**PLC Ladder Logic Control System**

This project is a ladder logic program built using Rockwell Automation's Logix Designer. It demonstrates core PLC control concepts such as timers, counters, range-based output control, and push button interaction.

**Project Overview**

This PLC project simulates a basic industrial control system using Allen-Bradley ladder logic programming. It incorporates:

* **Start/Stop control logic**
* **Retentive and non-retentive timers**
* **Push button-triggered counters**
* **Range-based output triggers**
* **One-shot output pulses**
* **Manual timer reset**

**Features and Logic Breakdown**

**1. Start/Stop Latching Logic**

* **Inputs:** Start and Stop push buttons
* **Output:** Maintains a Run state using latch/unlatch logic.

**2. Retentive Timer (RTO)**

* **Timer:** RTO1 accumulates run time while system is active.
* **Type:** Retentive (accumulates across stops)
* **Manual Reset:** Triggered by a reset button input.

**3. Free-Running Timer (TON)**

* **Timer:** FreeRunning cycles every 5 seconds.
* **Resets automatically** when done (creates a repeating loop).

**4. Output Trigger by Timer Threshold**

* **Output:** Out\_1 is activated when the timer exceeds 4000 ms.

**5. Counter (CTU)**

* **Trigger:** Activated by a push button (PB\_1)
* **Action:** Increments each time the button is pressed.
* **Max Count:** 5 (resets after reaching max)

**6. Output on Specific Count**

* **Output:** Out\_4 activates when the counter reaches 4.

**7. Range-Based Output Activation**

Five outputs are activated when the timer value is within specific ranges:

| **Output** | **Range (ms)** |
| --- | --- |
| Out\_5 | 100–200 |
| Out\_6 | 300–400 |
| Out\_7 | 500–600 |
| Out\_8 | 700–800 |
| Out\_9 | 900–1000 |

**8. One-Shot Output Pulse**

* **Logic:** When FreeRunning.ACC > 4000
* **Behavior:** Out\_10 is activated **once** using a one-shot (ONS) instruction.

**I/O Configuration (Local:1)**

**Inputs**

| **Input** | **Address** | **Description** |
| --- | --- | --- |
| Stop | <Local:1:I.Data.0> | Stop button |
| Start | <Local:1:I.Data.1> | Start button |
| PB\_1 | <Local:1:I.Data.2> | Push button |
| Reset Btn | <Local:1:I.Data.4> | Reset RTO1 |

**Outputs**

| **Output** | **Address** | **Trigger Condition** |
| --- | --- | --- |
| Out\_1 | <Local:1:O.Data.0> | FreeRunning > 4000 |
| Out\_3 | <Local:1:O.Data.3> | PB\_1 pressed |
| Out\_4 | <Local:1:O.Data.4> | Counter == 4 |
| Out\_5–9 | <Local:1:O.Data.5–9> | Timer within set ranges |
| Out\_10 | <Local:1:O.Data.10> | One-shot after > 4000 |

**Files**

| **File** | **Description** |
| --- | --- |
| Assinment1TC.ACD | Logix Designer project file (not included here) |
| README.md | Project write-up and documentation |

**How to Use**

1. Open the .ACD file using **RSLogix 5000 / Logix Designer**.
2. Review and download to a **ControlLogix or CompactLogix PLC**.
3. Use the designated input addresses to simulate push buttons.
4. Observe outputs on the corresponding addresses as the logic runs.

**Educational Goals**

This project is ideal for demonstrating:

* Retentive vs. non-retentive timers
* One-shot instructions
* Counter usage
* Input latching logic
* Real-time analog-style control using timers and limit testing