

**MENG 5335: Programmable Logic Controller_
Programmable Logic Controls Training System**

Allen Bradley PLC Portable Training System FCS-PLC-
1461-AB Instruction Manual

Introduction



Figure 1. Allen Bradley PLC Micro 820 Training System (FCS-PLC-1461-AB)

This AB training system was designed to teach students and workers how to understand and troubleshoot Allen-Bradley Micro820 Programmable Logic Controls. The AB-Micro820 hands-on PLC training system includes real world components commonly found in the Manufacturing, Processing and Automation Industry.

Components

▪ 2 Industrial Limit Switches with Normally Closed (NC) & Normally Opened (NO) Contacts
▪ 2 Industrial Pushbutton Switches with 2 sets of NO and NC Contacts
▪ 1 Alarm Buzzer
▪ 1 Two-Position Industrial Selector Switch with 1 set of NO Contacts
▪ 3 Lights-Red, Blue & Green
▪ 2 Standard 8 pin Ice Cube Relays with sockets
▪ 1 IEC Motor Starter
▪ 1 IEC Contactor
▪ 1 PLC Ethernet Cable

AB-Micro820 Controller



Figure 2: Controller Overview

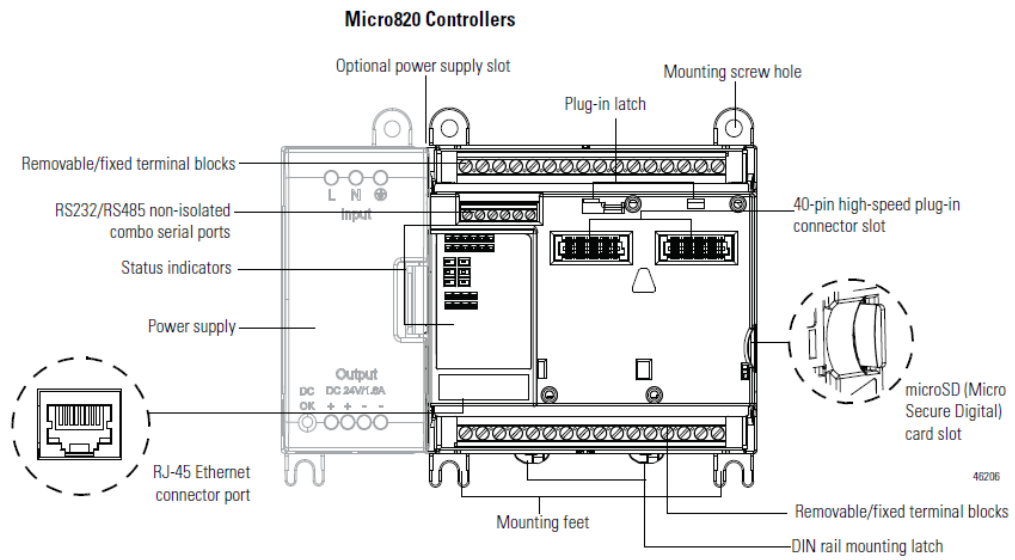


Figure 3: Controller Schematic

Programming Software

Micro800-850 Controllers are programmed by Connected Components Workbench (CCW), which is a set of collaborative tools supporting the controllers. CCW is based on Rockwell Automation and Microsoft Visual Studio technology and offers controller programming, device configuration, integration with HMI editor, and design operator's interface applications. CCW provides a choice of programming languages (ladder diagram, function block diagram, structured text) with user defined function block support that optimizes machine control.

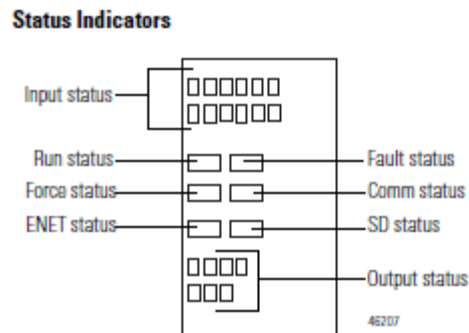


Figure 4: Status Indicators LEDs

Wiring Micro820 Controller

The controller is configured with **Sink Input** and **Source Output**. This indicates that the relay base Micro820 has its input transistor designed to take -24Vdc at its common and +24Vdc at input terminal respectively as shown below in Fig.5. The Sourcing Output indicates that the Micro820 has its output transistor designed to take +24Vdc at its common and output terminal, wired directly to the positive terminal of the Load as shown in Fig.6.

Sink Input Wiring Example

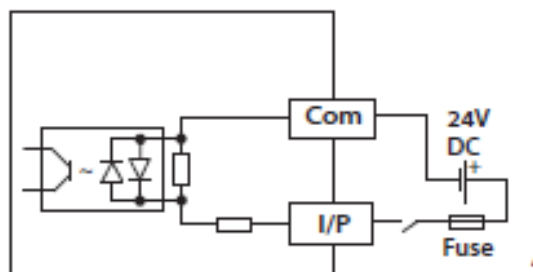


Figure 5: PLC Sinking Input

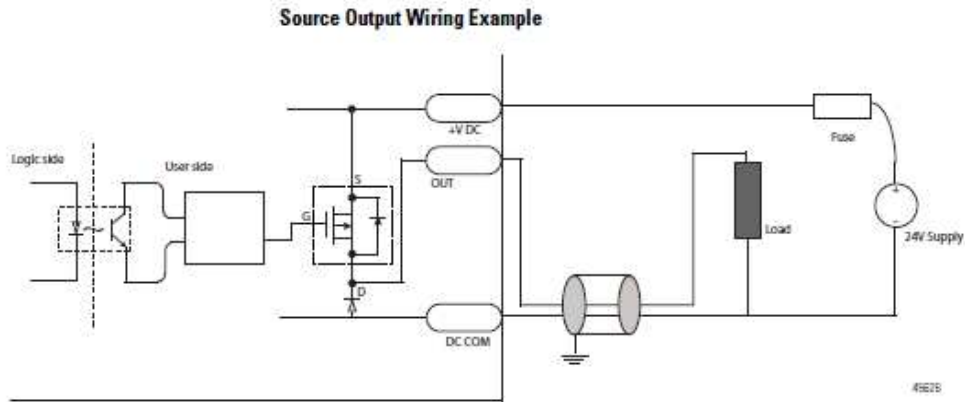


Figure 6: PLC sourcing Output

Quick Start Programming Guide

Start the already installed Connected Component Workbench (CCW) software by launching the program from Windows start Menu -> Rockwell Automation -> CCW -> Connected Component Workbench.

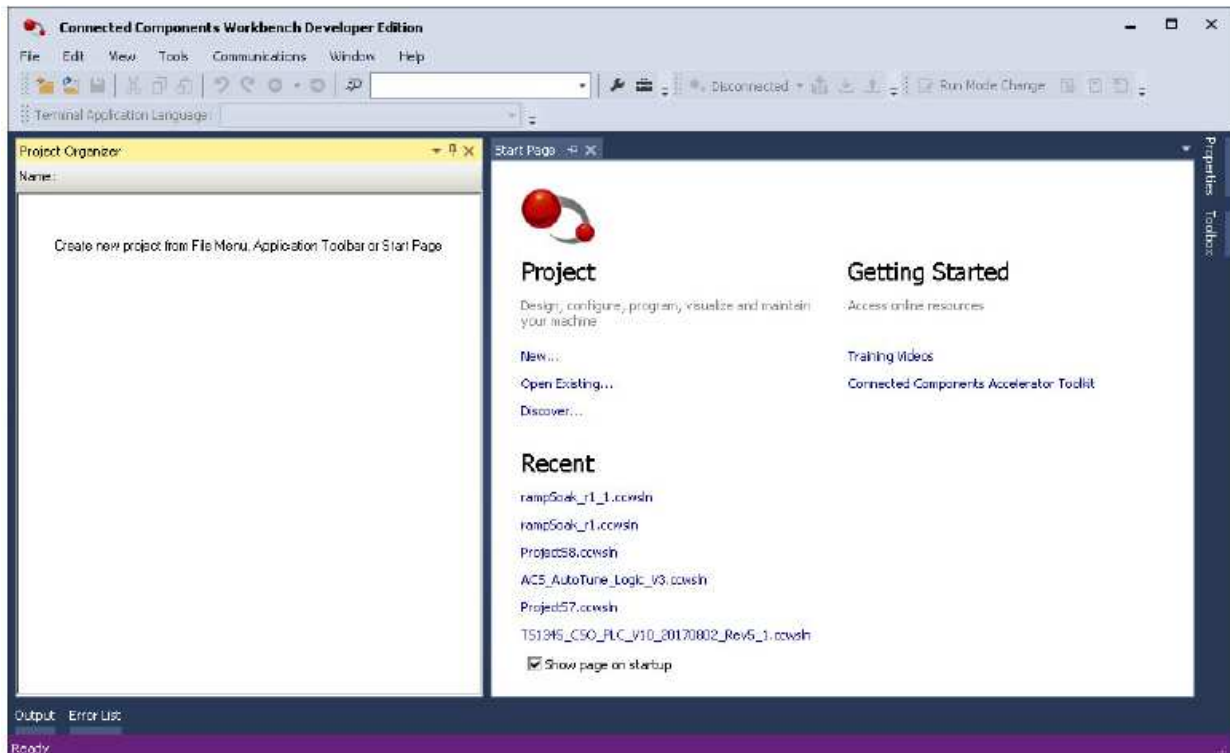
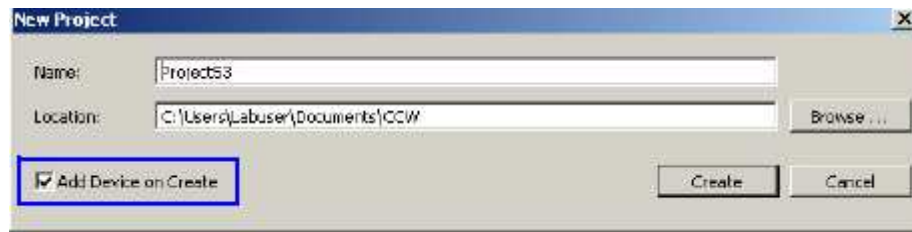


Figure 7: Default project layout

Create a CCW Project

To create a new project, do the following:

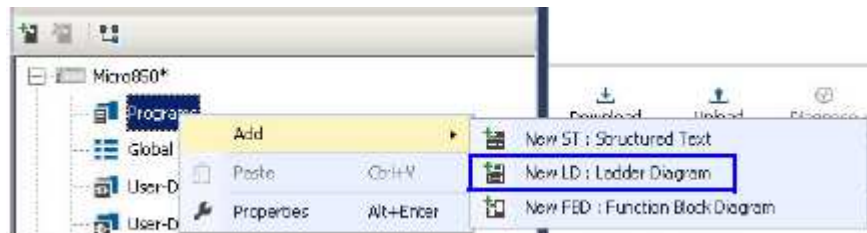
1. Click **New** under **Project** to create new project
2. Enter a name for your project and click create in the popped-up window. Select the **Add Device on Create** checkbox. This will open a Add Device dialog box for you to add a device to this project.



3. In the left panel, click the “+” sign on Micro820 to expand the list of catalogs and select the device to add to the Selection list. In this case, you will select 20BD-LCD20-20QWB from the list.
4. Click **Add To project** to complete device selection.

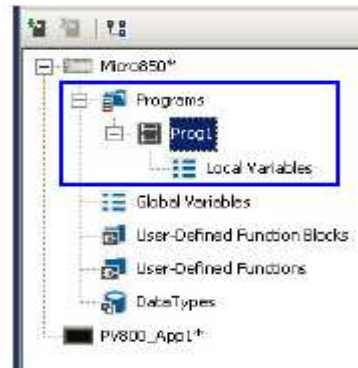
Add a Ladder Diagram program to your project

1. Right-click Programs under the Micro820 controller in the project organizer and select Add->New LD: Ladder Diagram



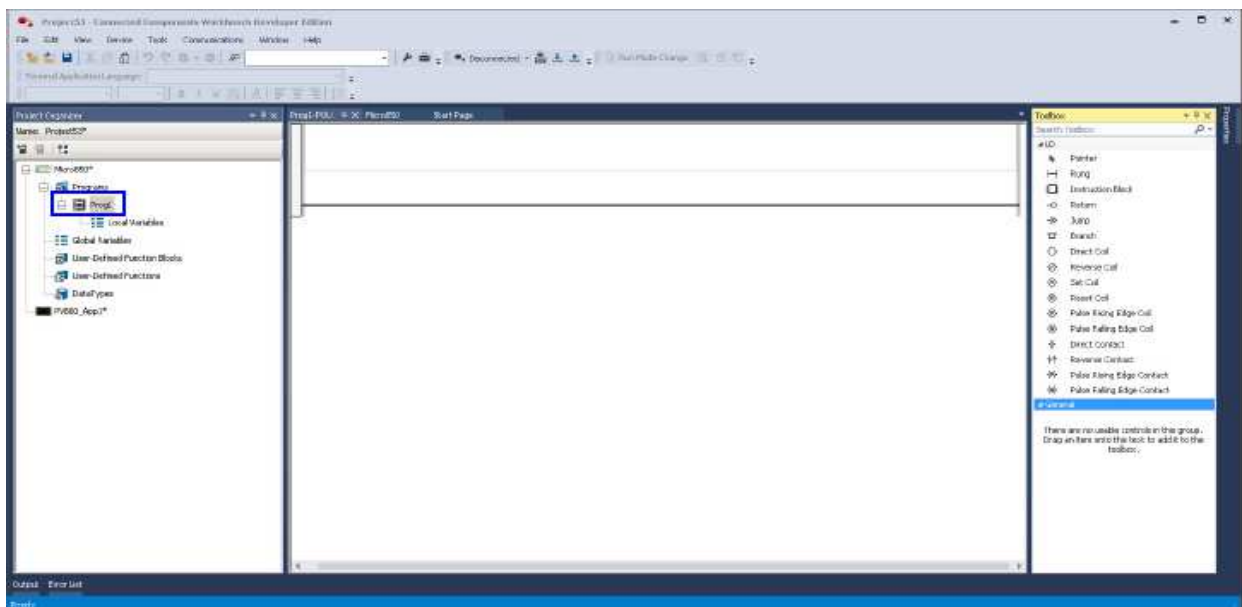
Add a Ladder Diagram program to your project

2. Observe that a new Ladder Diagram program called **Prog1** has been added under Programs



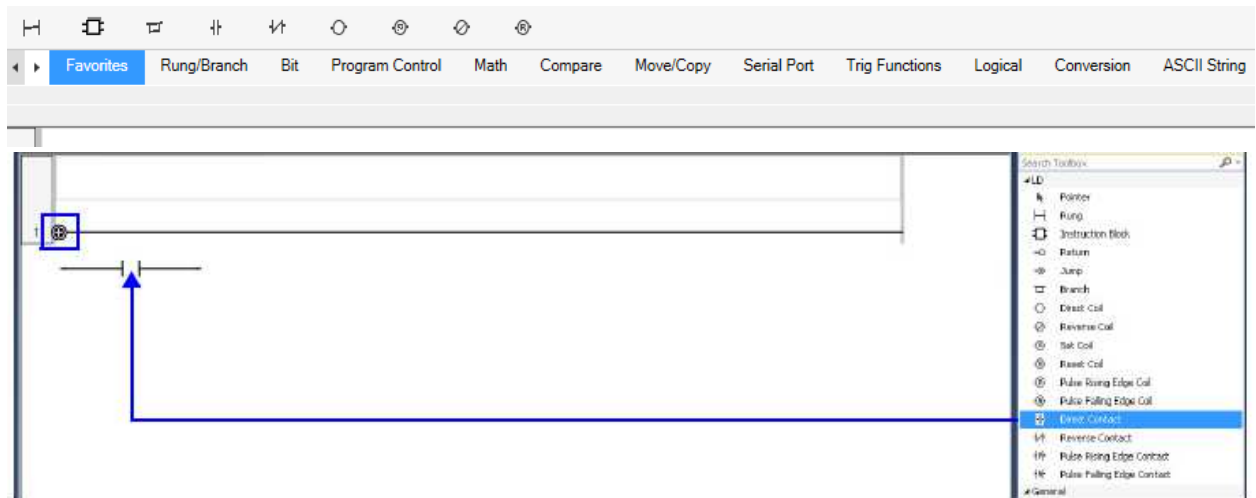
Note: *Micro800-850 controllers allow you to create multiple programs and use multiple types of programs (such as Structured Text or Function Block Diagram) in the same controller application.*

3. Double-click **Prog1**. A ladder diagram editor appears in the main project workspace with one empty rung.



Add a Ladder Diagram program to your project

4. Right-click **Prog1** and select rename to change the name of the program.
5. Locate the **Direct Contact** instruction in the Toolbox window and drag -and -drop it onto the left side of the rung.

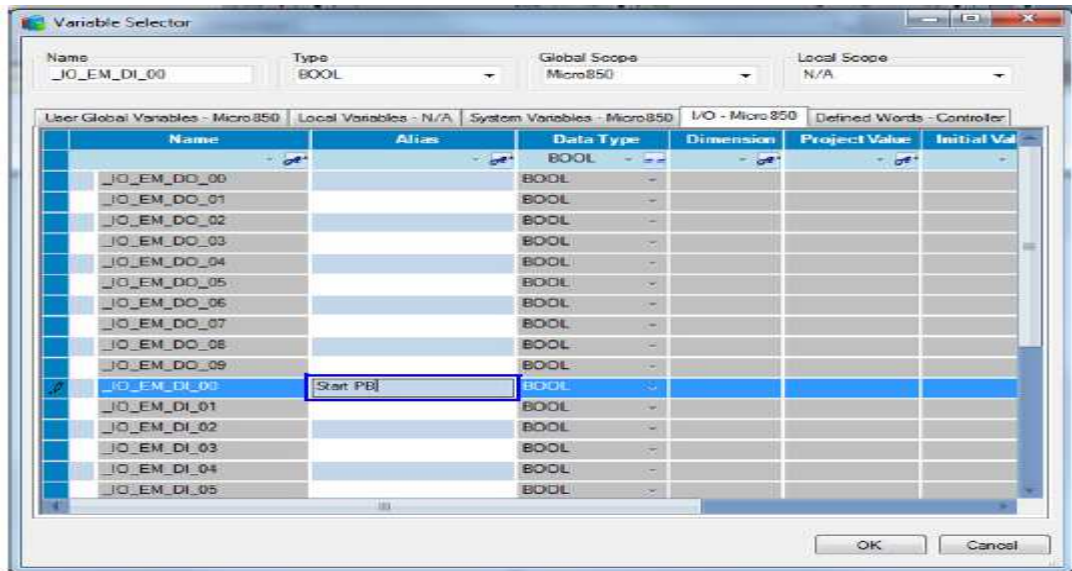


Note: The “+” icon on the rung indicates the location of a drop point for the instruction. After adding the instruction, your rung should look like the following.

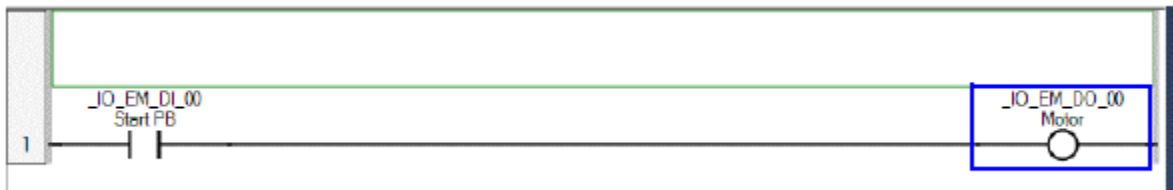


6. After inserting the Direct Contact instruction, the Variable Selector dialog box appears, and you can select the variable or I/O point to assign to this instruction. Each I/O point could be given desired name under the **Alias** column.

Add a Ladder Diagram program to your project



7. Locate the **Direct Output Coil** instruction in the Toolbox and drag-and-drop it onto the far-right side of the rung. Assign it to the embedded I/O point, `_IO_EM_DO_00` with alias "Motor". Your rung should look like the following.



For example, shown in the figure below is a Ladder Logic program to turn on a LED light when the start button is pressed and turn it off when the stop button is pressed on the simulator.



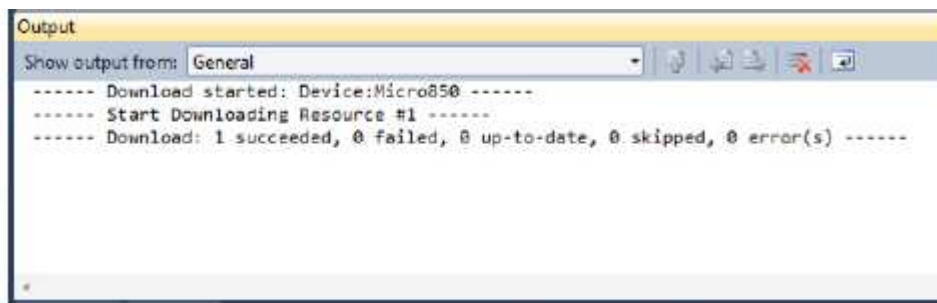
NOTE: Save the project by selecting File-> Save Project As, then save project under desired name and click OK.

Add a Ladder Diagram program to your project

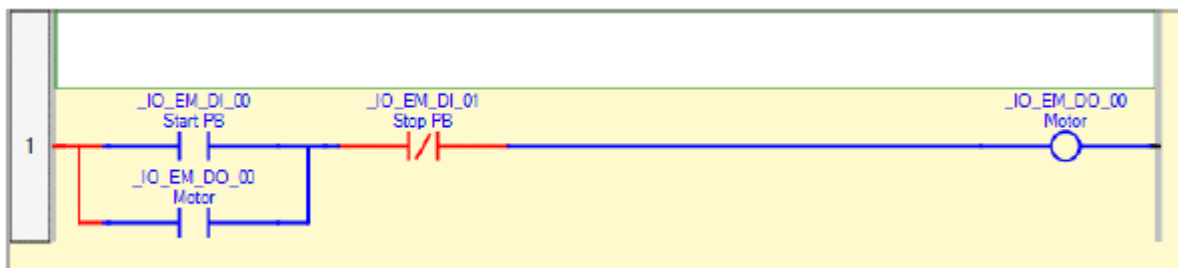
8. Build and download the project to the Micro Controller by clicking Device->Build.



9. The output window and status bar show the status of the build. Then connect the PC to your Micro Controller via ethernet cable.
10. Download your project to your Micro820 controller by right clicking the controller in your Project Organizer and select **Download**.
11. To run the program, change the controller to **RUN mode** after downloading the project and observe the messages in the Output window. The Output window will indicate that the Download has been successful.

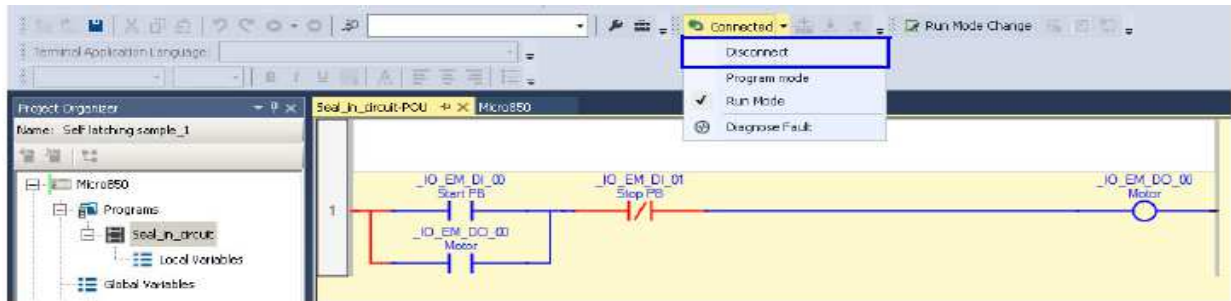


You can monitor your program on CCW visually in real time and watch values change in the program as you should observe the Ladder Diagram changes color as the inputs and outputs change state.



Note: Always remember to disconnect the PLC before making any modification on the program by clicking the connect button and selecting disconnect as shown in the figure below.

Add a Ladder Diagram program to your project



Note: Diverse Instructions are available in Micro800-850 controllers for various use for functional requirements and suitability.

Programmable Logic Controller Training System Wiring Guide

PLC training system wiring and connections with Lab. manual examples

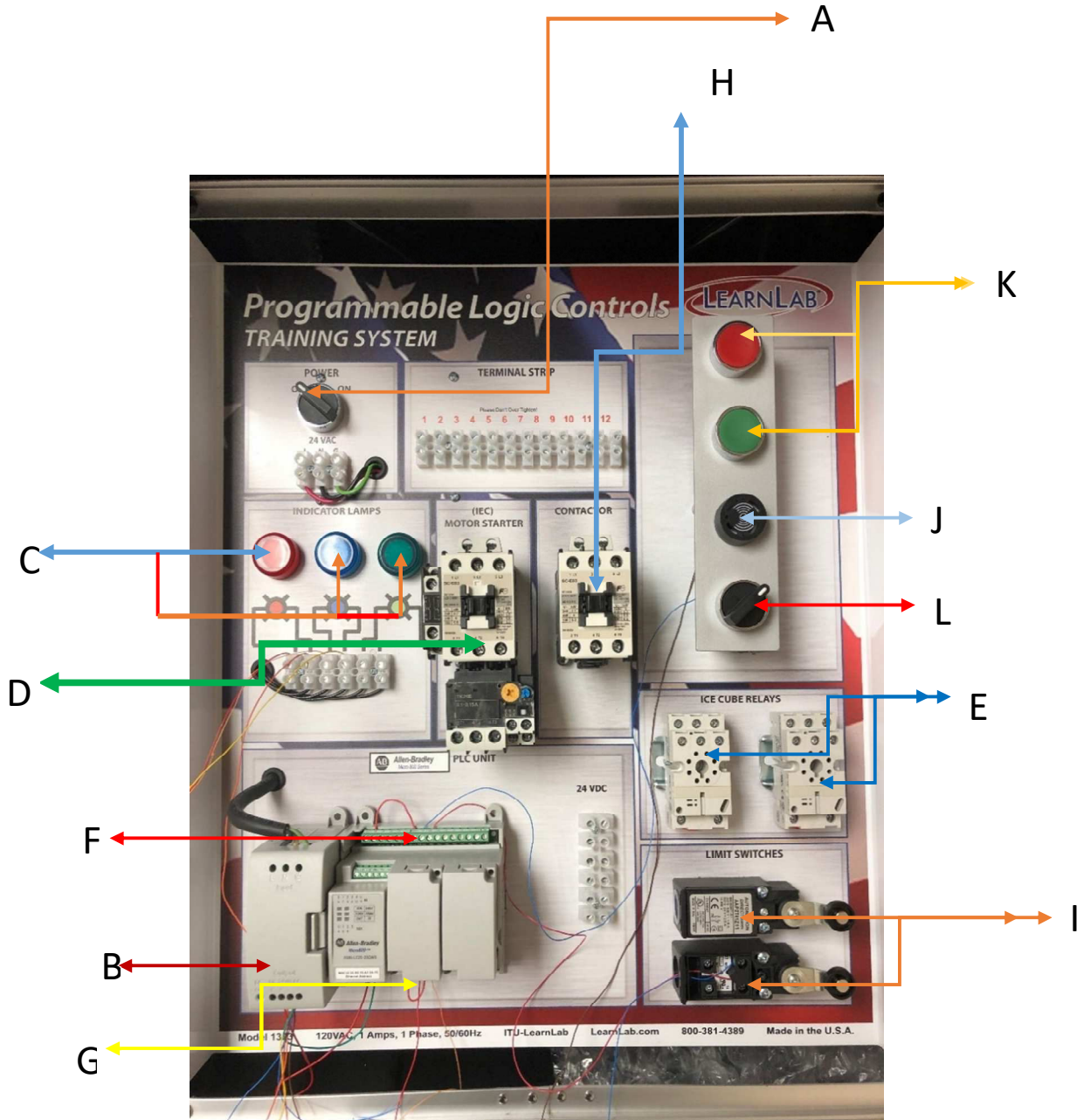


Figure 1(a) Portable PLC training system interface.

Components List

Components	Description
A	Training system power selector switch(on/off)
B	24v DC power supply unit ($\pm 24v$ DC Terminals)
C	3 LED indicators (2 terminals each)
D	IEC motor starter
E	2 cube relay blocks (sockets for relays)
F	PLC input terminal block (i00-i11)
G	PLC output terminal block(o00-o06), PLC 24v dc power supply
H	IEC contactor
I	2 Industrial Limit switches (1 NO (green), 1 NC contact)
J	Alarm Buzzer
K	2 Push buttons (1 NO (green), 1 NC (red) contact)
L	1 Selector switch (1 NO (green) contact)

PLC overview

Wiring on PLC training system

Note: Micro820 controller was designed to have a *SINKING INPUT* and *SOURCING OUTPUT*.
The controller must be powered via 24v supply and wired in conformity with the design below before wiring for any project design.

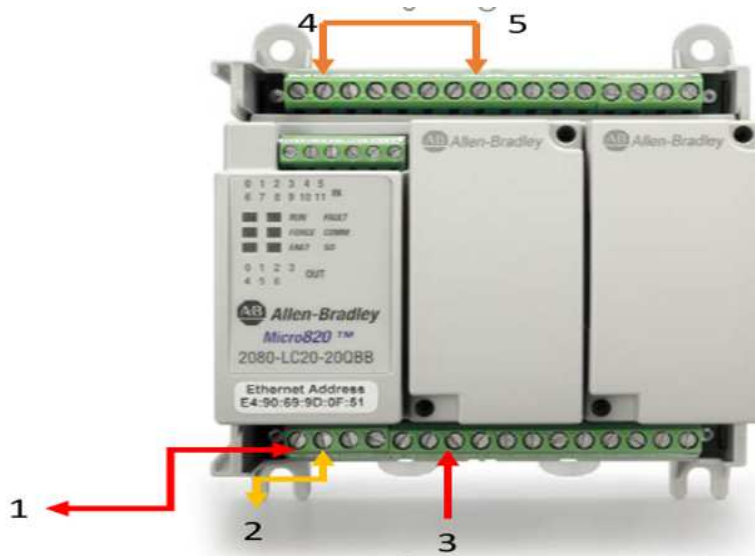


Figure 1(b) Micro820 controller

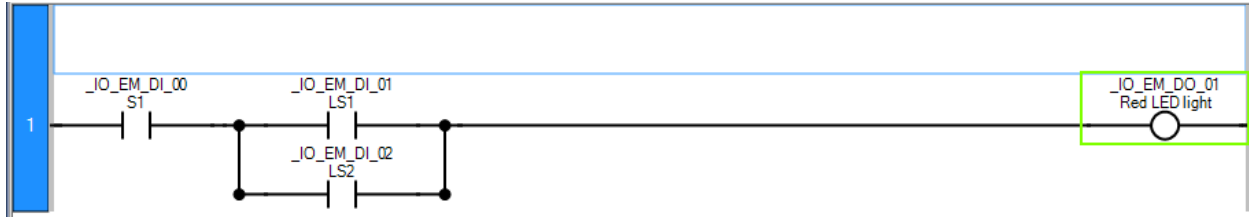
Micro820 controller	
1.	+24v DC power supply (positive terminal)
2.	Negative terminal of DC power supply.
3.	+24v DC power supply connected to output block COM terminal.
4.	Internally wired -24v DC terminal.
5.	-24v DC power supply connected to input block COM terminal.

For this exercise, the elements involved are represented by the following components on the PLC training system:

- Pressure switch = **Selector switch (L)**
- Temperature switch = **NO contact on Limit switch (I)**
- Manual push button = **Green push button (K, NO contact)**
- Motor starter = **D (24v DC powered starter coil),**
- Stop button = **Red push button (K NC contact)**

CHAPTER 1

Exercise 1-5



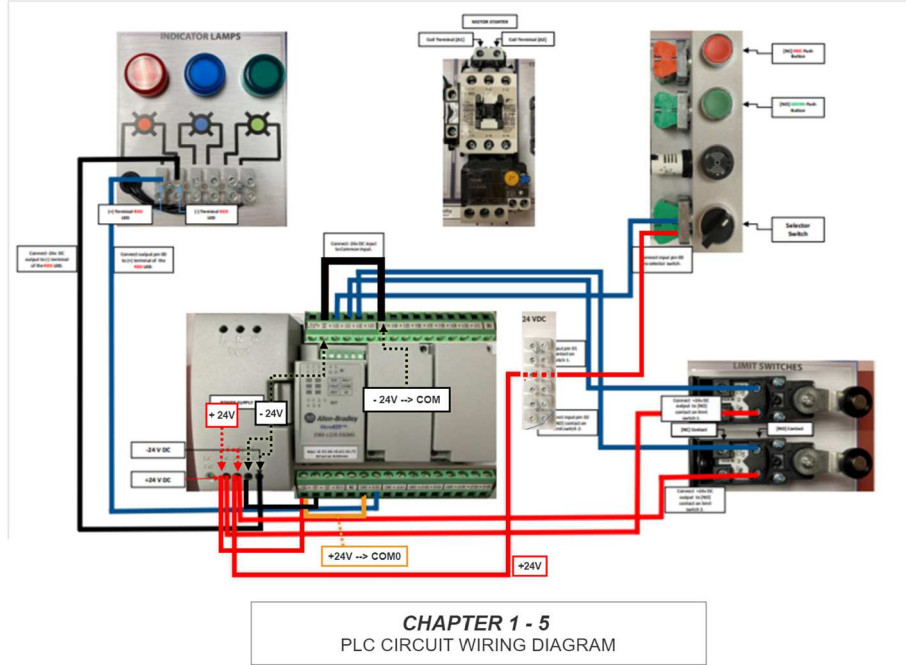
For this exercise, the elements involved are represented by the following components on the PLC training system:

- S1 = Selector switch (L)
- LS1= NO contact on Limit switch 1 (I)
- LS2 = NO contact on Limit switch 2 (I)

Components wiring to PLC

Note: *The SINKING INPUT AND SOURCING OUTPUT DEFAULT WIRING SHOULD BE DONE AT ALL TIME BEFORE COMPONENTS WIRING*

Circuit Diagram Components wiring to PLC



CHAPTER 1 - 5
PLC CIRCUIT WIRING DIAGRAM

Figure (1-5)

The Ladder Logic program written above is then run on the PLC, it will be observed that the **RED LED LIGHT** would be energized when **SELECTOR SWITCH(L)** and either **LIMIT SWITCH 1** or **2** is depressed.

CHAPTER 2

PLC Hardware Components

Exercise 2-1

- 1 Green pushbutton [NC contact (red) side “K”]
- 1 NO limit switch [NO contact of “I”]
- L2= Red LED
- L1=Blue LED

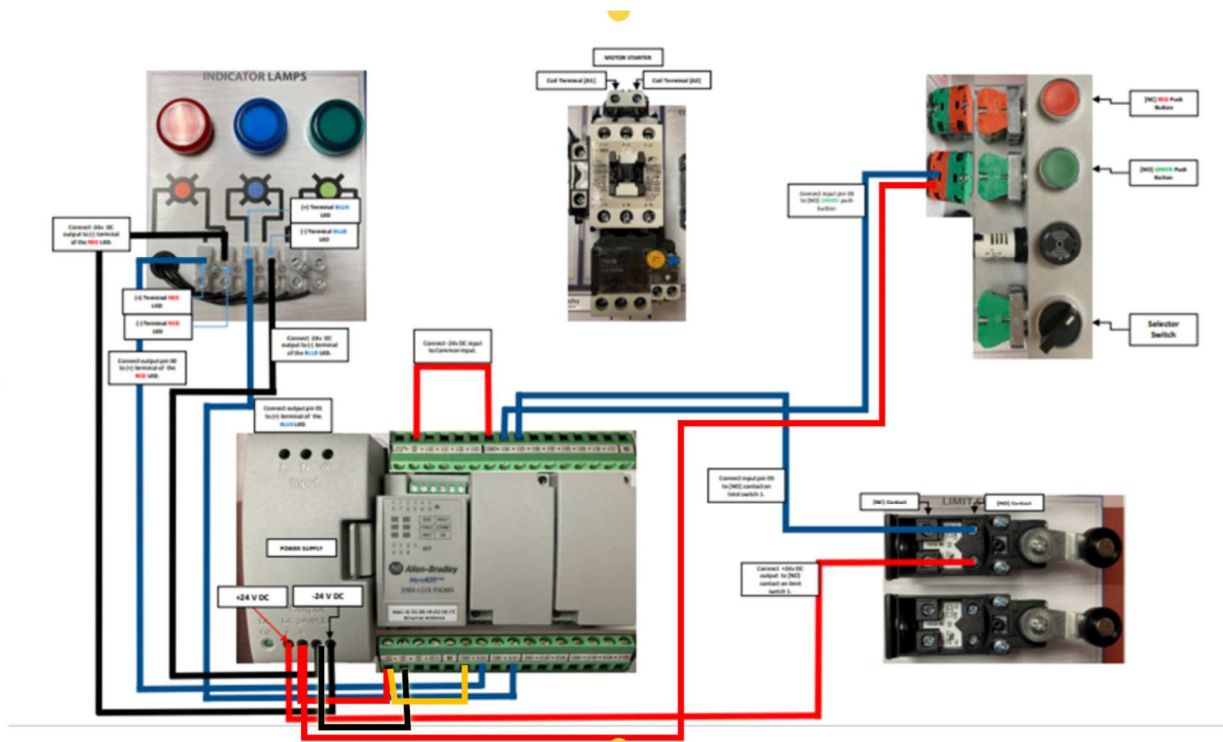
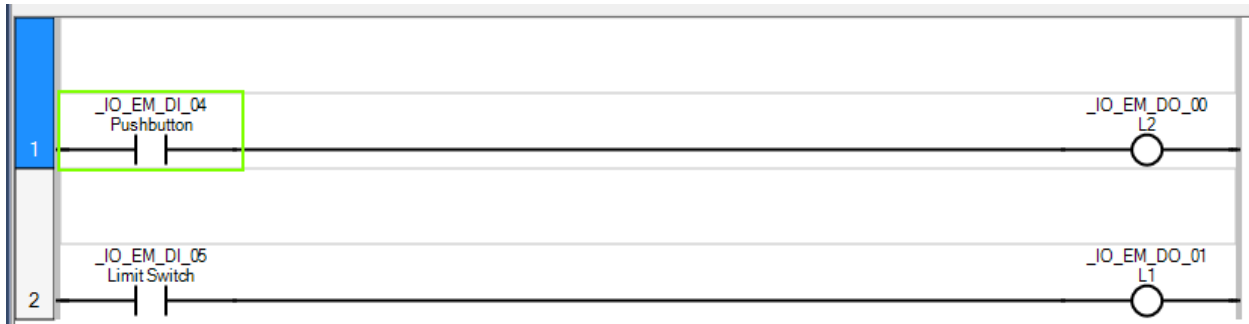


Figure (2-1)

Results: Red LED light is energized as soon as PLC is powered, Blue LED light is energized through input from Limit switch.

CHAPTER 4

Fundamentals of Logic

Exercise 4-1

Normally open pressure switch A [**Selector switch L**], Normally open pressure switches B [**NO “green” contacts of K1**], Normally open limit switches C & D [**NO contacts of “I”**], Normally open reset button [**NO “green” contacts of K2**], Pilot Light (RED LED Light

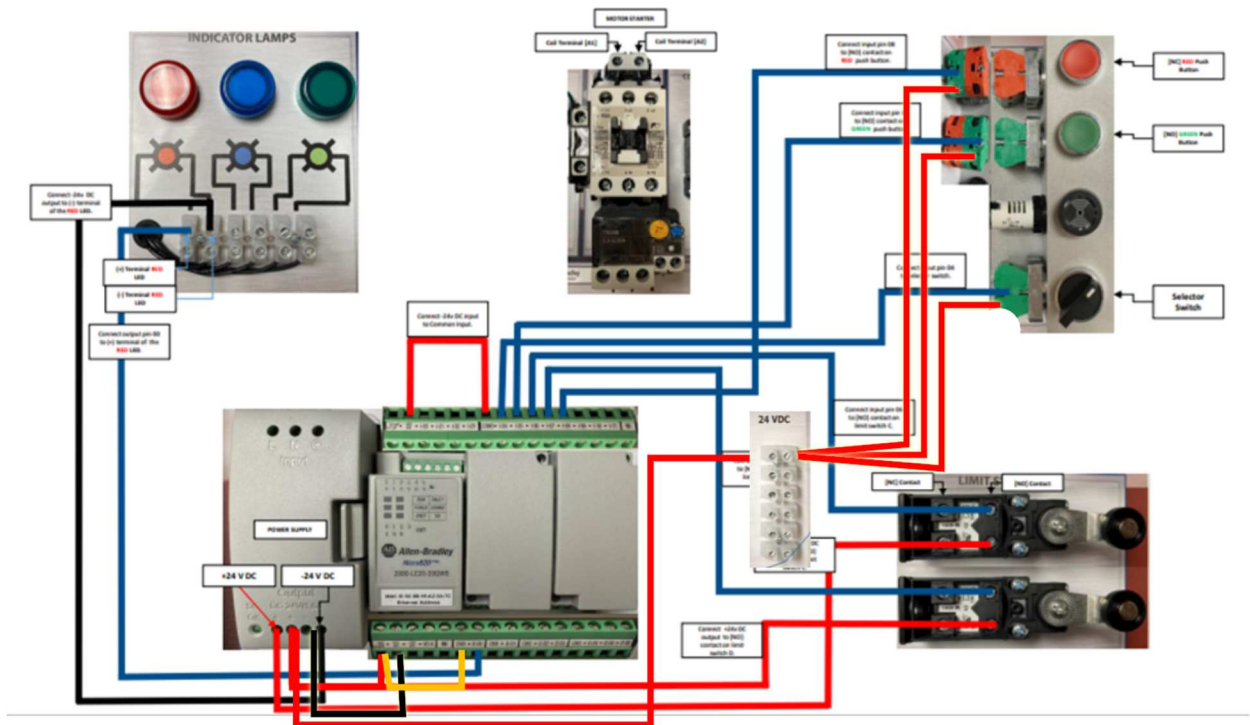
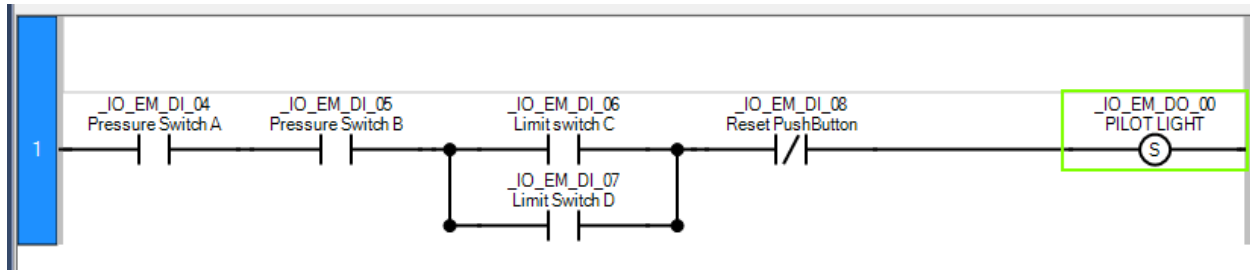


Figure (4-1)

Exercise 4-5

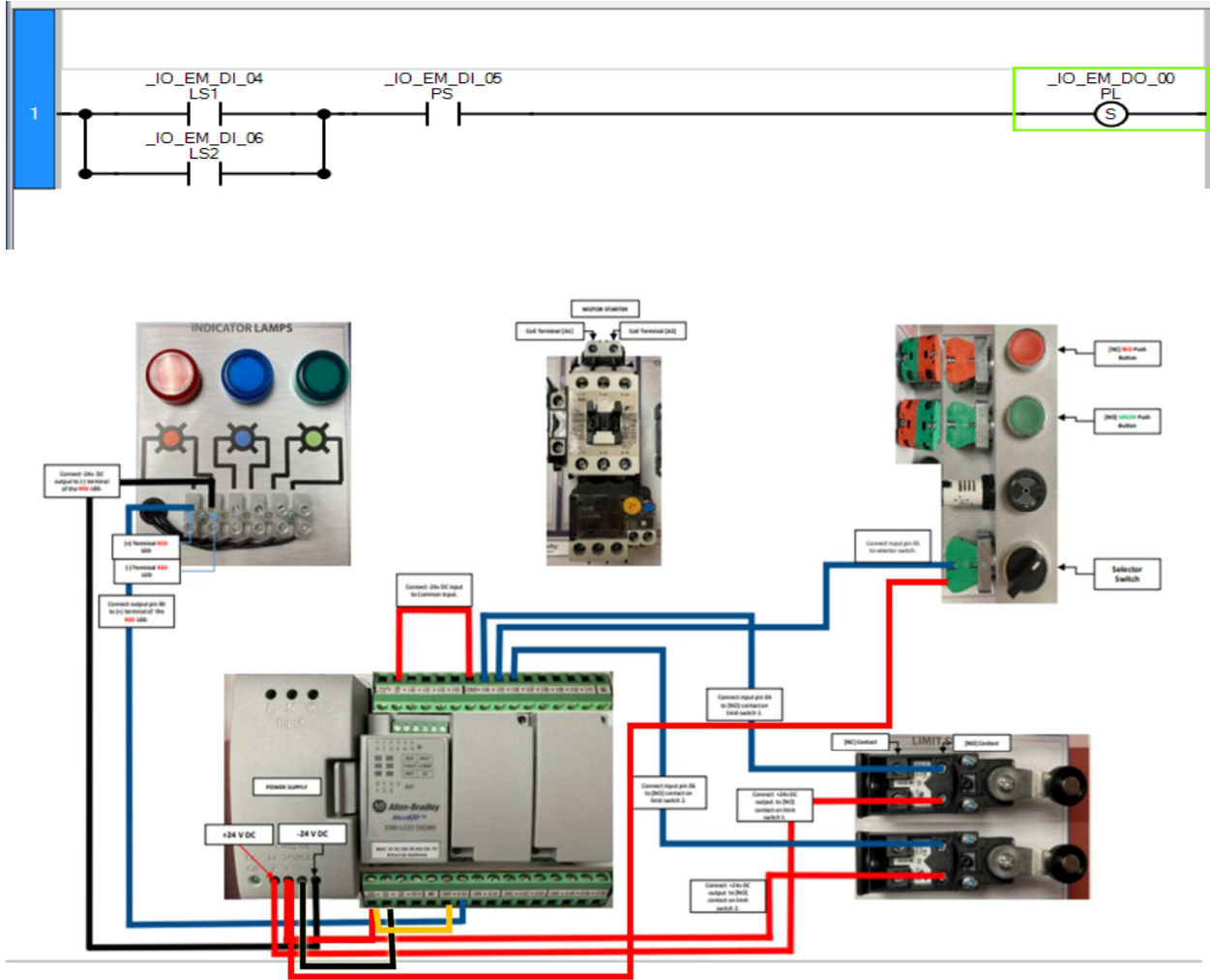
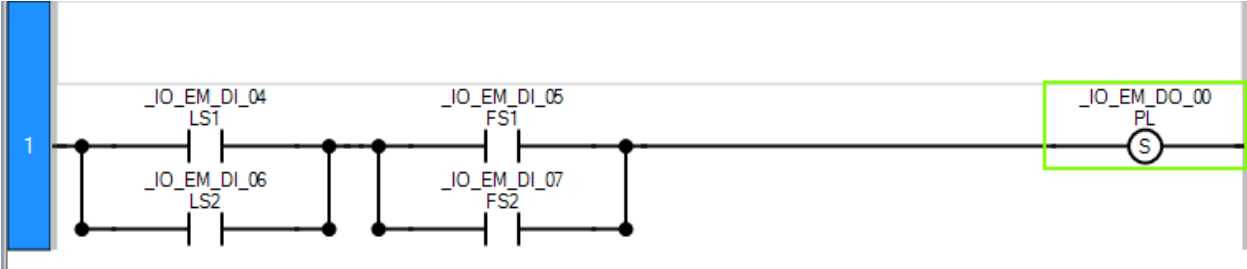


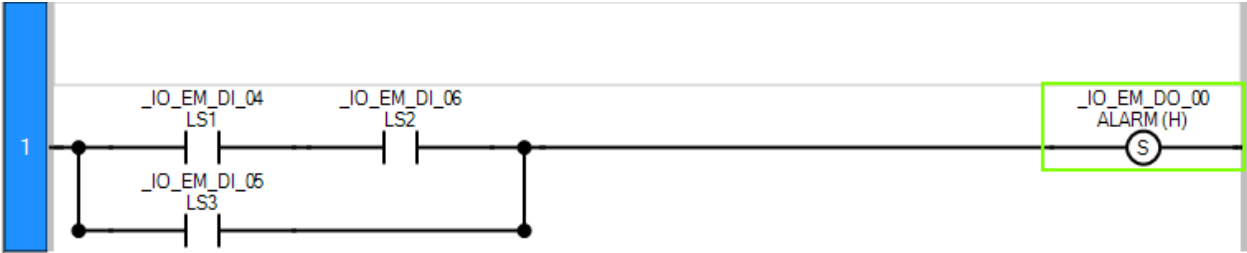
Figure (4-5)

For the following exercises in this chapter, wire the training board how you see fit. **ONLY** use the portions of the training board that have been previously covered in the lab manual. Use your engineering intuition to choose the best input and output devices

Exercise 4-6



Exercise 4-7



Exercise 4-8

