

# Equipment

1. Siemens S7-1200 PLC Module or LOGO PLC
2. PC with TIA Portal or LOGO Soft Comfort installed

## ON-Delay Timer (TON)

The ON-delay timer activates an output (e.g., lamp, motor) after a specified time delay. The delay duration is adjustable based on the application's requirements.

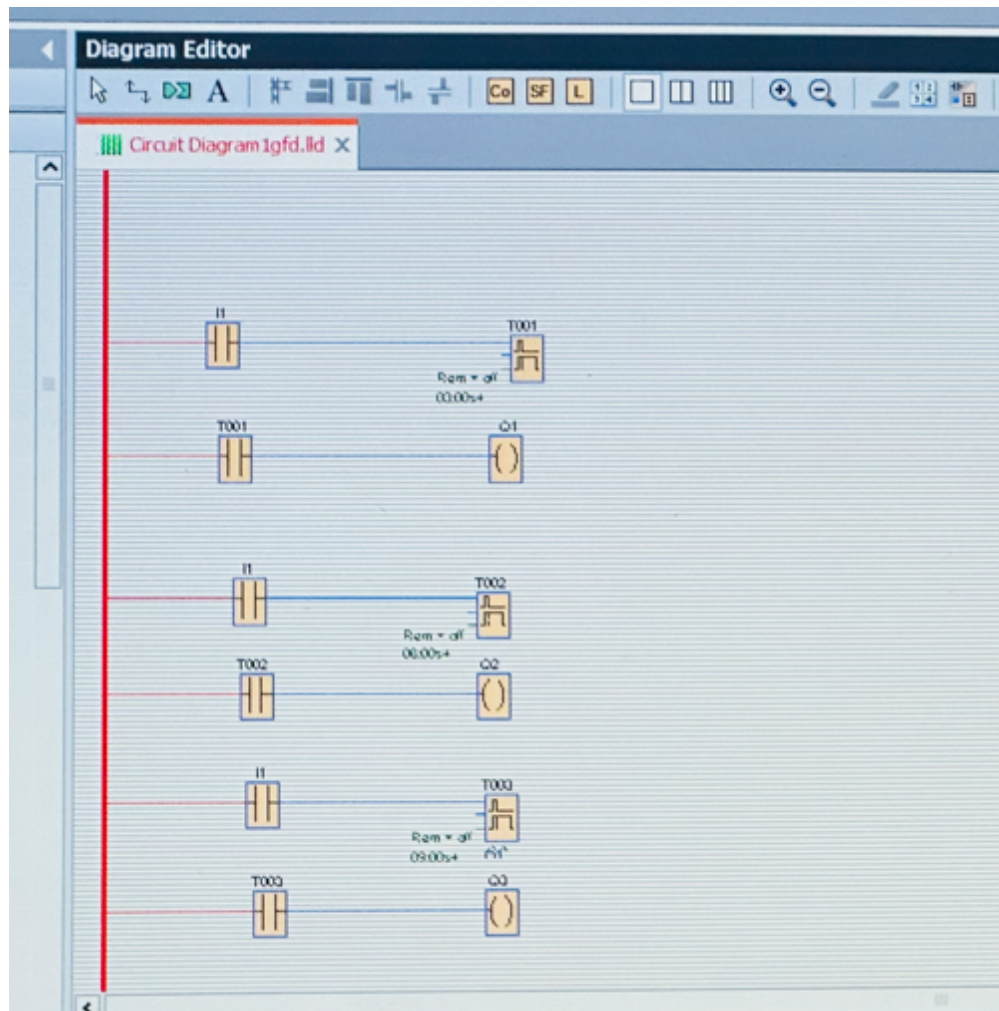


Figure 1: ON timer operation: In LOGO Soft Comfort

## OFF-Delay Timer (TOFF)

The OFF-delay timer deactivates an output after a specified time delay. Like the TON timer, the delay is configurable.

## **Retentive Timer (RTO)**

The retentive timer accumulates time when powered and retains the accumulated time value during power loss or changes in rung state. The timer's contacts remain unaffected after reaching the preset value, and a separate reset signal is required to clear the accumulated time.

## **Experimental Work**

### **System Description**

The system under PLC control comprises two conveyor belts. The operational sequence is as follows:

- Pressing the Start button initiates Conveyor Belt-1.
- After 5 seconds, Conveyor Belt-2 activates.
- After the system operates for 15 seconds, Conveyor Belt-1 stops.
- Conveyor Belt-2 continues for an additional 5 seconds before stopping.
- An emergency-stop button can reset the system at any time.

The control logic is implemented using a Ladder Diagram (LAD) for the Siemens S7-1200 PLC.

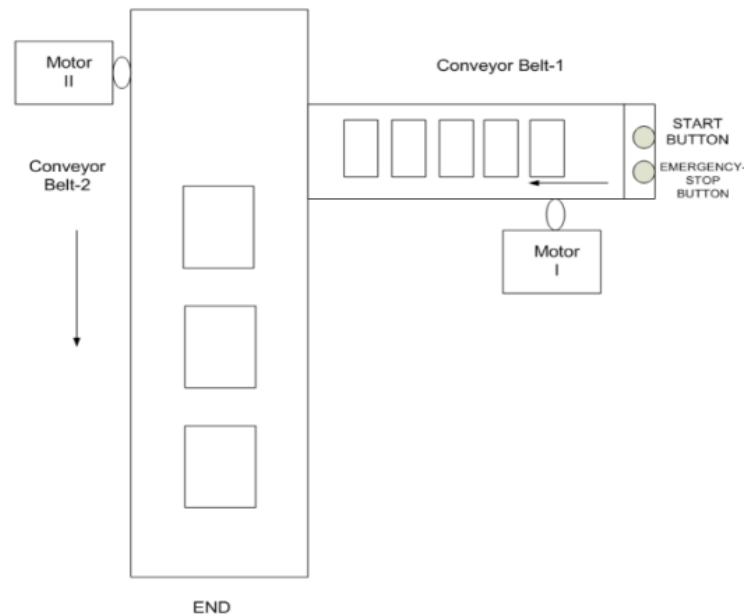


Figure 2: An industrial operation using timers

## Ladder Diagram Logic

The LAD for the S7-1200 PLC is designed to achieve the described sequence:

- **Start Button:** Triggers the TON timer (T1) to start Conveyor Belt-1 immediately.
- **TON Timer (T1):** Set to 5 seconds to activate Conveyor Belt-2.
- **TON Timer (T2):** Set to 15 seconds to stop Conveyor Belt-1.
- **TON Timer (T3):** Set to 20 seconds (15 + 5 seconds) to stop Conveyor Belt-2.
- **Emergency-Stop Button:** Resets all timers and stops both belts instantly.

## Results and Discussion

The implemented LAD successfully controls the conveyor belts according to the specified sequence. The TON timers accurately manage the 5-second delay for Conveyor Belt-2's activation and the 15-second and 20-second delays for stopping Conveyor Belt-1 and Conveyor Belt-2, respectively. The emergency-stop functionality effectively resets the system, ensuring safety and operational flexibility. The use of timers demonstrates their critical role in sequencing and timing control in industrial automation.