Rationale: Module 1 - Find and trace signals through function blocks

Current Situation

The general strategy of the course is to store the higher-order decisions a technician has to make in a troubleshooting job aid. The job aid guides the technician through the troubleshooting process more efficiently and accurately than if the technician had to commit each decision and subsequent decisions to memory.

During the troubleshooting process, certain sets of actions come up time and time again. For example, whether the problem is with a motor, a pump, or a valve, a technician will often have to trace through the function block logic that governs how the device operates. If a technician committed the tracing skills to memory, they could work through any problem faster. The troubleshooting job aid could also be written more efficiently because it could assume a certain skill level to begin with.

The goal of this module is to develop the student's proficiency in the core troubleshooting sub-skills so they are ready to learn the higher-order decisions they have to make to solve specific problems.

Accomplishment-Based Instructional Model

Because employers are looking for successful on-the-job performance when technicians leave the course, the course is designed according to an accomplishment-based instructional model. In an accomplishment-based model, the designer asks, "What are the outputs-of-value the students have to produce?" (Harless, 1987) Those outputs provide the context for the course and guide the designer through the entire analysis, design, and development process. They also provide a way for students to find meaning behind any effort they make in the course and to be able to relate it to their own lives, experiences, and situations.

As Harless points out, an accomplishment-based model has these advantages:

Advantage		Reason
1	Increased value and relevancy of content learned	Employers place value on the accomplishments (outputs) the employees produce. Deriving course content from the behavioral processes required to produce those accomplishments ensures the content will also be relevant and valuable. Additionally, setting the content in the context of valued-accomplishments gives us a basis for discriminating between all-there-is-to-know and valuable-to-know.
2	Increased attention and effort by students	If we derive content directly from the accomplishments students know they have to produce on the job, they will see that content as more meaningful. This increases the chances that they will expend the energy required to learn it.
3	Allows for more in-depth learning	Less quantity means more quality. Accomplishments give us a way to narrow the scope of the content. This gives more time to build the students' fluency in the content. The more fluent the student is, the more successful they will be at producing the accomplishments back at the workplace.
4	Increases probability of transfer	If we derive content from behavioral processes, it is more likely that content will be presented in the same signal-action configuration students will see on the job. This increases the probability that the student will transfer what they learned to the job, where the same signal-action configuration is required.
5	Allows for more meaningful assessment of learning	When outcomes are clearly defined in terms of valued-accomplishments, we can assess students' ability to produce those accomplishments. The resulting assessments will give us a more meaningful picture of how successful the student will be in applying what they've learned to the job.

In summary, I've chosen an accomplishment-based model because it offers a very useful way to:

- Ensures the course yields the results employers expect to see
- Filters out unnecessary content, thereby reducing employers' costs which results in an increased return on their investment in the training

References

Harless, J. (1987). *Accomplishment-Based Curriculum Development System*. Newman, GA: Guild V Publications.

Harless, J. (1998). *The Eden Conspiracy: Educating for Accomplished Citizenship*. Wheaton, IL: Guild V Publications.

Unit Outcomes: Module 1 - Find and trace signals through function blocks

Module goal

This module teaches a set of sub-skills the students will use regardless of the type of problem they have to troubleshoot. Once they are proficient in these sub-skills, they will be ready to focus on the discriminations and generalizations required to troubleshoot specific types of problems.

Unit outcomes

Each module is divided into these units:

Unit		Outcome
1.1	Prepare equipment for restart	Students will be able to produce field devices (e.g., motors, pumps, valves, sensors) that are clear of inactive alarms, clear of latched interlock conditions, and in the correct mode for operation. (Discriminations)
1.2	Find function blocks in the controller	Students will be able to produce an operator workstation that is set up to show the function block logic running in the system's controller for a field device (e.g., motor, pump, valve, sensor). (Discriminations)
1.3	Trace through function blocks	Students will be able to produce decisions about which device is causing a problem by tracing data flow through the function blocks in the controller. (Rules)
1.4	Determine I/O chassis, slot, and terminals for device	Students will be able to determine the I/O card and terminals a discrete device is wired to. (Problem solving)

Unit 1 Pre-Assessment

Objective

Determine student's incoming skill level to:

- ❑ Identify inactive alarms, latched interlock conditions, and incorrect modes
- ❑ Connect and go online to a controller
- ❑ Find the function block for a device and interpret its input and output data

Materials

- ❑ Process system trainer

Set-up

- ❑ Use the failure simulation switches on the back of the unit to set up 2 situations that require students to trace through the function blocks to resolve:
  - ❑ **Situation 1**: Make situation a problem that includes a latched interlock, which students have to clear in order to bring the equipment back into operation.
  - ❑ **Situation 2**: Make situation a problem that locks a device in the wrong mode so students have to both trace through the blocks to find the problem and put the device back in the correct mode.

Procedure

- ❑ Have student go to the process system trainer.
- ❑ Tell them to identify any problems they see and to gather as much diagnostic information about those problems as they can.
- ❑ Give only enough prompting so you can assess student's skills in the items on the observer's checklist.
- ❑ If student finds the block for a device, ask:
  - ❑ What state is the output in?
  - ❑ Why is the output in that state?
- ❑ Complete the observer's checklist as student works through the situations.

Observer's checklist	Actions — Did student…		Yes	No
	1.	Identify device with latched interlock?		
	2.	Identify device that is in wrong mode?		
	3.	Use at least one of the sources on the operator workstation to determine the block for each device?		
	4.	Connect correct cable and go online to correct controller?		
	5.	Find block for device in some way?		
	6.	Determine the state of the block's output?		
	7.	Identify the reason the output is in that state?		

Unit 1.1: Prepare equipment for restart

Objective

By the end of the unit, students will be able to produce field devices (e.g., motors, pumps, valves, sensors) that are clear of inactive alarms, clear of latched interlock conditions, and in the correct mode for operation.

Materials

- ❑ Process system trainer for each pair of students
- ❑ Handouts of screen prints showing examples of operator software screens with different combinations of alarms, interlock conditions, and device modes
- ❑ Computer and projector to show how to clear alarms, clear interlocks, and change modes

Lesson 1 (Preview)

5 min

- ❑ Tell students the objective of the unit.
- ❑ Tell students that they have clear alarms, clear interlocks, and put devices in the correct mode after they work on the equipment and fix the problem.
- ❑ Emphasize that if they overlook this last part of troubleshooting, it will prevent the operators from resuming production and cause unnecessary downtime.
- ❑ Show live examples of alarms, tripped interlocks, and wrong modes on an operator workstation.

Lesson 2 (Presentation)

10 min

Identify alarms that need to be acknowledged

- ❑ List the 4 severity levels of active alarms. Draw the symbol for each and show an example.
- ❑ Show how the alarm symbol changes to a blue or white bell when the tripping condition goes away.
- ❑ Tell students the key rule about acknowledging alarms: A blinking alarm means you have to acknowledge or reset it. Show several examples.
- ❑ Have students do Activity 1.1A.
- ❑ Give them feedback as soon as they finish.

Lesson 3 (Presentation)

10 min

Identify the mode of a device

- ❑ List the 5 modes a device can be in. Show and example of the symbol for each mode.
- ❑ Draw the order of precedence among modes. Demonstrate how a mode with higher precedence overrides the commands of a lower-precedence mode.
- ❑ Have students do Activity 1.1B.
- ❑ Give them feedback as soon as they finish.

Lesson 4 (Presentation)

5 min

Determine interlock status

- ❑ Show examples of the stop sign symbol that means interlock conditions are not met.
- ❑ List a few interlock conditions. Have students identify interlock conditions they are familiar with.
- ❑ Have students do Activity 1.1C.
- ❑ Give them feedback as soon as they finish.

Lesson 5 (Presentation)

10 min

Clearing alarms, clearing latched interlocks, and changing modes

- ❑ List the steps for clearing an alarm.
- ❑ Have students talk you through the steps of clearing an alarm while you do them.
- ❑ List the steps for clearing a latched interlock.
- ❑ Have students talk you through the steps of clearing a latched interlock while you do them.
- ❑ List the steps for changing modes.
- ❑ Have students talk you through the steps of changing modes while you do them.

Lesson 6 (Practice-to-fluency)

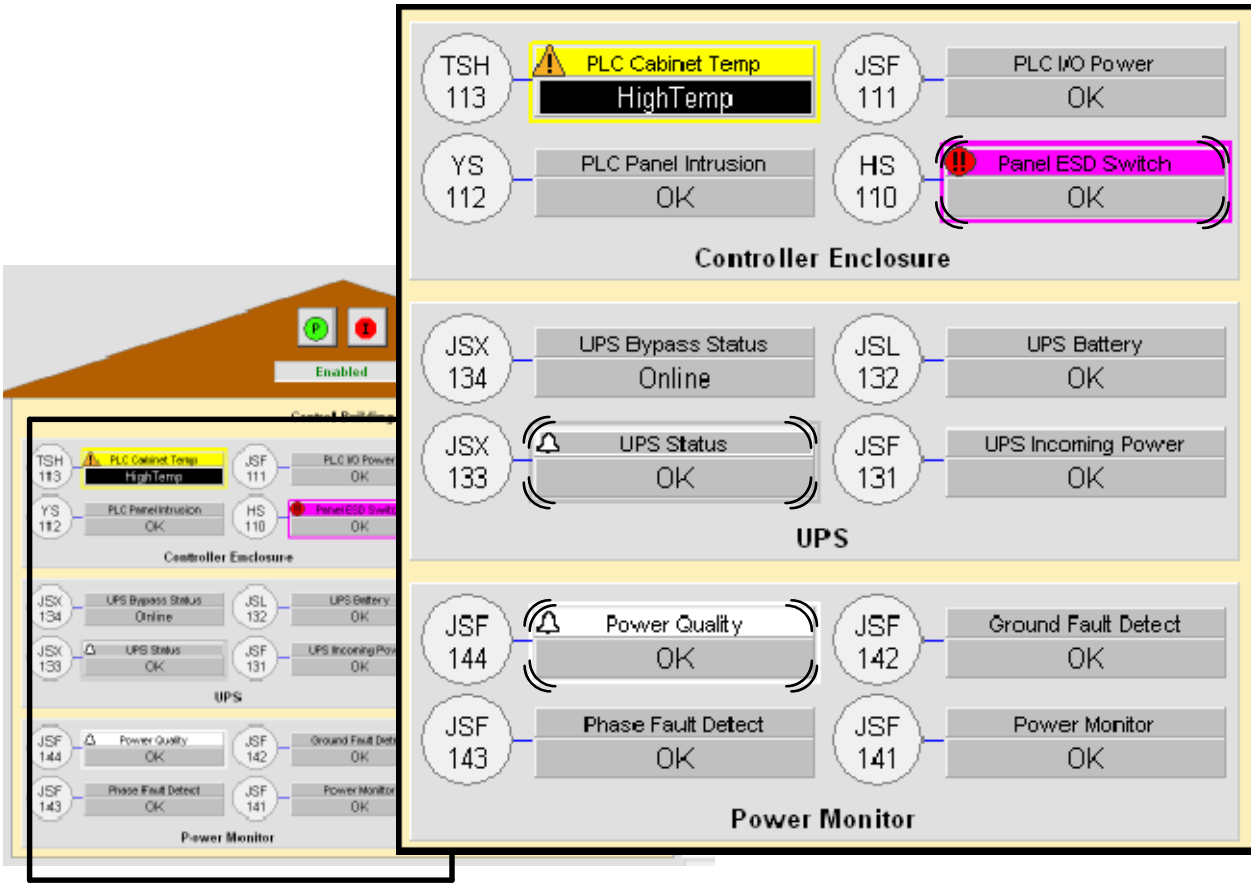
5 min

Clearing alarms, clearing interlocks, and changing modes

- ❑ Have students do Activity 1.1D as fast as they can.
- ❑ Review the answers as soon as they finish.

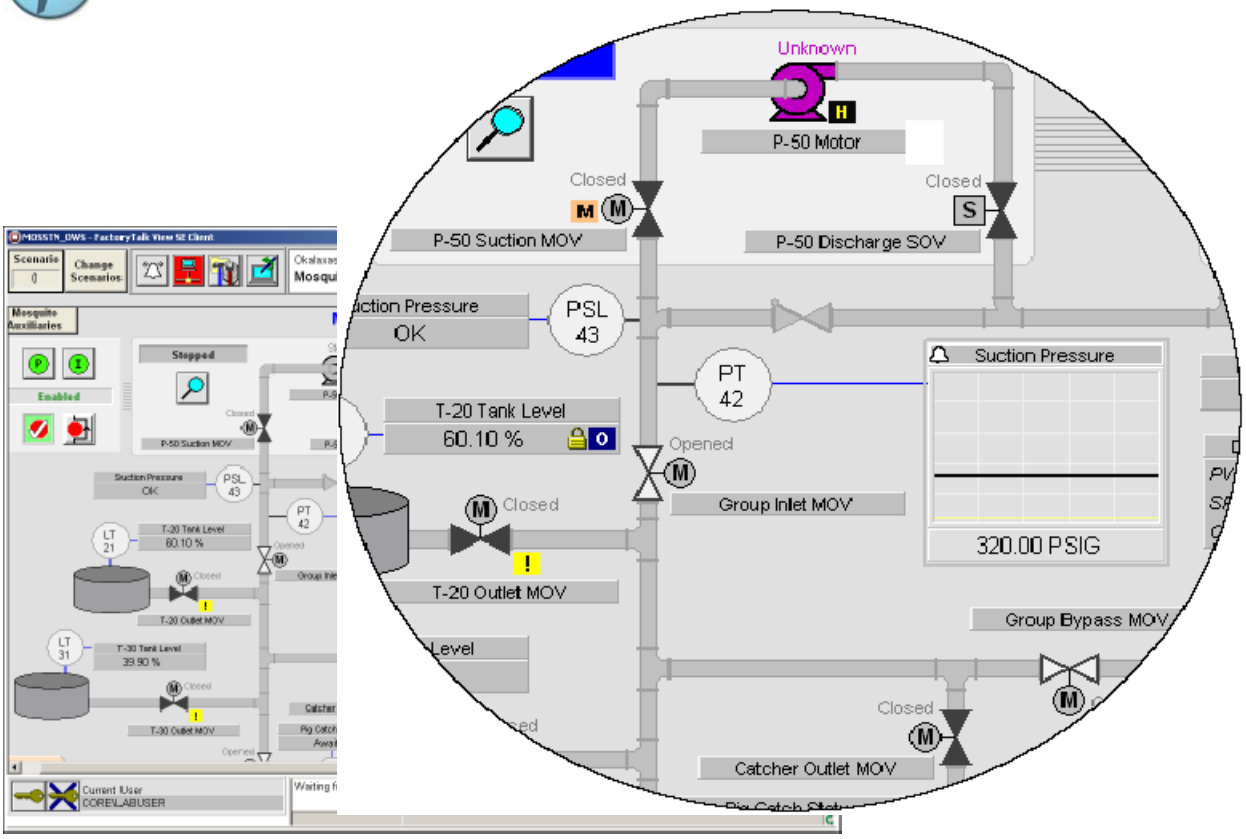
Activity 1.1A: The picture below shows an operator workstation with several alarms in various states.

Double lines around an alarm mean the alarm is blinking.



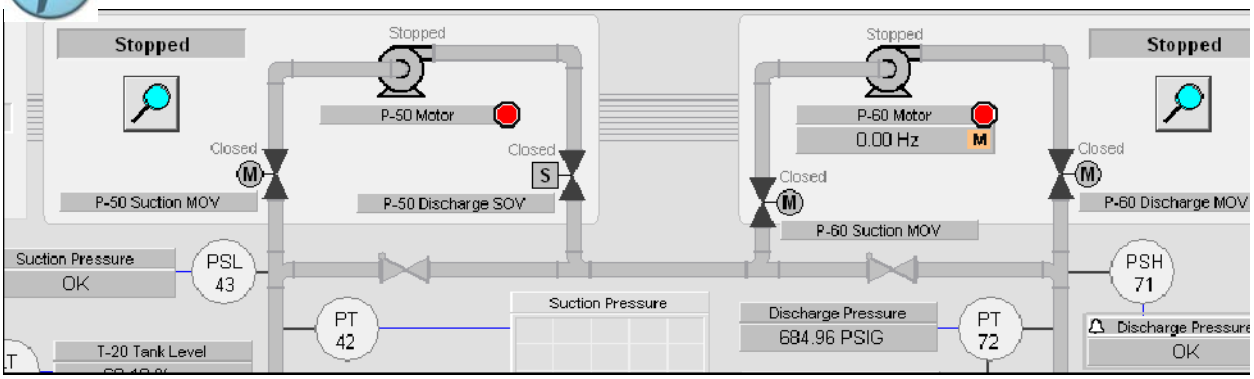
Decide which alarms are waiting to be acknowledged or reset and list the devices in the space below:

Activity 1.1B: The picture below shows devices in various modes and alarm states.



Decide which devices are in Hand, Maintenance, or Override mode. List the devices and their mode in the space below. Also list any devices with unacknowledged alarms.

Activity 1.1C: The picture below shows devices in various modes and alarm states.



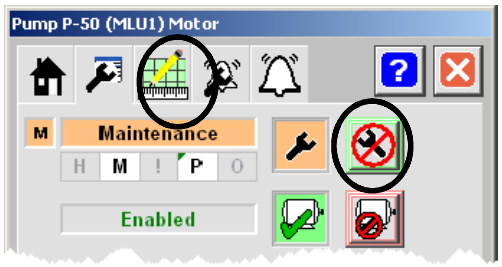
Decide which devices are not ready to run because of interlock conditions, mode, or alarm. List them below along with the reason: interlock, mode, alarm.

Activity 1.1D: Set up several alarms and latched interlocks and then pretend you have cleared the problems and are ready to restart the equipment:

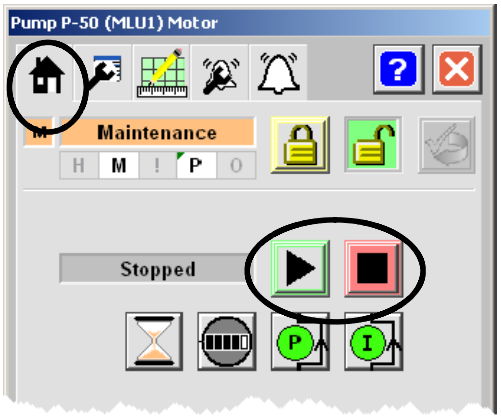
1. Go to the operator workstation on your process system trainer.
2. Go to the Station Control display, if you aren't there already.
3. Press the Change Scenarios button in the upper left corner of the display and enter "4".
4. Acknowledge and Reset all alarms.
5. Reset any latched interlocks.
6. Put P50_Motor in Maintenance mode and then start and stop it. Take it out of Maintenance mode when you are done.
7. Put XV_51 in Maintenance mode and then open and close it. Take it out of Maintenance mode when you are done.
8. Change back to scenario "0".

Answers: Activity 1.1D

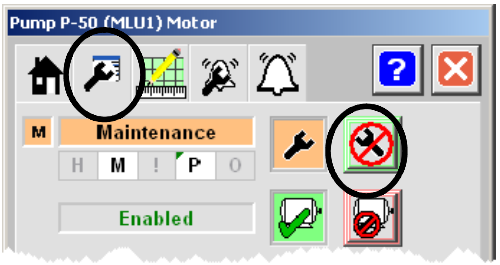
4. You should have acknowledged or reset these alarms:
   - ❑ LI_21 had a device failure that was back to normal.
   - ❑ PI_80 had a High-High alarm that was back to normal but latched
5. You should have reset these latched interlocks:
   - ❑ P50_Motor had a high bearing temperature that was back to normal.
   - ❑ P60_Motor had a power loss that was back to normal.
6. To run a device in Maintenance mode, remember to:
   - ❑ Request Maintenance mode on the Maintenance tab.



   - ❑ Use the command buttons on the Home - Operator tab.



   - ❑ Release Maintenance mode when you are done.



Unit 1.2: Find function blocks in the controller

Objective

By the end of the unit, students will be able to produce an operator workstation that is set up to show the function block logic running in the system's controller for a field device (e.g., motor, pump, valve, sensor).

Materials

- ❑ Process system trainer for each pair of students
- ❑ P&ID drawings for the simulated process that is running on the process system trainers
- ❑ Activity handouts
- ❑ Job aid cards for going online and finding blocks
- ❑ Computer and projector to show examples from simulated system

Lesson 1 (Preview)

3 min

- ❑ Tell students the objective of the unit.
- ❑ Tell students that for some problems they need to get additional diagnostic information by looking at the logic running in the controller.
- ❑ Emphasize that the faster they can find the data they need, the faster they will be at troubleshooting the problem.

Lesson 2 (Presentation)

10 min

Identify the name of the function block for a device

- ❑ Have students find the P&ID drawings for their process trainers. Explain that each device on the drawings has a corresponding function block in the controller.
- ❑ Show a live screen from the operator workstation. Show the different places to find the name of the block for each device:
  - ❑ Tool tip
  - ❑ Lower-right corner of the Home – Operator tab
  - ❑ Engineering tab
- ❑ Have students do Activity 1.2A.
- ❑ Give them feedback as soon as they finish.

Lesson 3 (Presentation)

10 min

Find your way around the logic in the controller

- ❑ Go online to the controller in a process system trainer. Open the Browse Logic window to show the logic in the controller.
- ❑ Show and tell students how the logic is structured within the controller:
  - ❑ Tasks determine how often to scan…
  - ❑ …programs, which contain groups of block and related logic called…
  - ❑ …routines that perform a specific function for a section of equipment and is divided into…
  - ❑ …sheets of blocks for specific groups of devices
  - ❑ Engineering tab
- ❑ Have students do Activity 1.2B.
- ❑ Give them feedback as soon as they finish.

Lesson 4 (Presentation)

20 min

Find a block online in the controller

- ❑ Tell students that once they know the name of the block they want, they are ready to go online and find it in the controller.
- ❑ Clarify these terms:
  - ❑ **Offline**: Looking at a static view of the controller's logic that is stored in a file on your computer
  - ❑ **Online**: Looking at the running view of the logic that is currently running in the controller
  - ❑ **Download**: Move a new file from your computer to the controller
  - ❑ **Upload**: Take a snapshot of the logic running in the controller and make it a file on your computer
- ❑ **Step 1:** Show and tell students the first thing they have to do is connect their computer to the controller. Point out these options:
  - ❑ Ethernet cable
  - ❑ USB cable

Lesson 4 (Presentation)

Cont.

- ❑ Pass out the job aid cards. Tell students they should use them in class and back on the job until they can do the steps accurately and quickly each time they need to.
- ❑ **Step 2:** Have students be your job aid by talking you through how to go online to the controller.
- ❑ **Step 3:** Have students be your job aid by talking you through how find a block for a device.
- ❑ Go back offline and repeat steps 2 and 3 several more times.

Lesson 5 (Practice-to-fluency)

10 min

Find blocks online

- ❑ Have students do Activity 1.2C. Tell them to time how long it takes them to find each block. Challenge them to get faster with each block.
- ❑ Review the answers as soon as they finish.

Job aid cards

Go online to a controller

1. Open the RSLogix 5000 project for the controller if you have it..
2. From the Communications menu, choose Who Active.
3. Browse to the controller and select it.
4. Do you have the project open?

Yes	Click Go Online.
No	A. Click Upload. B. Click Select File. C. Leave the default File name and click Select. D. Click Yes to create the file and upload.

Go online to a controller

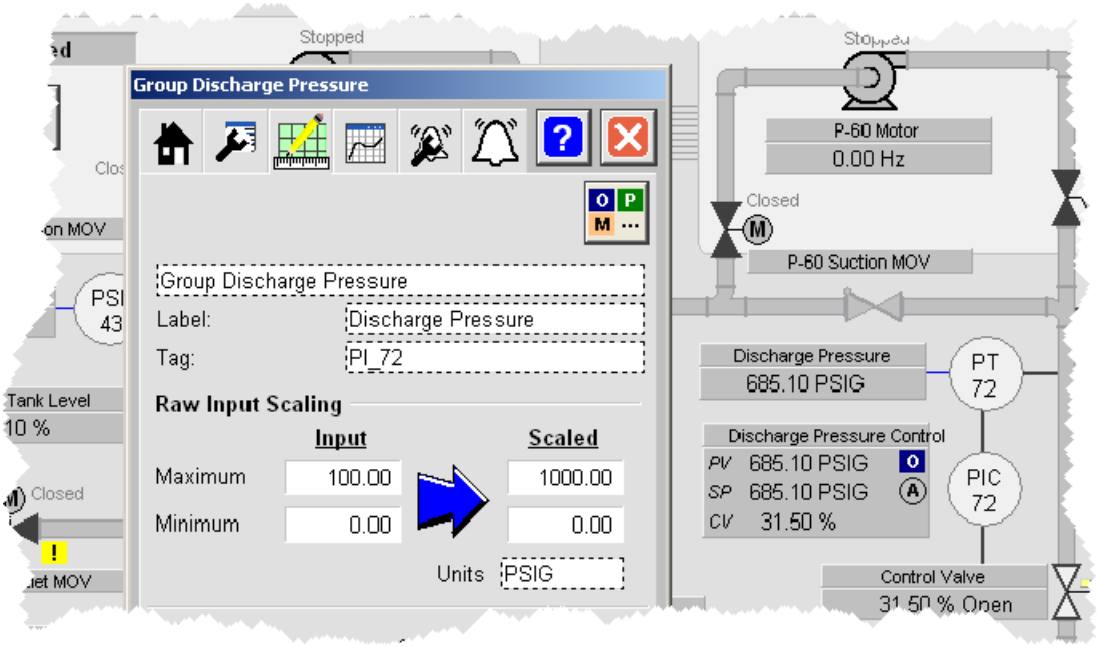
1. Press CTRL + F.
2. Choose a Limit To option:

To find	For example	Choose
Block		Text Only
Alias tag		
Documentation		
I/O module tag		References to Tag

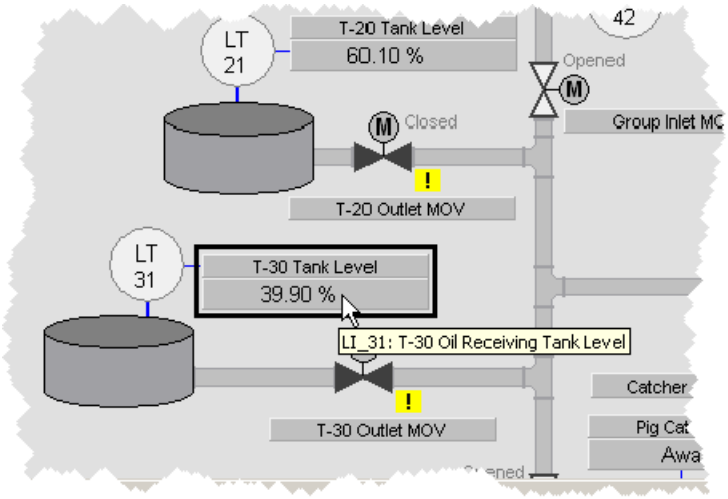
3. In the Find What box, type the characters that you want to find.
4. Make sure the Find Where drop-down list is set to All Routines.
5. Make sure the Wrap check box is selected.
6. Click Find Next each time you want to find a match.

Find a tag (e.g., block)

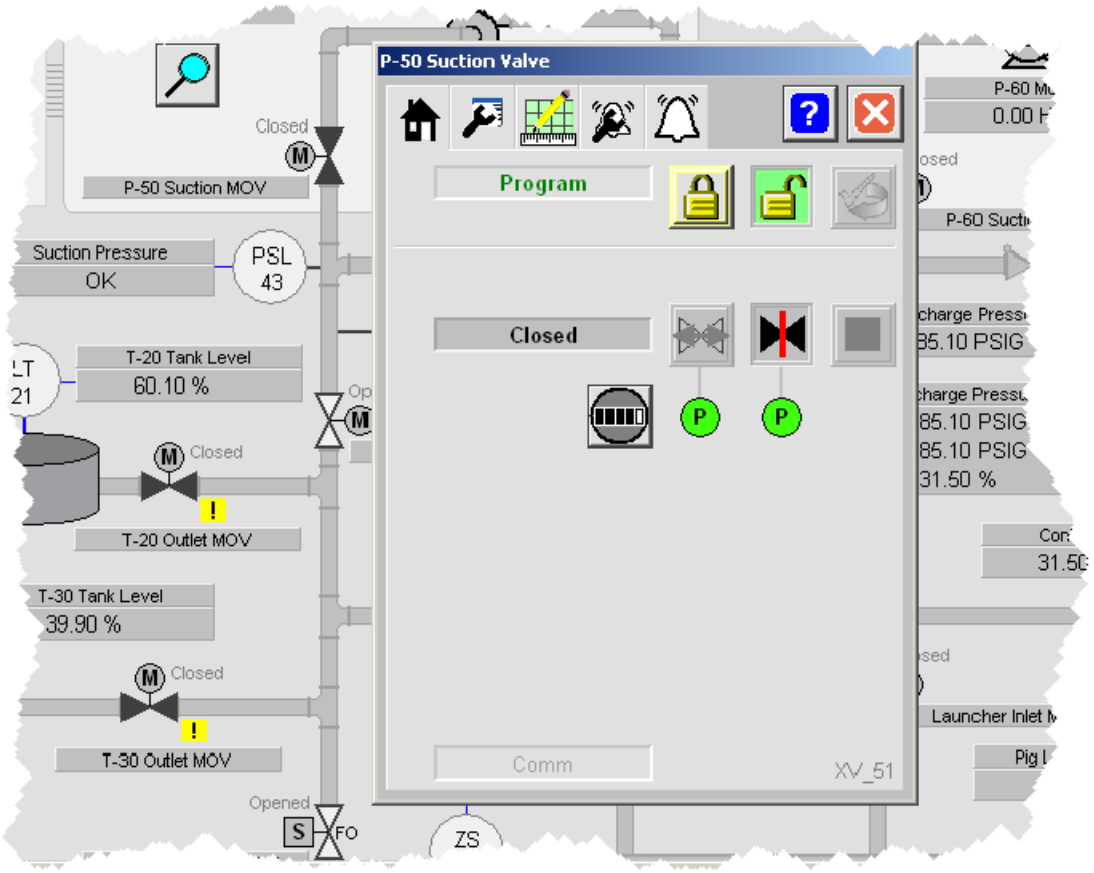
Activity 1.2A: Here's a series of pictures showing sections of the operator workstation. Find the name of each block called out.



The name of the block for PT72 is:



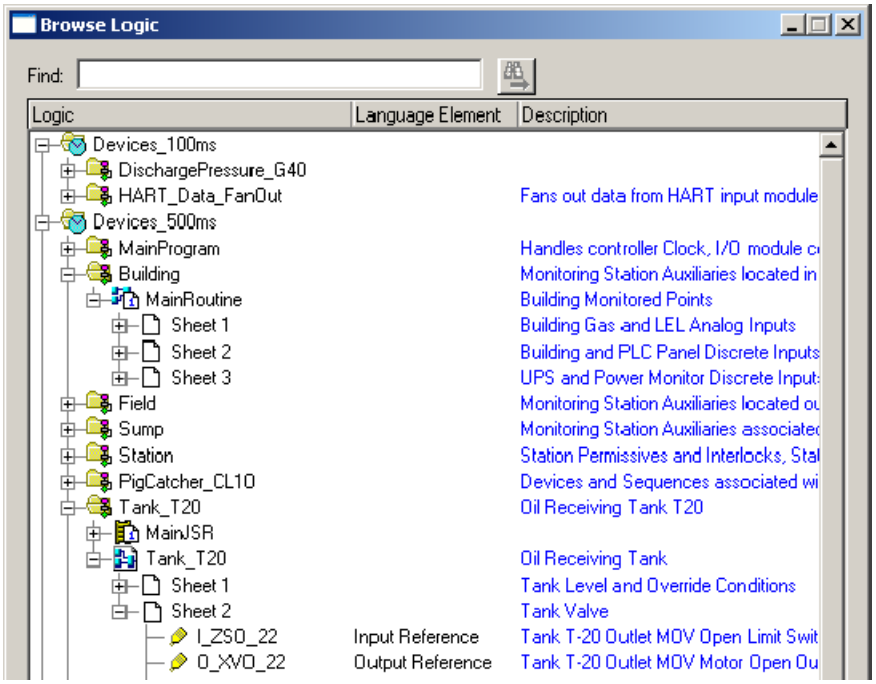
The name of the block for LT31 is:



The name of the block for P-50 Suction MOV is:

Activity 1.2B: Here's picture of the Browse Logic window for the project running in your training unit. Mark-up the picture like this:

- ❑ Put a large "T" next to the name of each task.
- ❑ Draw a large circle around each program.
- ❑ Draw a circle with a squiggly line around each routine.
- ❑ Draw a small square next to each sheet.



Activity 1.2C: Use your PlantPAx training unit to practice finding blocks online. You'll have to work between the operator displays and RSLogix 5000 software:

1. Go to the operator workstation (OWS) on your process system trainer.
2. Go online to the controller in your training unit. It's RSLogix 5000 project file is named MOSSTN_Ctrlr.
3. Find each of the blocks listed below and write down where you found it:

The block for this device	Is in this program	In this routine	On this sheet
PT42			
P50			
FSL P50			

Answers: Activity 1.2C

4. You should have found the blocks here:

The block for this device	Is in this program	In this routine	On this sheet
PT42	Group_G40	Group_Devices	2 – Pressure Transmitters
P50	Pump_P50	P50_Devices	6 – Pump Motor
FSL P50	Pump_P50	P50_Devices	3 – Analog, Discrete Inputs from misc devices

Unit 1-3: Trace through function blocks

Objective

By the end of the unit, students will be able to produce decisions about which device is causing a problem by tracing data flow through the function blocks in the controller.

Materials

- ❑ Process system trainer for each pair of students
- ❑ Activity handouts
- ❑ Computer and projector to show examples

Lesson 1 (Preview)

5 min

- ❑ Tell students the objective of the unit.
- ❑ Tell students once they find the block for a device they can use it to narrow down the problem. This often requires they trace through the logic to find the source of a problem.
- ❑ Tell students that the logic in the controller is laid out like a map that leads them to the source of a problem. The faster they can read the map, the faster they can find and fix the problem.
- ❑ Give students an overview of the rules they will use the trace through function blocks:
  - ❑ **Rule 1:** To see an output from a block, look for a pin on the right.
  - ❑ **Rule 2:** To see an input to a block, look for a pin on the left and trace along the wire upstream to the pin at the other end.
  - ❑ **Rule 3:** Treat ICONs and OCONs as if they are parts of the wire passing through to another place on the sheet or on a different sheet.
  - ❑ **Rule 4:** If an output value is NOT OK, interpret the block and decide which pins to trace upstream to their source values.
  - ❑ **Rule 5:** When you come to an IREF, determine if you've reached an input device or a connection to other logic.
  - ❑ **Rule 6:** If you come to another block while tracing upstream, repeat rule 4.
  - ❑ **Rule 7:** If a block's output is OK, verify that any downstream blocks aren't affecting the data for the device.

Lesson 2 (Presentation)

10 min

Rule 1: To see an output from a block, look for a pin on the right.

- ❑ Draw some simple function block logic on the board that has to inputs, a block, and an output. Describe the data flow through the logic:
  - ❑ Input pins are on the block's left and feed data into the block.
  - ❑ The block processes the data according to its function.
  - ❑ Output data leaves the block from the pins on the right.
- ❑ Go online to a sample block. Point out the value at each output pin. Give students several situations and ask them what the output value is.
- ❑ Have students do Activity 1.3A.
- ❑ Give them feedback as soon as they finish.

Lesson 3 (Presentation)

10 min

Rule 2: To see an input to a block, look for a pin on the left and trace along the wire upstream to the pin at the other end.

- ❑ Tell students that sometimes they will know right away which input pin they want to look at. Give an example.
- ❑ Go online to another group of blocks. Show how to trace a wire upstream to the value at the other end.
- ❑ Give students several situations that require them to trace a wire to find the answer.
- ❑ Have students do Activity 1.3B.
- ❑ Give them feedback as soon as they finish.

Lesson 4 (Presentation)

5 min

Rule 3: Treat ICONs and OCONs as if they are parts of the wire passing through to another place on the sheet or on a different sheet.

- ❑ Show students an example of an ICON/OCON pair of connectors. Use an analogy to describe their function. For example, say that they work like a window where each one is just a different side of the same point.
- ❑ Have students do Activity 1.3C.
- ❑ Give them feedback as soon as they finish.

Lesson 5 (Presentation)

10 min

Rule 4: If an output value is NOT OK, interpret the block and decide which pins to trace upstream to their source values.

- ❑ Tell students the state of the output is the key factor in whether they trace upstream or downstream.
- ❑ Show a block that has a simple function that students can easily understand. Give them different combinations of inputs and ask them to write down the resulting output. Give them feedback on their answers.
- ❑ Now tell students to reverse the process. Show an example of an output value that is NOT OK. Ask students which pin might be causing the output to be in the wrong state. Work through a few more examples.
- ❑ Have students do Activity 1.3D.
- ❑ Give them feedback as soon as they finish.

Lesson 6 (Presentation)

15 min

Rules 5 & 6: Trace through other blocks

- ❑ Show several examples input references that read input devices and other that read outputs from other blocks.
- ❑ Tell students when they trace, they usually need to keep going until they come to a device. Point out that field devices cause 90% of the problems.
- ❑ Tell students these 2 rules and that they are related. Rule 5 often leads to rule 6:
  - ❑ **Rule 5:** When you come to an IREF, determine if you've reached an input device or a connection to other logic.
  - ❑ **Rule 6:** If you come to another block while tracing upstream, repeat rule 4.
- ❑ Have students talk you through an example of rule 5 that includes several IREFs to other blocks.
- ❑ Have students do Activity 1.3E.
- ❑ Give them feedback as soon as they finish.
- ❑ Have students do Activity 1.3F.
- ❑ Give them feedback as soon as they finish.

Lesson 7 (Presentation)

10 min

Rule 7: If an output is OK, trace downstream to make sure it reaches the device.

- ❑ Tells students that the last rule has 2 parts:
  - ❑ If a block's output is OK, verify that any downstream blocks aren't affecting the data for the device.
  - ❑ If you find an output that isn't OK on a downstream block, follow rule 4 and start tracing upstream to see why.
- ❑ Point out that this rule takes their tracing in the other direction—downstream.
- ❑ Compare the decision to trace downstream verses upstream. Show examples of outputs OK and NOT OK. Have students tell you which direction they would trace.
- ❑ Have students talk you through an example of rule 5 that includes several IREFs to other blocks.
- ❑ Have students do Activity 1.3G.
- ❑ Give them feedback as soon as they finish.

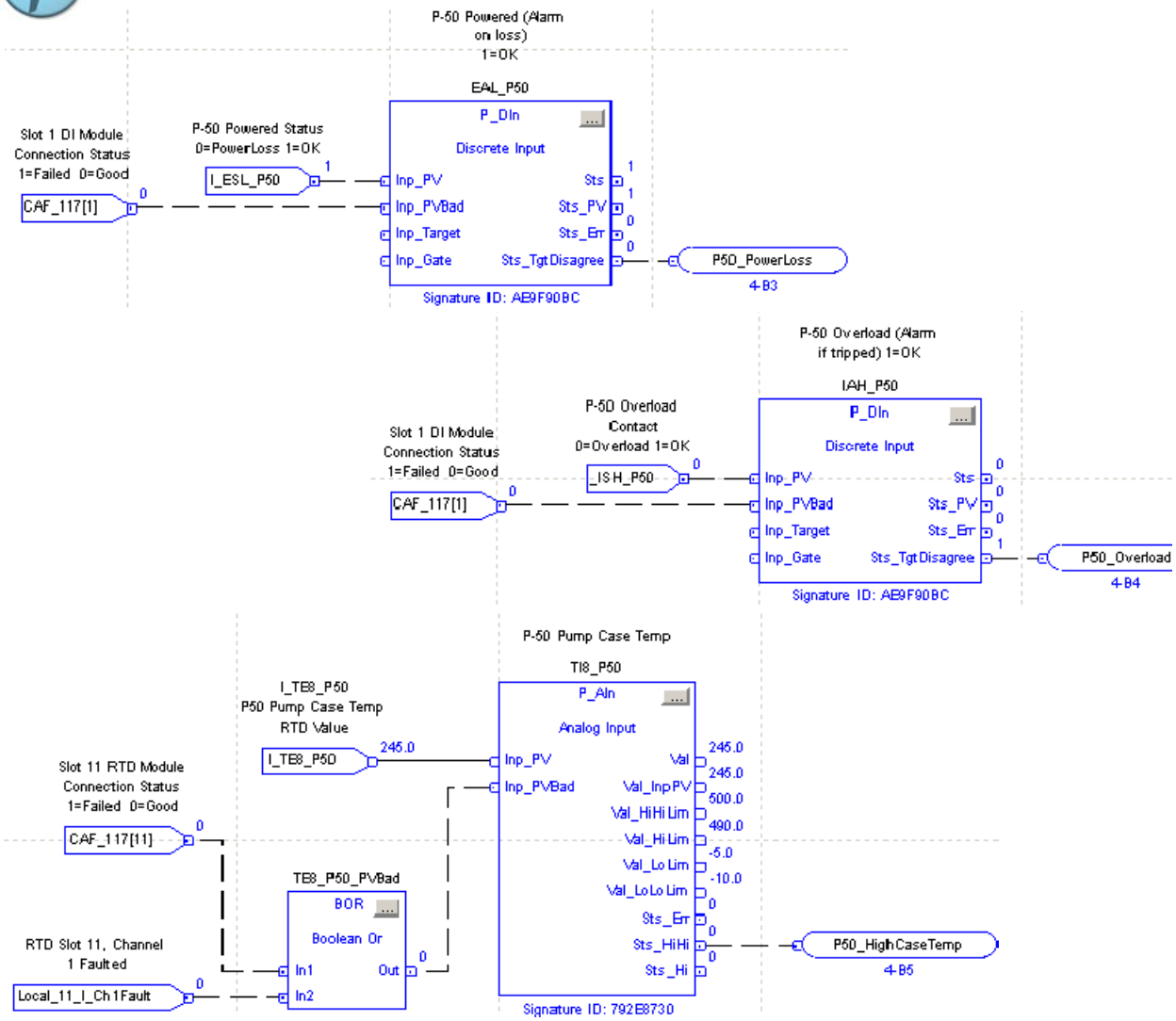
Lesson 8 (Practice-to-fluency)

10 min

Trace through blocks online

- ❑ Have students do Activity 1.3H.
- ❑ Review the answers as soon as they finish.

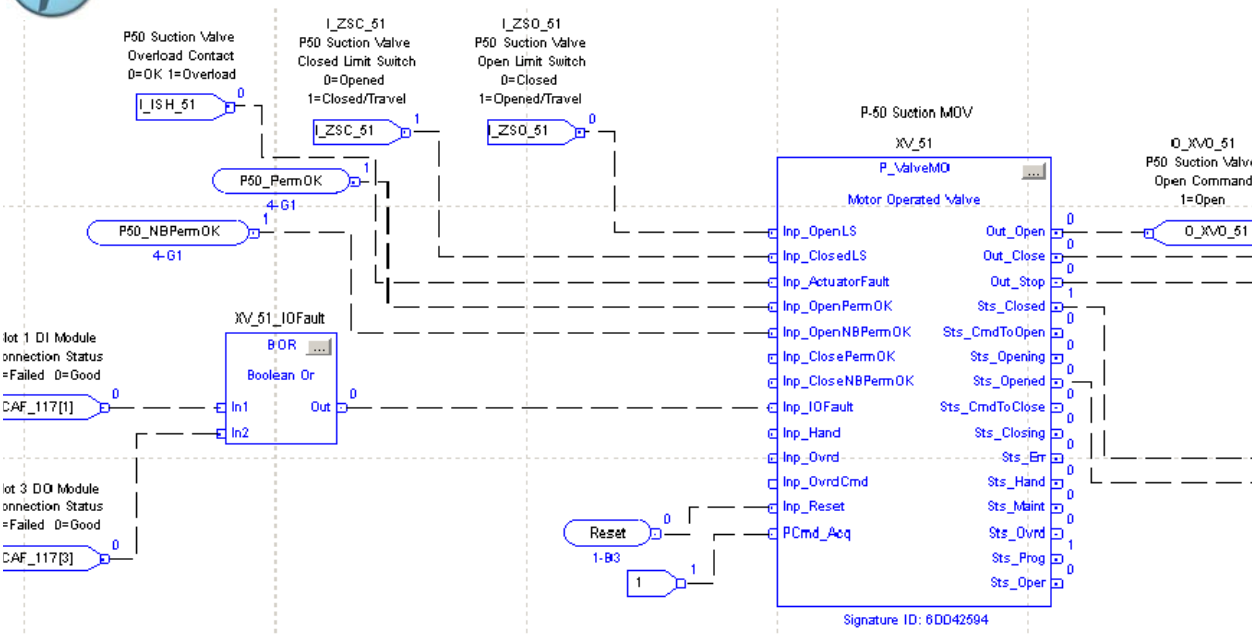
Activity 1.3A:



Identify these value for the blocks above:

To see	I would look at this pin	Which has a value of
A. If EAL_P50 is indicating there is power		
B. If VAH_P50 is indicating high vibration		
C. TI8_P50's output value to the rest of the logic		
D. High limit of TI8_P50		

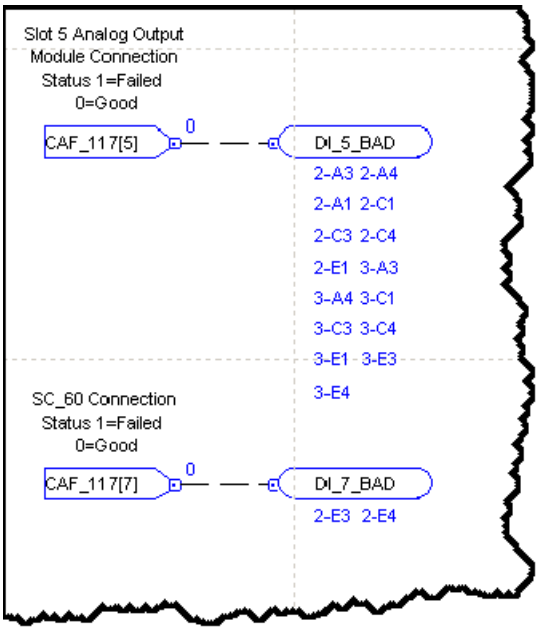
Activity 1.3B:

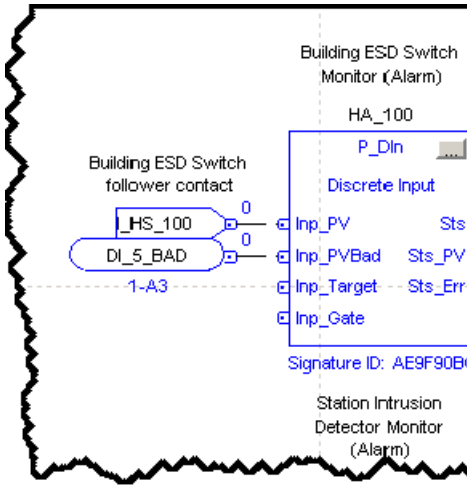


Identify these values for the blocks above:

To see if	I would look at this pin	Which has a value of
A. XV_51's closed limit switch is on or off		
B. XV_51 is sensing an actuator fault		
C. XV_51 is closed		
D. XV_51 is sensing an I/O fault		
E. XV_51 is in Operator mode		

Activity 1.3C:



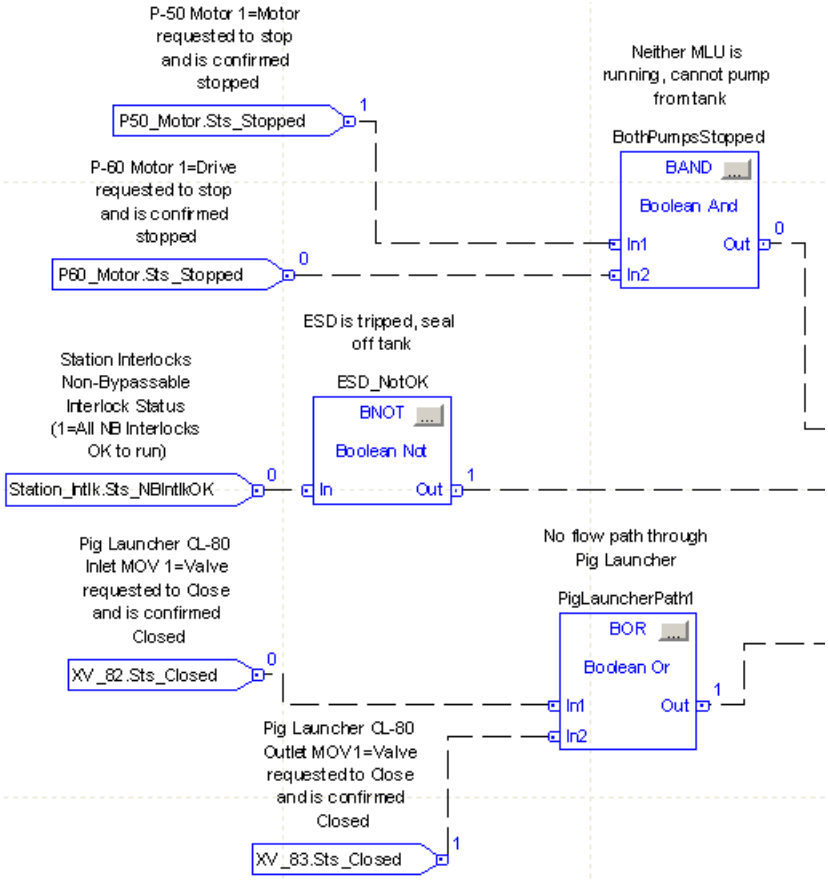


For the blocks above:

1. Is the process variable for HA_100 OK? How do you know?

2. What tag supplies to good/bad condition of the HA_100's PV?

Activity 1.3D:



This instruction	Does this
BNOT	Out = NOT In
BAND	Out = In1 AND In2 AND In3 AND...
BOR	Out = In1 OR In2 OR In3 OR...

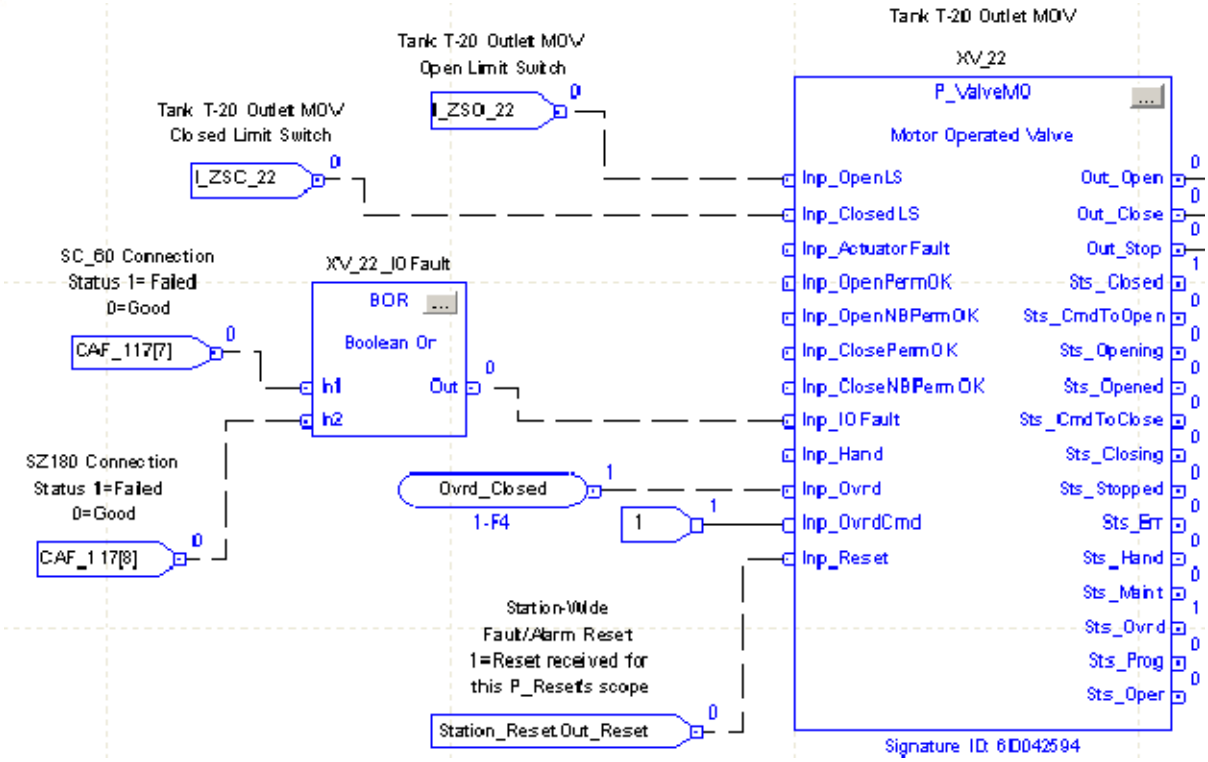
For the blocks above:

1. Why is the BNOT block flagging that the ESD is not OK?

2. Is the BothPumpsStopped block indicating you can or cannot pump from the tank? What's causing this indication?

3. Is the BothPumpsStopped block indicating you can or cannot pump from the tank? What's causing this indication?

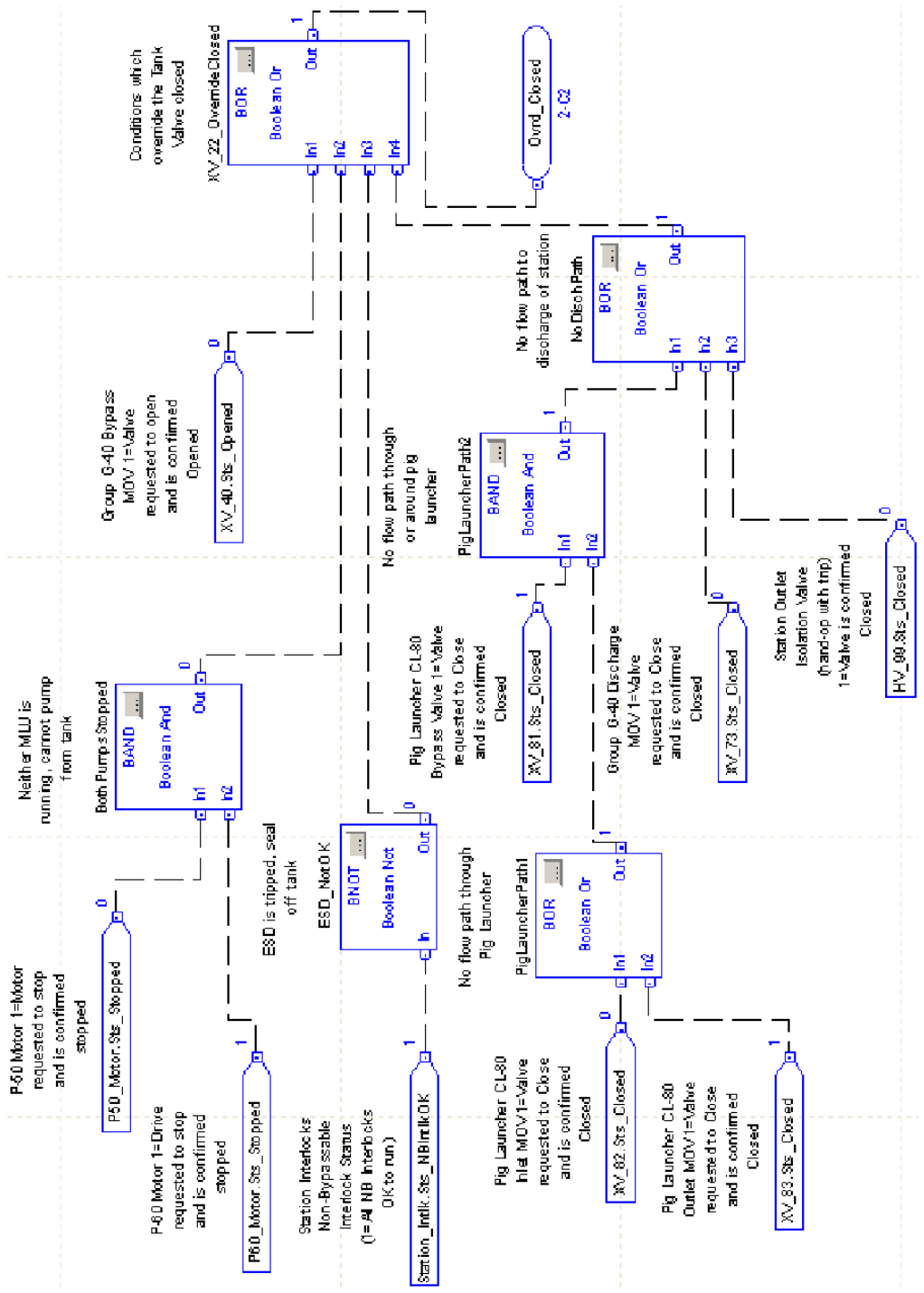
Activity 1.3E:



On the diagram above, put 1 of these letters next to each IREF:

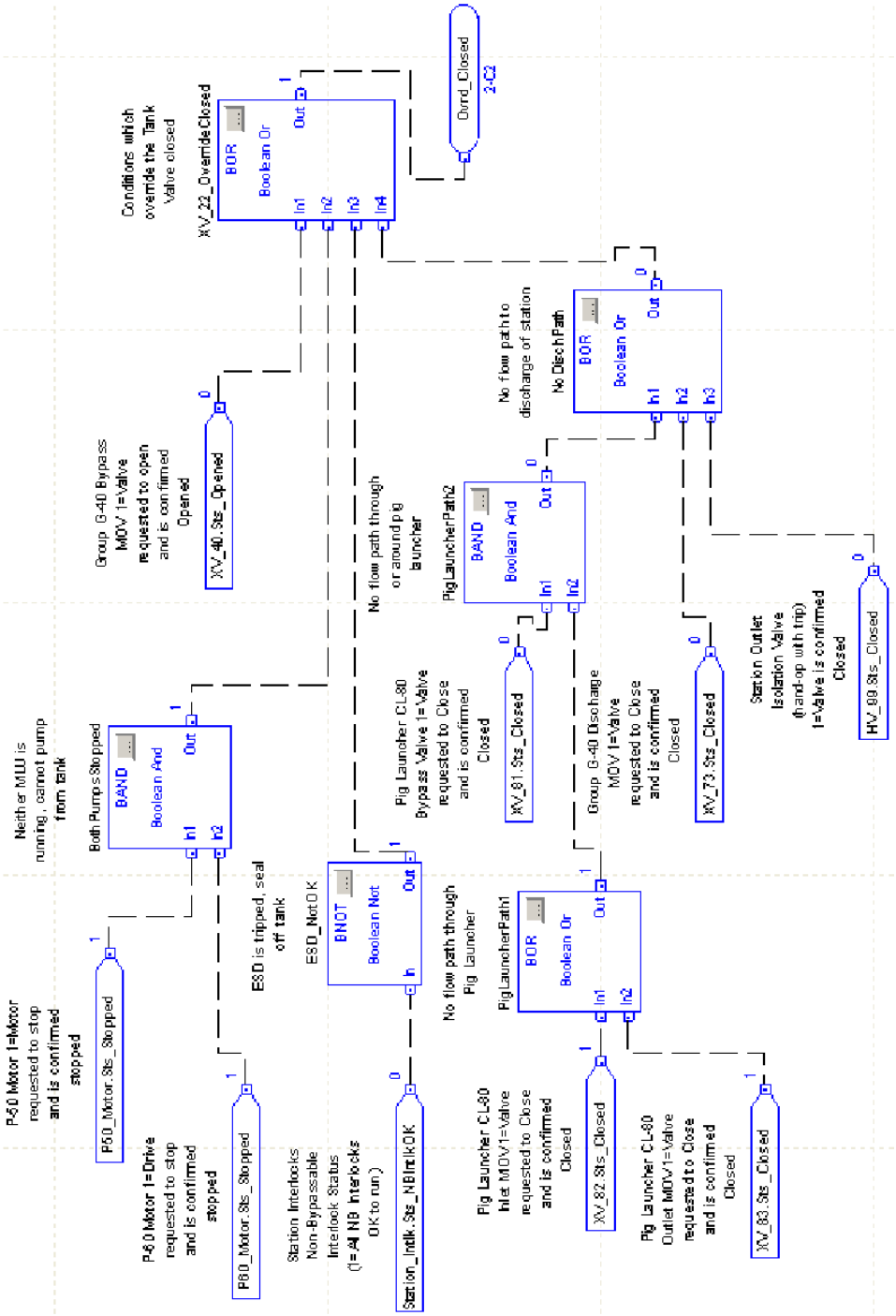
- If the IREF reads other logic, put an L.
- If the IREF reads a sensor, put an S.
- If the IREF reads a constant value, put a C.

Activity 1.3F:



Trace through the logic and determine why tank valve XV_22 is being overridden to the closed state.

Activity 1.3G:



Starting at the PigLauncherPath2 block, trace through the blocks and determine why the tank valve is still in override even though their is a flow path to discharge of station:

Activity 1.3H: Trace through the function blocks running on your process system trainer and answer these questions about the data flow:

1. Go to the operator workstation (OWS) on your process system trainer.
2. Go to the Main Control display, if you aren't there already.
3. Go online to the controller and find the block for the Group Bypass MOV.
4. According to data on the diagram, what is the state of each limit switch?

5. What is the state of the I/O fault input and what does this mean?

6. What conditions would trip an I/O fault?

7. Are permissives OK to open the valve?

8. Suppose permissives where not OK to open the valve. What tag or tags would have caused this and what state would they be in?

9. Go back to the OWS and open the Group Bypass MOV.
10. Return to the function block for the valve.
11. How does the status of the valve serve as an interlock condition? What interlock number is it?

12. Does status of the G-40 interlocks block show that the interlocks are OK to run or not OK?

13. Are the interlocks being bypassed? How can you tell?

14. Go back to the OWS and close the Group Bypass MOV.

Answers: Activity 1.3H

4. The open limit switch is 0, meaning open. The closed limit switch is 1, meaning closed.
5. Inp_IOFault is 0, meaning input communication is OK.
6. Either of these conditions trip an I/O fault: the controller loses its connection to the digital input module OR it loses its connection to the digital output module.
7. Yes. Both the open permissives and the non-bypassable open permissives are 1, meaning OK to open the valve.
8. The off-sheet connector leads to a permissives block. The block has 2 permissive inputs: Station.Sts_NBPermOK and Station.Sts_PermOK. According the their descriptions, a 1 means the corresponding permissives are OK.
11. When the valve is open, its Sts_Closed pin is 0. This signal is an input to the BNOT block. The BNOT inverts the signal and sends it to an interlocks block for the group via an off-sheet connector. The state of the valve in interlock 4.
12. Sts_IntlkOK is 0, meaning stop, not OK to run.
13. Inp_BypActive is 0, meaning interlocks are not being bypassed.

Unit 1 Post-Assessment

Objective

Determine if student can produce:

- ❑ Field devices clear of inactive alarms, clear of latched interlock conditions, and in the correct mode for operation
- ❑ Workstation set up to show the function block logic running in the system's controller for a field device
- ❑ Decisions about which device is causing a problem by tracing data flow through the function blocks in the controller

Materials

- ❑ Process system trainer

Set-up

- ❑ Use the failure simulation switches on the back of the unit to set up 2 situations that require students to trace through the function blocks to resolve:
  - ❑ **Situation 1**: Make situation a problem that includes a latched interlock, which students have to clear in order to bring the equipment back into operation.
  - ❑ **Situation 2**: Make situation a problem that locks a device in the wrong mode so students have to both trace through the blocks to find the problem and put the device back in the correct mode.
- ❑ Makes sure the situations are different from any used in the pre-assessment.

Procedure

- ❑ Have student go to the process system trainer.
- ❑ Tell them to resolve any problems as if they were on the job and an operator called them for help.
- ❑ Your role is to observe and complete the observer's checklist as student work through the situations.

Observer's checklist	Actions — Did student…		Yes	No
	1.	Identify device with latched interlock?		
	2.	Connect correct cable and go online to correct controller?		
	3.	Go directly to block for device using search tools?		
	4.	Trace through blocks in correct direction to sources of problem?		
	5.	Correctly interpret any intermediate blocks?		
	6.	Identify device that is in wrong mode?		
	Output evaluation— Is/are …		**Yes**	**No**
	1.	Identification of problems correct?		
	2.	Devices free of alarms and latched interlocks?		
	3.	Equipment ready to start?		