MINI PROJECT (ISE-716)

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(i) Normally Open= NO, Normally Closed = NC

INPUTS (Digital SIGNAL ON/OFF) -	**FUNCTION**
1.Photo Sensor 1 – Local 2:I.Data[1].5 , NO	1. It senses PART at position I, gives HIGH output ..
2.Photo Sensor 2 – Local 2:I.Data[1].4, NO	2. It senses presence of PART at position II, gives HIGH output
3.START button – Local 2:I.Data[1].1, NO Could be pushbutton or toggle , I have shown results using both in the case(i) case(ii)	3. Used to start system and Green Light#3 is ON..
4.Left Hand tie down bTN- Local 2:I.Data[1].3, NO	4. Safety measure for left hand , push it to run PART to II
5.Right Hand tie down bTN- Local 2:I.Data[1].2, NO	5. Safety measure for right hand, put it to run PART to II
6.Emergency Stop bTN- Local 2:I.Data[1].0,NO	6. Emergency stop for conveyor operation ,
7.Proximity Door SENSOR- Local 2:I.Data[1].6, NO	7. Safety feature for door, should be closed all time. It makes Green Light 2 ON
INTERNAL RELAY INPUTS	
8.T4.DN – Timer when done	8. Gives 1 second delay to actuator, used TON timer,EN,DN bits
9. Local 2:O.Data[0].3 – Green Light1 Hold	9. For holding/latching of green light1
10. Local 2:O.Data[0].5 – Green Light3 Hold	10. For holding/latching of green light3
11. Local 2:O.Data[0].4 – Green Light2	11. For holding/latching of green light2
12. Local 2:O.Data[0].6 – Green Light4	12. For holding/latching of green light4
13. Local 2:O.Data[0].7 – Actuator ON input relay	13. For latching actuator control & Enable Timer
14. Local 2:O.Data[0].7 – REV Motor ON input relay	14. For holding REV motor function
15.T4.EN – Timer while enabled	15. Enable bit of timer to use actuator for 1 second
16.Reflector 1 & Reflector 2	16. For photo sensor functioning light signal.

OUTPUTS (Digital SIGNAL ON/OFF)-	**FUNCTION**
1. Green Light#1 LED Local 2:O.Data[0].3	1.Shows PART is present at position 1.
2. Green Light#2 LED Local 2:O.Data[0].4	2.Shows door is closed.
3. Green Light#3 LED Local 2:O.Data[0].5	3.Start Push button is pressed.
4. Green Light#4 LED Local 2:O.Data[0].6	4.Left & Right finger tie are pressed
5. RED Light#5 LED Local 2:O.Data[0].2 (Fault alert)	5. Door open, emergency stop or finger ties not pressed
6. Forward DC Motor Local 2:O.Data[0].8	6.Part going from position 1 to 2
7. Forward DC Motor Local 2:O.Data[0].11	7.Part going from position 1 to 2
8. Reverse DC Motor Local 2:O.Data[0].9	8. Conveyor belt coming from position 2 to 1
9. Reverse DC Motor Local 2:O.Data[0].10	9. Conveyor belt coming from position 2 to 1.
10.Pneumatic Actuator Local 2:O.Data[0].7	10.It push the part into bin and retract after 1 sec
1.TIMER T4 (TON) – set value 1000 msec = 1 second	Timer used to do 1 sec timing function for actuator and also the DN and EN bits used for stop and reversal ON signal.
1.COUNTER CTU (Count Up)	Counter increase by 1 when it gets signal of DN bit from timer to record number of parts.

LADDER LOGIC DIAGRAM on Next Page

Since its not mentioned in the question, hence I have made following assumptions-

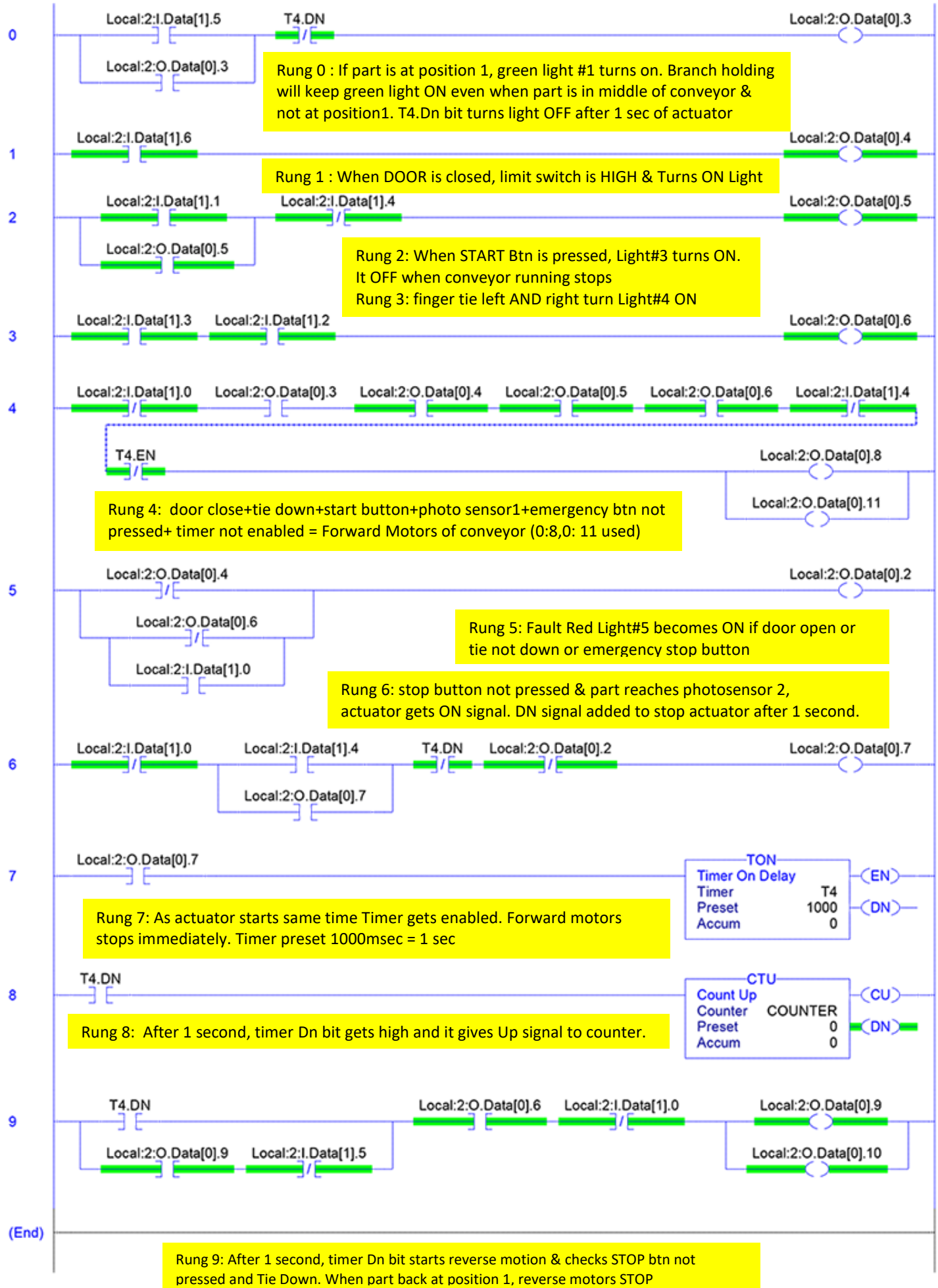
-Used the DC motors configuration – O:8, O:11 for Forward & O:9, O:10 for Backward motion

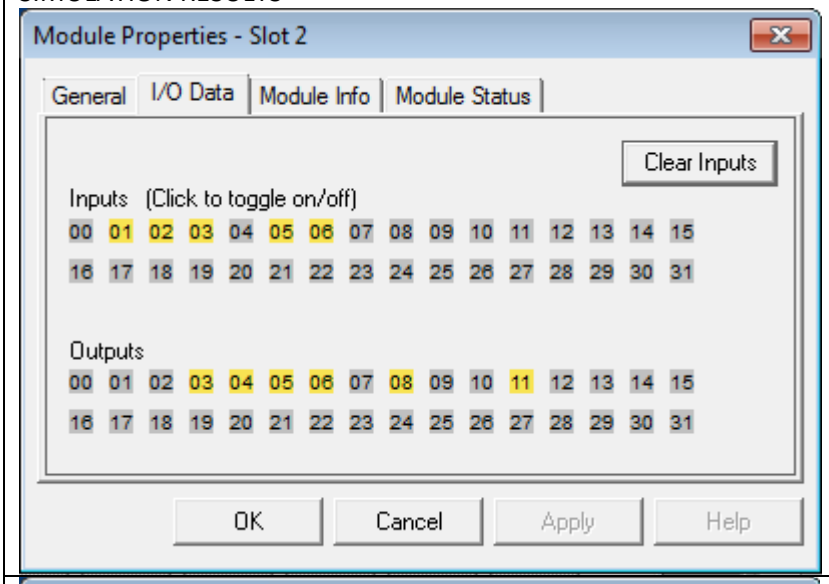
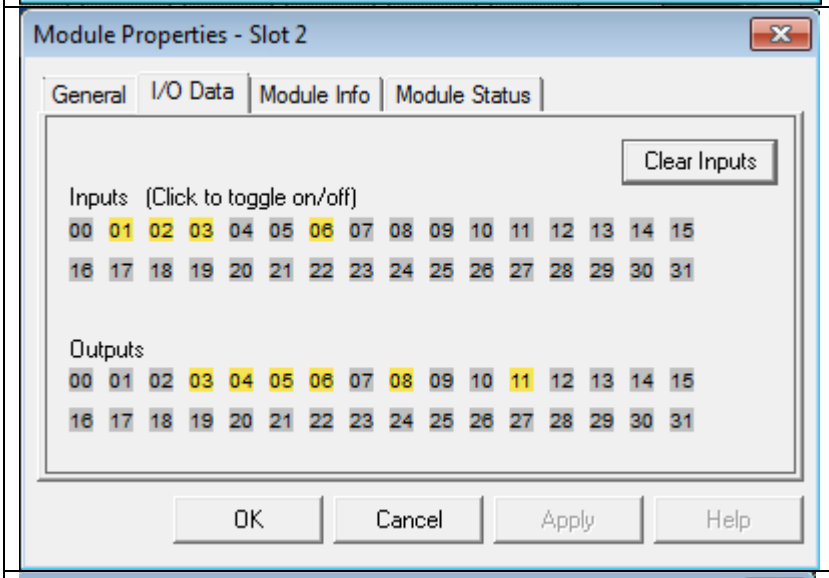
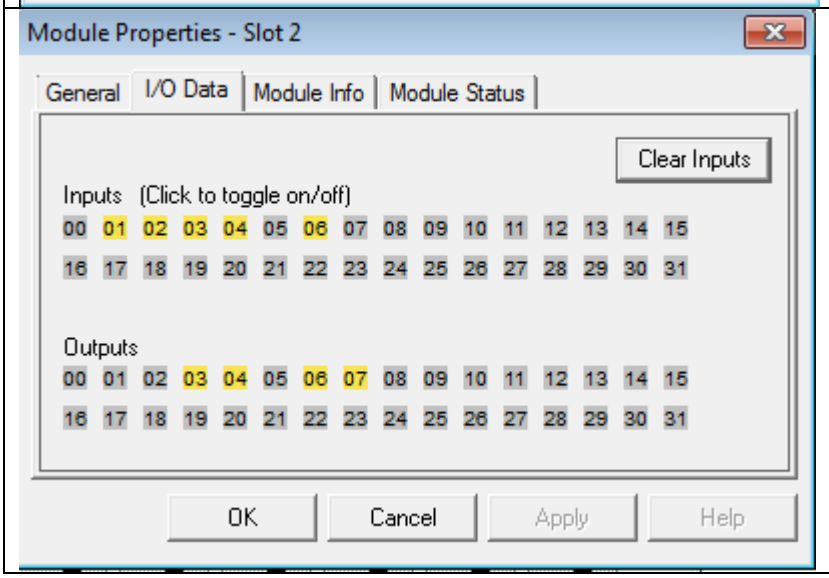
- I have shown 2 different cases in last step of simulation results for Start Push button & Start Toggle button.

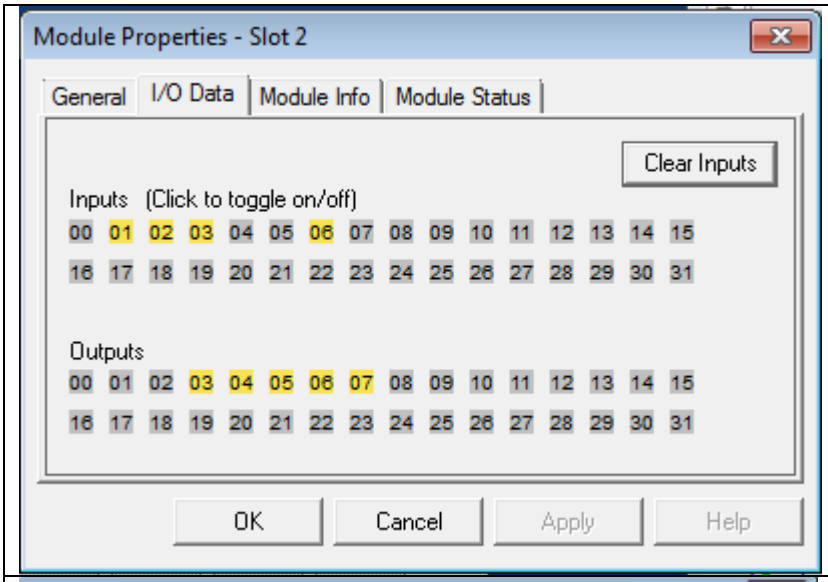
-Green light 3 is ON when system is in operation. It is OFF for 1 second of actuator ON

- Counter Preset is 0 as we are just using it for counting purpose.

- Comments in program are highlighted by Yellow Color


0
Local:2:I.Data[1].5
T4.DN
Local:2:O.Data[0].3
Local:2:O.Data[0].3
Rung 0 : If part is at position 1, green light #1 turns on. Branch holding will keep green light ON even when part is in middle of conveyor & not at position1. T4.Dn bit turns light OFF after 1 sec of actuator
1
Local:2:I.Data[1].6
Local:2:O.Data[0].4
Rung 1 : When DOOR is closed, limit switch is HIGH & Turns ON Light
2
Local:2:I.Data[1].1
Local:2:I.Data[1].4
Local:2:O.Data[0].5
Local:2:O.Data[0].5
Rung 2: When START Btn is pressed, Light#3 turns ON. It OFF when conveyor running stops
Rung 3: finger tie left AND right turn Light#4 ON
3
Local:2:I.Data[1].3
Local:2:I.Data[1].2
Local:2:O.Data[0].6
4
Local:2:I.Data[1].0
Local:2:O.Data[0].3
Local:2:O.Data[0].4
Local:2:O.Data[0].5
Local:2:O.Data[0].6
Local:2:I.Data[1].4
T4.EN
Local:2:O.Data[0].8
Local:2:O.Data[0].11
Rung 4: door close+tie down+start button+photo sensor1+emergency btn not pressed+ timer not enabled = Forward Motors of conveyor (0:8,0: 11 used)
5
Local:2:O.Data[0].4
Local:2:O.Data[0].2
Local:2:O.Data[0].6
Local:2:I.Data[1].0
Rung 5: Fault Red Light#5 becomes ON if door open or tie not down or emergency stop button
Rung 6: stop button not pressed & part reaches photosensor 2, actuator gets ON signal. DN signal added to stop actuator after 1 second.
6
Local:2:I.Data[1].0
Local:2:I.Data[1].4
T4.DN
Local:2:O.Data[0].2
Local:2:O.Data[0].7
Local:2:O.Data[0].7
7
Local:2:O.Data[0].7
TON
Timer On Delay
Timer T4
Preset 1000
Accum 0
EN
DN
Rung 7: As actuator starts same time Timer gets enabled. Forward motors stops immediately. Timer preset 1000msec = 1 sec
8
T4.DN
CTU
Count Up
Counter COUNTER
Preset 0
Accum 0
CU
DN
Rung 8: After 1 second, timer Dn bit gets high and it gives Up signal to counter.
9
T4.DN
Local:2:O.Data[0].6
Local:2:I.Data[1].0
Local:2:O.Data[0].9
Local:2:O.Data[0].9
Local:2:I.Data[1].5
Local:2:O.Data[0].10
(End)
Rung 9: After 1 second, timer Dn bit starts reverse motion & checks STOP btn not pressed and Tie Down. When part back at position 1, reverse motors STOP

SIMULATION RESULTS  	When Left & Right fingers are both tie down INPUT 2 & INPUT 3 are HIGH ⇨ Fault light OUTPUT -2 becomes LOW ⇨ Green Light#4 at OUTPUT-6 is HIGH ⇨ Conveyor start to move forward motor at INPUT 8 & 11 are ON
 	Part is at Middle Position as we turn INPUT-5 of position sensor 1 to LOW. Forward Motors still moving. Green Lights#1,2,3,4 are ON
 	When Position 2 is reached at INPUT-04 is HIGH. Forward Motor Output 8 & 11 STOPS. Actuator at OUTPUT-7 begins immediately to push the part away. Green Light #1 at OUTPUT 3 will be OFF after “1 Second”. (**For taking screenshot, I have SET time as 20 Second here)

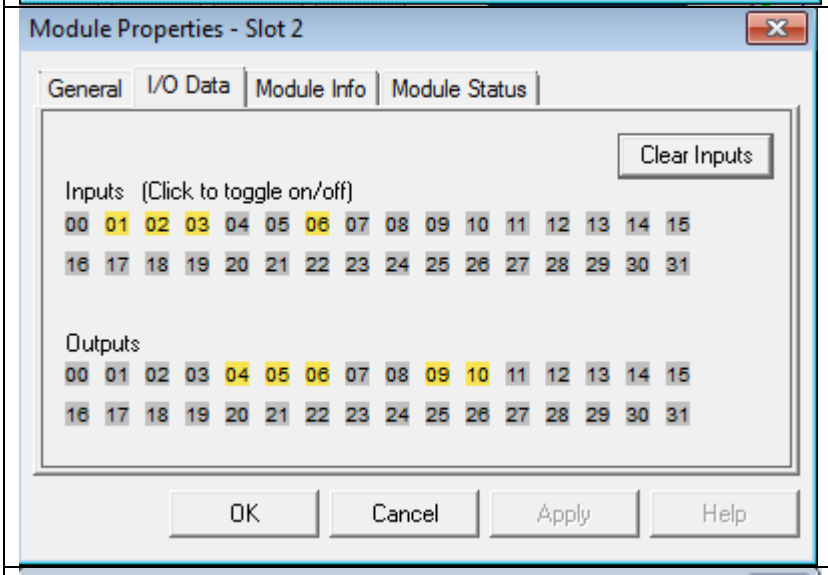


Actuator OUTPUT – 7 is HIGH for “1 Second”, after which it retracts

PART is pushed away and Position Sensor 2 is not detecting.

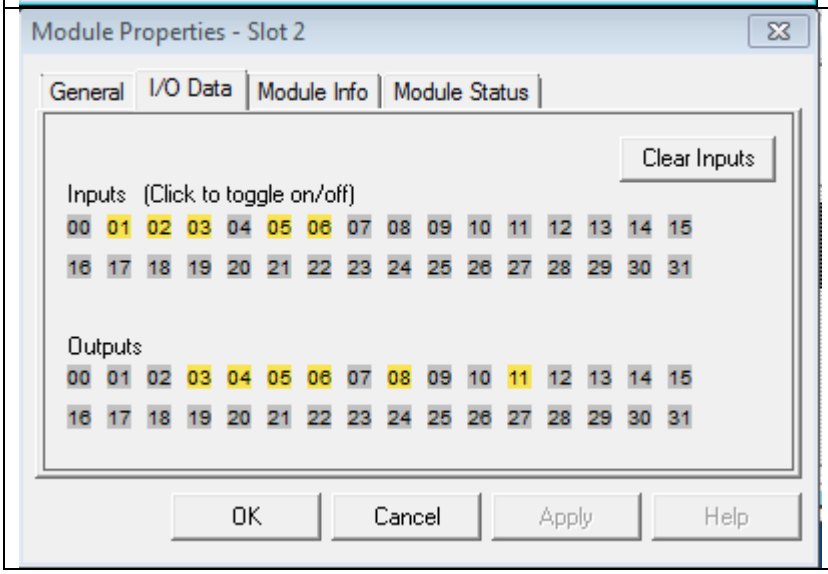
DURING 1 Second

** For simulation purpose I used Time=20 seconds.



After 1 Second

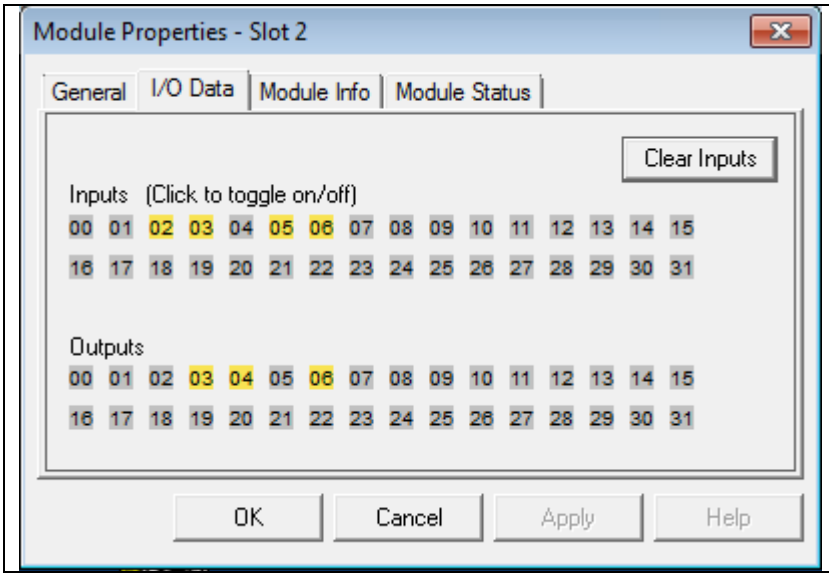
- ⇨ Green Light#1 is off at OUTPUT-3
- ⇨ REVERSE Motors at OUTPUT 9, 10 are HIGH
- ⇨ Actuator has retracted
- ⇨ COUNTER has increased by 1



Case(i) IF Start button is LOCKING.

When Part comes at Position 1 sensor, INPUT-5 is High

Reverse Motors Stop.
Forward Motors Start.



Case (ii)
If our Start Button was push button.

Then after part at Position 1,
Conveyor will be STOP mode
Until Start Push Button pressed again.