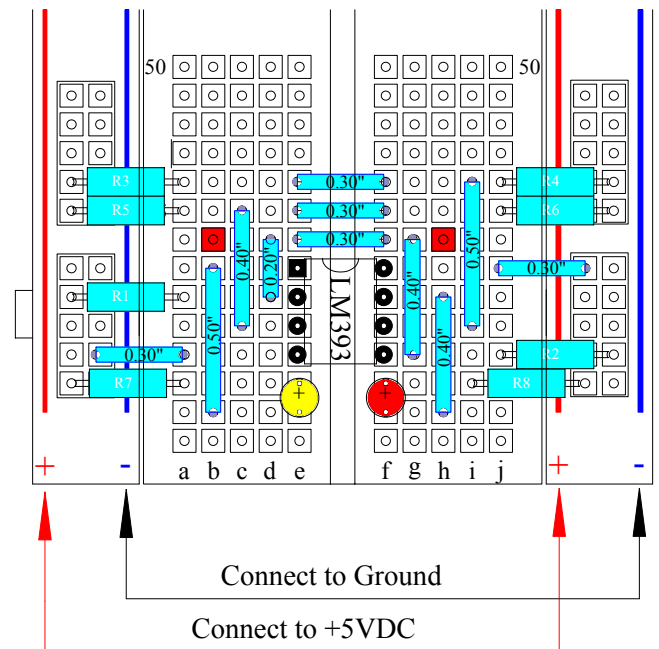


FIG 5.1



Parts Layout for the Logic Probe Kit