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*Figure 1 – Built up circuit with Shift Register.*

1. **Q:** Briefly explain how the circuit works / what function does it perform?

**A:** The circuit works with the use of three different Integrated Circuits being a Shift Register (74HC595) and two D-Latches (74HC75) that stores the digital data from the Shift Register and outputs that data to eight LEDs (the circuit shifts eight bits). The circuit uses a DIP Push button in a Pull-Up Configuration. This causes the data of the shift register to return 11111111 though this changes with the shift register. Once the user flips the DIP switch, it adds a zero to the outputted data from the left and with each flip shifts the data to the left towards the least significant bit. The number of zeros added along with the number of shifts varies upon the clock frequency.

1. **Q:** Explain what is the relationship between the clock frequency and output of the LED?

**A:** The relationship between the clock frequency and the output of the LED goes back to the function of the shift register with the Time Diagram taken into account. The clock frequency determines how quickly the shift register would shift the values of its outputs depending on Shift In Input. The faster the clock frequency the faster the LED outputs would show the shifting of the eight-bit value to the left. This in quickly seen on the circuit first starting up, due to the input being in a pull-up configuration, this causes the shift register to input a High Value to all of its outputs. It can be seen how fast these values shift from low to high. The higher the frequency, the faster the shift register shifts the outputted data to the left.

1. **Q:** What is the relationship between shift in and output?

**A:** Once the user uses the DIP Switch up and down to send a input signal to the Shift Register the output (in this case) would modify the High LED to have the outs return from the Shift Register one or more low signals thus shifting the data outputs to the left. The number of shifts is dependent upon how the user keeps the switch on a High State along with the clock frequency. Depending on the clock frequency the number of shifts occur from the user flipping the switch in a high state maybe a low number of shifts or high numbers of shifts per second.

1. **Q:** What are the control signals for 74HC595?

**A:** The control signals for the 74HC595 are at Pin 13, Pin 12, Pin 11, and Pin 10. These signals are the Output Enable, Latch Clock, Shift Clock, and Reset respectively.

1. **Q:** What are the control signals for 74HC75?

**A:** The control signals of the 74HC75 are Pin 4 and Pin 13 with each being the Low Enable. Pin 4 is the Low Enable for Input 1 and 2 while Pin 13 is Low Enable for Input 3 and 4.