



# PROBLEM BASED LEARNING

## Environmental Control Technology

(Heating, Ventilation,  
Air Conditioning and Refrigeration)



### ECT 27: Advanced Direct Digital Controls

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## **PROBLEM BASED LEARNING (PBL) SCENARIO**

**Instructor:** Chuck Frost

**Course:** Direct Digital Controls Advance Class

**Course Number/Code:** ECT 027

### **SCENARIO TITLE**

“Why is the light on?”

### **Course Concept:**

Troubleshooting at the laser laboratory control system, by determining the sequence of operation and the unknown cause of the light being on in the University of California, Berkeley, laser laboratory.

### **SCENARIO DURATION**

2 class periods

- Date: \_\_\_\_\_ Introduction and discussion of the Problem Based Learning (PBL) scenario
- Date: \_\_\_\_\_: Presentation and documentation of the problem and proposed solutions

### **BUSINESS PARTNER**

University of California, Berkeley

### **LEARNING OBJECTIVES**

By the end of the semester, students will be able to demonstrate the ability to:

- Identify applicable equipment documentation
- Interpret control documentation for a particular job and identify where to find necessary research information
- Determine the problem, provide solution(s) and recommendations
- Properly document the problem, solution(s) and recommendations

### **THE FOCUS OF THE PROBLEM**

The focus of this Problem Based Learning (PBL) scenario is based around a real life scenario.

In various settings, the Problem Based Learning (PBL) scenario may be presented as a real time problem, hands-on scenario, or hypothetical problem. Using critical thinking and investigation, the students go through a process to solve a problem and provide recommendations for a solution.

### **PROBLEMATIC SITUATION**

There is a professor at the University of California, Berkeley, that noticed that there was a light on in his laboratory. Each time he entered the laboratory, he noticed that this light remained on indefinitely. While inspecting the laboratory he found that there was no problem with the laser and everything in the laboratory was working properly, but the light still remained on.

It is your job to investigate why the light is on, the possible solution(s) and provide future recommendations to the professor.

Questions to think about while investigating the Problem Based Learning (PBL) scenario:

**WHO** is involved?

**WHAT** is not working?

**WHEN** did the problem start?

**WHERE** is this scenario taking place?

**TIME** pressures or deadlines?

### **STUDENT MATERIALS**

The instructor will provide students with the following information:

- A copy of the Problem Based Learning (PBL) cycle and steps
- An explanation of the Problem Based Learning (PBL) approach
- A visual diagram of the system document
- Pictures of the university laboratory
- Tool: “Need to know board” to gather information
- Tool: Scoring rubric for final presentation
- Tool: Proper Troubleshooting Steps
- Tool: Assessing your team members evaluation
- Problem Based Learning (PBL) scenario evaluation

### **Resources and Media:**

- The internet
- Manufacturer documentation (Equipment schedule on document / bill of material on the drawing devices used )
- Educational materials and books
- Direct Digital Controls website: DDC Online.org

### **INSTRUCTOR ROLE**

The instructor will support the Problem Based Learning (PBL) experience by:

- Introducing the scenario and process
- Facilitating reflection and discussion
- Providing applicable resources and materials
- Answering any questions related to the scenario and coursework
- Providing class time to work on the scenario

## **STUDENT ROLE AND GUIDELINES**

### **Individual**

The intended outcome will be measured by having each student:

- Create a file folder for the build system of all pertinent documentation for manufacturer devices on site (such as, controller and all its inputs and outputs)
- Demonstrate that they can interpret the documentation process
- Distribute project tasks between the group members
- Complete a Problem Based Learning (PBL) scenario evaluation and team evaluation as a part of the final project

### **Group**

The intended outcome will be measured by providing:

- A presentation where each student will orally present a part of the group presentation (1-2 minutes per group member)
- Documentation of the problem
- Suggestions and future recommendations

### **Group Size:**

- Each group will consist of 2 students

## **STUDENT FEEDBACK**

As a team, and individually - students will review, assess and provide feedback regarding the Problem Based Learning (PBL) scenario experience.

Requirements of the final project:

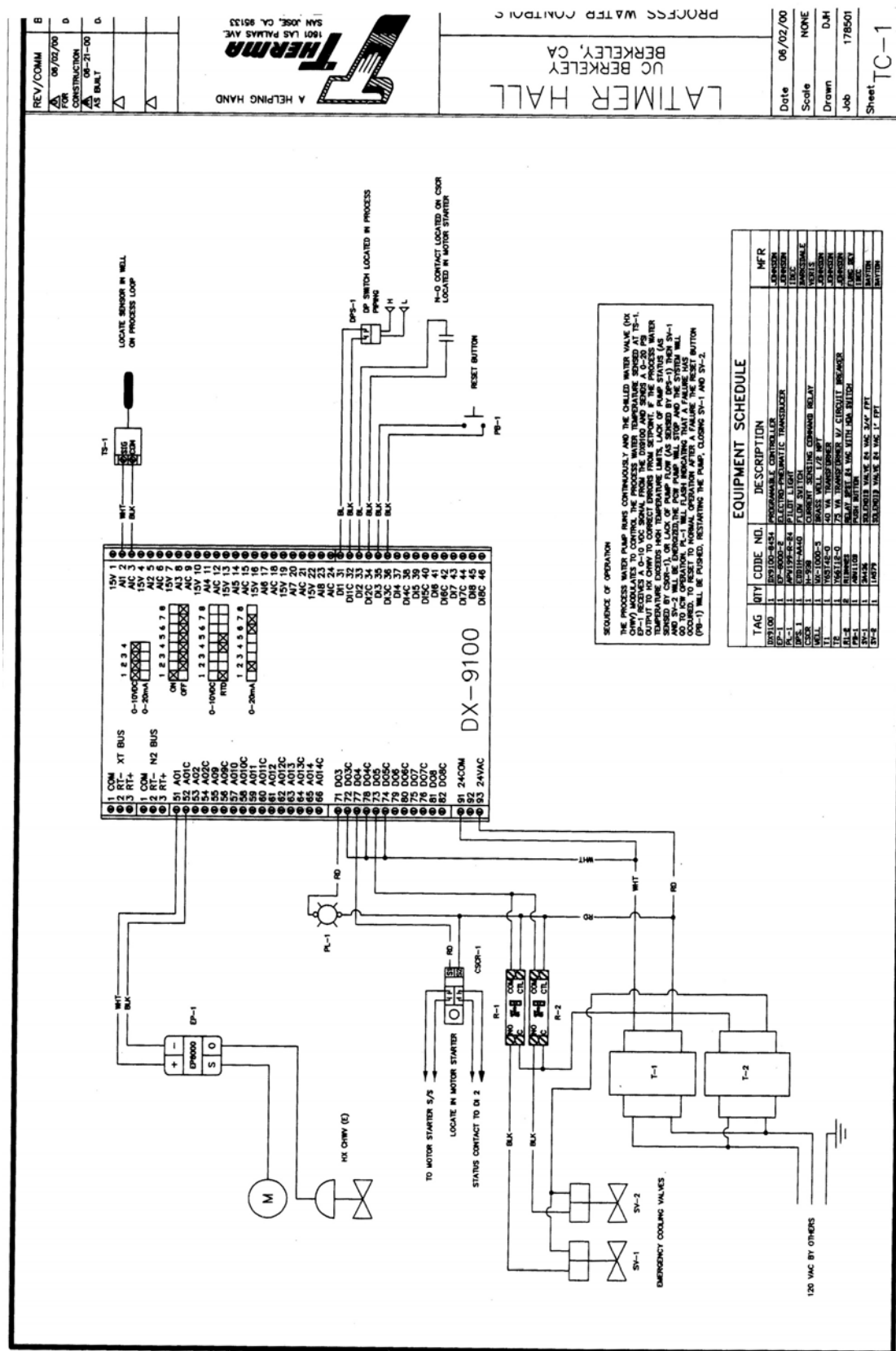
- Completion of a short Problem Based Learning (PBL) online survey
- Completion of a short team member evaluation

## **TEAM LINK**

The instructor will support the team learning process by allowing:

- The students to have the option to meet during class, outside of class and on the phone to work on the scenario

## Diagram of the Inputs and Outputs





## Images of the University of California Laser Lab

**Process Water Alarm**



**Water Pump**



**Differential Pressure Switch**



**Control Panel**

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