Allen Bradley Counters Instructions Lab

Objective: Upon completion of this lab exercise, the student should be able to:

1. Explain the operation of the CTU and CTD instructions.
2. Explain the operation of the Allen Bradley Counter instruction status bits.
3. Explain how the RES instruction affects the Counter data values.
4. Identify one application for a CTU instruction in an industrial environment
5. Change the data values of a CTU/CTD instruction while online.

Allen Bradley Counter Basics:

Counter Instruction:
CTU stands for Count UP. The CTU instruction when energized will increase the accumulated value of the counter address by one.
CTD stands for Count Down. The CTD instruction when energized will decrement the accumulated value of the counter address by one. CTD are seldom used, but are usually used with a CTU in a pair.
RES stands for Reset. The RES instruction when energized will reset the Accumulated value and status bits of a Counter.

Data Range: -32768 to +32767

Status Bits:
DN – Done Bit – This bit is "on" when the Acc value is equal to or greater than the PRE value.
CU – CTU Enable – This bit is "on" when the CTU instruction has power on it.
CD – CTD Enable – This bit is "on" when the CTD instruction has power on it.
OV – Overflow Bit – This bit is "on" when the Acc value of the counter goes greater than +32767.
UN – Underflow Bit – This bit is "on" when the Acc value of the counter goes less than –32,768.

PROCEDURE:

1. Key in the following PLC program using either the RSLogix500 and save it to a local drive. Download the new program into the SLC-500 processor. Put the PLC into the RUN mode and go Online to it with the program panel to complete the following procedure.

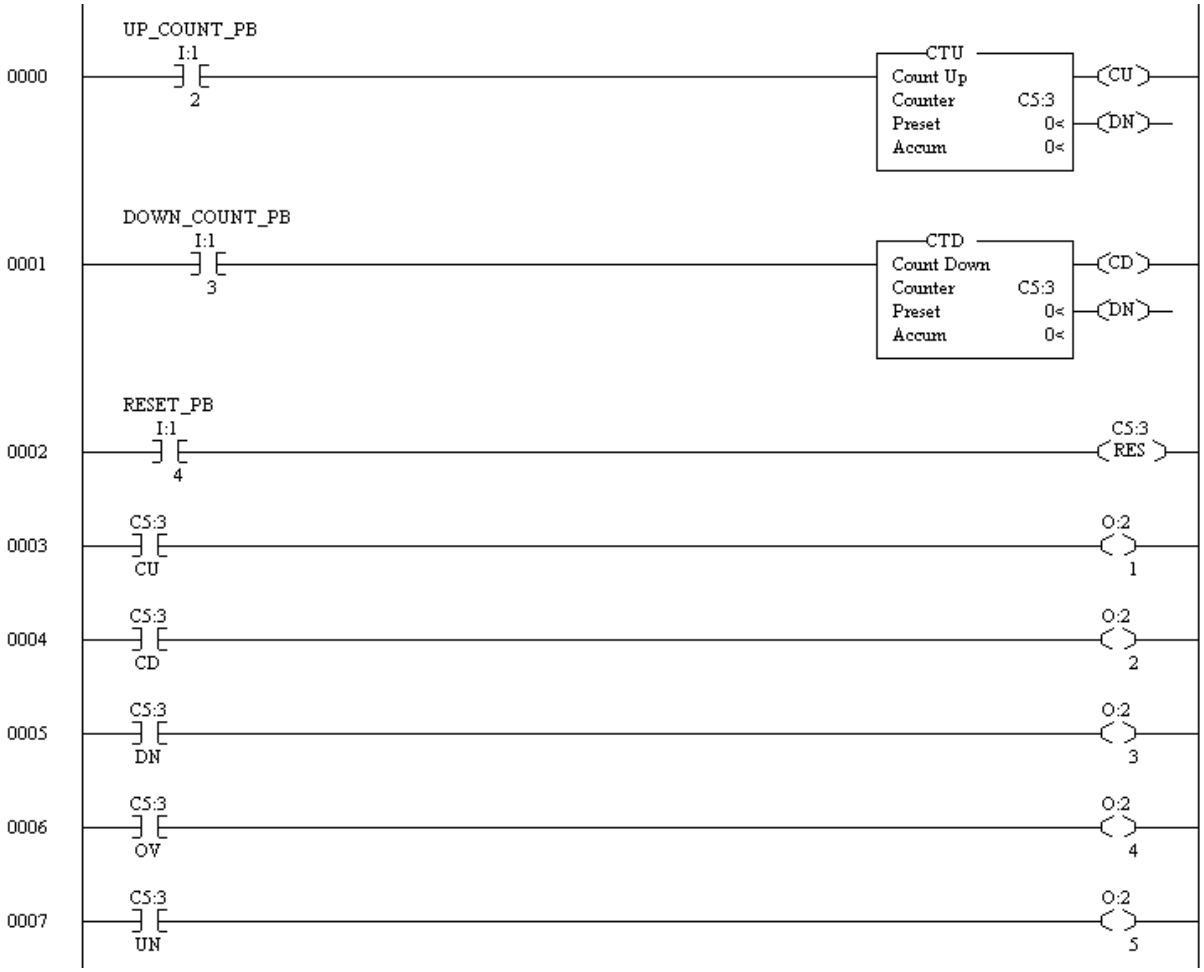

Figure 1. Basic CTU/CTD/RES ladder logic program.

2. Push input **I:1/2 (Up_Count_PB)**.
   What happens to the Accumulated value in the CTU and CTD?
   What status bit comes on?

3. Push input **I:1/2 (Up_Count_PB)** 10 more times.
   What is the Accumulated value now?
   What status bits are on?

4. Push **I:1/3 (Down_Count_PB)** four times.
   What is the Accumulated value?

What status bits are on?

Is the Accumulated value in the CTD the same as the value in the CTU? Explain!!

5. Now turn on input **I:1/4 (Reset_PB)**.
   What happens to the Accumulated value?
   What happens to the state of the status bits?

6. Change the **Accumulated** value of the counter to **32,765**.

7. Push input **I:1/2 (Up_Count_PB)** three times.
   What is the Accumulated value?
   What status bits are on?

8. Change the **Accumulated** value of the counter to **-32,765**.

9. Push input **I:1/3 (Down_Count_PB)** four times.
   What is the Accumulated value?
   What status bits are on?

10. Key in the following PLC program using either the RSLogix500 software and save it to a local drive. Download the new program into the PLC processor. Put the PLC into the RUN mode and go Online to it with the program panel to complete the following procedure.

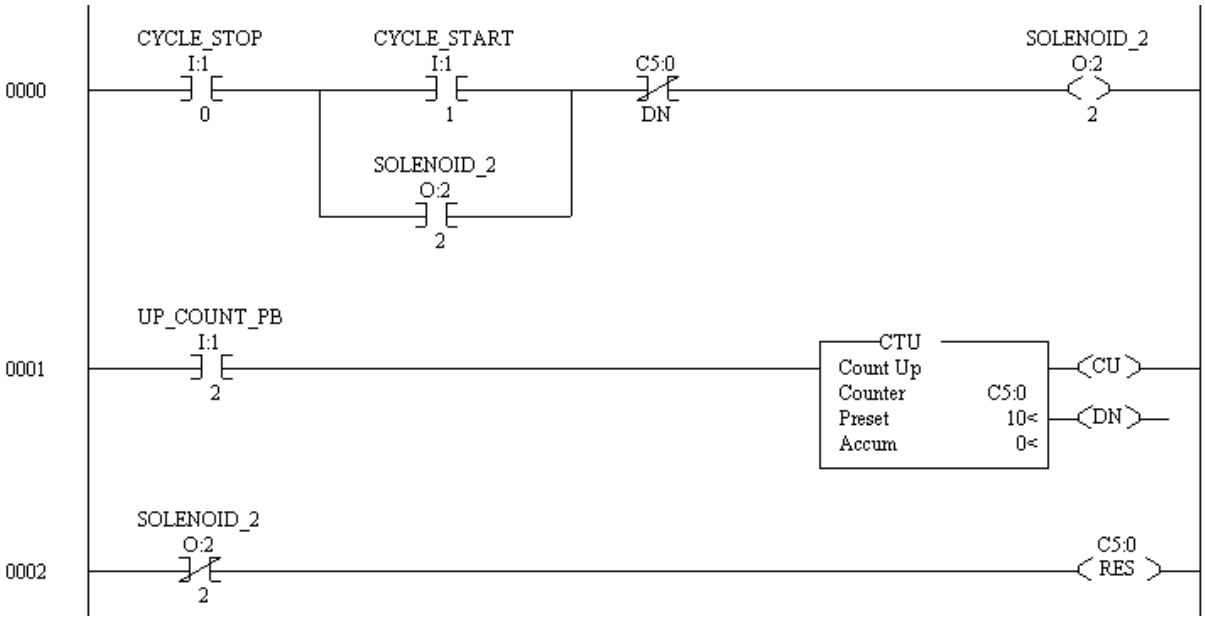

Figure 2. CTU resetting a hold-in logic program.

11. Push the **Cycle Start** button to energize **Solenoid_2**.

12. Push **I:0.0/2** 10 times.

    What happens to Solenoid_2? Why?

12. Change the preset of **C5:0** to 12.

QUESTIONS:

1. Why is the Accumulated value in both the CTU and CTD instruction in the lab always the same?

2. What increments the Accumulated value of a CTU instruction?

3. When does the DN bit referenced from a counter turn on?

4. When does the OV bit referenced from a counter turn on?

5. When does the UN bit referenced from a counter turn on?

6. What happens to the Accumulated value of a counter with a CTD of that address is energized?

7. When does the CU status bit come on?

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