

Lab Objectives

In this lab you will learn the following:

- Get familiar with the Do More software.
- Operation of a seal-in circuit
- Build a ladder diagram corresponding to the circuit using the Do-more-Designer

Lab Duration

45 – 60 minutes

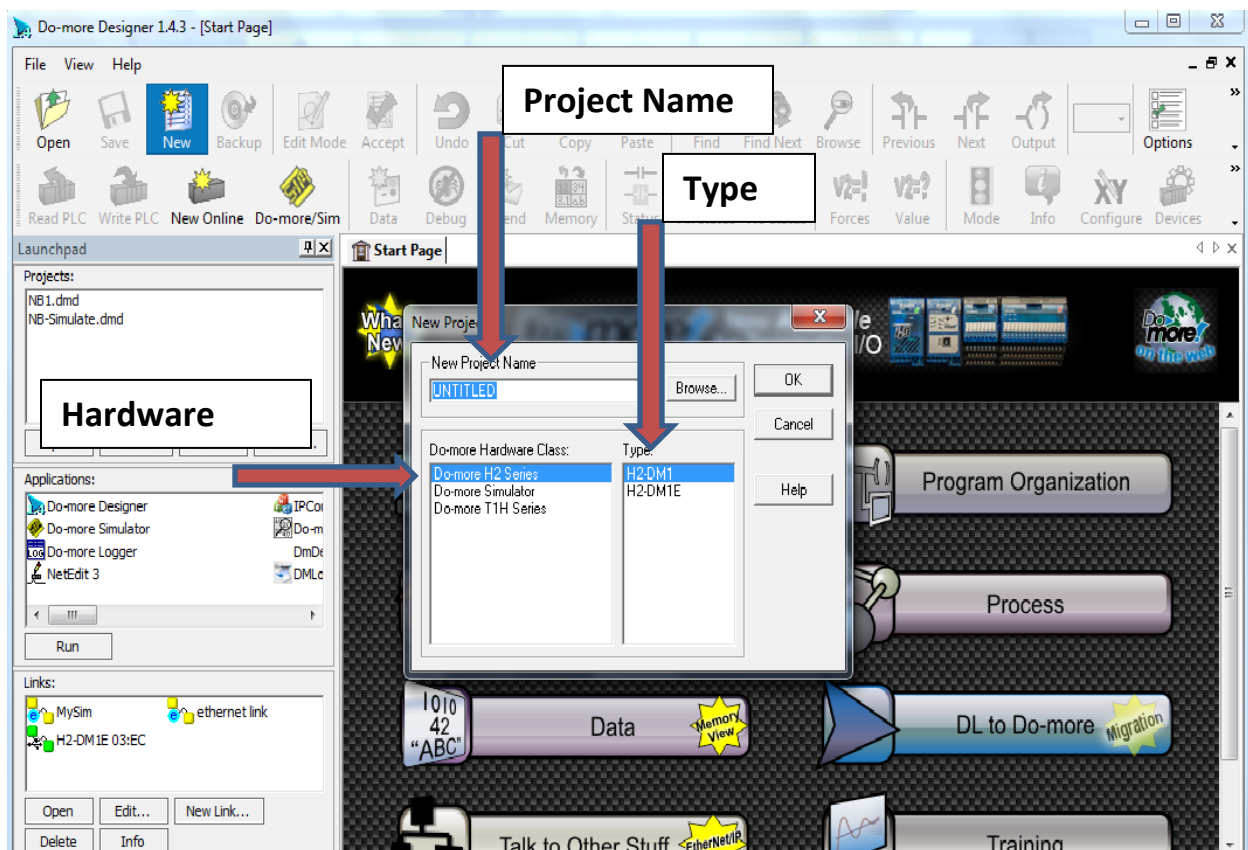
Lab Procedure

The following link contains useful videos on how to use the Do-more-Designer software.

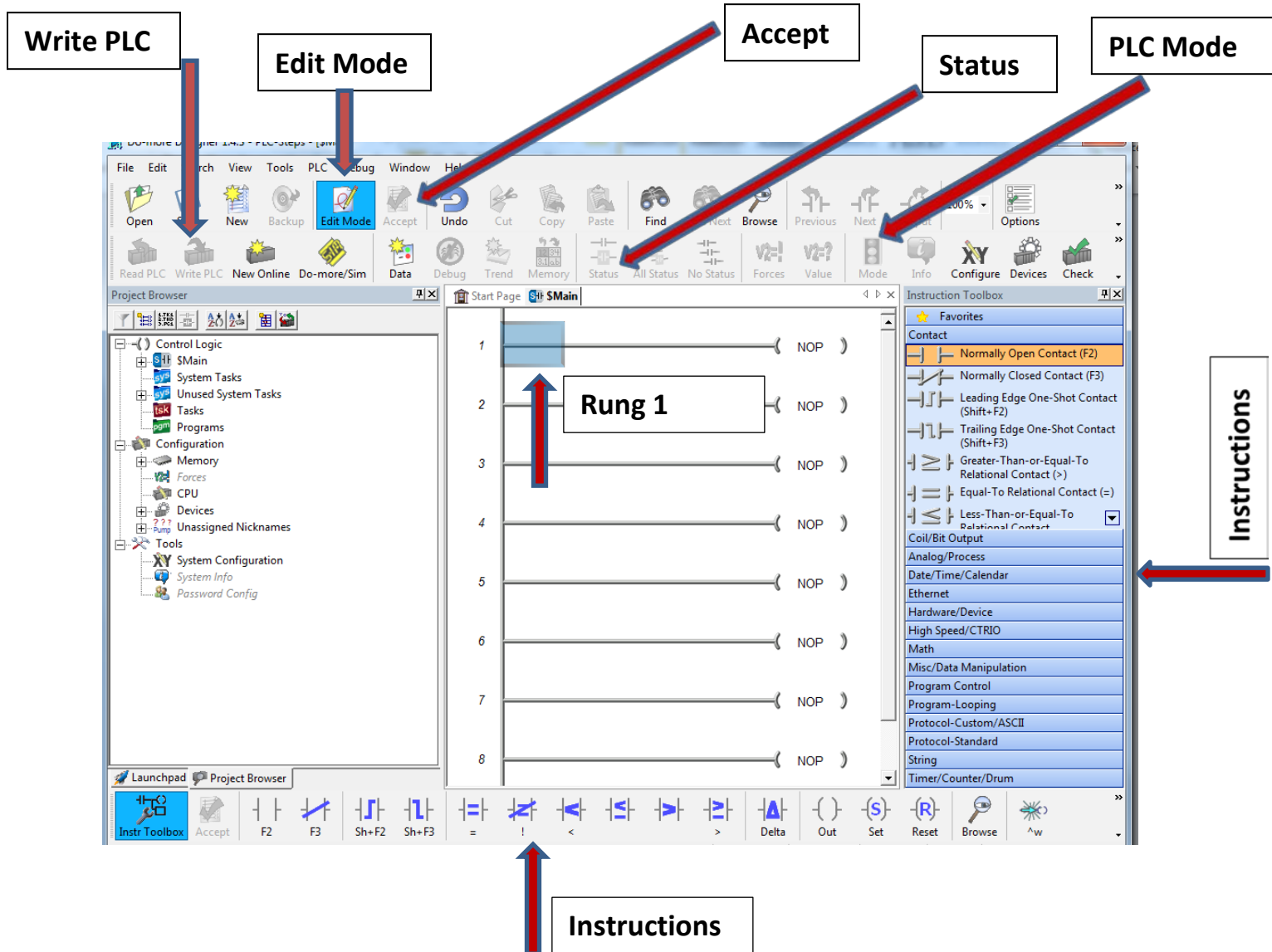
<https://www.youtube.com/watch?v=jUugb68K41Q>

Getting Started

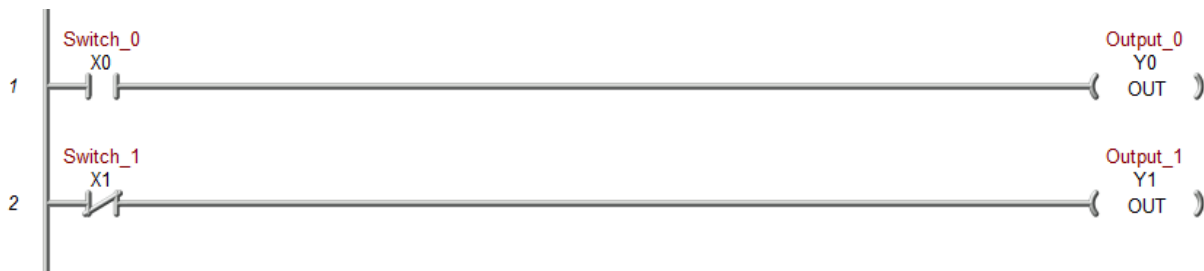
1. Open the Do-more Designer program
2. Click on **New** on the menu to create a new project. A dialog box will appear.



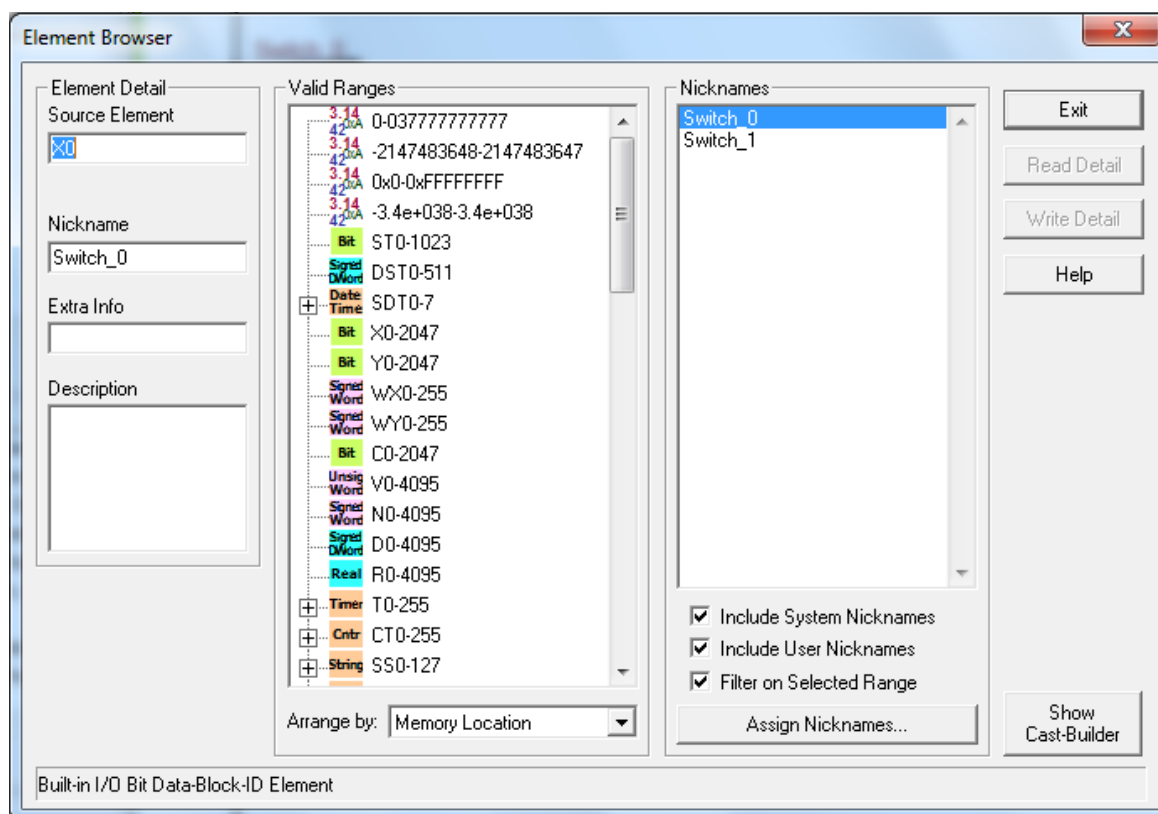
3. Enter the name of the project in the **Project Name** box.
4. Select **Do-more H2 series** from the **Hardware** section.
5. In the **Type** box, select **H2-DM1E** and then click **OK**. The following window will be displayed.



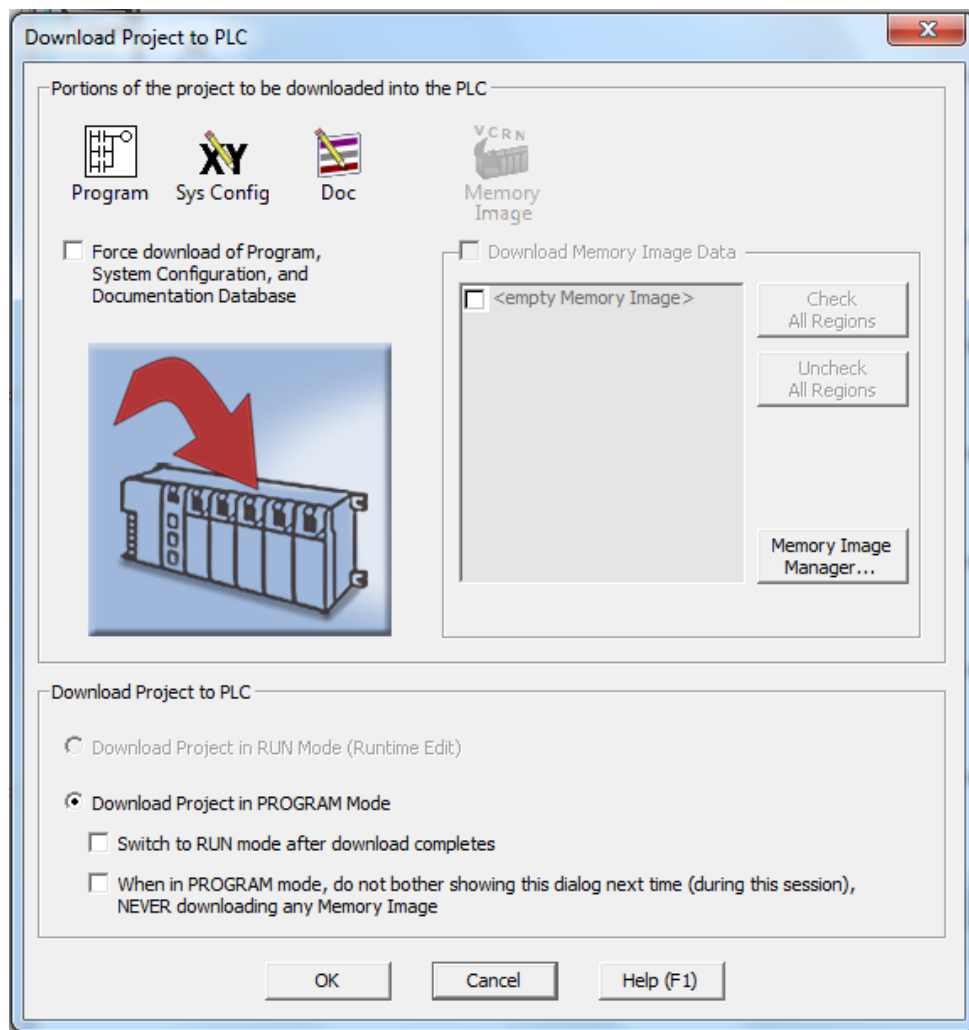
6. If not highlighted, click on the **Edit Mode**. A set of **Instructions** will appear at the bottom and to the right of the window. This allows the user to build the program by double clicking or dragging on the specific instruction.
7. Click to the left of rung 1 and begin inserting instructions till the program is complete.
8. Create the diagram below. The inputs are labeled as Xs and the outputs as Ys.



9. To add a label to the inputs and outputs, double click on the appropriate instruction and enter the name in the **Nickname** option of the window below. Click **Exit** and then **Save** to complete the process.



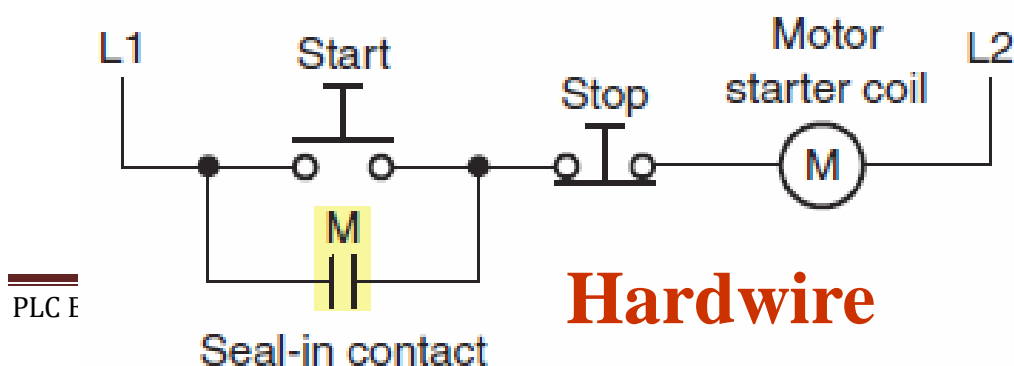
10. When done with the diagram, it is time to save it and download it to the PLC's memory. This done using the next two steps.
11. **Saving (Accepting) changes to the program:** Click **Accept** when highlighted.
12. **Downloading the program to the PLC:** Use the **Write PLC** command when highlighted.
13. When clicking on the **Write PLC** command, the window below will appear, click **OK** to complete the downloading process.
14. Change the PLC mode from **Program** to **Run** by clicking on the **PLC Mode** icon.
15. To see the status (on or off) of each instruction click on the **Status** icon. Any input/output that is on will be highlighted blue.



16. Observe the state of the outputs. Output_1 is on without touching Switch_1.
17. Turn On/Off Switch_0 and observe the state of output_0. Repeat the process for Switch_1.

Seal-in Circuit

The seal-in circuit is one of the most widely used circuit in industry. The process of starting and stopping a motors, pumps, conveyors, etc... is achieved through the seal-in circuit. The hardwired (relay) diagram is shown below.



It consists of a normally open (NO) Start push button, a normally closed (NC) Stop push button, and a coil M. The operation of the circuit is as follows:

The coil M is energized (powered) once the Start button is momentarily pressed. This allows for an electrical path to be first established between L1 and L2 through the Start-Stop buttons. The contact M (parallel to Start) associated with the coil will close and provides an alternative path (seal-in) for the coil M to stay energized once the Start button is released. The Motor will run as long as the coil remains energized until the Stop button is pushed cutting the power to the Motor through the coil M and breaking the electrical path. The operator needs to press the Start button only once and the Motor will then run continuously till stopped.

The objective is to develop a ladder diagram that will perform the function of the seal-in circuit. Proceed as follows:

1. Create a ladder diagram similar to the one below. A normally closed instruction is used for the stop button.
2. **Creating Branches/Parallel lines:** Use the **Control** key along with the **Arrow** keys.
3. **Deleting Branches/Parallel lines:** Use **Edit/Wire** from the tool menu.



4. Turn the **Stop button (X1)** on, because it is normally closed.
5. Turn the **Start buttons (X0)** on and observe the status of the Motor output.
6. Is the Motor instruction On/Off? Does the program work as it supposed to?
7. Leave the first rung unchanged and create a second rung as listed below.



8. Save changes, download to PLC, and test the program again. Make sure you test for starting and stopping of the motor. Which rung matches the operation of the seal-in circuit?
9. What conclusion can be drawn when programming normally open and normally closed switches?