

OBJECTIVE

After completing this exercise, the student will be able to:

- Identify the XIC and XIO instructions
- Enter XIC and XIO instructions on a rung

REFERENCES

Cox, Technician's Guide to Programmable Controllers, Ch 7
 Allen-Bradley, Bulletin 1761 User Manual

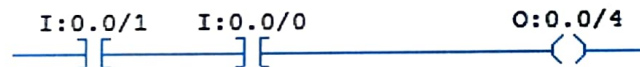
MATERIALS NEEDED

Allen-Bradley MicroLogix 1400 programmable controller with simulator
 RSLogix 500 and RSLinx Software

DISCUSSION

The MicroLogix 1400 is programmed in RLL (Relay Ladder Logic) language which uses a system called Boolean logic. Boolean logic recognizes that if two instructions are in series, both instructions must be TRUE for a flow of logic to take place.

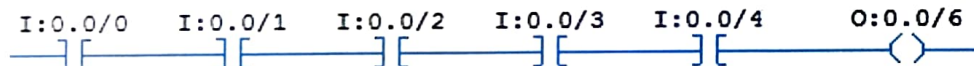
For example:



XIC I/1 AND XIC I/0 must be true to energize the output. Therefore, this is called AND logic.

be true to energize

In the following example:



XIC I/0 AND XIC I/1 AND XIC I/2 AND XIC I/3 AND XIC I/4 must be true to energize OTE O/6.

The same principles apply if some or all of the rung conditions are examined off.

For example:



XIO I/1 AND XIO I/2 AND XIC I/3 must be true to energize output O/4. Remember, TRUE and FALSE are not the same as ON and OFF.

EXPERIMENTAL PROCEDURES

- Energize the programmable controller.
- Clear the processor memory. To do this with RSLogix 500 software, go online with the processor and from the menu select "Comms" and then "Clear Processor Memory." You'll be prompted to save the program and you may do so if it is something you need to save.

3. Open the RSLogix 500 software, create a new program with the appropriate MicroLogix controller selected and set the communication path to use the DF1 serial driver then enter the following program:



- From the User tool bar, click on the "New Rung" icon.
 - Drag two XIC instructions and one OTE on to the rung. Make sure the square is green before releasing the mouse button.
 - Open the input data file and drag the addresses shown above to the appropriate XIC.
 - Open the output data file and drag the appropriate output address to the OTE instruction.
4. When you are programming with the software you are working offline, so the program now needs to be downloaded to the processor. Make sure you check the RSLinx DF1 driver to see if it is recognizing the MicroLogix controller on the network. If so download the program to the MicroLogix controller by Clicking on the drop down list in the upper left hand corner, that says "OFFLINE" and selecting "Download...". Follow the prompts and go online with the controller. If you don't see the controller in RSLinx, ask your Instructor for help.

5. Change to the RUN mode.

Q1. Looking at the PLC, close toggle switch 5 with all of the other switches off. What did you observe?

I:0.0/5 = True, got green

O:0.0/3 = NO ENERGIZE

Q2. Now close toggle switch 2. What did you observe?

I:0.0/2 = green = True

O:0.0/3 = ENERGIZE → green

Q3. Right click on one of the XIC instructions and select "Goto Data Table". Drag the window down a little so you can see rungs and the data table. Open toggle switch 5 and 2. What happened to the XIC instructions on the ladder and what values do you see in the data table at addresses I:0.0/5 and I:0.0/2?

green go OFF in both XIC

I:0.0/5 = 0

I:0.0/2 = 0

Q4. Now close toggle switch 5 and 2. What happened to the XIC instructions on the ladder and what values do you see in the data table at addresses I:0.0/5 and I:0.0/2?

- on the ladder they change to green

on the data table I:0.0/5 = 1 and I:0.0/2 = 1

Q5. Describe how the on and off position of the toggle switches affects the data table value for that corresponding address.

The on/off position change the state of the addresses in the data table from 0 to 1 or viceversa

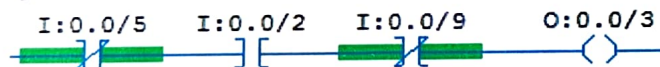
Q6. Describe how the on and off position of the toggle affects the XIC instruction and it's green handles for that corresponding address.

The xic instruction change from no green to green handle or false to true reciprocally go from green to no green or true to false

Q7. Complete the Truth Table below for this program. Refer to page 122 in your textbook.

XIC I:0.0/5	XIC I:0.0/2	OTE O:0.0/3
0	0	0
1	0	0
0	1	0
1	1	1

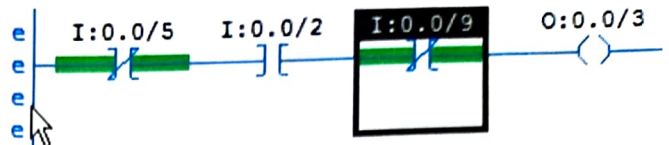
12. Go offline and edit your program to look like the one below:



- Right click on the XIC with address I:0.0/5 and select change "Change Instruction Type". XIC will be highlighted.
- Type "xio" and press enter. Notice it isn't case sensitive.
- From the user tool bar, drag an XIO instruction to the right of the remaining XIC and drop it on a green box. Repeat the process if you miss the green box.
- Double click on the "INPUT" Data File, select address I:0.0/9 and drag it from the file to the XIO instruction with the "?" on it and release it on a green box. You may have to drag the Data File window to a different location before selecting your address if it is covering the instruction you want to operate on.

e) Your screen should look something like the one below:

Notice the "e's" the arrow is pointing to means the rung is in the process of being edited. You could run the Verify File or Verify project to eliminate them, but the RSLogix 500 software will do



that anyway, so at this point download the program to the MicroLogix controller. The Revision Prompt may come up and if so click "OK" but first look at the ladder rung and notice that the "e's" are gone. This means the software run the Verify Project routine and found no errors in the program. This doesn't mean your program is right, it only means you didn't violate any programming rules for the MicroLogix. Follow all of the prompts to put the processor back into run mode and go online with it.

Q8. Looking at the PLC, close toggle switch 2 with all of the other switches off. What did you observe?

Switch 2 go green = true and O:0.0/3 go green = energize

Q9. Now close toggle switch 5 and 9. What did you observe?

Switch 5 and 9 green handle disappear O:0.0/3 = NO energize

Q10. Right click on the XIC instruction and select "Goto Data Table". Drag the window down a little so you can see the rungs and the data table. Open all of the toggle switches. What happened to the XIC instruction on the ladder and what value do you see in the data table at addresses I:0.0/2 and what happened to it's green handles on the ladder?

The green handle disappear I:0.0/2 = 0

Q11. Now close toggle switch 5 and 9. What happened to the XIO instructions on the ladder and what values do you see in the data table at addresses I:0.0/5 and I:0.0/9?

green handle disappear I:0.0/5 = 1 and I:0.0/9 = 1

Q12. Describe how the on and off position of the toggle switches affects the data table value for that corresponding address.

The toggle switches change the state of the data table addresses from 1 to 0 and vice versa

Q13. Describe how the on and off position of the toggle affects the XIO instructions and its green handles for that corresponding address.

The toggle switches change the XIO instruction from green handle to no green handle or false to true

Q14. Describe how the on and off position of the toggle affects the XIC instruction and its green handles for that corresponding address.

The toggle switches change the XIC instruction from no green handle to green handle or false to true

Q15. Complete the Truth Table below for this program. Notice how adding the extra XIO instruction in the program added extra Truth Table combinations. Counting in binary insures that no combinations are missed. The count goes 000, 001, 010, 011, 100, 101 and 111. Which binary values cause the OTE to energize?

XIO I:0.0/5	XIC I:0.0/2	XIO I:0.0/9	OTE O:0.0/3
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	1	0