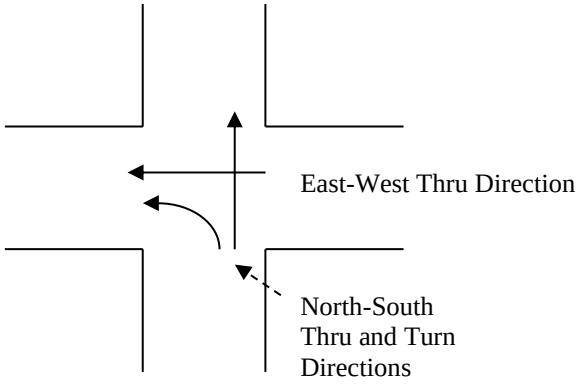
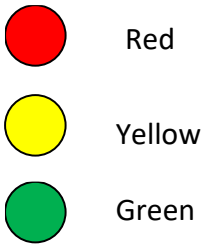
Chapter 4 The Traffic Intersection

A traffic intersection has the following three lane assignments:

East-West Thru
North-South Turn
North-South Thru



Two sets of traffic lights are found for each turn direction although the lab uses only one set. Each turn direction has a set of three lights as follows:



Although traffic intersection logic tends to be very complicated in order to provide fool-proof operation of the traffic intersection, a simplified chart of the operation of the lights can be used to program the lights and operate the intersection. Each interval is an interval of time and after the last interval, the process repeats from the top. The intersection's operational chart:

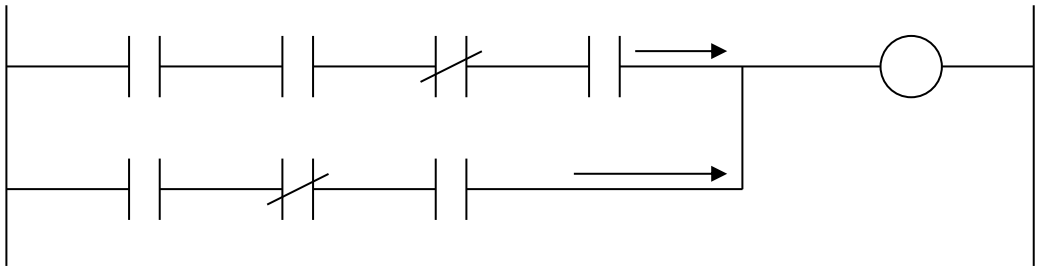
Interval	N-S Thru Lane	N-S Turn Lane	E-W Thru Lane
1	Green	Red	Red
2	Yellow	Red	Red
3	Red	Green	Red
4	Red	Yellow	Red
5	Red	Red	Green
6	Red	Red	Yellow

This lab consists of programming the nine lights to cycle through the proper sequence to control traffic flow at the intersection described above.

A helps program can be found accompanying this lab to start the process of setting up timers, especially to cycle and repeat a sequence. Notice that two timers can be set up the same as six or more timers to control such events as a flashing yellow or flashing red light. The same two timers can be used for all such flashing functions. Thus, two timers are all that are needed if a flashing sequence is needed.

Notice the EN, DN and TT contacts found with every timer. Timers start with T4:0 and proceed upward. Use the TON timer, or the On Delay Timer. Addressing for timer contacts is T4:0/DN, T4:0/TT, T4:0/EN. Refer to the Allen-Bradley Instruction Reference Manual for more detailed information about the use of timers. Also, look at the helps program to view a basic cycling program that works.

Also, the outputs must be programmed. Remember that only <u>one</u> output should be programmed for each light. Outputs are programmed to allow multiple branches to turn on the selected output. For instance, the top or bottom branch of the rung would allow the output to turn on. This is a parallel branching function so either of these branches would turn on the output.



Options for Lab

A Add a selector switch to delete intervals 3 and 4 during a rush hour.

B Add a selector switch to blink N-S lanes yellow, E-W lanes red for late-night.

C Add a short time delay between intervals 2-3, 4-5, and 6-1 while all lights are red.

D Add a push button to allow pedestrians to walk in all directions for an interval of time while all lanes are red.

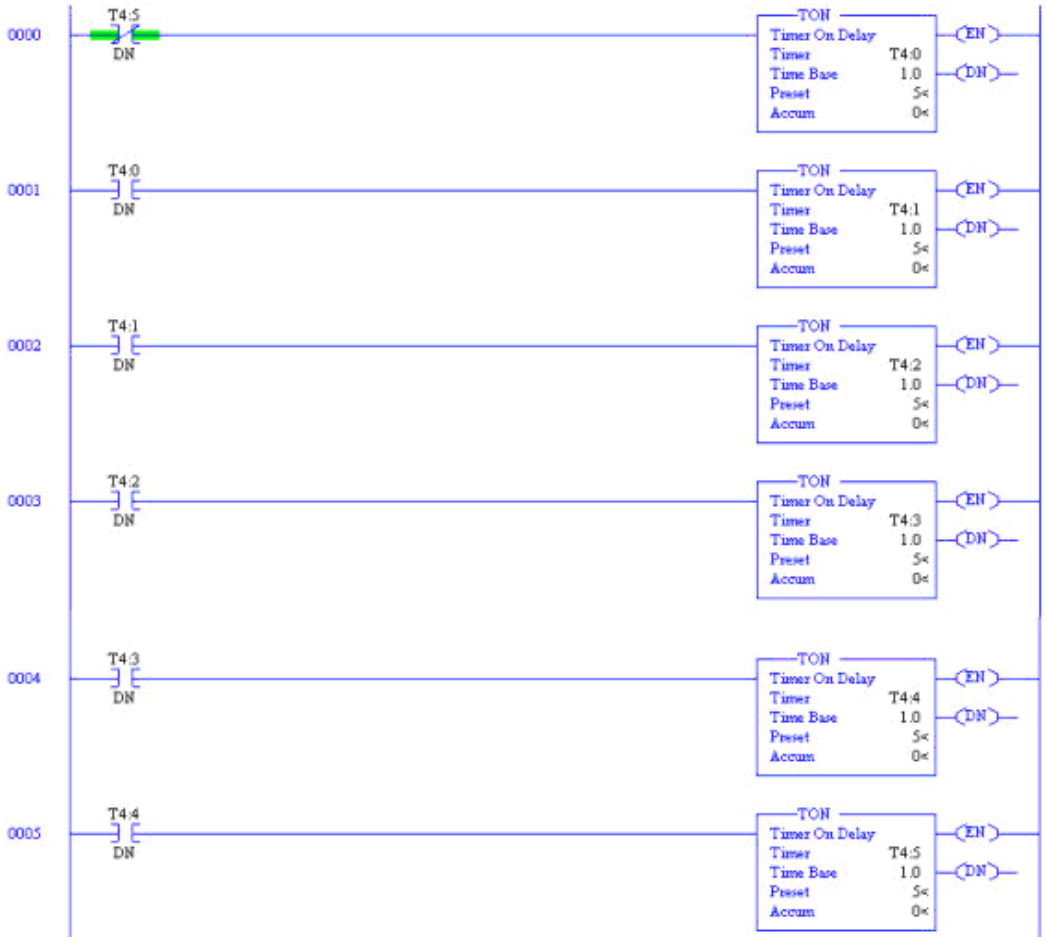
E Add a push button that acts as a button in the pavement that will only allow a turn lane signal if there has been a car activate the turn signal in the time prior to the turn signal's position in the cycle.

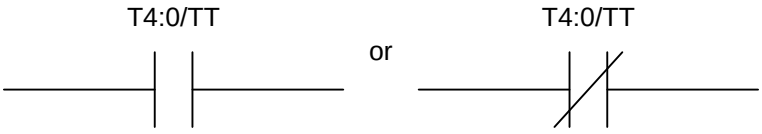
F Add a switch imbedded in the road to sense when there is a back-up of cars

wanting to use the turn lane. If there is a back-up, use a longer time preset for the turn lane. If the switch turns on rapidly, then there is no back-up. If the switch turns on but not in rapid succession, there is a back-up.

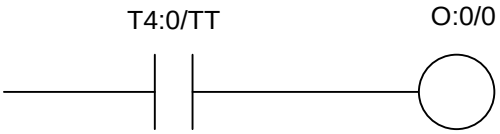
Hints for Lab

Program the timer circuit below to give the intervals needed. View the T4 Timer Table on-line with the processor running. Notice the TT and DN contacts. Use the TT (or EN or DN) contacts in logic to turn on the lights in order.

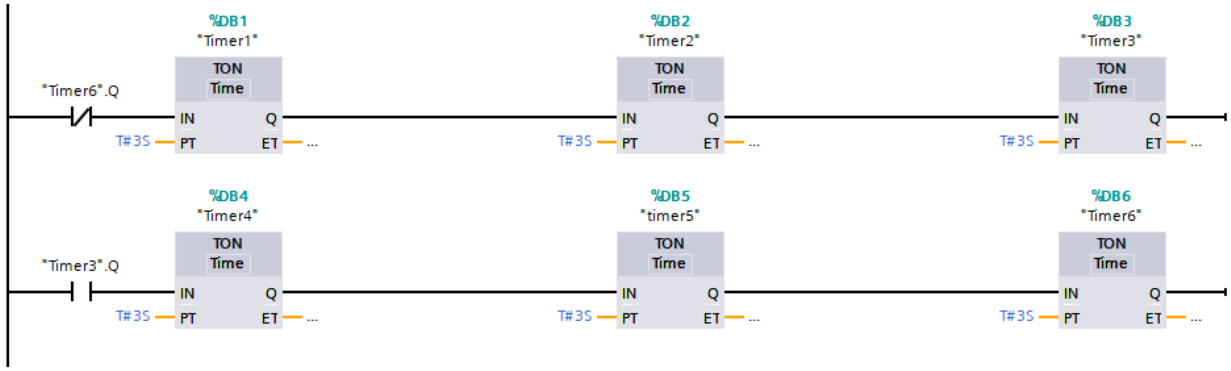




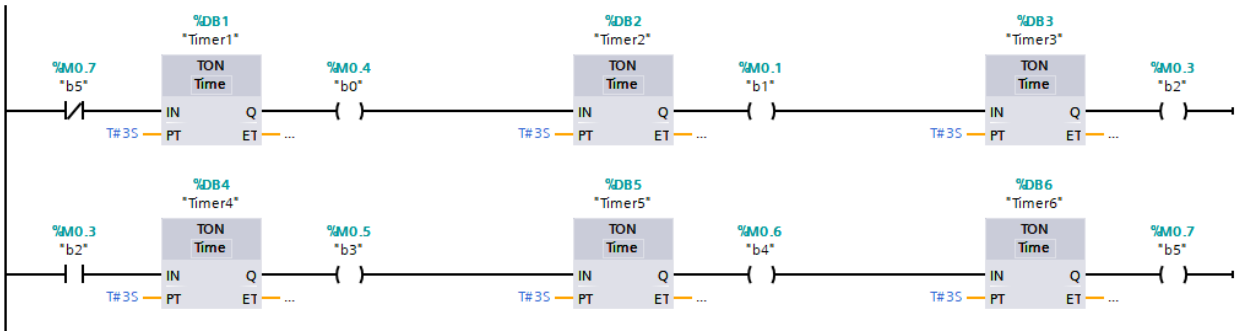
The logic to provide outputs and the outputs themselves may be combined. For instance, to turn on a specific traffic light from the program above, program the following:



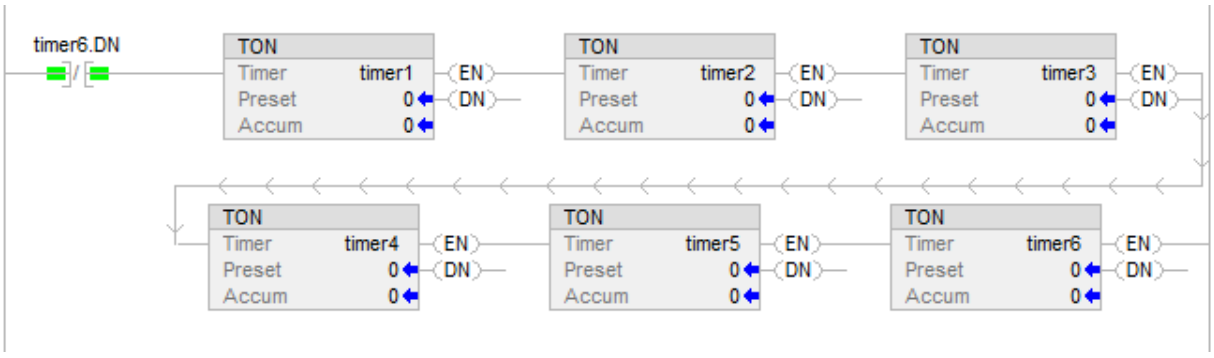
The following Siemens program will provide the same function as the A-B program above: You may use either the .Q bit or define timer output coils at each time interval.



The following Siemens uses the coils instead of .Q bit.



You can try the following but it will not work properly. Do you know why?



The above A-B rung gives what result? Why?

Definition of Inputs:

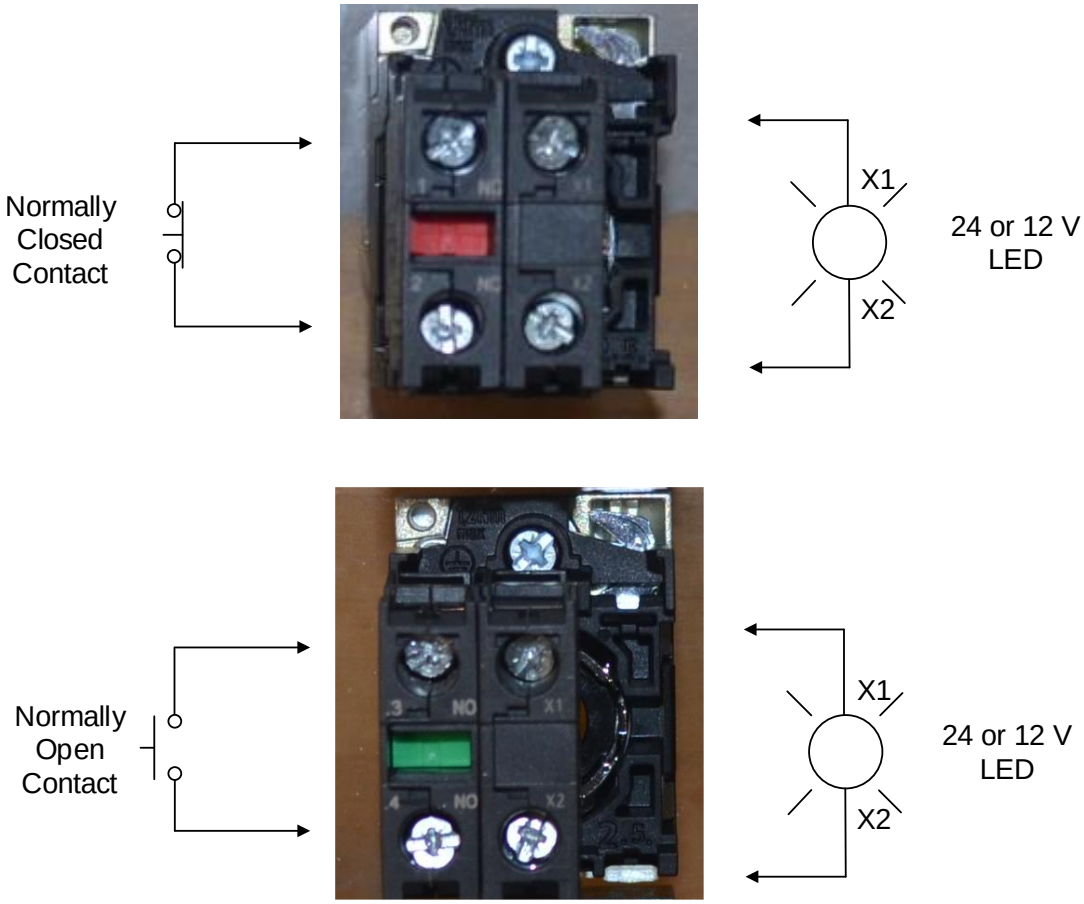
Sensor	Function/State	Signal Assignment

Definition of Outputs: Table 5-6b

Actuator	Function/State	Signal Assignment

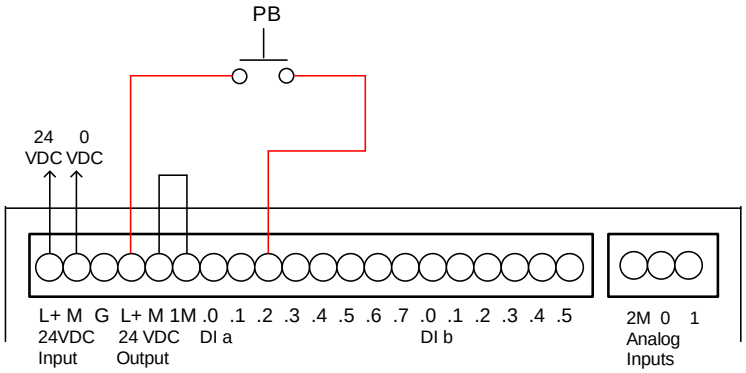
The wiring of the outputs to the lights can be accomplished using the following interface board:

Front side of New Pushbutton Stations

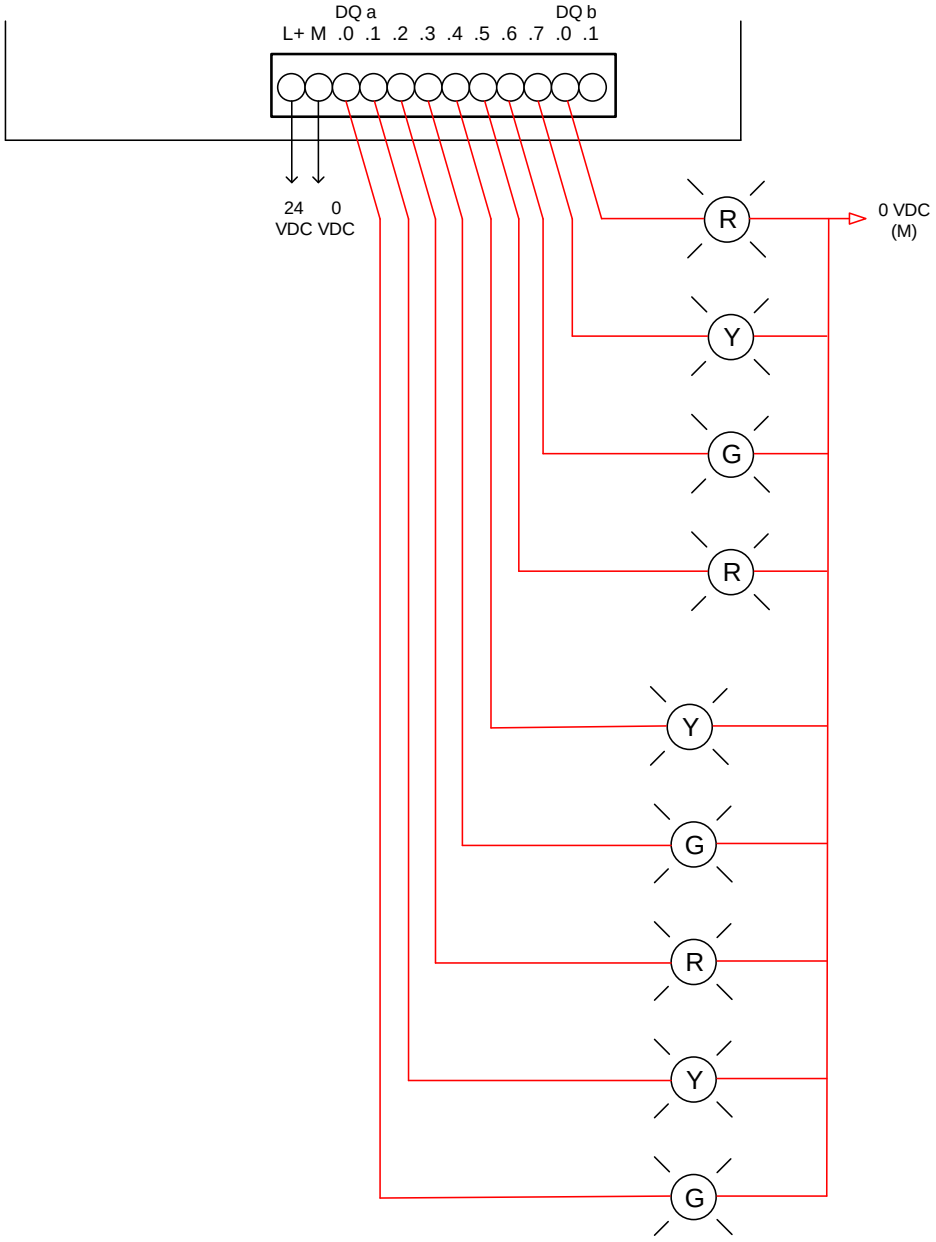


Back side of New Pushbutton Stations

Wiring for the lights and pushbuttons can be found on the following diagram.



Wire Lite to output Q0.5



The same circuit can be built using LEDs and resistors. The following shows this arrangement on a breadboard. We can use 4.7 KΩ resistors or another value near 5K for this circuit.