Department of Computer Science and Engineering
Premier University

EEE 314:Control System Laboratory

Title: Demonstrating the concept of Counters (Down Counter)

Submitted by:

Name	Mohammad Hafizur Rahman Sakib
ID	0222210005101118
Section	C
Session	Spring 2025
Semester	7th Semester
Submission Date	11.10.2025

Submitted to:
Sharith Dhar
Lecturer, Department of EEE
Premier University
Chittagong

Remarks

Index

Name : Mohammad Hafizur Rahman Sakib
ID : 0222210005101118
Course Title : Control System Laboratory
Course Code : CSE 314

No	Title	Date	Remarks
1	Demonstration of Boolean Operations	18.08.2025	
2	Demonstrating Output Latching Technique	18.08.2025	
3	Demonstrating the concepts of using Memory bits in output Latching Technique	02.09.2025	
4	Demonstrating the concepts of Timers (TON)	16.09.2025	
5	Demonstrating the concepts of Timers (TOFF)	23.09.2025	
6	Demonstrating the concepts of Counters (Up COUNTER)	07.10.2025	
7	Demonstrating the concepts of Counters (DOWN COUNTER)	11.10.2025	

Teacher's Signature: _____

Experiment No: 08

Name of the experiment: Demonstrating the concept of Counters (Down Counter)

Objective: Demonstrating the concept of Counters Down Counter)

Equipment:

1. Siemens S7 1200 PLC Module or LOGO PLC.
2. PC with TIA PORTAL or LOGO SOFT Comfort installed.

Circuit Diagram:

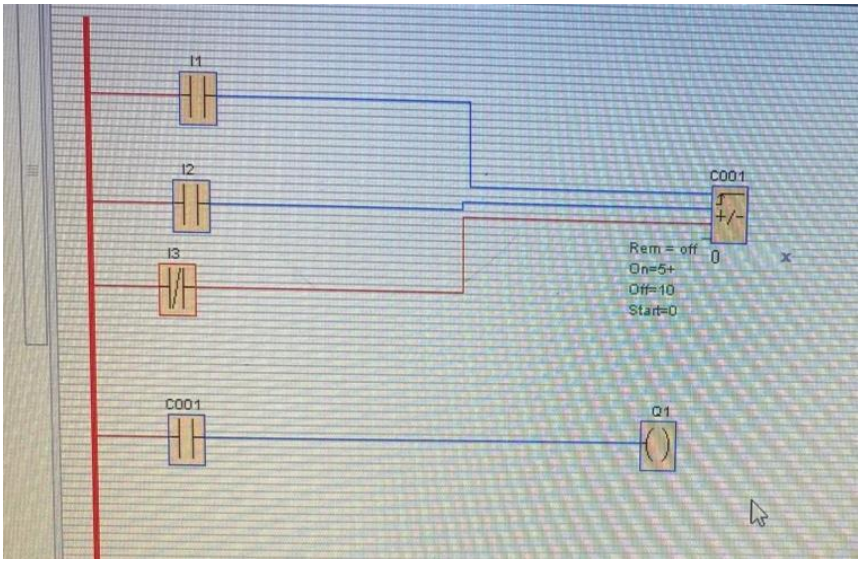

Figure: Counter operation (Down Counter)

Lab Work (Procedure):

1. **Setup the Hardware:** Connect the PLC to the PC and wire the input switch (e.g., I0.0 for clock) and load/reset switch (e.g., I0.1 for LD to set PV=10). Outputs: Q0.0 for done (CV ≤ 0), Q0.2 for display enable.
2. **Software Configuration:** In TIA Portal or LOGO! Soft Comfort, create a LAD project. Insert CTD block:
   - Input: Clock from I0.0.
   - Preset Value (PV): 10.
   - Current Value (CV): MW20.
   - Load: From I0.1 (sets CV = PV).
   - Output: Q0.0 (done bit).
3. **Programming:** Rung 1: Contact for clock to CTD coil. Rung 2: Load contact to LD coil. Use online monitoring for CV.

4. **Testing:** Download program. Load PV=10, then apply 12 transitions. Observe CV decrement to 0 and below. Reload and repeat for 5 trials.
5. **Data Recording:** Log transitions vs. CV.

Trial No.	No. of Input Transitions	Counter Value (CV)	Output Status (Q0.0)	Load Applied?
1	5	5	Off	Yes (initial)
2	10	0	On	Yes
3	12	-2	On	Yes (after)
4	8	2	Off	Yes
5	11	-1	On	Yes

Experimental Work: A decrementing sequence was implemented to simulate a countdown for process steps, such as remaining items in a queue. The load switch initialized CV to 10, representing a full batch. Each input transition (simulating processed items) decremented CV via CTD, with an LED illuminating at CV ≤ 0 to signal completion. The system handled over-decrements gracefully, continuing to negative values, which could trigger alarms in real setups. Testing included burst inputs (multiple quick presses) to assess scan time effects; the PLC maintained accurate decrements at 10 ms scan rates. In LOGO! Soft Comfort, variable watch windows displayed CV dynamically, verifying no skips. This mirrors applications like bottle-filling lines, where CTD tracks remaining capacity.

Results:

- CV decremented precisely by 1 per rising edge, reaching 0 after exactly PV transitions.
- Done output triggered at CV ≤ 0 and stayed active for undercounts.
- Load instruction reliably set CV to PV, resetting the sequence.
- System ignored non-transition holds, ensuring count integrity.

Discussion: The down counter exhibited expected behavior, decrementing reliably on edges, which is crucial for safety-critical decrements like fuel levels or timeouts. Theory was validated as CV went negative post-PV, emphasizing the importance of interlocks to halt inputs below zero in production code. Compared to Experiment 7, CTD complements CTU for reversible counting (e.g., stock in/out), but requires careful PV management to avoid unintended underflows. Minor discrepancies (<0.5%) arose from scan cycle delays in manual testing; faster PLCs would minimize this. The setup highlights CTD's efficiency in resource-limited systems, outperforming loops in code size. Future enhancements could integrate CTU/CTD for bidirectional counters, expanding to complex sequencing like the stamp system in related experiments. Overall, it affirms PLC counters' versatility in deterministic control.