Timers and Counters Instructions
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Definitions

Counters: control the operations based on certain number events

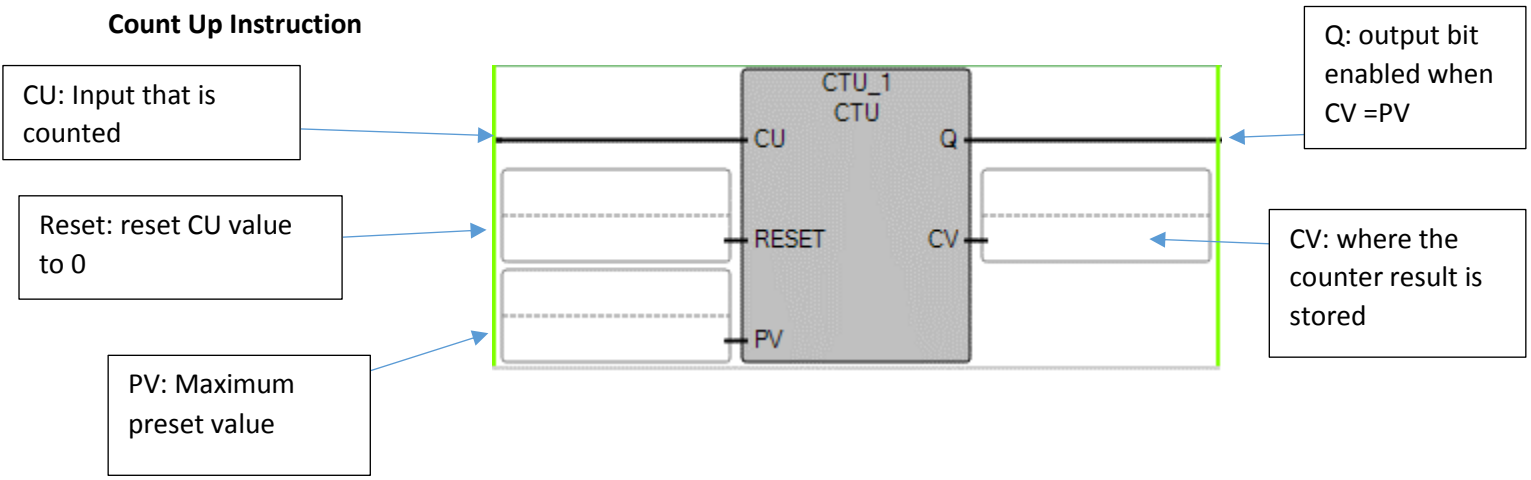
Application

- Keeping track of how many parts are produced or used
- Counting the number of people that enter an amusement park

3 Types of Counters in CCW

- Count Up (CTU)
- Count Down (CTD)
- Count Up or Count Down (CTUD)

Count Up Instruction



When programming a CTU instruction, one must enter the value you want the instruction to count down from in the PV parameter

Load Parameter is initially set to zero

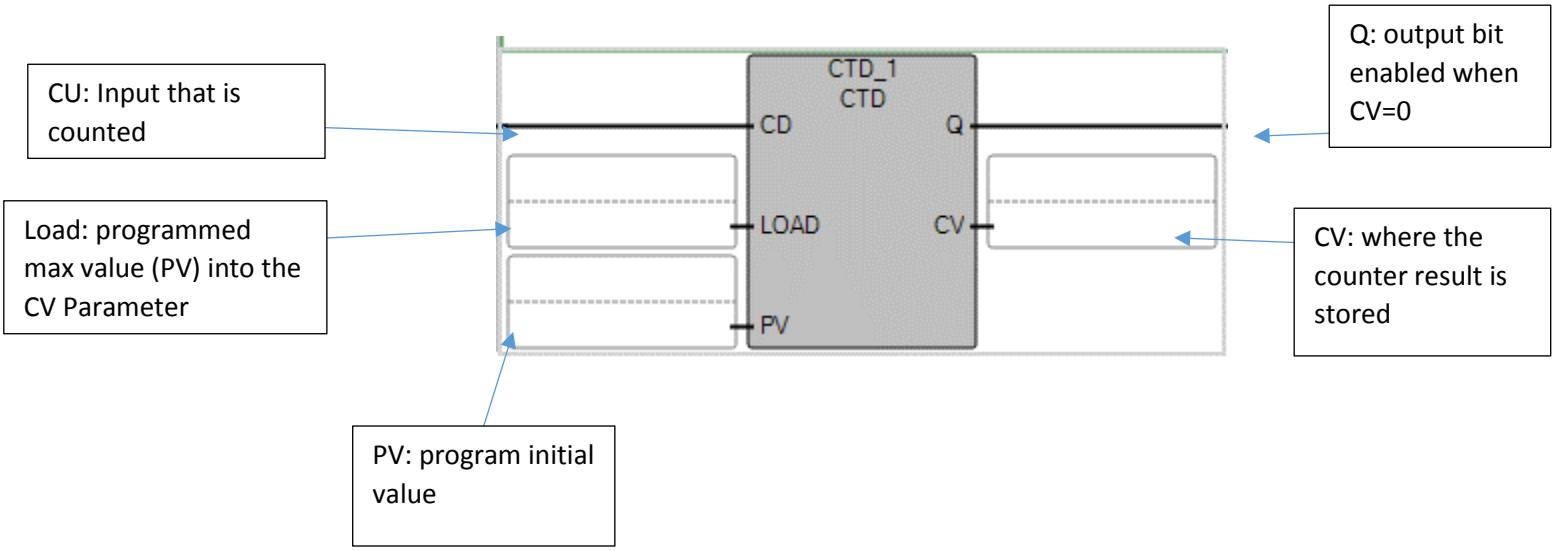
When CV equals PV, the Q parameter goes True

I.E If five parts equals a full box and you want a status light to indicated when the box is full, one would use a CTU Instruction

CV will increase to until 5 (PV) is reached

Once CV = PV = 5, Q will turn on

Count Down Instruction



When programming at CTU instruction, one must enter the max value one wants the instruction to count up to in the PV parameter

The Reset parameter is initially False

As the CU parameter increases towards the maximum preset value (PV), the accumulated value is stored in the CV parameter

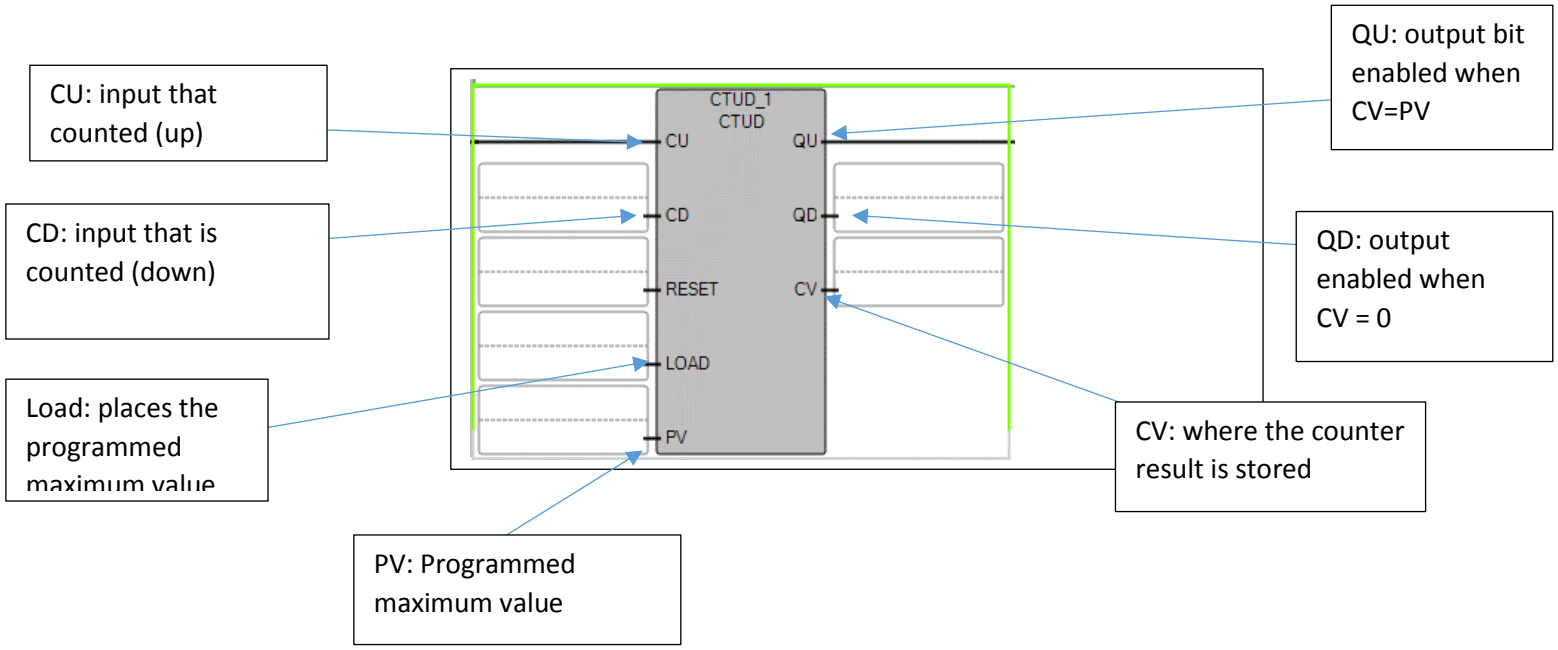
When CV equals PV, the Q parameter goes True

I.E If you start with a full box, 5 parts, and you want a status light to indicate when the box is empty, 0 parts, a CTD would be used

CV will Decrease until 0 (PV) is reached

CV = PV = 5; Result light turns on

Count Up or Count Down (CTUD) Instruction



I.E Wanted status light to indicate when a box is full. During operation parts are taken in and out of the box regularly. Input condition (CU) is initiated, CV will increase until 5 (PV) is reached. If someone takes a part out

- CD is initiated and decrease CV

- Once CV=PV=5, QU will turn on, initiating the status light

Timers Instructions

Timers are used in various application such as:

- Delaying the starting or stopping of equipment
- Determining the total running time of a process

The lesson will discuss the following timer instructions

- TON
- TOF
- TONOFF
- TP

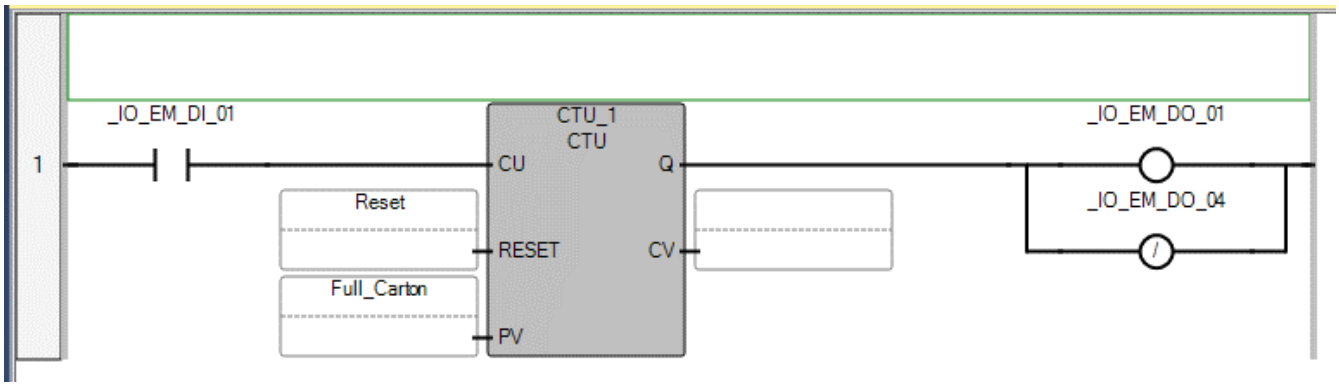
SEE TUTORIAL 1 Micro 850 and CCW Tutorial

1. Open CCW > Start a new Project called Egg Timer > Connect the Controller (2080-LC50-24QBB)
2. Create a new program called Egg Carton

   A Farmer has asked you to create a program that will help him count the number of eggs his chickens are producing

   - A full carton is 12 eggs
   - Once the carton is full a red output status light, D)1, turns on alerting the operator know the carton is not full
   - Until then, a green output status light, D05, is on letting the operator know the carton is not full
   - The egg sensor is wired is DI1

3. Create two variables
    a. Reset = 0
    b. Full_Carton = 12
4. Write a the following program



5. Build and debug the program
   Upload and debug the program

6. Applying Reset/Set Coils
   Reset Coil: Turns Off, provided that there is a logic continuity to the reset coil.
   Set Coil: Once declared the coil becomes energized and stays energized, independent of the original set condition, until a reset coil with the same address resets (unlatches) the coil condition

7. **Assignment: Carton Full**
   Modify the program to do the following

   Situation: Farmer now wants you to edit the Egg_ Counter program to set up a timer for the status indication. He wants a red status light to stay on for 5 seconds after the carton is filled so the swing arm can remove the full carton.

   After the carton is removed, the status light will change back to green.

   Rung 1: Remove Branch for lights
   Change: Coil DO1 Set Coil turns on the light until it is reset (Off) on the next rung

   Rung 2: Contact is a Light DO1 > Coil DO1 Reset Coil after a timer

   Rung 3: Turns light off (Reverse Contact DO1)

   Modify the program to meet the needs stated above. HINT: Will need to add two new rungs onto the program

   Build and Debug program
   Show teacher upon completion

8. Assignment: Egg Vision Check

Modify the program to do the following

Situation: Farmer has added a vision system and a sorting arm onto the conveyer systems so that they can now divert eggs that do not meet the quality standards to the liquefying area.

The vision system will provide a pulse (DI1) to the controller whenever an egg does not pass inspection DO0 will indicate to the operator an egg has been rejected. When 3 seconds have elapsed after receiving the pulse, the diverter arm (DO2) is energized for 200ms gently diverting the gg to the liquefying area. Each egg that has been diverted must be counted.

Rung 1: Start Direct Contact DI1 > CTU Instruction Block and a branch that goes around the Instruction block that uses a Set Coil Block linked to a variable called Bad_Egg

Rung 2: Start Reverse Contact (Bad_Egg) DO0 > TON Instruction Block 3sec > Reset Coil DO0 (Variable: Bad_Egg) with a branch under it with a Set Coil DO2 (Variable: Diverter_Arm)

Rung 3: Start Direct Contact DO2 (Variable: Diverter_Arm) > TON 200 ms > Reset Coil DO2 (Variable: Diverter_Arm)

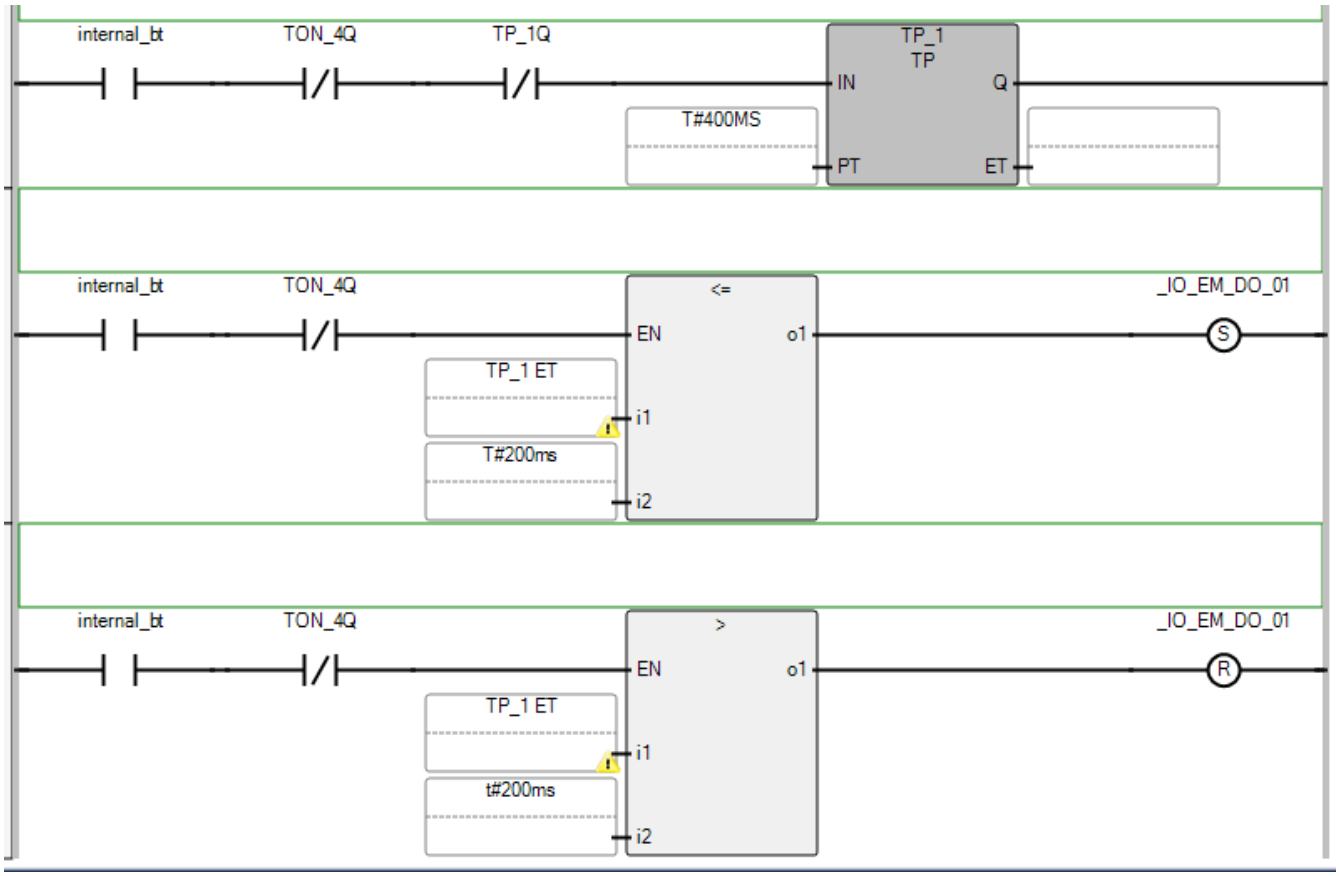
Build and Debug program
Show teacher upon completion

9. **Assignment: Student Crosswalk**

Situation: When a push button is pressed (DI0), the light for vehicles switches from green (DO4) to yellow (DO2) for two seconds then red (DO0). After the vehicle light has been red for two seconds, the pedestrian light will turn green (DO5) for ten seconds, then red (DO1) will blink for six seconds then become solid red and the vehicle light will then green.

Program will need 4 Timer On (TON) Instructional Blocks
ALL Coils will be either Set or Reset Coils. (Switches will not control the lights directly, but act as the walkers pushing the button to set the process in place to walk across the busy road.)

Example instructional rungs for blinking light:
NOTE: TP Instructional block controls the pulse control a blinking light.
NOTE: Variable: Internal_BT will be set in rungs above as a Set Coil when the traffic light changes from green to yellow to red, thus activity the walking light.



Build and Debug program
Show teacher upon completion