

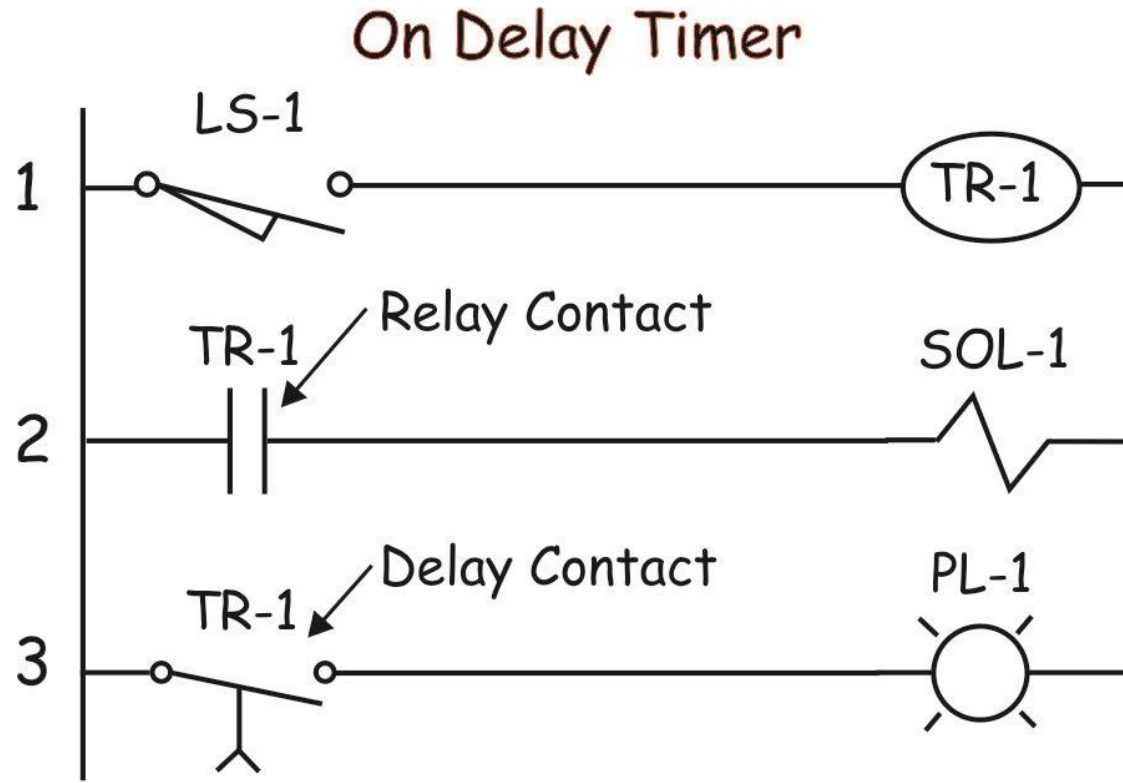
PLC200

SLC-500 Timer Instructions

Created by Tom Wylie

On 9/12/15

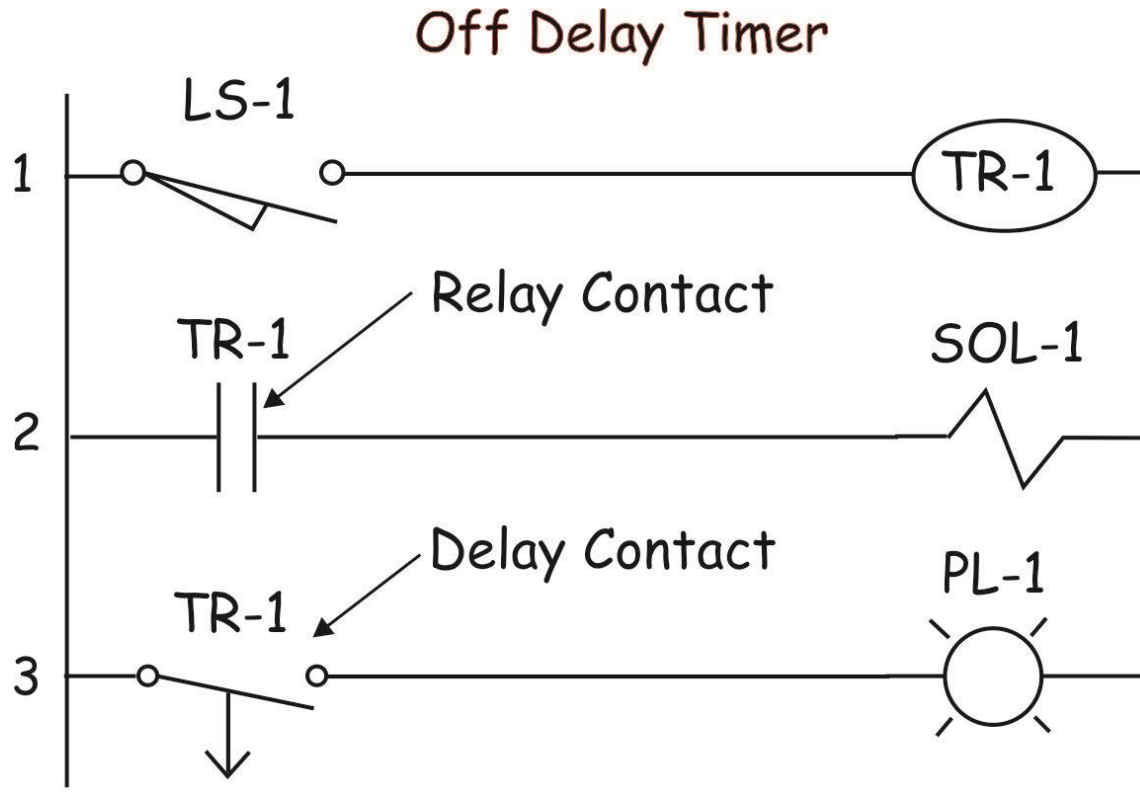
On-Delay Timer Review



On Delay Timers:

- The time cycle starts when the timer coil is turned on.
- When LS-1 closes, TR-1 coil is energized and starts the time cycle.
- Then the TR-1 relay contact in line 2 closes turning on SOL-1.
- After the time delay, the delay contact in line 3 closes and energizes the pilot light. Both outputs remain on.
- When LS-1 opens, TR-1 de-energizes and resets the circuit shutting off both outputs.

Off-Delay Timer Review



Off Delay Timers:

- The time cycle starts when the timer coil is turned off.
- When LS-1 closes, TR-1 coil is energized.
- Immediately the TR-1 relay contact in line 2 closes turning on SOL-1, and the TR-1 delay contact in line 3 closes turning on PL-1.
- When LS-1 opens, TR-1 coil goes off, and the TR-1 relay contact opens shutting off SOL-1. TR-1 delay contact remains closed, and the time cycle start.
- After the time cycle is complete, the delay contact in line 3 opens, shutting off PL-1, and the circuit is reset.

Data in an SLC-500 Timer Instruction

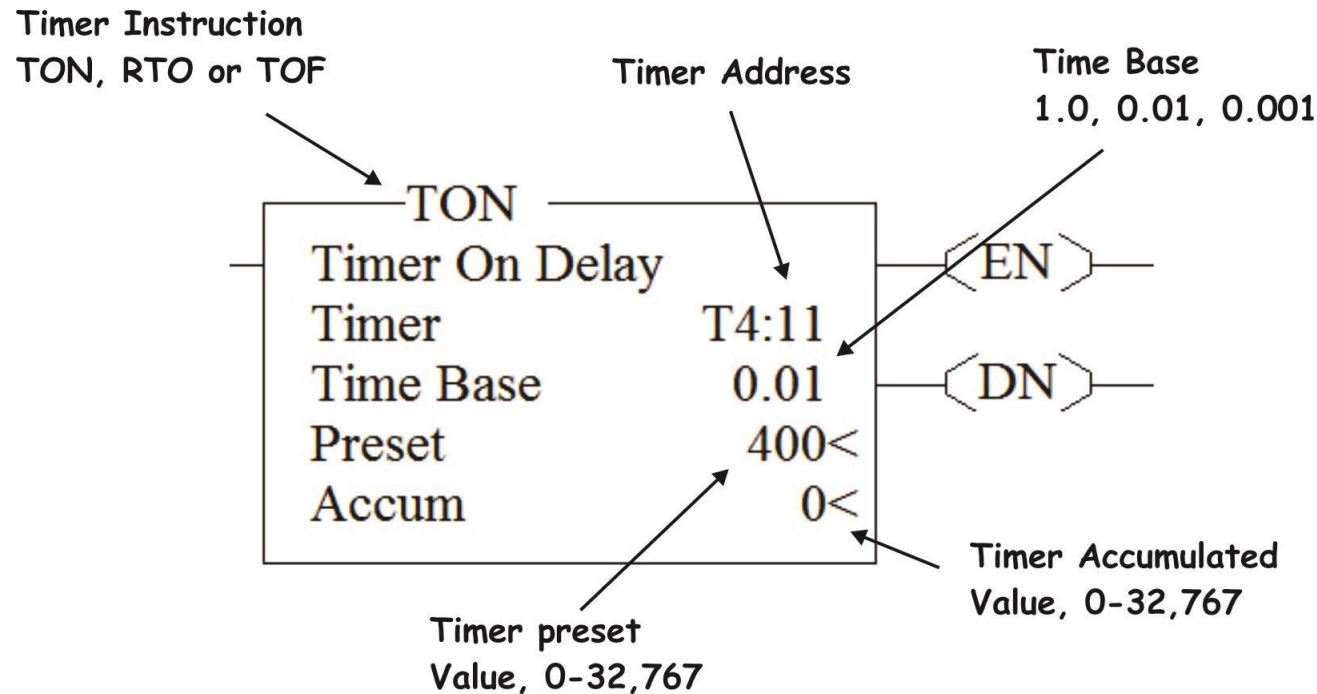
Timer Address: Each timer must have its own unique address.

Time Base: Determines the duration of each timing interval. The setting can be 1 sec., 0.01 sec., or 0.001 sec.

Timer Preset: This is the value the timer must time up to, in order to fulfill the time cycle.

Timer Accumulated: This value will show the time currently accumulated or elapsed.

The **timed value** will be the Time Base times the Timer Preset. If the preset value is 1500, and the time base is 0.01 sec., the timer would be a 15 second timer.

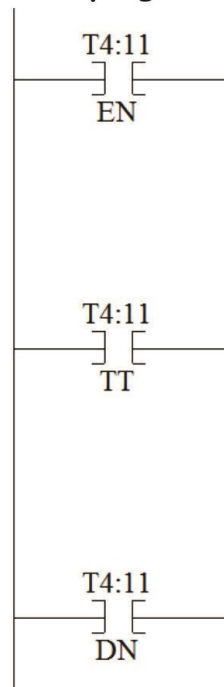


Timer Status Bits

T4:11/EN T4:11/TT T4:11/DN

Offset	EN	TT	DN	BASE	PRE	ACC	(Sym
T4:8	0	0	0	.01 sec	0	0	
T4:9	0	0	0	.01 sec	0	0	
T4:10	0	0	0	.01 sec	0	0	
T4:11	0	0	0	.01 sec	400	0	
T4:12	0	0	0	.01 sec	1200	0	
T4:13	0	0	0	.01 sec	900	0	
T4:14	0	0	0	.01 sec	0	0	
T4:15	0	0	0	.01 sec	0	0	
T4:16	0	0	0	.01 sec	0	0	
T4:17	0	0	0	.01 sec	0	0	
T4:18	0	0	0	.01 sec	0	0	

Status bits used in a ladder program



Timer status bits are bits in the timer data file that are set and resets according to the operation of the timer. Instructions in the ladder program(s) are referenced from these status bits, and will be used to control logic in the program.

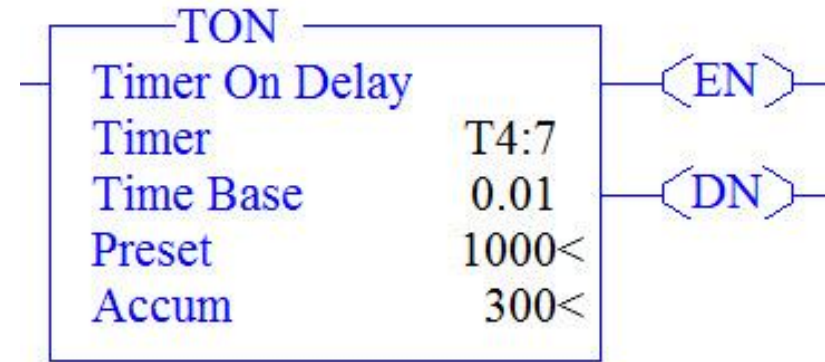
The three status bits are:

.EN – The enable bit.

.TT – The timer timing bit.

.DN – The timer done bit.

TON Instruction



- TON stands for Timer On Delay – This is a non-retentive timer.
- When the TON is powered, it starts timing. When it is shut off, the timer accumulated value and status bits are reset.
- TON Status Bits:
 - EN – Timer Enable bit. This bit is on (1) when the TON instruction is powered.
 - TT – Timer Timing bit. This bit is on (1) when the TON is timing
 - DN – Timer Done bit. This bit is on (1) when the TON is timed out (Accum value is equal to the Preset value).

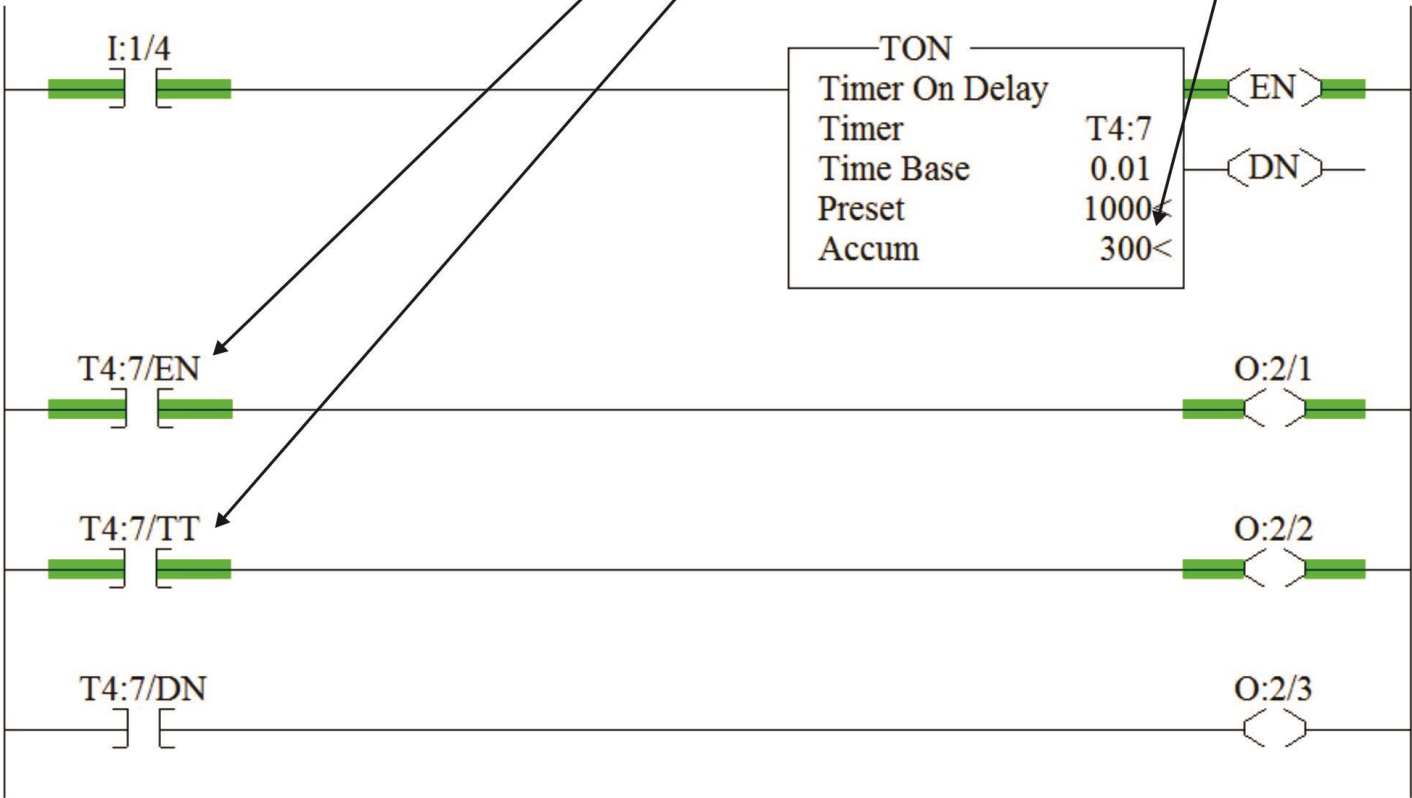
Example TON Program

The TON is energized, so the Enable bit is on, and the timer is timing (.TT bit is on)

T4:7 Status Bits

Offset	EN	TT	DN
T4:7	1	1	0

The TON has timed for 3 seconds, thus the Accum value is 300.



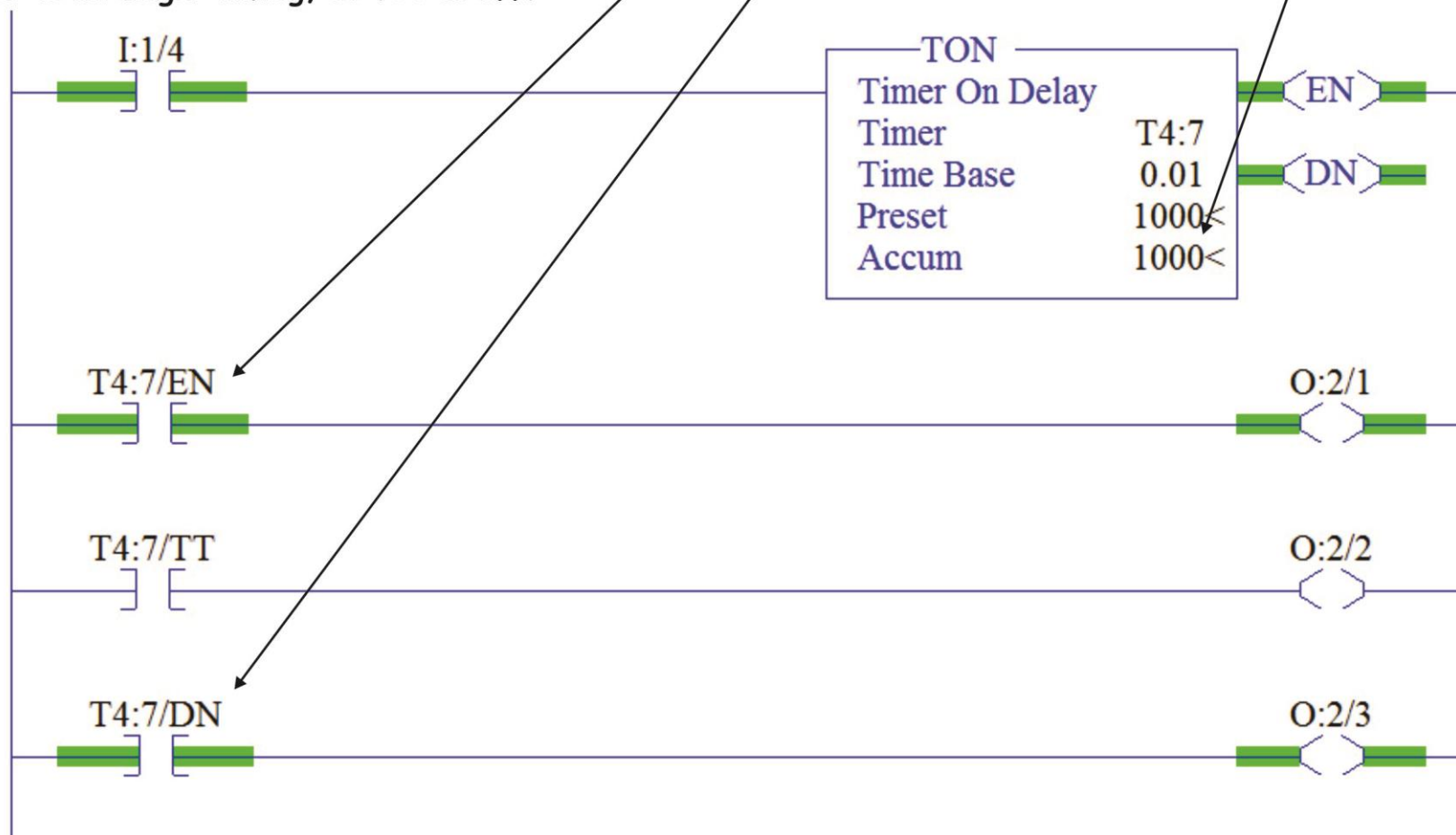
Example TON Program 2

The TON is energized, so the Enable bit is on, and the timer is timed out so the .DN bit is on. The timer is on longer timing, so .TT is off.

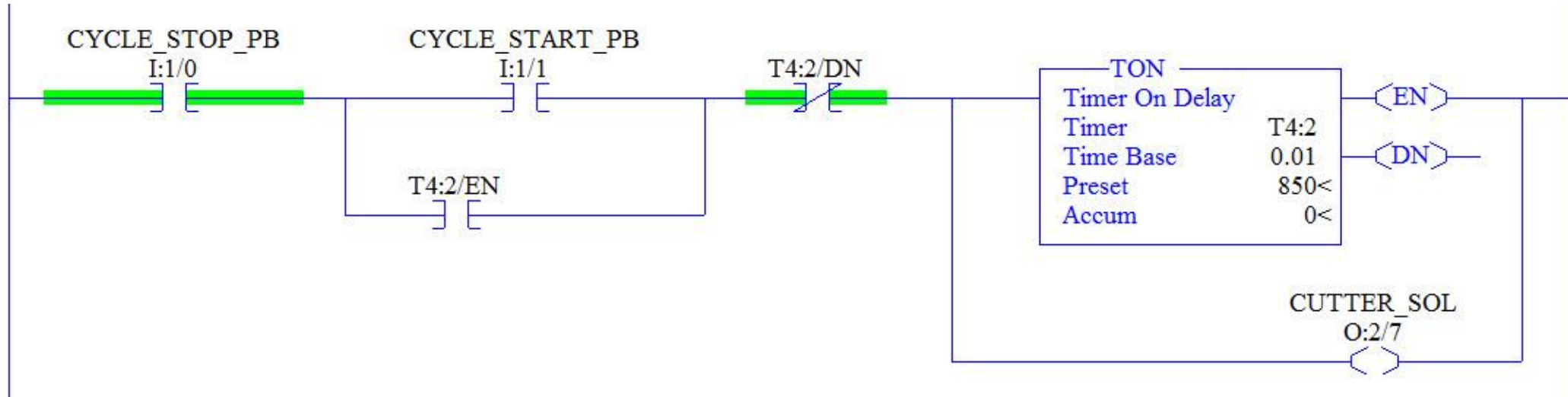
T4:7 Status Bits

Offset	EN	TT	DN
T4:7	1	0	1

The TON has timed out, thus the Accum value is equal to the Preset value.



TON used in hold-in logic

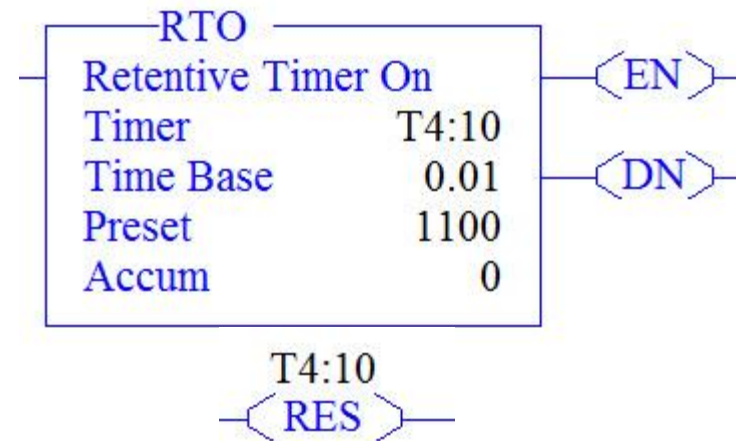


The TON is used in this program to reset the circuit after the time delay.

The CYCLE_START_PB input is pressed, which will complete the logic power flow to the TON. The timer starts timing, the Enable bit comes on which is in parallel with the CYCLE_START_PB XIC. The CUTTER_SOL comes on right away as well.

After the timer times out (8.5 seconds), the T4:2/DN bit comes on, which will make the XIO instruction false, which will open the power going to the timer, resets it, and the circuit is reset.

RTO & RES Instruction



- RTO stands for Retentive Timer On Delay – This is a retentive timer, which means when it is shut off, the accum value is not reset.
- When the RTO is powered, it starts timing. When it is shut off, the timer accumulated value stays where it is at, and starts from there when it is turned back on.
- The RES – Reset instruction, resets the accumulated value and status bits to zero when it is energized.
- RTO Status Bits:
 - .EN – Timer Enable bit. This bit is on (1) when the RTO instruction is powered.
 - .TT – Timer Timing bit. This bit is on (1) when the RTO is timing
 - .DN – Timer Done bit. This bit is on (1) when the RTO is timed out (Accum value is equal to the Preset value).

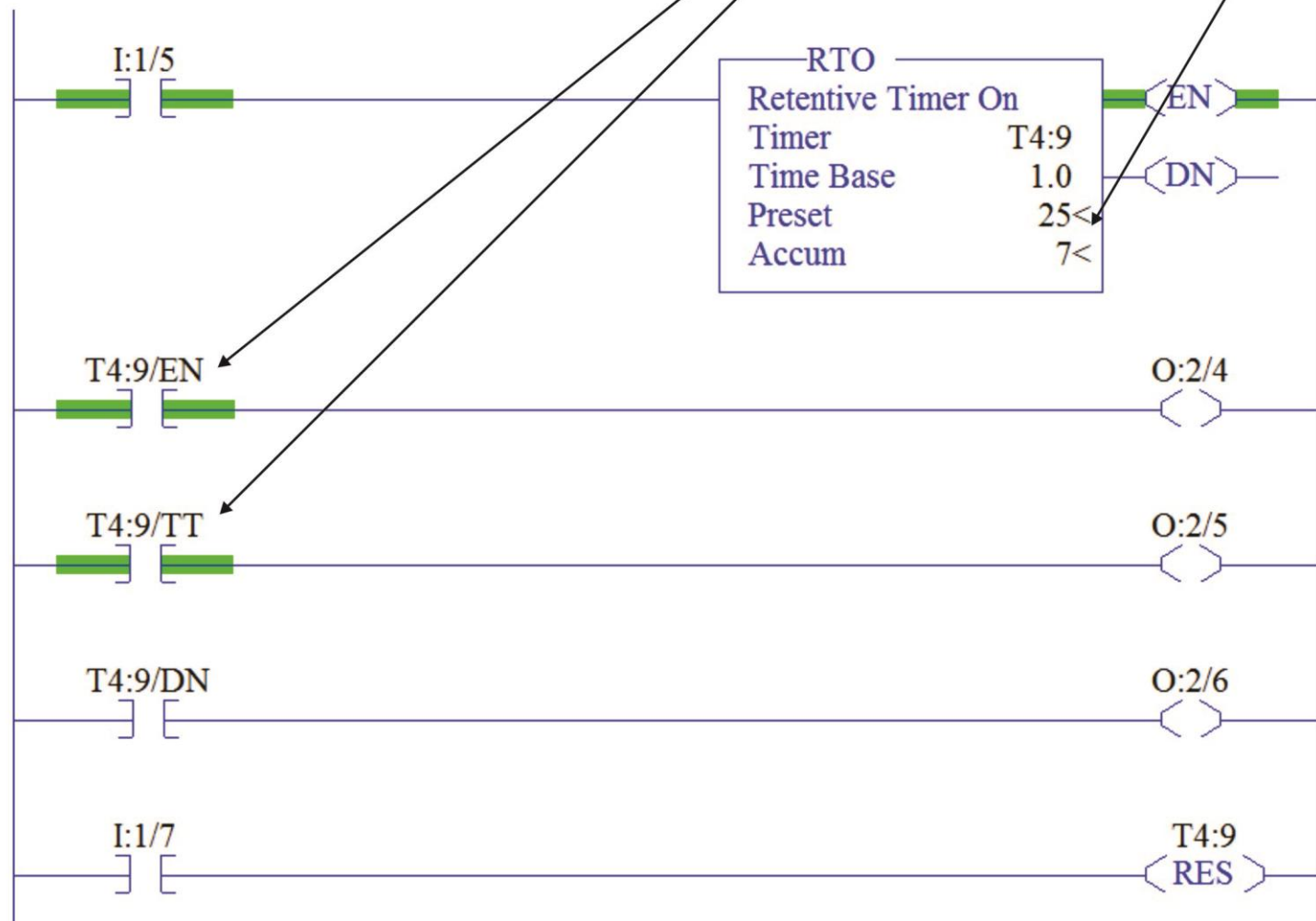
Example RTO Program

The RTO is energized, and is timing, thus the EN bit is on and the TT bit is on.

T4:9 Status Bits

Offset	EN	TT	DN
T4:9	1	1	0

The RTO is timing and is 7 seconds into the 25 second time delay



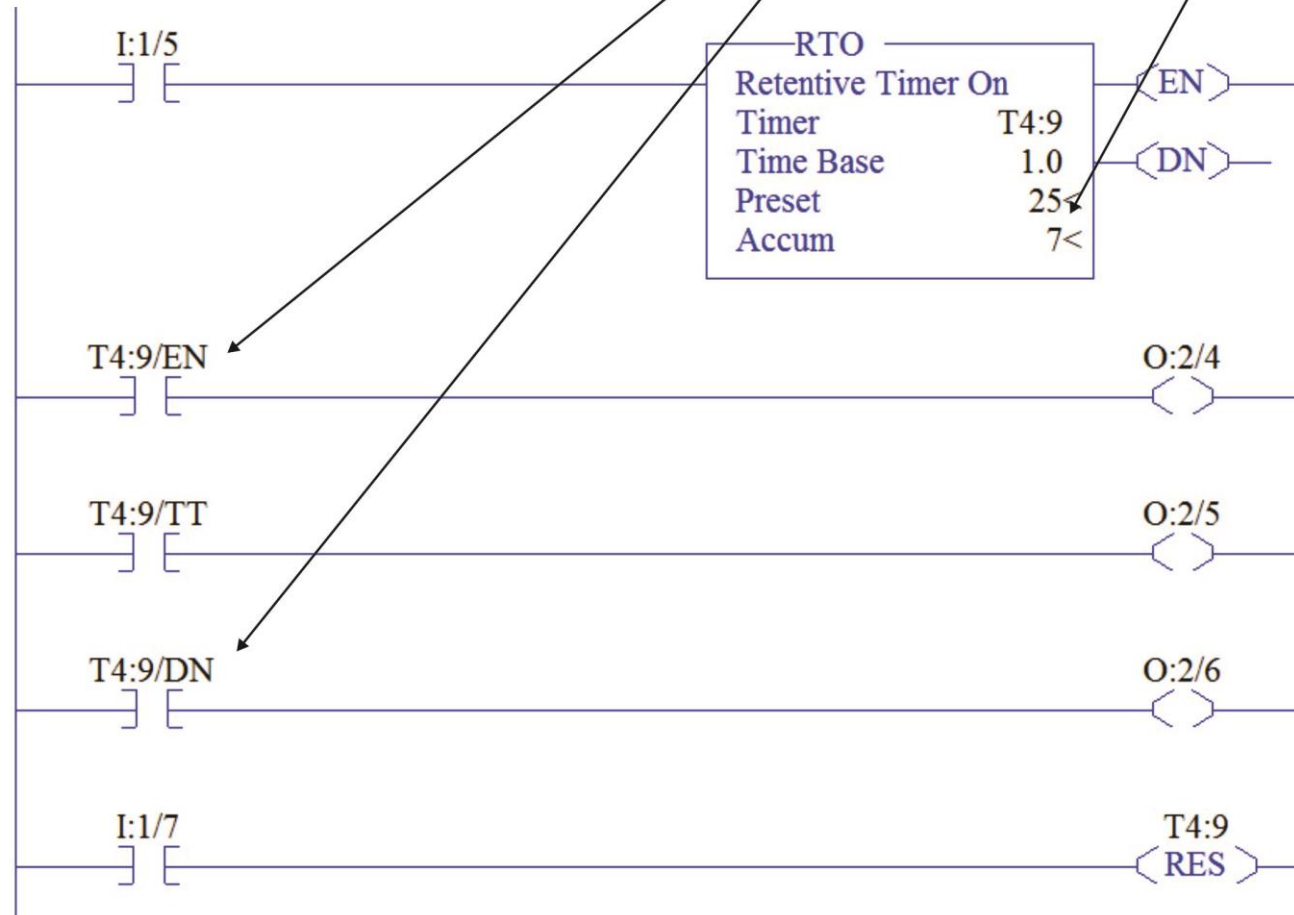
Example RTO Program continued

The RTO is de-energized, thus it stops timing. The Accum value is held where it had timed to. The status bits are off.

T4:9 Status Bits

Offset	EN	TT	DN
T4:9	0	0	0

The RTO is turned off and the Accum value is retained at the value it has timed up to.

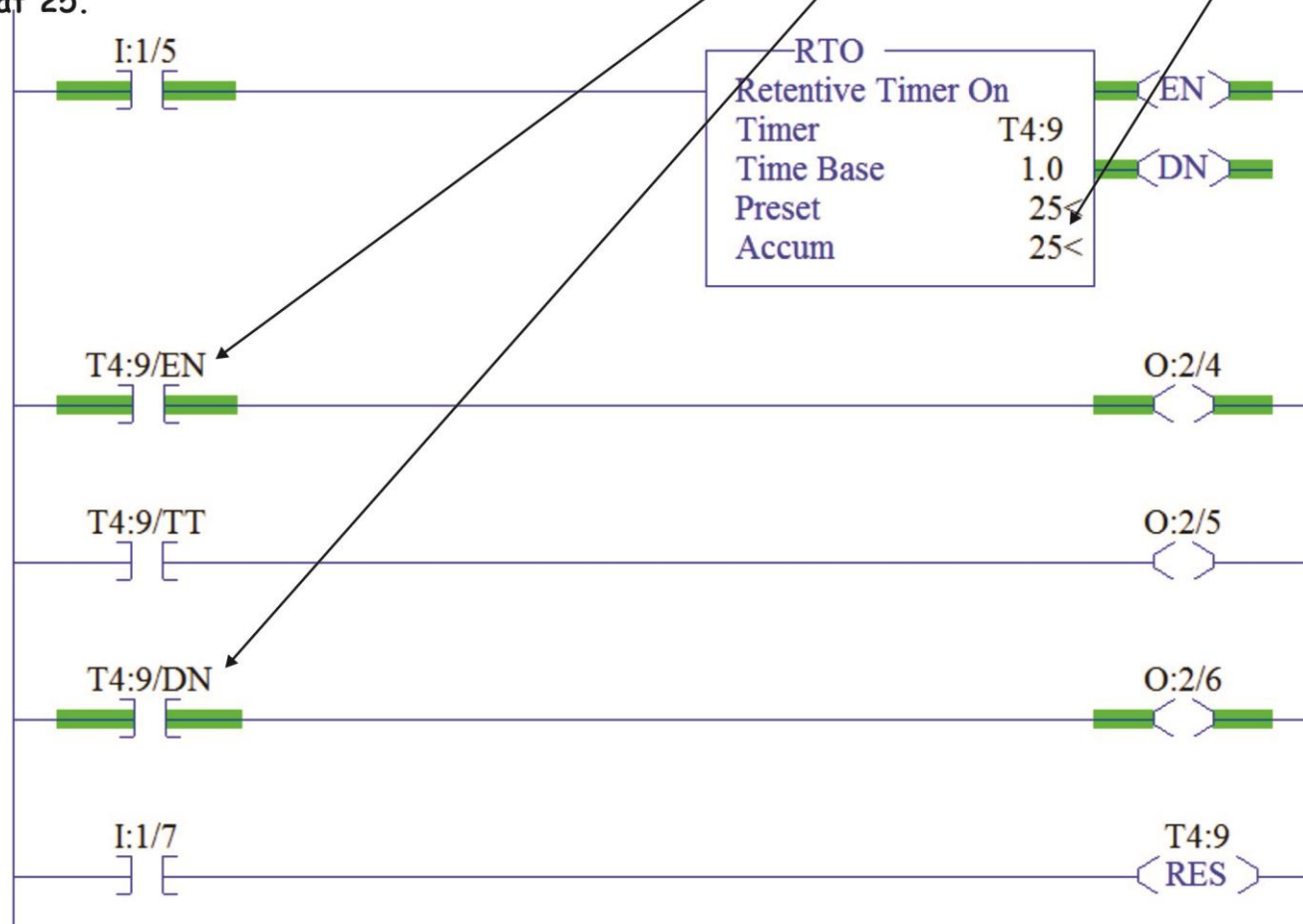


Example RTO Program continued

The RTO is timed out and still powered. The EN bit is still on and the DN bit is now on. If the RTO is de-energized, the Accum value will remain at 25.

T4:9 Status Bits			
Offset	EN	TT	DN
T4:9	1	0	1

The RTO is timed out, thus the Accum value is equal to the Preset value.

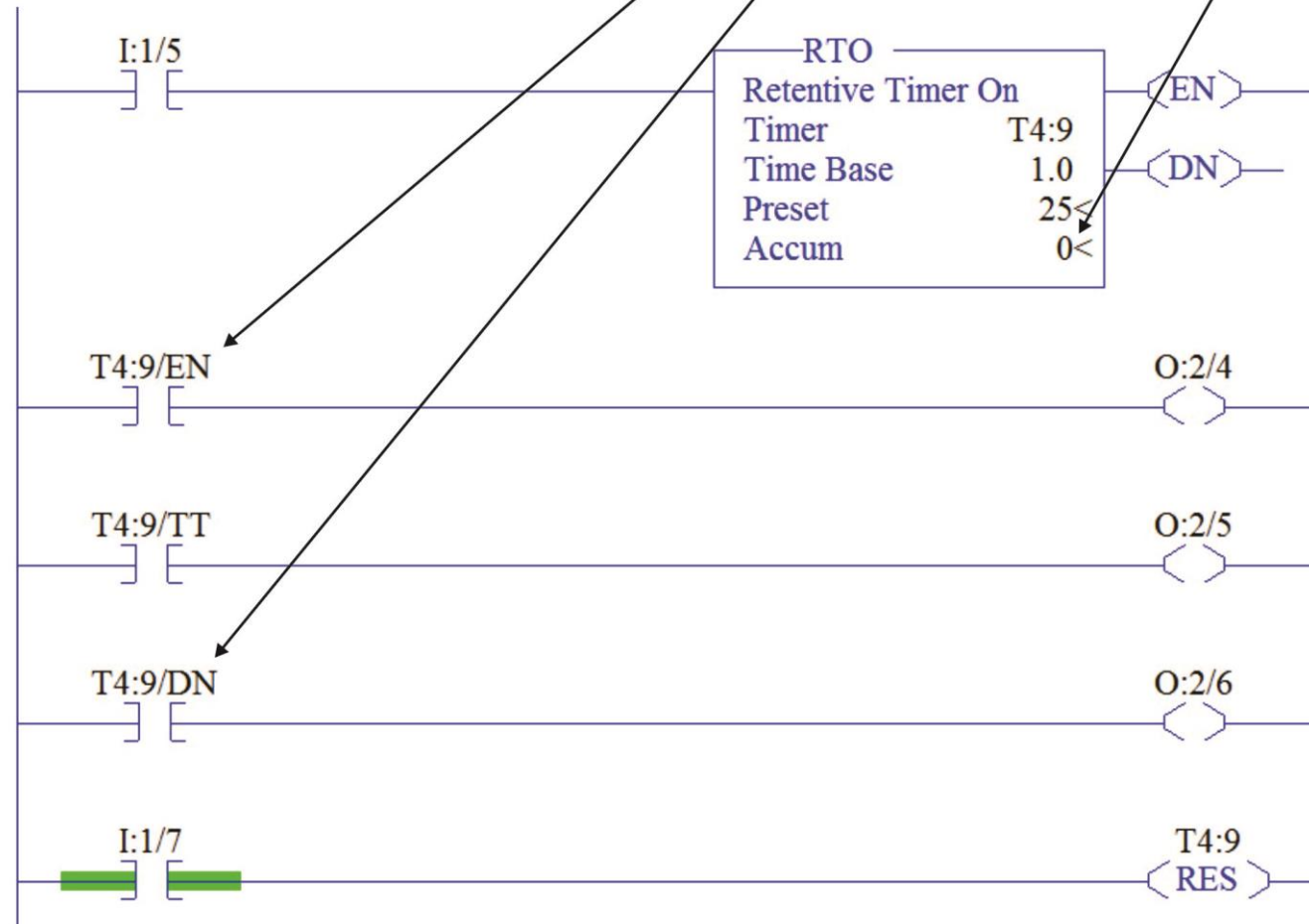


Example RTO Program continued

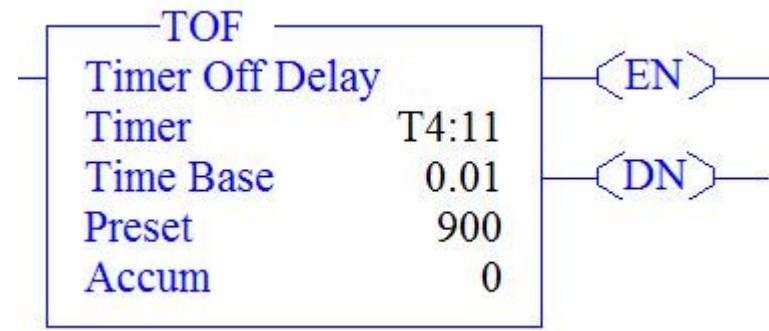
The RTO is de-energized and the RES for T4:9 is energized, which resets the Accum value to zero and resets the status bits to zero.

T4:9 Status Bits			
Offset	EN	TT	DN
T4:9	0	0	0

The RTO is reset
thus the Accum value
goes to zero, as well
as the status bits.

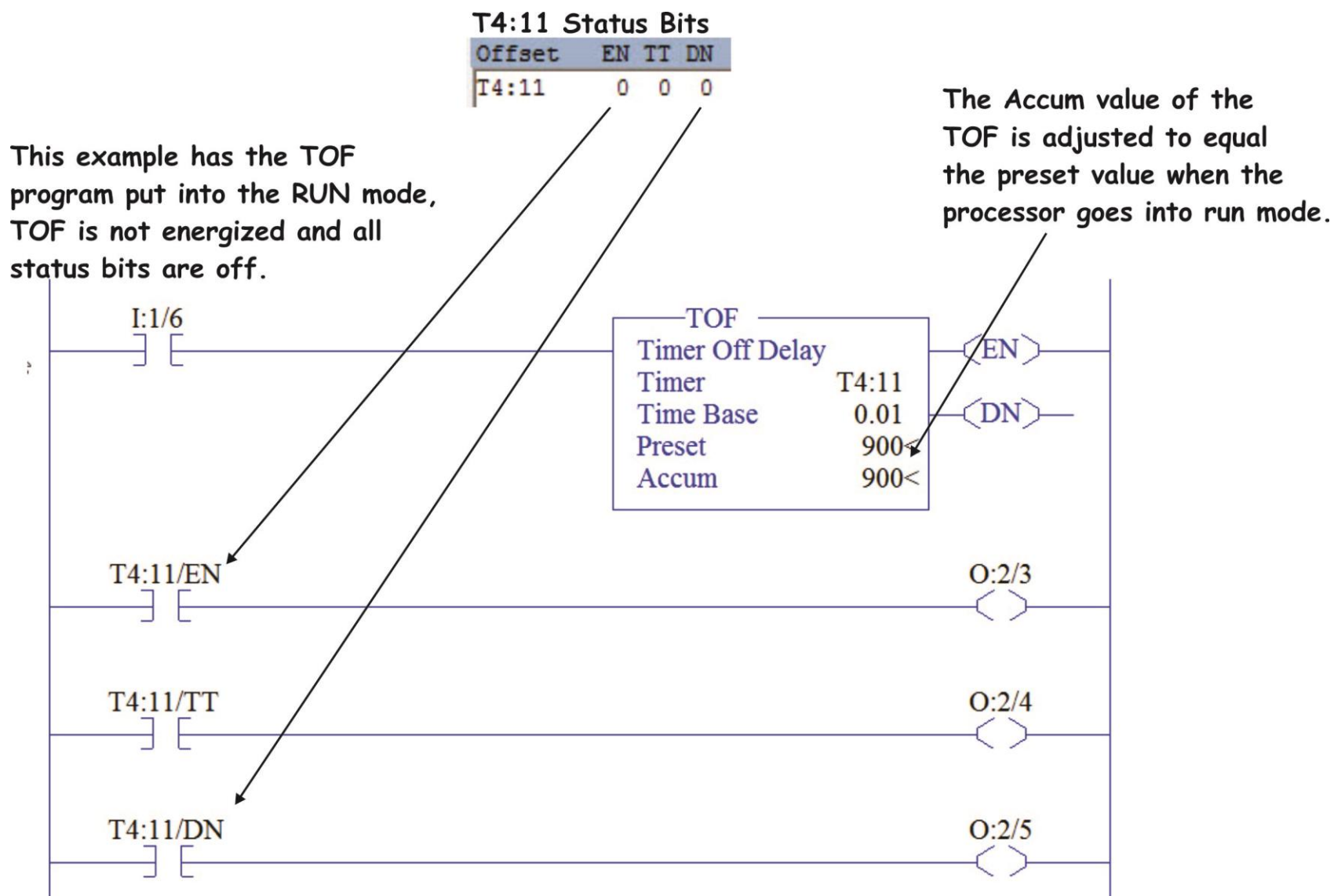


TOF Instruction



- TOF stands for Timer Off Delay – This is an off delay timer.
- When the process goes to the Run Mode, the Accum value is adjusted to equal the Preset value. The DN bit is off at this time.
- When the TOF is powered, the Accum value goes to zero and the DN bit comes on. When the TOF shuts off, the TOF starts timing, then when it times out, the DN bit shuts off.
- TOF Status Bits:
 - EN – Timer Enable bit. This bit is on (1) when the TOF instruction is powered.
 - TT – Timer Timing bit. This bit is on (1) when the TOF is timing
 - DN – Timer Done bit. This bit is on (1) when the Accum value is **not** equal to the Preset.

Example of a TOF Instruction

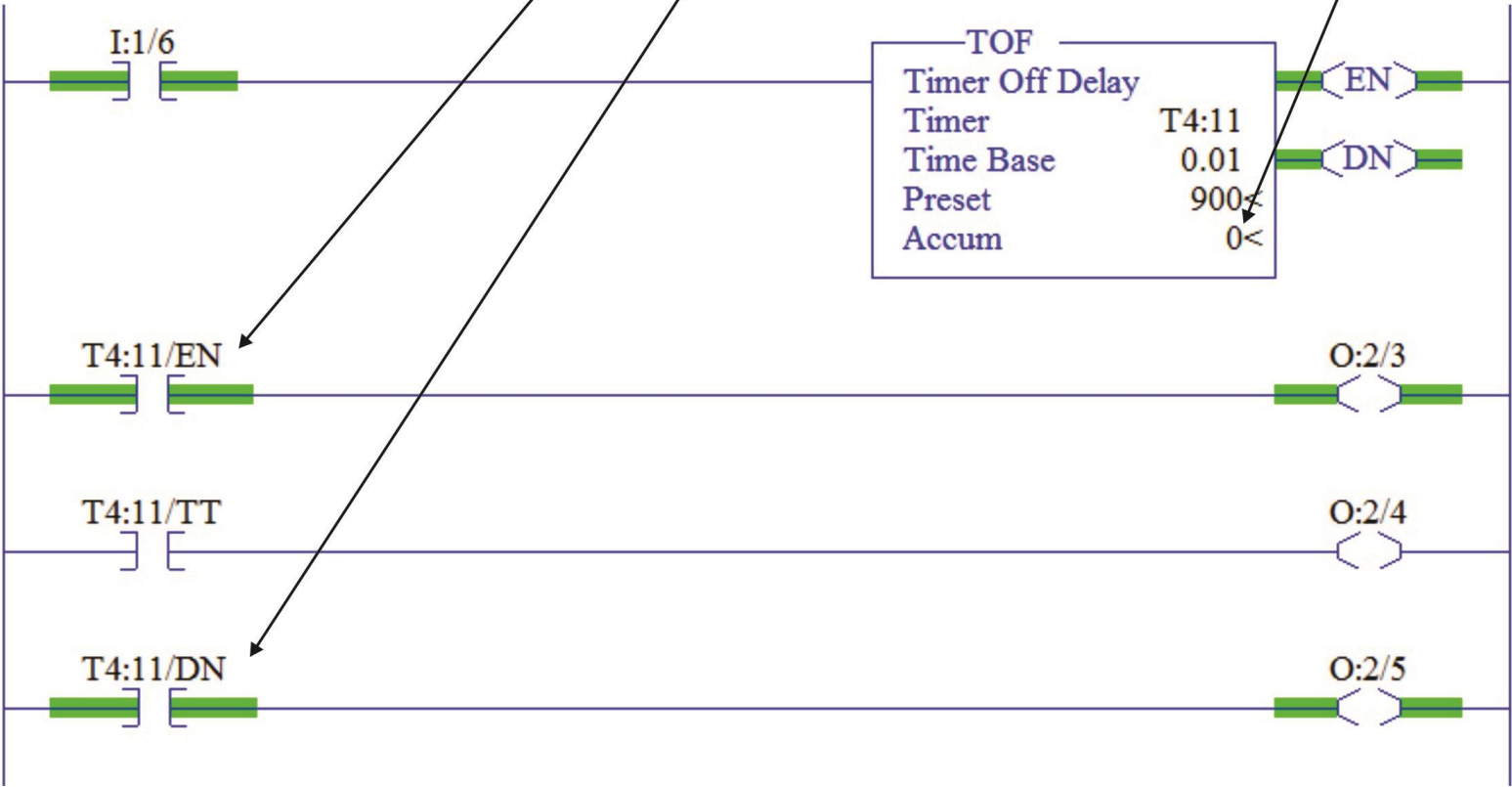


TOF Instruction Continued

This example the TOF instruction is energized, thus resetting the Accum value to zero and setting the DN bit.

T4:11 Status Bits			
Offset	EN	TT	DN
T4:11	1	0	1

The Accum value of the TOF is reset to zero when the TOF instruction is powered.



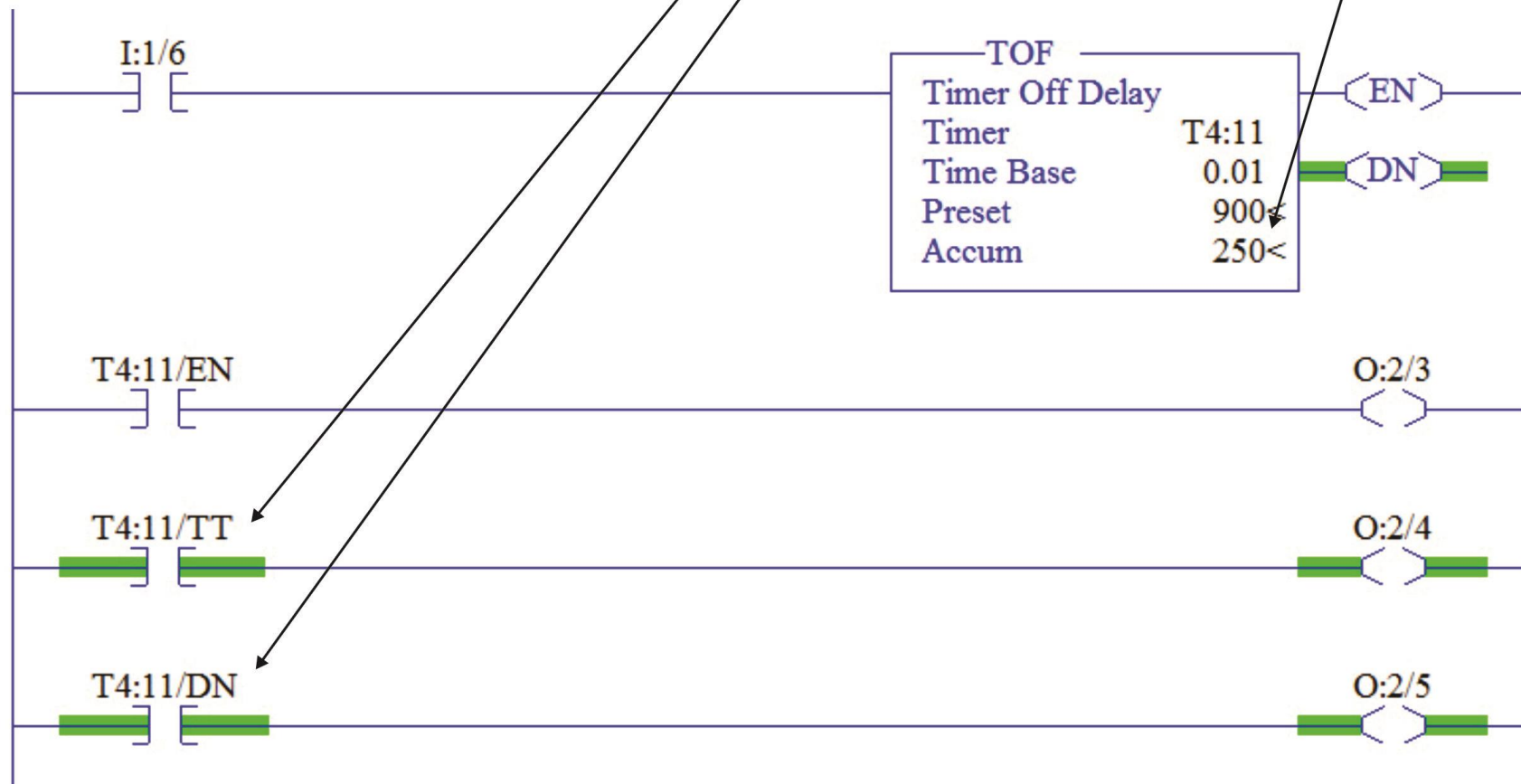
TOF Instruction Continued

This example the TOF instruction is deenergized, which starts the time cycle. During this timing the TT and DN bits are both on.

T4:11 Status Bits

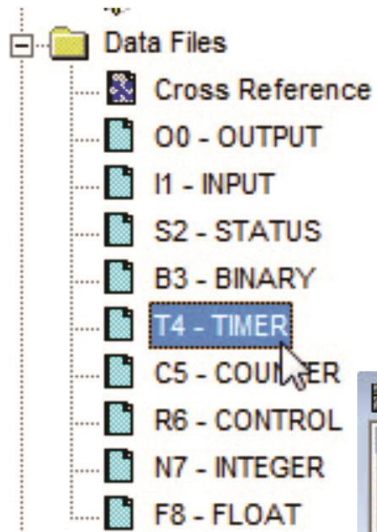
Offset	EN	TT	DN
T4:11	0	1	1

The Accum value of the TOF is timing up, showing the value of 250, which is 2.5 sec. into the cycle



Timer values stored in the Data Files and displayed in the Ladder Files

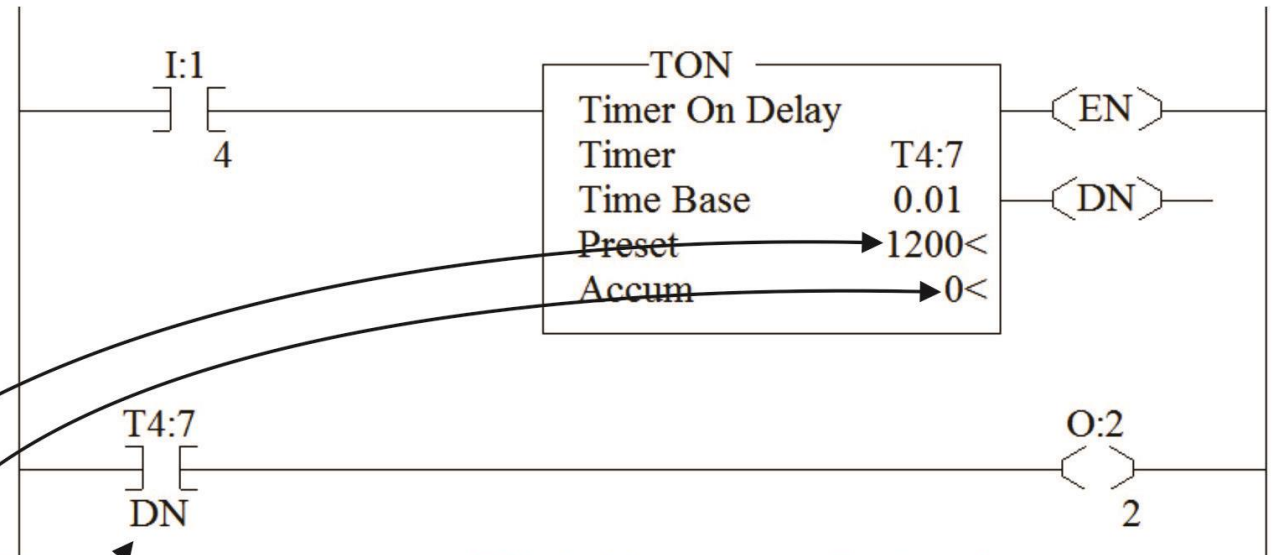
Data Files store discrete and numeric values in address locations (sometimes called registers) that can be accessed by instructions in the program or from external hardware devices such as HMIs.



Data Files number 4 is a timer file. When this file is opened up, it will show the following information.

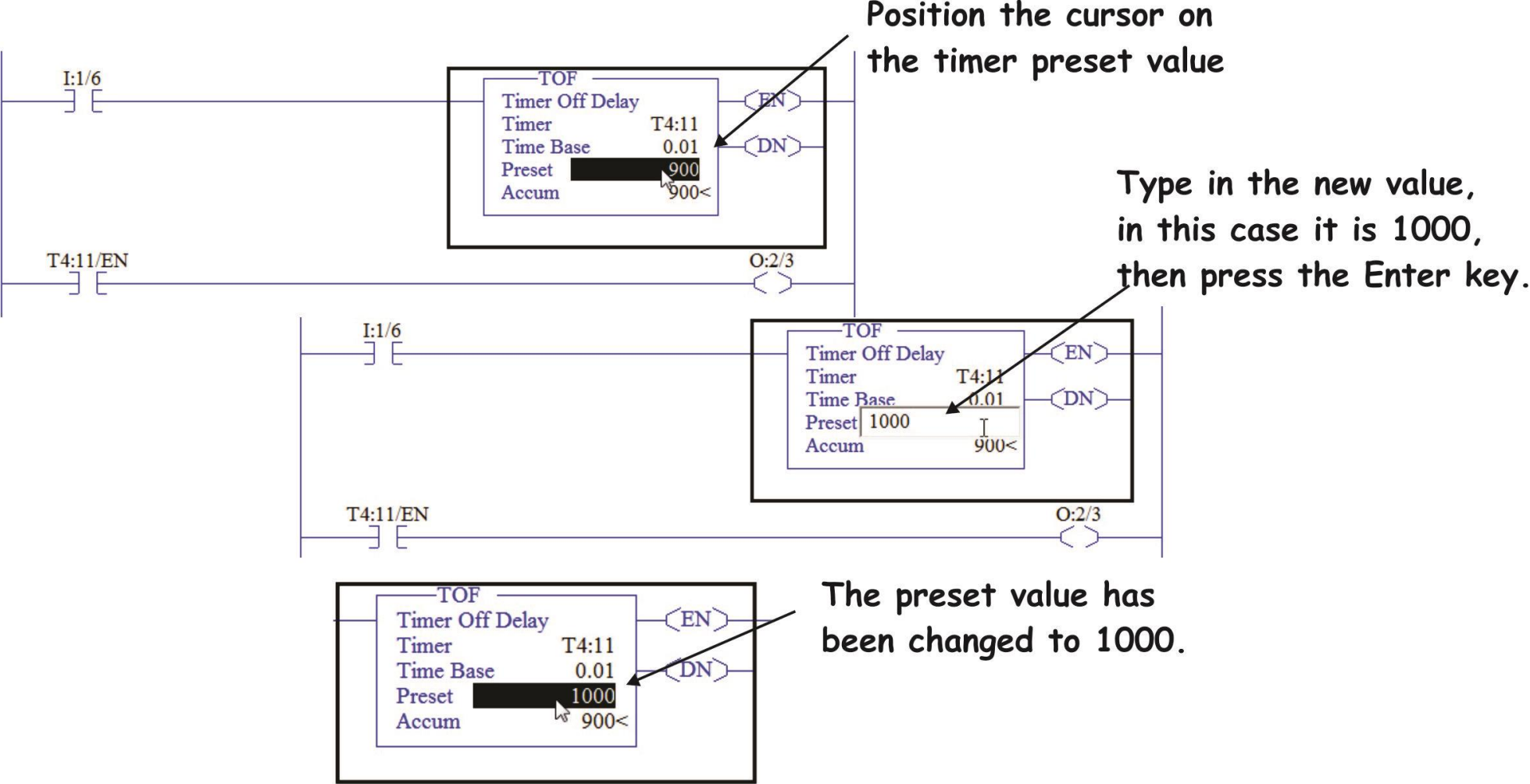
A screenshot of a window titled "Data File T4 -- TIMER". It contains a table with columns: Offset, EN, TT, DN, BASE, PRE, ACC, and Symb. The table lists timer data for offsets T4:0 through T4:10.

Offset	EN	TT	DN	BASE	PRE	ACC	Symb
T4:0	0	0	0	.01 sec	0	0	
T4:1	0	0	0	.01 sec	0	0	
T4:2	0	0	0	1.0 sec	10	0	
T4:3	0	0	0	.01 sec	1500	0	
T4:4	0	0	0	.01 sec	1200	0	
T4:5	0	0	0	.01 sec	1200	0	
T4:6	0	0	0	.01 sec	0	0	
T4:7	0	0	0	.01 sec	1200	0	
T4:8	0	0	0	.01 sec	0	0	
T4:9	0	0	0	.01 sec	0	0	
T4:10	0	0	0	.01 sec	0	0	



This ladder program is stored in Program File 2 (main ladder file)

Changing the Timer preset value on or offline



Changing the Timer preset value from the data file

Right mouse click on the timer address and choose GoTo Data Table

Move the cursor to the Preset value and type in a new value. In this case it is 1100, then press the Enter key.

The new value is displayed in the data file and on the Timer instruction in the ladder view window.

Data File T4 -- TIMER

Offset	EN	TI	DN	BASE	PRE	ACC	(Symbol)
T4:9	1	0	1	1.0 sec	25	9	
T4:10	0	0	0	.01 sec	0	0	
T4:11	0	0	0	.01 sec	1000	900	
T4:12	0	0	0	.01 sec	1200	0	
T4:13	0	0	0	.01 sec	900	0	
T4:14	0	0	0	.01 sec	0	0	
T4:15	0	0	0	.01 sec	0	0	
T4:16	0	0	0	.01 sec	0	0	
T4:17	0	0	0	.01 sec	0	0	
T4:18	0	0	0	.01 sec	0	0	
T4:19	0	0	0	.01 sec	0	0	

TOF Timer Off Delay

Timer T4:11

Time Base 0.01

Preset 1100<

Accum 900<

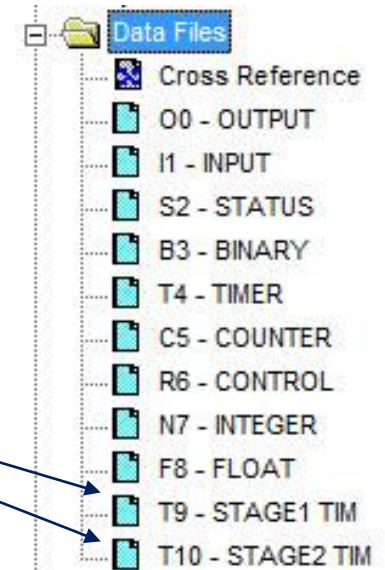
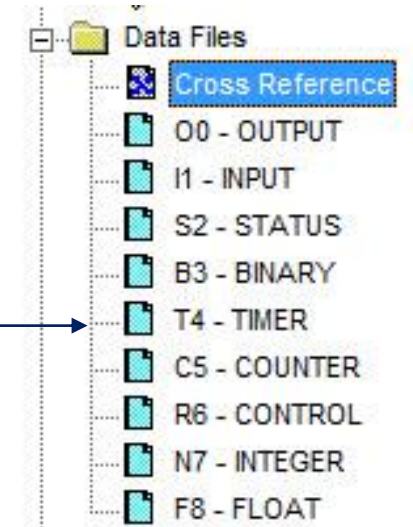
O:2/3

Timer Addressing

- A timer element is addressed as T4:10.
- A timer element is made up of 3 words:
 - Preset: T4:10.PRE
 - Accum: T4:10.ACC
 - Status bits: T4:10/EN, T4:10/TT, T4:10/DN
- Each word consists of 16 bits in the preset and accum words.
- Only 3 bits are accessible in the status word
- A user could see bits addressed as: T4:10.ACC/2 (the bit is 0-15)

Timer Data Files

- Data File #4 is a timer file by default.
- Each timer file can have 256 timers (0-255)
- Data files 0-8 are predefined, and files 9-255 can be defined to any type of file except: input, output or status file types.
- In this example, a T9 and T10 data files were added. When these files are opened up, they view the data in a timer format.





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