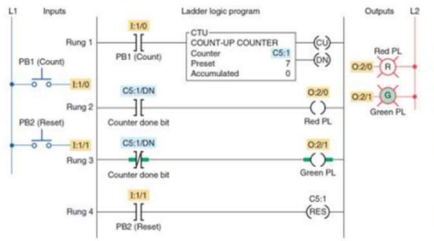
1. What is UP and DOWN Counter? Explain both with ladder diagram, address and Instruction bits?

Allen Bradley PLC

UP COUNTER

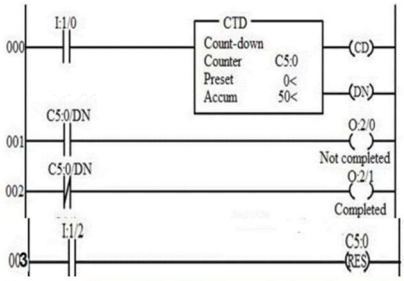


1. Operating pushbutton PB1 provides the off-to-on transition pulses that are counted by the counter.
2. The preset value of the counter is set to 7.
3. Each false-to-true transition of rung 1 increases the counter's accumulated value by 1.

4. After 7 pulses, or counts, when the preset counter value equals the accumulated counter value, output DN is energized.
5. As a result, rung 2 becomes true and energizes output O:2/0 to switch the red pilot light on.
6. At the same time, rung 3 becomes false and de-energizes output O:2/1 to switch the green pilot light off.
7. The counter is reset by closing pushbutton PB2, which makes rung 4 true and resets the accumulated count to zero.
8. Counting can resume when rung 4 goes false again.

Allen Bradley PLC

DOWN COUNTER



1. The Accumulated value of the counter is set to 50.
2. The preset value is 0. Each time input I:1/0 transitions from off to on, the accumulated value will be decremented by one decimal value. The done bit will true during the entire count from 50 to 0
3. In both rung 001 and 002 the done bit is used. In rung 001, done bit is used as normally open instruction.The output a lamp used to display the status of the process (not completed state).

3. As the done bit will be true during the entire count from 50 to 0, the logical continuity will be established in rung 000 during the entire count from 50 to 0 and not completed lamp (O:2/0) will be glowing. In rung 002, the done bit is used as normally closed instruction. The output a lamp used to display the status of the process (completed state). So when the accumulated value decreases and becomes equal to preset value (in this case 0), done bit of the counter is reset. So in rung 002, logical continuity is established and completed lamp (O:2/1) becomes energized. In other word our process completed status is displayed. Rung 004 is used to reset the counter

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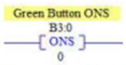
2. What is OSR and OSF Counter? Explain both ?

Allen Bradley PLC

OSR - One Short Rising

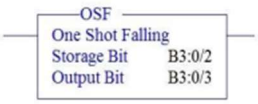
The OSR instruction is a retentive input instruction that triggers an event to occur one time. Use the OSR instruction when an event must start based on the change of state of the rung from FALSE-to-TRUE.



There are two types of OSR functions available i.e.

One Shot Rising Instructions

One Shot Shot Falling Instructions



Storage Bit: This bit is to store the status of input.

Output Bit: This bit store the value when it executes the function of Block

Allen Bradley PLC

One Shot Rising (OSR)

One shot rising - It gives single pulse at the time of going ON condition. Storage bit stores the status of input.

Output bit stores the status of function performed by the block.

One Shot Falling (OSF)

One shot falling gives single pulse at the time of going input' s OFF condition which is connected to it. Storage bit stores the status of input. Output bit stores the status of function performed by the block.

Allen Bradley PLC

RUNG 0000
Input 1 (I:0/0) is connected to OSR block. When input is turned ON, Storage bit (B3:0/0) turns 1 and output bit (B3:0/1) turns "1" for a second and goes to "0" again.

RUNG 0001
Input 2 (I:0/1) is connected to OSF block. When input is turned ON, Storage bit (B3:0/2) turns 1 and output bit (B3:0/3) remains "0".When Input turns OFF, Output bit turns "1" for a second and goes to "0" along with storage bit.

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3. What are the different types of Comparison Instructions? Explain any two with instruction diagram & address?

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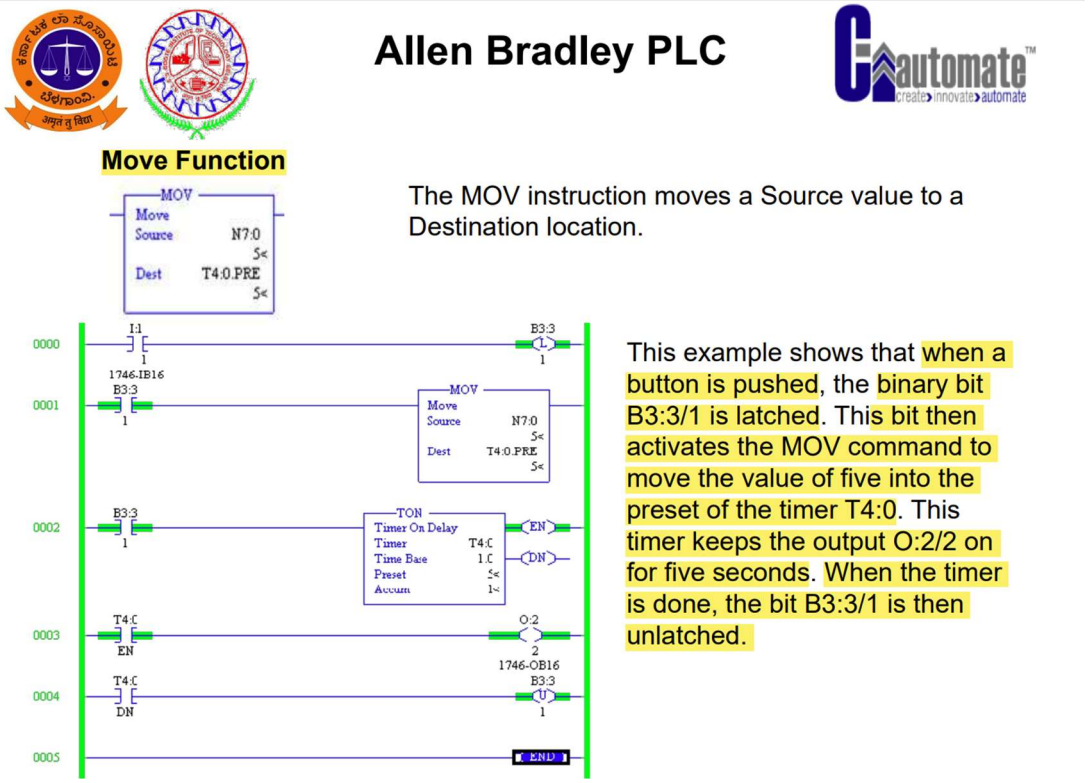
4. What is Move function block, Explain with ladder diagram?



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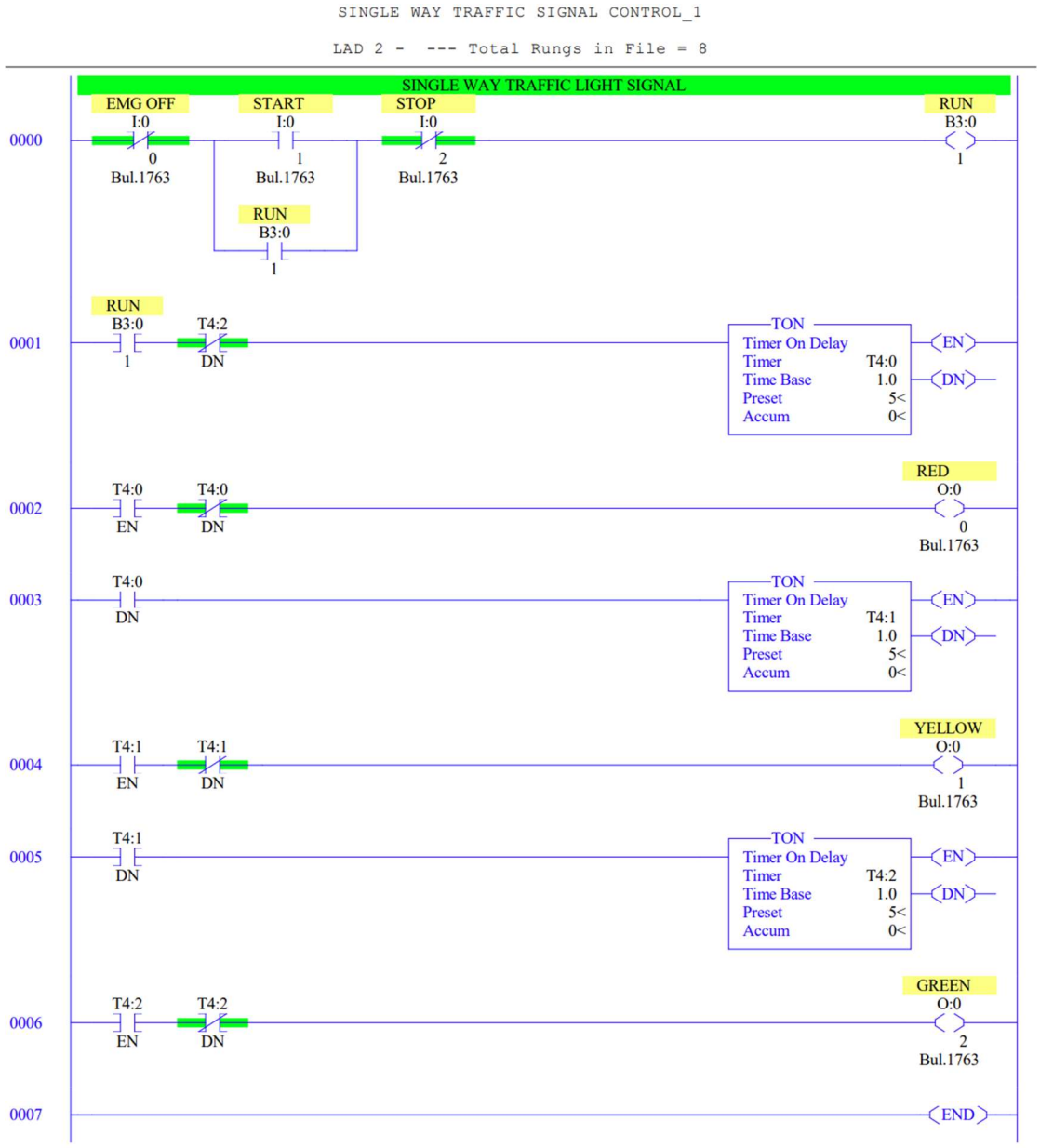
5. Write the PLC Ladder programme for Direct ON Line (DOL) Starter with addressing and names?

6. Write the Ladder program for Single Way Traffic Signal Control
   a) Start the single way traffic signal cycle by pressing Start Push Button
   b) Red Light gets ON,Timer 1 for 30 Seconds to Stop.
   c) Yellow Lights ON, Timer 2 ON for 5 Seconds To Ready.
   d) Green Lights ON, Timer 3 ON for 25 Seconds to GO.
   e) Continue the cycles as per the above sequence till we press the Emergency OFF or Stop Push Button.



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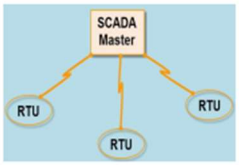
7. What are the different types of SCADA Systems ? Explain all ?

Types of SCADA Systems

1. First Generation: Monolithic or Early SCADA systems,
2. Second Generation: Distributed SCADA systems,
3. Third Generation: Networked SCADA systems and
4. Fourth Generation: Internet of things technology, SCADA systems

1. Monolithic or Early SCADA Systems:

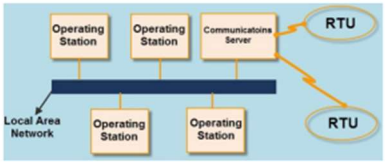
In earlier times, during the time of first generation, monolithic SCADA systems were developed wherein the common network services were not available. Hence, these are independent systems without having any connectivity to other systems.



Types of SCADA Systems

2. Distributed SCADA Systems:

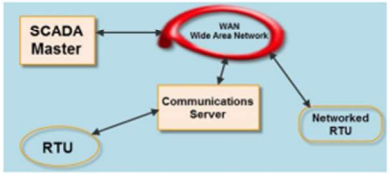
In the second generation, the sharing of control functions and data is distributed across the multiple systems connected to each other using Local Area Network (LAN). Hence, these were termed as distributed SCADA systems. These individual stations were used to share real-time information and commands. The cost and size of the station were reduced compared to the first generation system, as each system of the second generation was responsible for performing a particular task with reduced size and cost.



Types of SCADA Systems

3. Networked SCADA Systems:

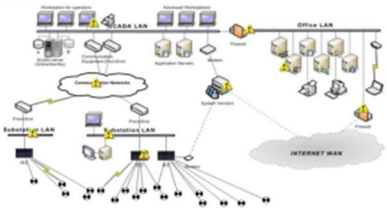
The current SCADA systems are generally networked which communicate using Wide Area Network (WAN) Systems over data lines or phone. These systems use Ethernet or Fiber Optic Connections for transmitting data between the nodes frequently. These third generation SCADA systems use Programmable Logic Controllers (PLC) for monitoring and controlling various parameters in the system.



Types of SCADA Systems

4. Internet of Things (IOT) SCADA systems:

In fourth generation, the cost of the SCADA systems is minimized by adopting the internet of things technology with cloud computing. The maintenance and integration is also very easy for the fourth generation compared to the earlier SCADA systems. These SCADA systems are able to report state in real time by using the cloud computing facility.



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8. Explain SCADA tags ?

SCADA tags

SCADA systems typically implement a distributed database, commonly referred to as a tag database, which contains data elements called tags or points. A point represents a single input or output value monitored or controlled by the system.

Tags are two types: Tag means variable value in computer langauge.

1. System-defined Tags: It represents the system value in the SCADA it is represented by dollar sine $

2.User-defined tags: This tag is defined by the user or programmer. Except (A, S) are not defined

User will give the tags in Integer i.e. N7:0 to display the message or value.

If user wants to display the value in fraction the tags given in Floating i.e. F8:0 which will display the actual value in fraction.

SCADA tags

Classification of tags:

Direct tags
Indirect tags

Direct tags:
These tags are directly used by the programmer to represent the value of plant or variable

Indirect tags:
These tags are used by the programmer from other system to show or represent the value of plant or variable

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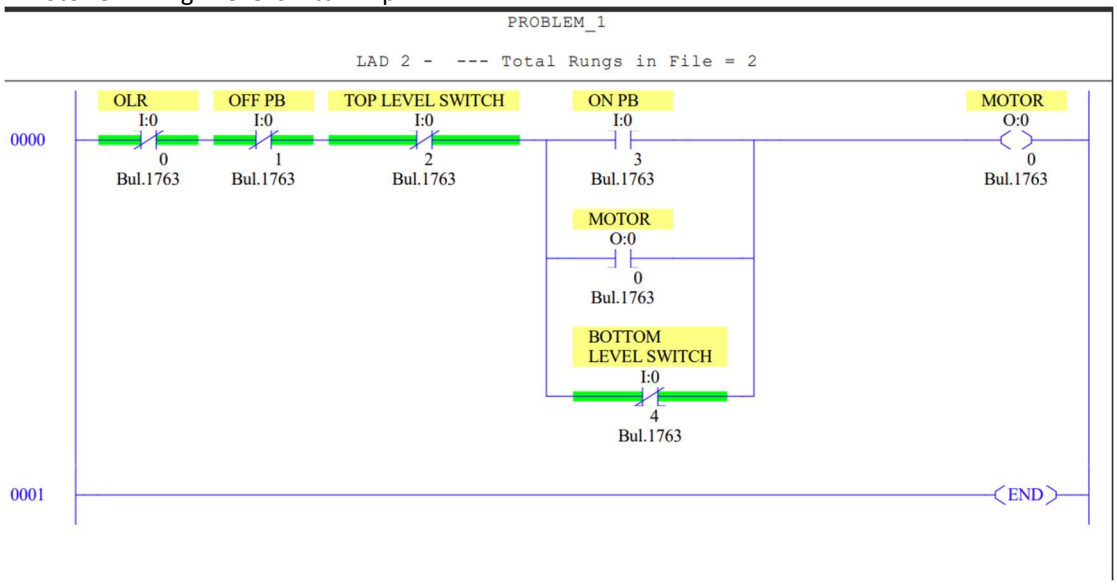
9. Write PLC Programme for below Diagram?
   a) Motor ON & OFF using Start and Stop push button (DOL starter)
   b) Motor ON - Low Level Switch Trip
   c) Motor OFF - High Level Switch Trip



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10. Explain Latch and Unlatch Blocks using ladder ?

Allen Bradley PLC

Latach and Unlatch Blocks

Solution - 1

By pressing the start push button the input I:0/1 will be on and hence bit B3:0/0 will be On too. Once the operator release the start button. The start button input signal will go Off but B3:0/0 will stay on because of the OTL (Latch) instruction that we have used. This bit will stay on as long as the Stop button is not pushed.

Once the stop button is pushed the rung will evaluate to true and hence the OTU (unlatch) instruction will kick in and release the bit B3:0/0.

When bit B3:0/0 is on or off; the motor will be energized or de-energized

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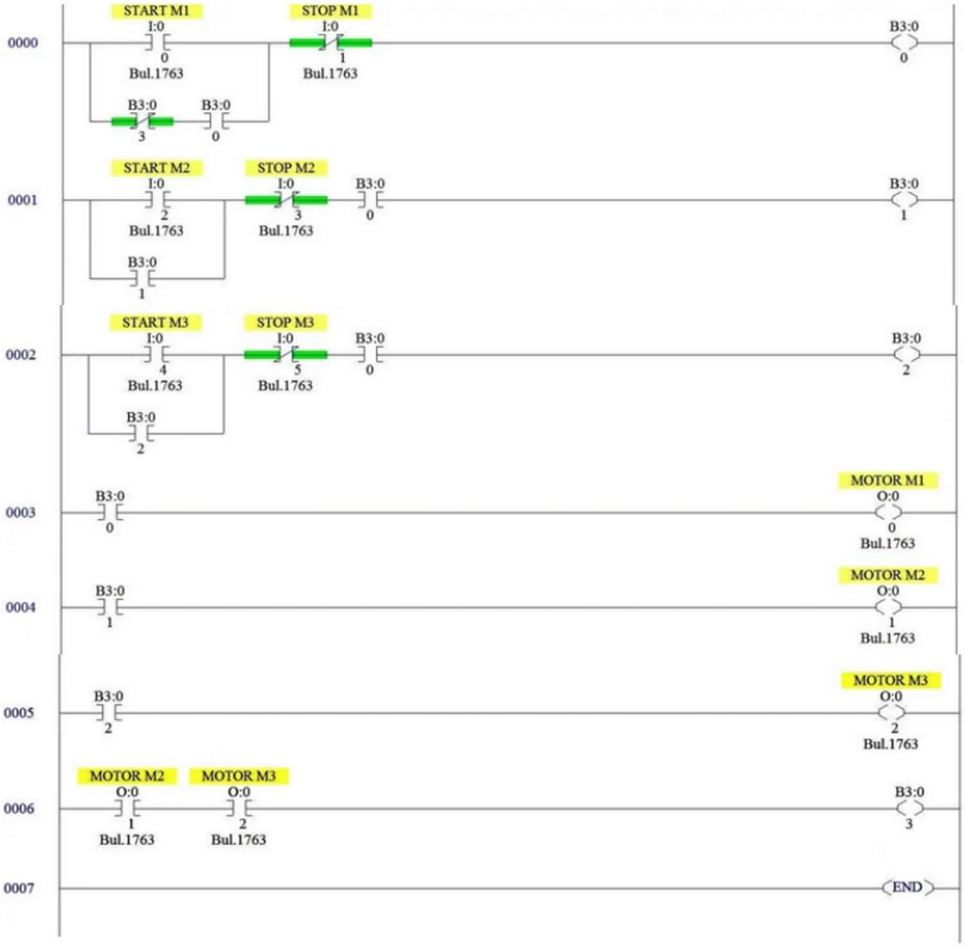
11. Write the PLC Programming Motors logic for the following problem.
    a) There are three motors (M1, M2 & M3), having a separate start and stop push button.
    b) M1 must be running before starting of M2 and M3 motor.
    c) M2 and M3 can start and stop without affecting M1 operation.
    d) Only two motors can run at the time. Starting of the third motor will shut down all the outputs immediately irrespective of its input.



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12. Write the PLC Programme,
    a) There are three mixing device motor in processing line A, B, C.
    b) After the process begins mixer A is to start
    c) After 15 seconds of starting mixer A next mixer B is to start
    d) After 10 seconds of starting mixer B next mixer C to start.
    e) The entire mixer to stop after pressing master switch.

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13. Explain SCADA briefly with meaning of S, C and DA? What are the types/generation of SCADA?

SCADA

SCADA means - Supervisory Control and Data Acquisition

SCADA stands for "Supervisory Control and Data Acquisition". SCADA is a type of process control system architecture that uses computers, networked data communications and graphical Human Machine Interfaces (HMIs) to enable a high-level process supervisory management and control.

SCADA systems gather pieces of information and data from a process which are analyzed in real-time (the "DA" in SCADA). It records and logs the data, as well as representing the collected data on various HMIs. This enables process control operators to supervise (the "S" in SCADA) what is going on in the field, even from a distant location. It also enables operators to control (the "C" in SCADA) these process by interacting with the HMI.

SCADA systems are essential to a wide range of industries, and are broadly used for the controlling and monitoring of a process.

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