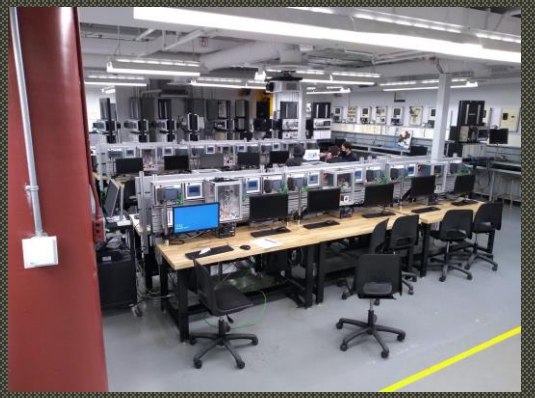


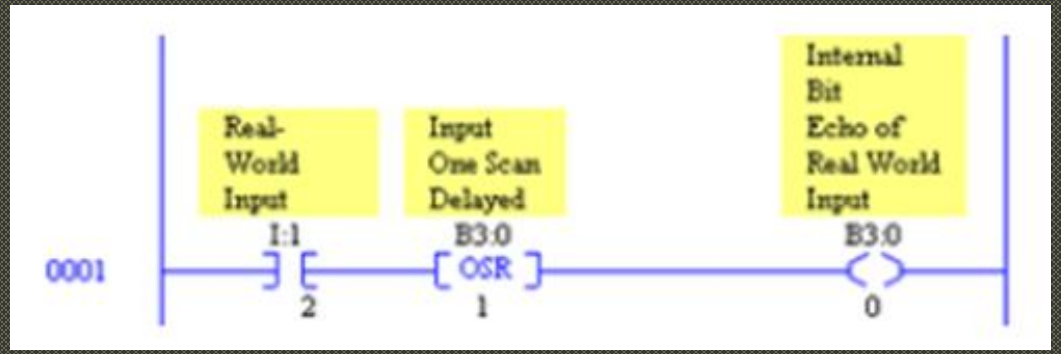
PROGRAMMABLE LOGIC CONTROLLERS
MENG 3500

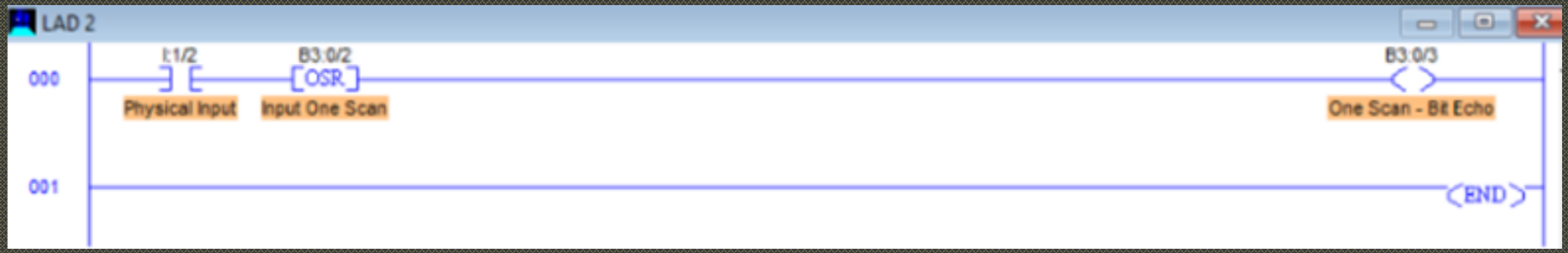
HUMBER

PROGRAMMABLE LOGIC CONTROLLERS

1. Design a One-Shot (pulse) instruction without using the OSR (One-Shot Rising) instruction.

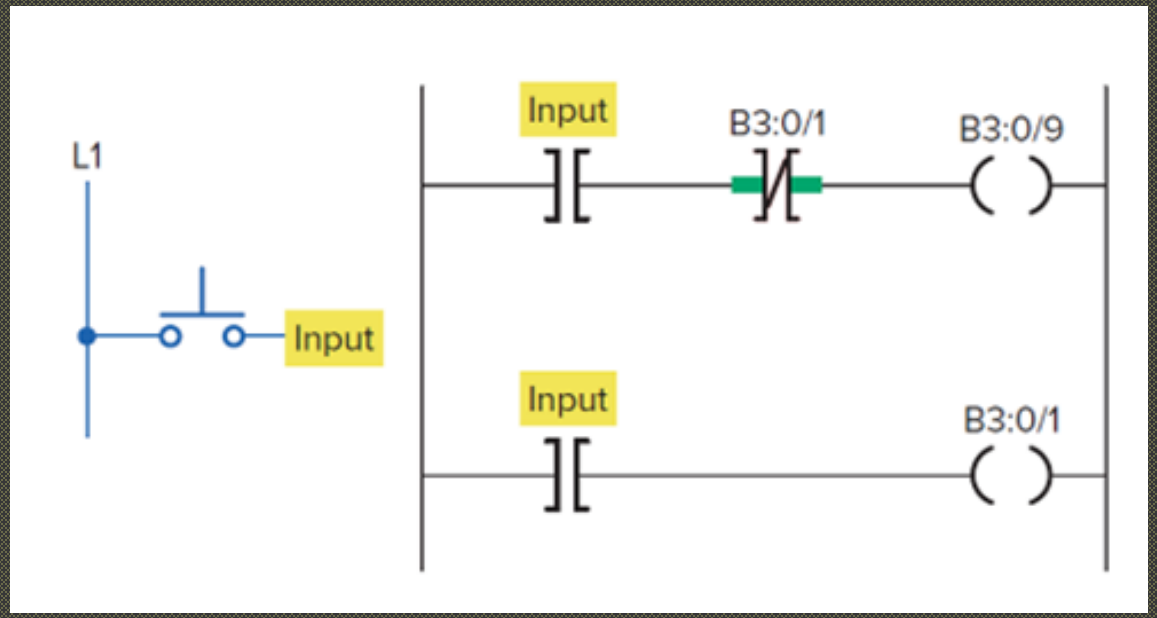
1. Design a One-Shot (pulse) instruction without using the OSR (One-Shot Rising) instruction.





PROGRAMMABLE LOGIC CONTROLLERS

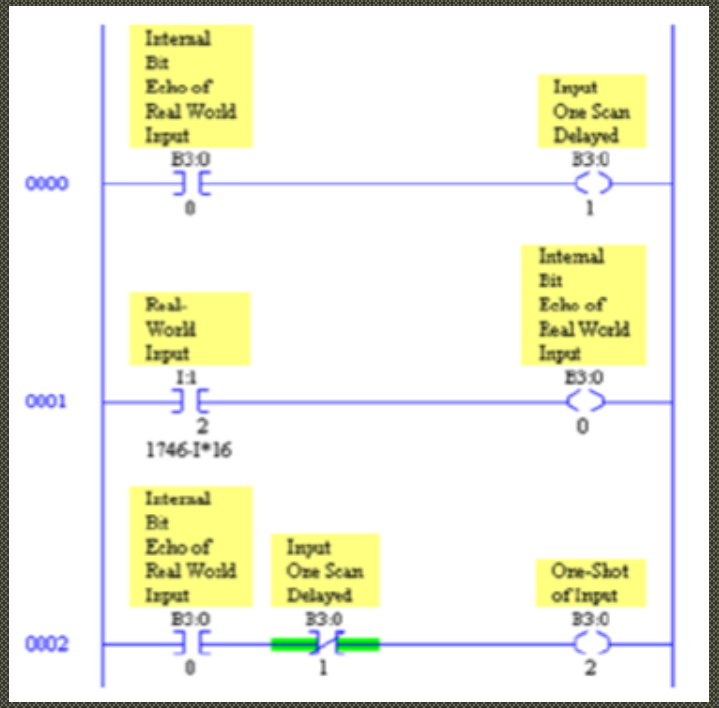
1. Design a One-Shot (pulse) instruction without using the OSR (One-Shot Rising) instruction.



HUMBER

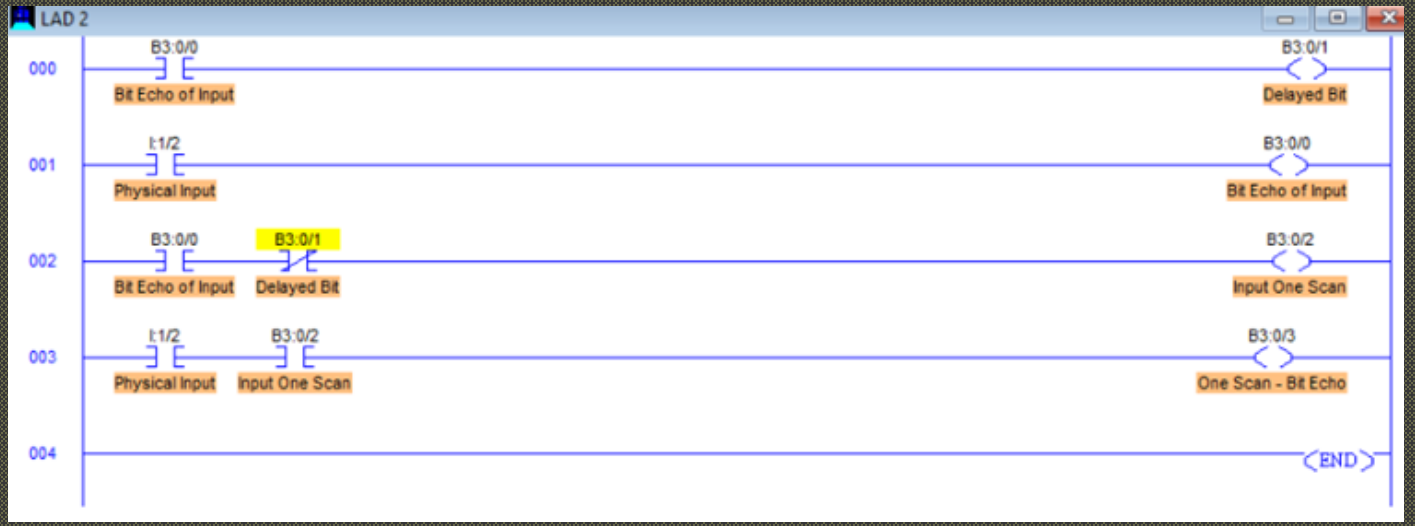
(Frank D. Petruzella Programmable Logic Controllers 6th edition)

1. Design a One-Shot (pulse) instruction without using the OSR (One-Shot Rising) instruction.



	Scan 1	Scan 2	Scan 3	Scan 4
B3:0/0	0	1	1	1
B3:0/1	0	0	1	1
B3:0/2	0	1	0	0
I:2/1	0	1	1	1

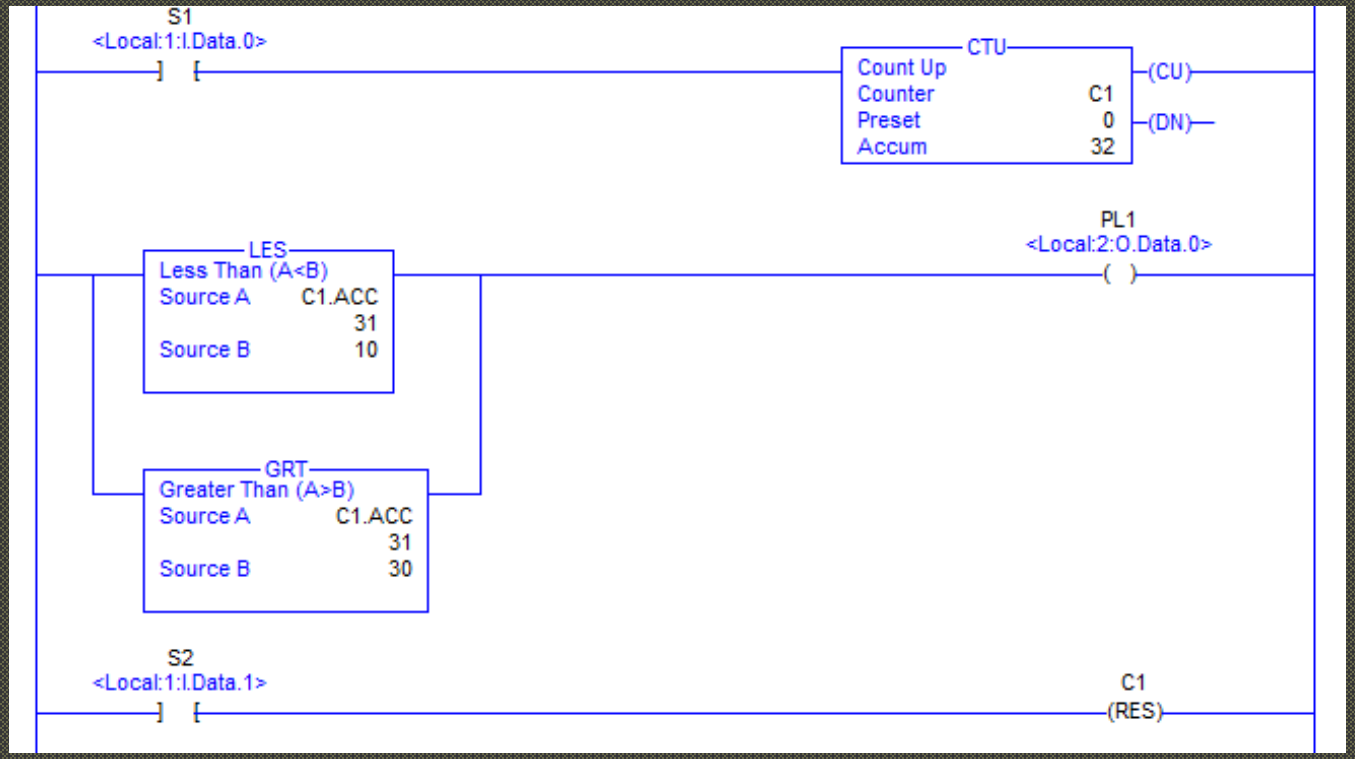
Signifies One Shot



PROGRAMMABLE LOGIC CONTROLLERS

2. Develop a PLC program that activates a light when the counter value is **below 10** or **above 30**. Additionally, include a pushbutton to reset the counter to zero.

2. Develop a PLC program that activates a light when the counter value is **below 10** or **above 30**. Additionally, include a pushbutton to reset the counter to zero.

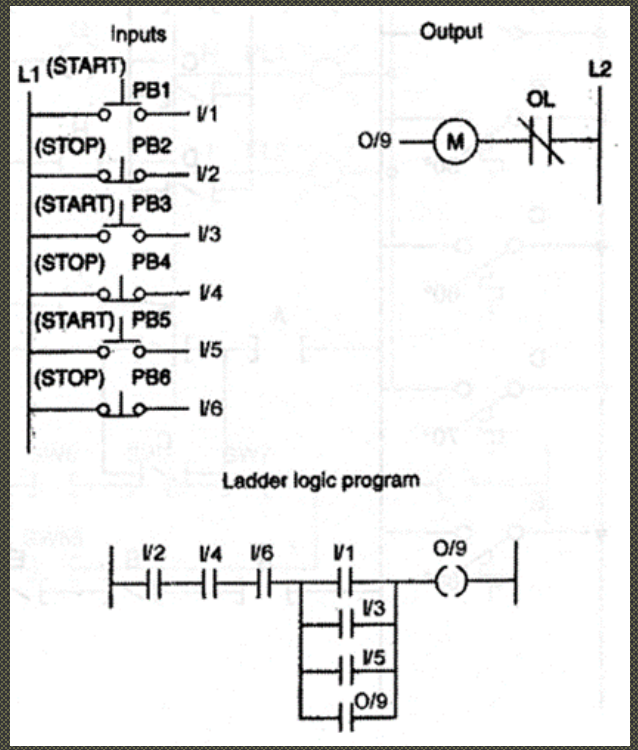


PROGRAMMABLE LOGIC CONTROLLERS

3. Design a PLC program and prepare a typical I/O connection diagram and ladder logic program for the following motor control specifications:
   a. A motor must be started and stopped from any one of three start/stop pushbutton stations.
   b. Each start/stop station contains one NO start pushbutton and one NC stop pushbutton.
   c. Motor OL contacts are to be hardwired.

PROGRAMMABLE LOGIC CONTROLLERS

3. Design a PLC program and prepare a typical I/O connection diagram and ladder logic program for the following motor control specifications:
   a. A motor must be started and stopped from any one of three start/stop pushbutton stations.
   b. Each start/stop station contains one NO start pushbutton and one NC stop pushbutton.
   c. Motor OL contacts are to be hardwired.

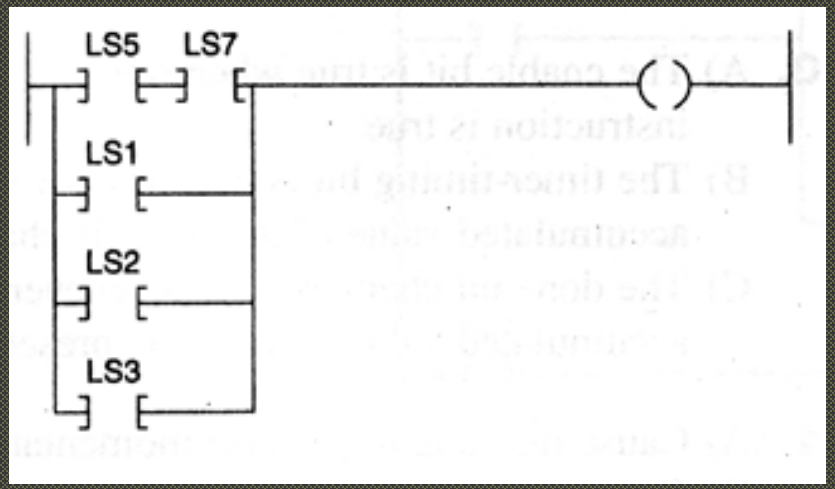


HUMBER

PROGRAMMABLE LOGIC CONTROLLERS

4. Write the optimum ladder logic rung for each of the following scenarios, and arrange the instructions for optimum performance:
   a. If limit switches LS1 or LS2 or LS3 are on, or if LS5 and LS7 are on, turn on; otherwise, turn off (Commonly, if LS5 and LS7 are on, the other conditions rarely occur)

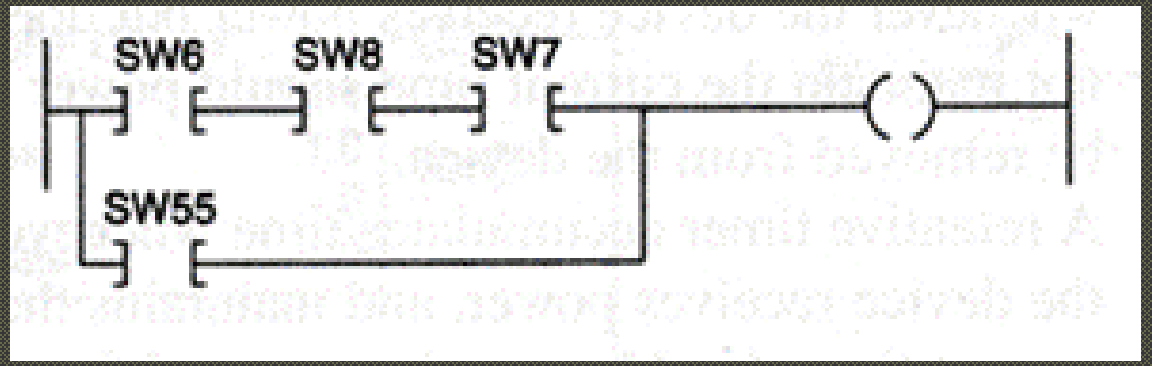
4. Write the optimum ladder logic rung for each of the following scenarios, and arrange the instructions for optimum performance:
   a. If limit switches LS1 or LS2 or LS3 are on, or if LS5 and LS7 are on, turn on; otherwise, turn off (Commonly, if LS5 and LS7 are on, the other conditions rarely occur)



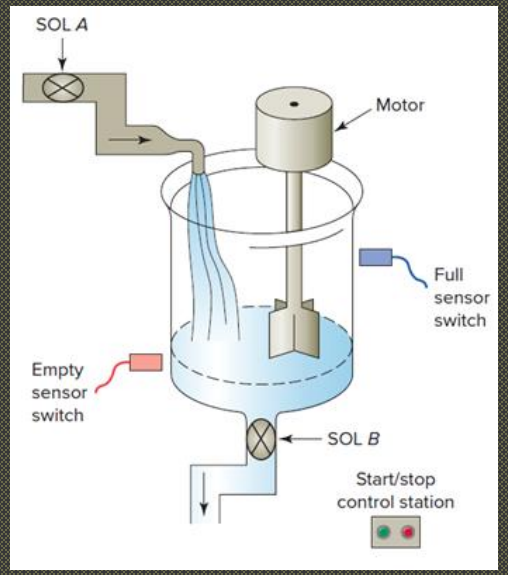
PROGRAMMABLE LOGIC CONTROLLERS

4. Write the optimum ladder logic rung for each of the following scenarios, and arrange the instructions f or optimum performance:
   b. Turn on an output when switches SW6, SW7, and SW8 are all on, or when SW55 is on. (SW55 is an indication of an alarm state, so it is rarely on; SW6 is on most often, then SW8, then SW7)

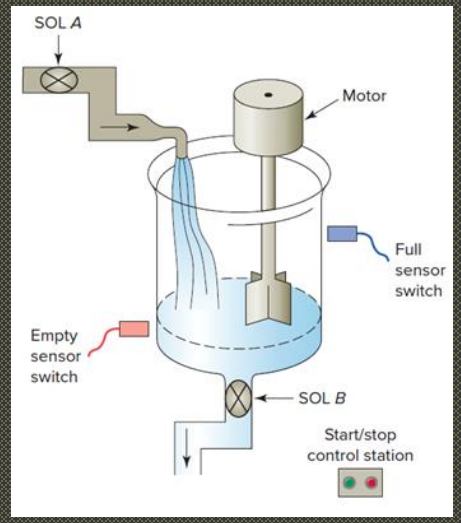
4. Write the optimum ladder logic rung for each of the following scenarios, and arrange the instructions f or optimum performance:
   b. Turn on an output when switches SW6, SW7, and SW8 are all on, or when SW55 is on. (SW55 is an indication of an alarm state, so it is rarely on; SW6 is on most often, then SW8, then SW7)

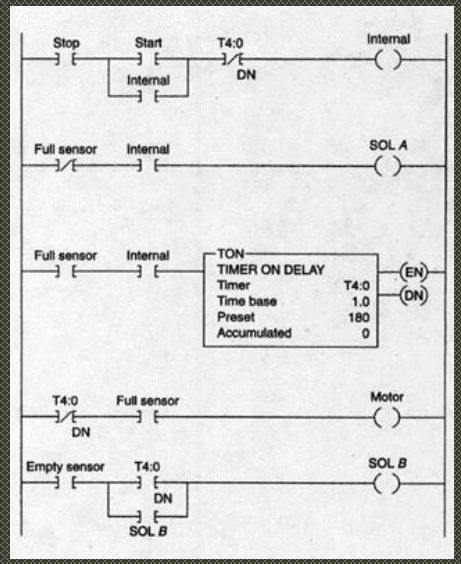


5. Write a program to implement the process illustrated. The sequence of operation is to be as follows:
   a. Normally open start and normally closed stop pushbuttons are used to start and stop the process.
   b. When the start button is pressed, solenoid A energizes to start filling the tank.
   c. As the tank fills, the empty level sensor switch closes.
   d. When the tank is full, the full level sensor switch closes.
   e. Solenoid A is de-energized.
   f. The agitate motor starts automatically and runs for 3 min to mix the liquid.
   g. When the agitate motor stops, solenoid B is energized to empty the tank.
   h. When the tank is completely empty, the empty sensor switch opens to de-energize solenoid B.
   i. The start button is pressed to repeat the sequence.



5. Write a program to implement the process illustrated. The sequence of operation is to be as follows:
   a. Normally open start and normally closed stop pushbuttons are used to start and stop the process.
   b. When the start button is pressed, solenoid A energizes to start filling the tank.
   c. As the tank fills, the empty level sensor switch closes.
   d. When the tank is full, the full level sensor switch closes.
   e. Solenoid A is de-energized.
   f. The agitate motor starts automatically and runs for 3 min to mix the liquid.
   g. When the agitate motor stops, solenoid B is energized to empty the tank.
   h. When the tank is completely empty, the empty sensor switch opens to de-energize solenoid B.
   i. The start button is pressed to repeat the sequence.

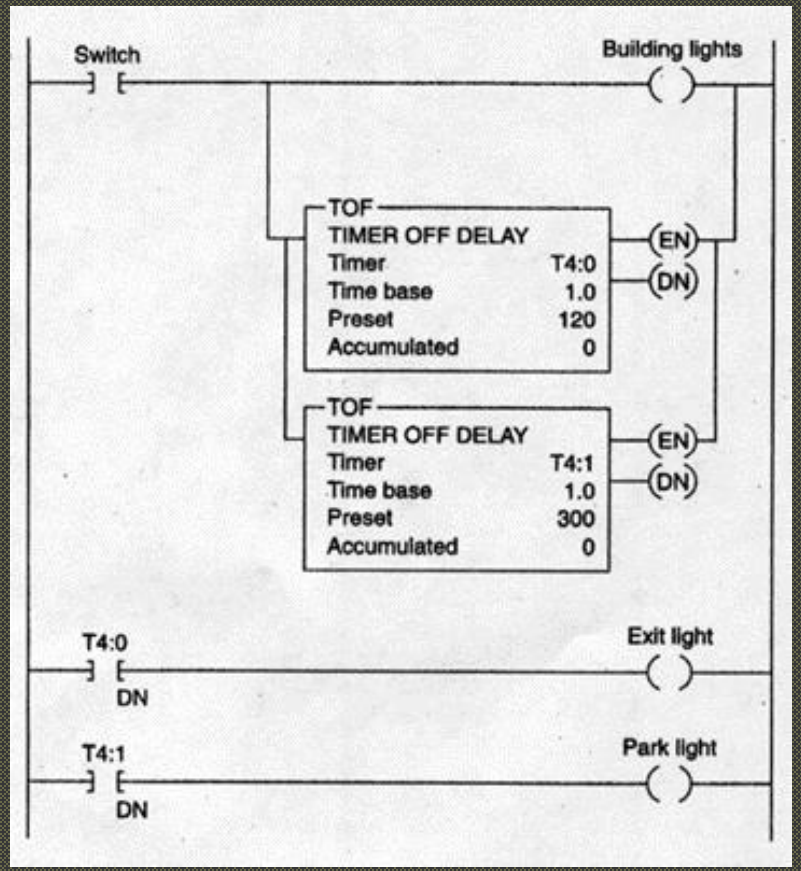




PROGRAMMABLE LOGIC CONTROLLERS

6. When the lights are turned off in a building, an exit door light is to remain on for an additional 2 minutes, and the parking lot lights are to remain on for an additional 3 minutes after the door light goes out. Write a program, using Timer Off Delay instructions, to implement this process.

6. When the lights are turned off in a building, an exit door light is to remain on for an additional 2 minutes, and the parking lot lights are to remain on for an additional 3 minutes after the door light goes out. Write a program to implement this process.



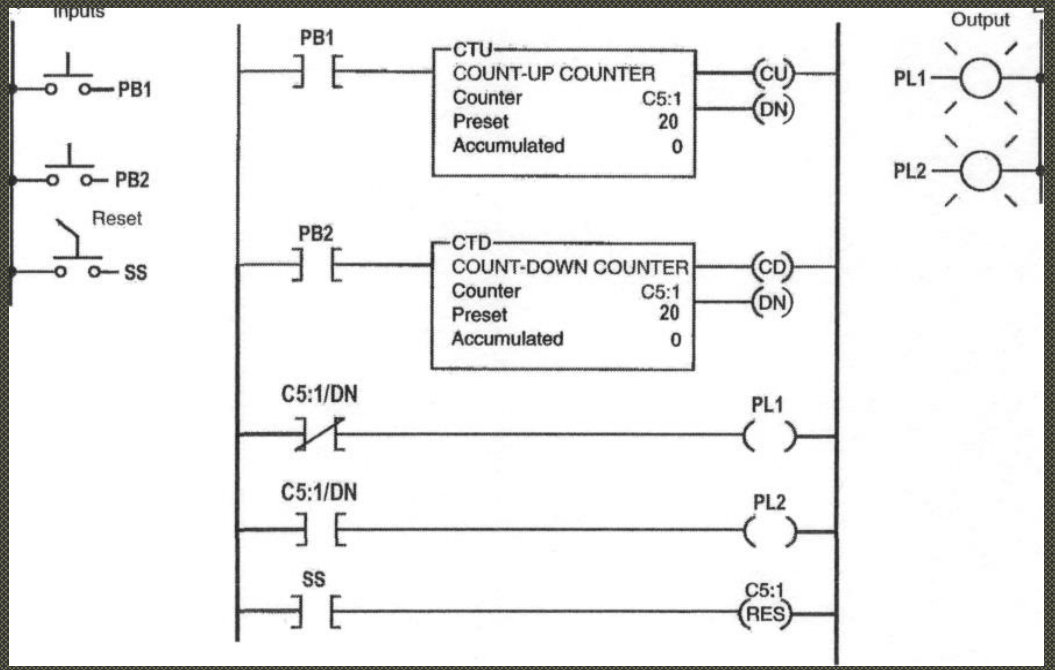
PROGRAMMABLE LOGIC CONTROLLERS

7. Develop a PLC program along with a typical I/O connection diagram and ladder logic program based on the following counter specifications:

- Increment Count: A pushbutton press increases the counter value.
- Decrement Count: A second pushbutton press decreases the counter value.
- Indicator Light 1: Activates when the counter value is below 20.
- Indicator Light 2: Activates when the counter value is 20 or higher.
- Counter Reset: A selector switch resets the counter to zero.
- Note: The program must achieve these conditions without using comparison instructions.

PROGRAMMABLE LOGIC CONTROLLERS

7. Develop a PLC program along with a typical I/O connection diagram and ladder logic program based on the following counter specifications:
   - Increment Count: A pushbutton press increases the counter value.
   - Decrement Count: A second pushbutton press decreases the counter value.
   - Indicator Light 1: Activates when the counter value is below 20.
   - Indicator Light 2: Activates when the counter value is 20 or higher.
   - Counter Reset: A selector switch resets the counter to zero.
   - Note: The program must achieve these conditions without using comparison instructions.



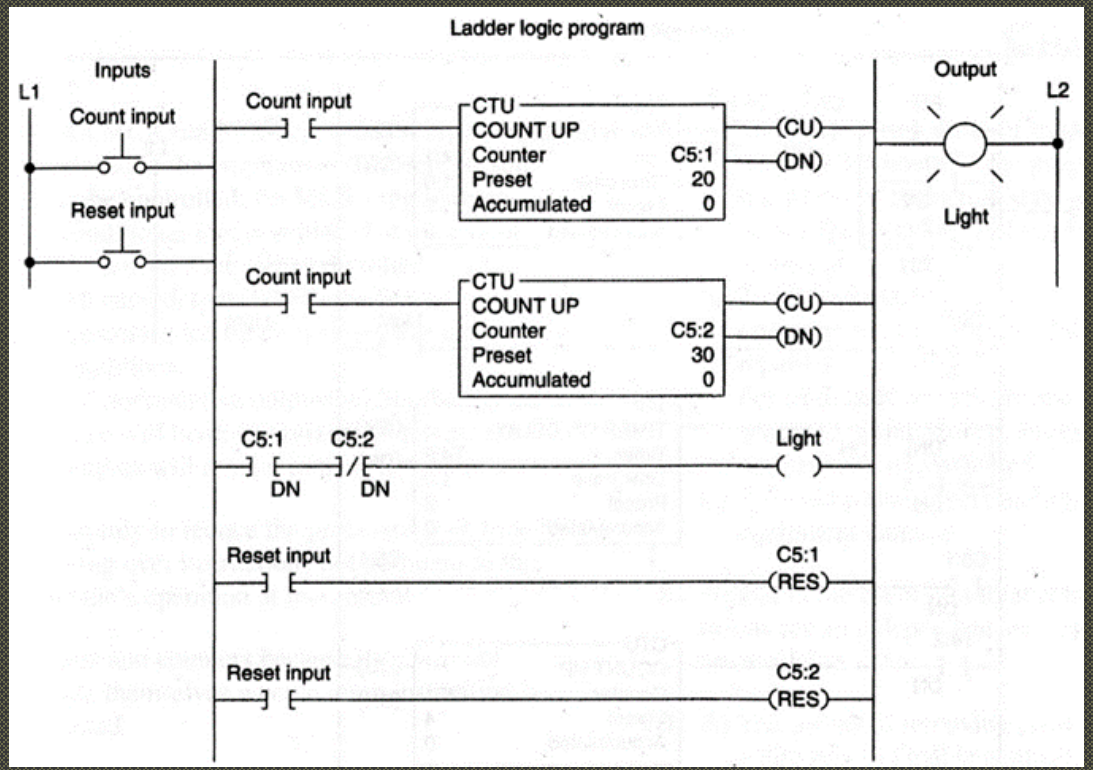
HUMBER

PROGRAMMABLE LOGIC CONTROLLERS

8. Develop a PLC program that controls a light based on the following count conditions:
   - Light ON: When the count reaches 20.
   - Light OFF: When the count reaches 30.
   - Simultaneous Reset: Both counts should reset together using a designated control input.
   - Note: The program must be implemented without using comparison instructions.

PROGRAMMABLE LOGIC CONTROLLERS

8. Develop a PLC program that controls a light based on the following count conditions:
   - Light ON: When the count reaches 20.
   - Light OFF: When the count reaches 30.
   - Simultaneous Reset: Both counts should reset together using a designated control input.
   - Note: The program must be implemented without using comparison instructions.

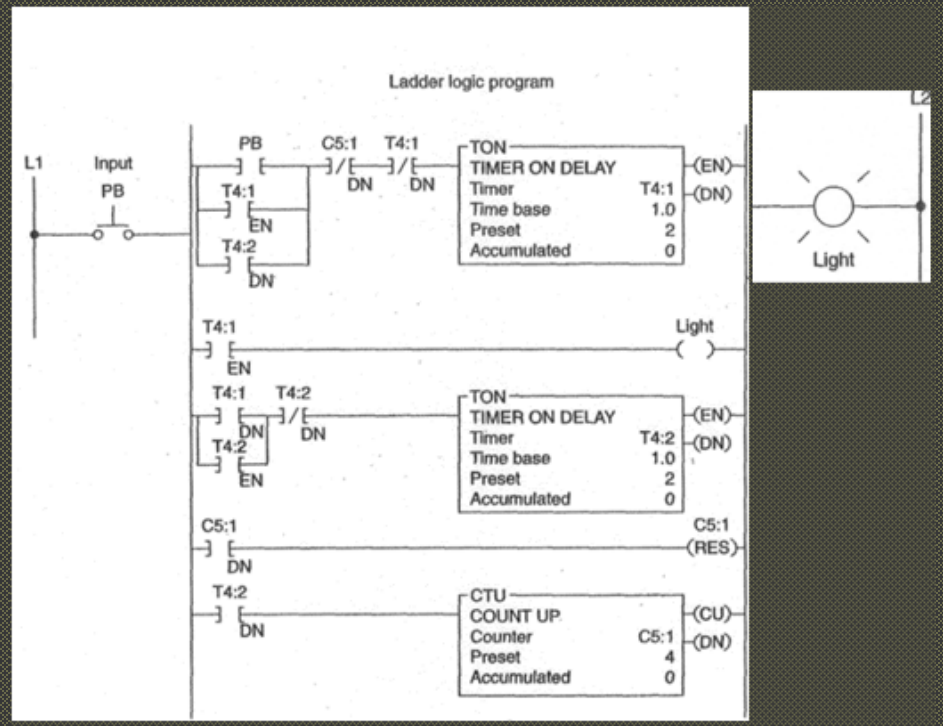


HUMBER

9. Write a program to operate a light according to the following sequence:
   - A momentary pushbutton is pressed to start the sequence.
   - The light is switched on and remains on for 2 s.
   - The light is then switched off and remains off for 2 s.
   - A counter is incremented by 1 after this sequence.
   - The sequence then repeats for a total of 4 counts.
   - After the fourth count, the sequence will stop and the counter will be reset to zero.

PROGRAMMABLE LOGIC CONTROLLERS

9. Write a program to operate a light according to the following sequence:
   - A momentary pushbutton is pressed to start the sequence.
   - The light is switched on and remains on for 2 s.
   - The light is then switched off and remains off for 2 s.
   - A counter is incremented by 1 after this sequence.
   - The sequence then repeats for a total of 4 counts.
   - After the fourth count, the sequence will stop and the counter will be reset to zero.

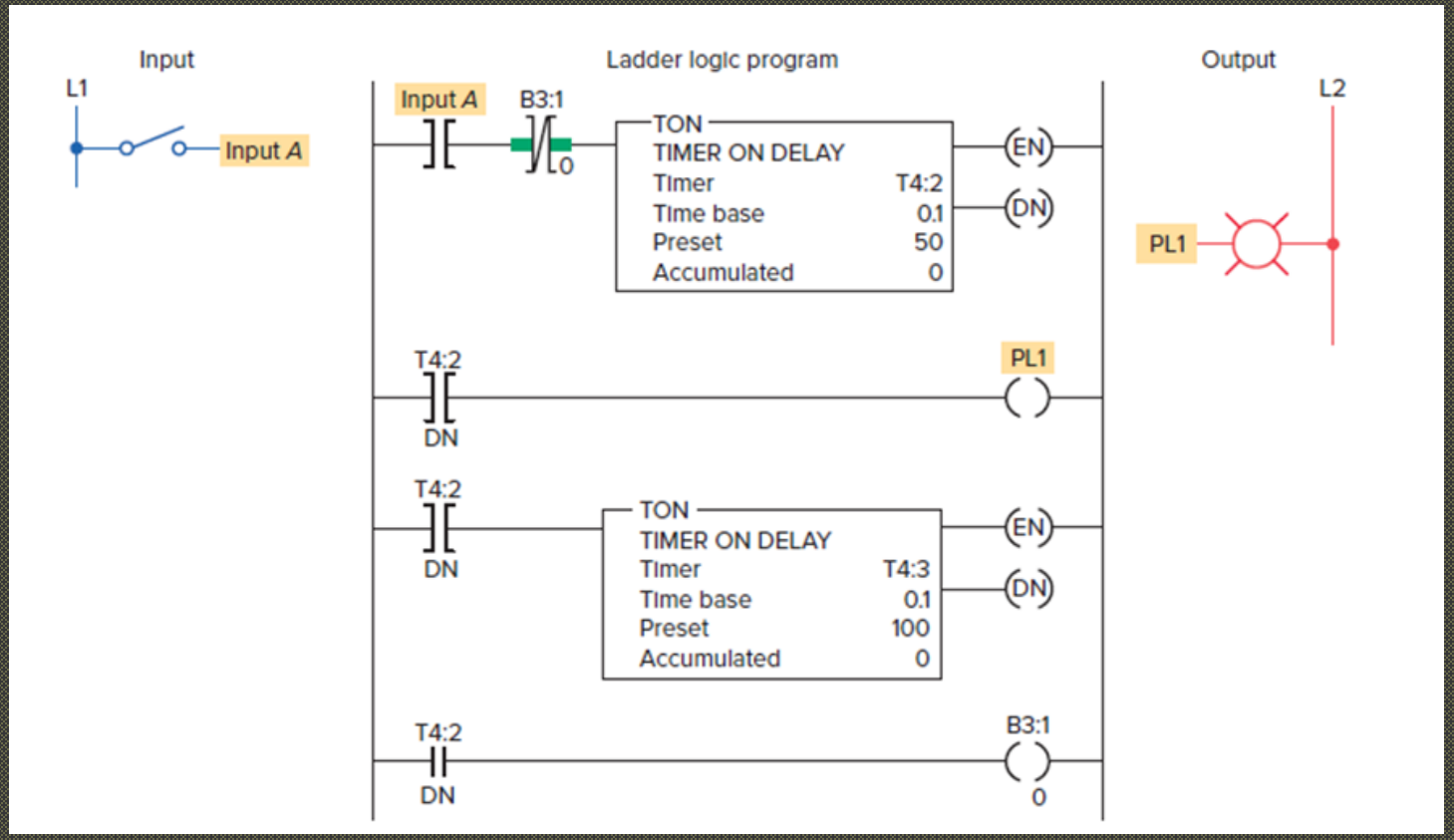


HUMBER

PROGRAMMABLE LOGIC CONTROLLERS

10. The program shown is supposed to execute to sequentially turn PL1 off for 5 seconds and on for 10 seconds whenever input A is closed.

    a. Examine the ladder logic and describe how the circuit would operate as programmed.
    b. Troubleshoot the program and identify what needs to be changed to have it operate properly.



HUMBER

PROGRAMMABLE LOGIC CONTROLLERS

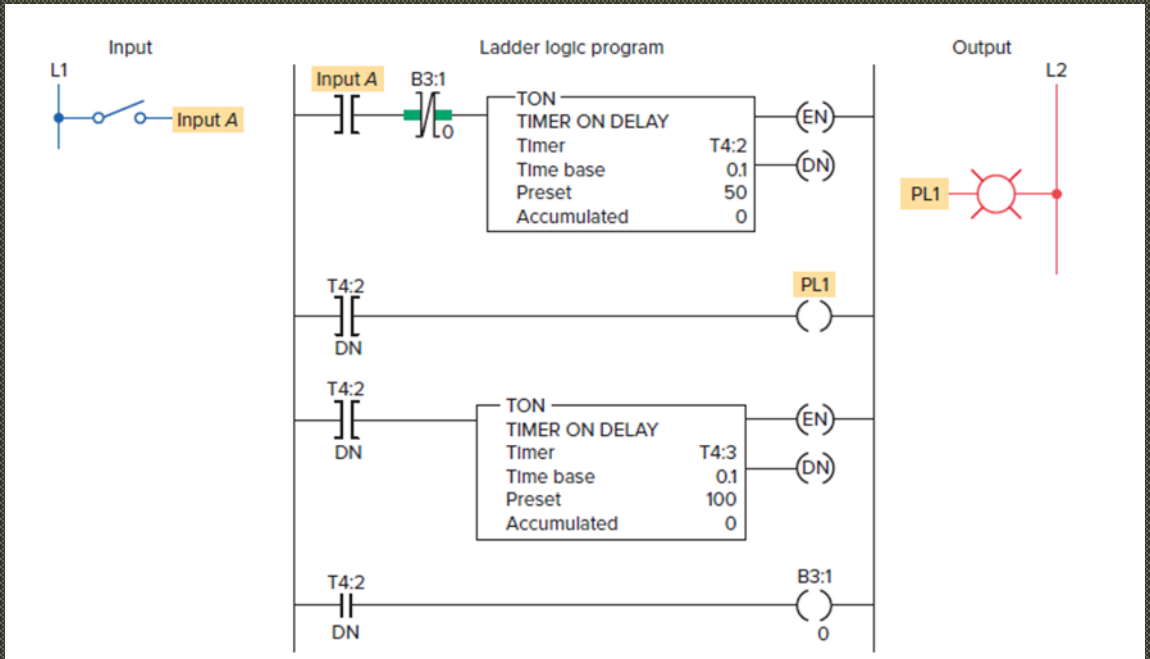
10. The program shown is supposed to execute to sequentially turn PL1 off for 5 seconds and on for 10 seconds whenever input A is closed.

a. Examine the ladder logic and describe how the circuit would operate as programmed.

i. When input A is closed PL1 would always be off except for the short pulse of time it takes to reset timer T4:2.

b. Troubleshoot the program and identify what needs to be changed to have it operate properly.

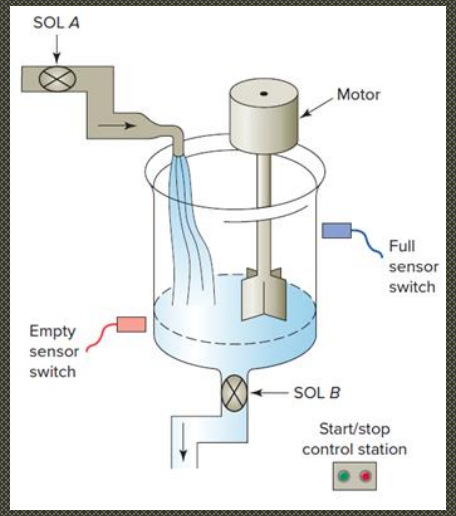
ii. The address of the conditional contact that controls output B3:I/0 needs to be changed to T4:3/DN



(Frank D. Petruzella Programmable Logic Controllers 6th edition)

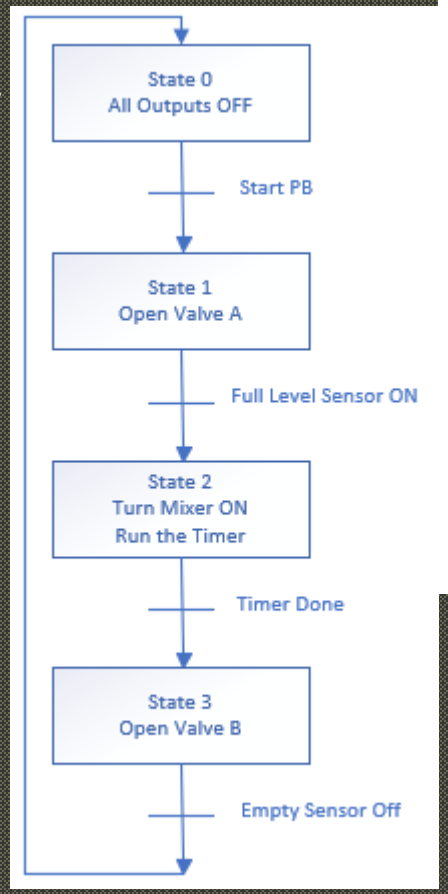
HUMBER

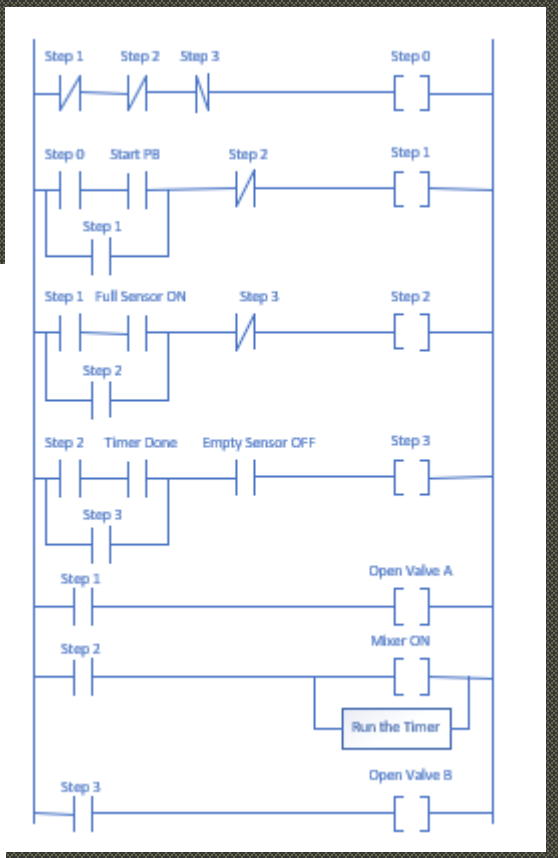
5. Write a Sequential Control program to implement the process illustrated. The sequence of operation is to be as follows:
   a. Normally open start and normally closed stop pushbuttons are used to start and stop the process.
   b. When the start button is pressed, solenoid A energizes to start filling the tank.
   c. As the tank fills, the empty level sensor switch closes.
   d. When the tank is full, the full level sensor switch closes.
   e. Solenoid A is de-energized.
   f. The agitate motor starts automatically and runs for 3 min to mix the liquid.
   g. When the agitate motor stops, solenoid B is energized to empty the tank.
   h. When the tank is completely empty, the empty sensor switch opens to de-energize solenoid B.
   i. The start button is pressed to repeat the sequence.



PROGRAMMABLE LOGIC CONTROLLERS

5. Write a Sequential Control program to implement the process illustrated. The sequence of operation is to be as follows:
   a. Normally open start and normally closed stop pushbuttons are used to start and stop the process.
   b. When the start button is pressed, solenoid A energizes to start filling the tank.
   c. As the tank fills, the empty level sensor switch closes.
   d. When the tank is full, the full level sensor switch closes.
   e. Solenoid A is de-energized.
   f. The agitate motor starts automatically and runs for 3 min to mix the liquid.
   g. When the agitate motor stops, solenoid B is energized to empty the tank.
   h. When the tank is completely empty, the empty sensor switch opens to de-energize solenoid B.
   i. The start button is pressed to repeat the sequence.





HUMBER

Thank you!

Discussions?