# Evaluation Plan: Troubleshoot a Process Automation System

## Evaluation strategy

Students are most successful transferring classroom skills to the job if the classroom experience matches or simulates the job as much as possible. The more the practice and evaluations look like the real job, the more likely the students will be at successfully applying what they learned to the job.

To support a transfer of skills, the Troubleshoot a Process Automation System course will use a process system trainer that simulates the process equipment a students will troubleshoot on the job. Students will use the trainers for hands-on practice and evaluation. This will let them:

- Practice and apply the skills/knowledge/information they are learning to real equipment in a safe and controlled setting
- Demonstrate their ability to produce the intended module outcomes under conditions that simulate the real job as closely as is safe, practical, and cost-effective

## Process system trainer

The process system trainer is a tabletop unit that simulates a process automation system. It has common components such as motors, valves, switches, relays, power supplies, and operator controls. By integrating process system trainers in the course, students get hands on practice with realistic hardware. The process system trainer also has special switches instructors can use to simulate various failures and electrical problems that happen on the job. The combination of real components and realistic problems let students practice what they are learning in an environment that closely matches the real job.

## Module evaluation plans

Each evaluation plan for a module outlines how the instructor with determine if a student can produce the target outcome of the module. The evaluation plan includes these decisions about the module's evaluation activity:

| This item | Describes this component of the evaluation activity |
|---|---|
| Result produced | What the student is to produce during the evaluation |
| Type of activity | The general type of activity the students will do, such as hands-on, role play, case study, written exercise, etc. |
| Tools/equipment/materials | The specific things required to do the evaluation activity |
| Initial situation | The context the instructor and/or materials will present to the students |
| General scenario | What the students are to do |
| Critical student actions | The most important behaviors students must successfully demonstrate during the evaluation |
| Termination/intervene | How does the student know they are done and at what point should the instructor stop the evaluation, if any |

## Module 1: Find and trace signals through function blocks

| Item | Details |
|---|---|
| Result produced | Determination of states of output signals and conditions or inputs causing them based on the blocks running in the controller |
| Type of activity | Hands on |
| Tools/equipment/materials | Process system trainer |
| Initial situation | Several alarm or non-alarm situations that required tracing through function block diagrams to determine status of input or output |
| General scenario | Students determine starting tag for each situation. Then they go online, find the tag, and trace to appropriate input or output |
| Critical student actions | ▪ Enter correct search parameters<br>▪ Correct interpretation of data flow through the function blocks |
| Termination/intervene | Activity is done when students identify the required signals and conditions. |

## Module 2: Troubleshoot discrete device alarms

| Item | Details |
|---|---|
| Result produced | Determination of cause of problem with discrete device |
| Type of activity | Hands on |
| Tools/equipment/materials | Process system trainer |
| Initial situation | Instructor sets up range of problems on process system trainer, either all at once or one at a time as students solve them. |
| General scenario | Students determine cause of each problem and mark on paper to show instructor. Instructor resets condition that students marked. Students restart process to confirm their results. |
| Critical student actions | ▪ Correctly interprets function blocks<br>▪ Safely checks voltage |
| Termination/intervene | Activity is done when students determine the cause of each problem. |

## Module 3: Troubleshoot I/O faults

| Item | Details |
|---|---|
| Result produced | Determination of cause of I/O fault |
| Type of activity | Hands on |
| Tools/equipment/materials | Process system trainer |
| Initial situation | Instructor sets up several I/O faults on process system trainer, either all at once or one at a time as students solve them. |
| General scenario | Students determine cause of each fault and mark on paper to show instructor. Instructor resets condition that students marked. Students restart process to confirm their results. |
| Critical student actions | ▪ Determine if there is more than 1 I/O fault<br>▪ Trace through function blocks to the cause of fault |
| Termination/intervene | Activity is done when students determine the cause of each I/O fault. |

## Module 4: Troubleshoot non-alarm problems

| Item | Details |
|---|---|
| Result produced | Determination of cause of non-alarm problem |
| Type of activity | Hands on |
| Tools/equipment/materials | Process system trainer |
| Initial situation | Instructor sets up range of problems on process system trainer, either all at once or one at a time as students solve them. |
| General scenario | Students determine cause of each problem and mark on paper to show instructor. Instructor resets condition that students marked. Students restart process to confirm their results. |
| Critical student actions | ▪ Correctly interprets function blocks<br>▪ Safely checks voltage |
| Termination/intervene | Activity is done when students determine the cause of each problem. |

## Module 5: Troubleshoot switchovers and operator workstation problems

| Item | Details |
|---|---|
| Result produced | Determination of cause of switchover or workstation problem |
| Type of activity | Hands on |
| Tools/equipment/materials | Process system trainer |
| Initial situation | Instructor creates several switchovers and workstation problems one at a time on process system trainers as students solve them. |
| General scenario | Students determine cause of each problem and mark on paper to show instructor. Instructor resets condition that students marked. Students restart process to confirm their results. |
| Critical student actions | ▪ Correctly determines which controller or server is functioning as the primary one<br>▪ Determines cause of switchover without failing the working controller<br>▪ Distinguishes between a problem at the server verses one at the workstation |
| Termination/intervene | Activity is done when students determine the cause of each switchover or problem. |