



Manufacturing Automation (MTS-419)

DE-43 Mechatronics

Syndicate – A

Title: 4-Way Traffic Light Control System

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Introduction:

In modern urban environments, traffic management is a critical aspect of ensuring road safety and smooth vehicle movement. One of the most common and effective tools used in this domain is the traffic light control system. This project focuses on designing a 4-way traffic light control system using a Programmable Logic Controller (PLC) to simulate how intersections are managed in real-life scenarios.

Using RSLogix software, this project demonstrates how industrial automation tools can be applied to everyday systems. The logic is built using timers (TON), counters, latches, and reset buttons to ensure an accurate and repeatable sequence of light changes between North-South and East-West directions. This project not only helps in understanding the practical use of PLCs in traffic systems but also strengthens core concepts like time-based control, sequencing, and safe state management using latches and resets.

Components Used in Designing:

Got it! Here's a clean, simple list describing the components used in the logic of the traffic light control program:

1. Normally Open Switch

A switch that does not conduct current until it is pressed or activated. Commonly used for Start buttons in PLC logic.

2. Normally Closed Switch

A switch that conducts current by default and breaks the circuit when pressed. Often used for Stop or Reset buttons to ensure immediate interruption of a process.

3. Latch

A memory element that maintains its output state even after the input is turned off. The Set instruction keeps a bit ON and the Reset turns it OFF. Useful for keeping the program running until manually stopped.

4. TON

Delays turning ON an output for a specified time after the input condition becomes true. Used for timing traffic light phases.

5. Outputs

Represent the red, yellow, and green traffic lights for each direction. Controlled by the timers and internal bits to simulate the traffic light operation.

Working:

When the PLC starts, the program runs in a continuous loop through the traffic phases. A latch rung holds the “Run” state after the Start button is pressed and is released by the reset button. In the sequence, one direction say East-West is given green light while North-South is red, then East-West turns yellow, then red; next North-South turns green, then yellow, then red, and the cycle repeats. Each phase uses a TON timer for the green interval and another for the yellow interval. For example, when timer T4:0 (green timer) reaches its preset, its Done bit energizes the East Green output and keeps the others red. Timers can overlap to ensure mutually exclusive outputs.

Ladder Logic Diagram:





