

DCD: Logic Probe Laboratory 06

Task 1

Logic '0' = 0v -> 2.2V

Logic '1' = 5V -> 2.7V

Increasing to 200K ohms resistor will increase the time constant, making the output pulse longer.

Task 2

Does it perform the same function, yes

Task 3

The capacitor will store a voltage, increasing the voltage on the input of the IC to above that of the power supply. If you look at the data sheet for this device this could damage the IC. The addition of a diode will prevent this over-voltage i.e. clamp the input to supply+0.7v.

Task 4

The RC network forms a high pass filter, reducing the capacitor, increases the cut-off frequency, reducing the voltage on the input. This voltage is no longer large enough to cross the logic one/zero threshold. Increasing the frequency of the input waveform allows more signal to pass through the filter allowing the logic probe to work.

Therefore, the value of the RC can be used to set the minimum pulse frequency that will trigger the LED.

Task 5

What is the frequency of the output waveform = very fast, an approximate answer, in practice would be very dependent on the components used.

How would this change if the value of R is decreased or increased? Increasing R will increase the time constant slowing down the OSC i.e. will take longer to charge / discharge the C. Decreasing R will decrease the time constant speeding up the OSC.

Task 6

If multiple 'start' pulses occur during this time, will these re-start the monostable multivibrator? = No as the output from the second NOR gate masks the input signal.

What value of resistor is required to produce an output pulse of a 150ms? = 2M2

What additional component should be used to protect this device? = diode

Task 7

If the oscillator output has a 50 – 50 duty cycle i.e. is on (+5V) and off (0V) the same period of time, the average output voltage be 2.5V. The voltage created by the potential divider circuit, R6 and R7 is 2.5V, therefore, no voltage across the LEDs.

Also the OSC is running at a very high freq so any pulses will be too quick for the human eye

Task 8

Why is the edge detector circuit required? = only want changing signals to trigger the pulsing LED, otherwise a constant logic '1' would falsely trigger the pulsing LED

