

Introduction:

In this exercise you will download your program into the Compact Logix Controller (PLC) test the operation of the system.

Note – before beginning the following procedure, be sure

Procedure:

RSLOGIX 5000 SOFTWARE

Setting the Communications Path to the PLC

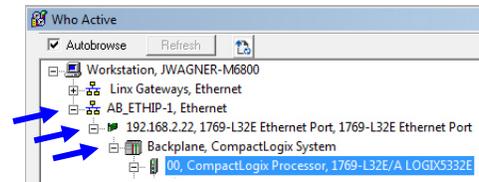
In order to download your program into the PLC, you must first set the communications “*path*” that the *RSLogix* software can use to locate your controller.

1. Click the  to the right of the “Path” field in the main window.



2. In the “Who Active” window that appears, expand the “AB_ETHIP-1, Ethernet” item by clicking its  and keep expanding the revealed items until the “00, CompactLogix Processor” is located.

Note that the items in your list may differ slightly from those shown in the list to the right:



3. Select the “00, CompactLogix Processor” and click the **Set Project Path** button and then close the “Who Active” window.



The path should now appear in the “Path” field as:  Path: AB_ETHIP-1\192.168.3.20\Backplane\0 

Note that, once the correct path has initially been defined, future attempts to set the path can be completed by *clicking* the down-arrow on the right side of the “Path” field and selecting the correct path from the displayed list of recently set paths.

Connection Status of the RS Logix Software to the PLC

The *RSLogix* software on the desktop computer will either be in an “Offline” or an “Online” state with respect to the operation of the PLC.

Offline – the RS Logix software is not in direct (real-time) contact with the PLC.



While offline, the ladder diagram displayed within the RS Logix window is completely independent of the program that is stored in the PLC’s memory.

The *RSLogix* software must be “Offline” while creating the ladder diagram because structural changes can only be made to the ladder diagram while in the offline state.

Online – the RS Logix software is communicating in real-time with the PLC. While online:

- the ladder diagram displayed within the *RSLogix* window is directly linked to the program that is stored within the PLC's memory such that the current state of the instructions and the values stored within the tag locations will be shown on the ladder diagram and updated in real time.
- the operator of the desktop computer has the ability to both monitor and affect the operation of the PLC.
- the *RSLogix* software will display the PLC's current operational state, which for this exercise will either be **Program Mode** or **Run Mode**.

Note that, when the key-switch is set to the **REM** (remote) position, the *RSLogix* software has the ability to remotely toggle the PLC between the Program and Run modes.



Operational State of the PLC

SAFETY NOTE – remotely switching the PLC between Program and Run modes can be **dangerous**, especially in a live industrial setting where unexpected motion or energization could pose a safety hazard to human life.

Program Mode (online) – the *RSLogix* software is communicating in real-time with the PLC but the PLC is not executing the program stored in its memory.

While in Program Mode, minor (non-structural) changes can be made to the program, such as the values stored in a tag location or specified in a MOV instruction.

Although the logic states of the ladder instructions will be displayed on the ladder diagram while in this mode, the PLC is configured such that all output ports will be false (off or de-energized) while in Program Mode.

Rem Prog

Run Mode (online) – the *RSLogix* software is communicating in real-time with the PLC while the PLC is executing the program stored in its memory.

Rem Run

While in Run Mode, logic states of the ladder instructions will be displayed on the ladder diagram.

Although changes cannot be made to the program while in this mode, the PLC's operation, including the state of its outputs, can be directly affected by the operator of the desktop computer. (This will be discussed at a later time)

SAFETY NOTE – while using the PLC system in the lab, if the PLC system starts operating in an unexpected or unsafe manner when the PLC is switched from Program to Run mode, **DO NOT PANIC** and **DO NOT CLOSE THE RS LOGIX PROGRAM WINDOW!!!**

Simple **toggle the PLC back into Program mode** using the *RSLogix* software.

If this does not solve the problem, then **shut-off the main breaker** located on the Lab Volt power supply to de-energize the entire system.

Downloading Your Program into the PLC and Going Online with the Controller

Now that the “path” to the controller has been set within the *RSLogix* software, you can **Download** your program into the PLC's memory and Go Online with the PLC as follows:

4. Click the down-arrow just to the right of the “Offline” field in the upper-left portion of the main *RSLogix* window and select “Download” to begin the download process.



5. If a *Connecting to Controller* window appears (it probably won't) stating that you must first update the firmware to be able to connect to the PLC, click on “Update Firmware” and answer positively to any other Update windows that may appear until the update is complete.
6. If a “Connected to Go Online” window appears stating that “The open project has changes that aren't in the controller” appears, choose “Download”.

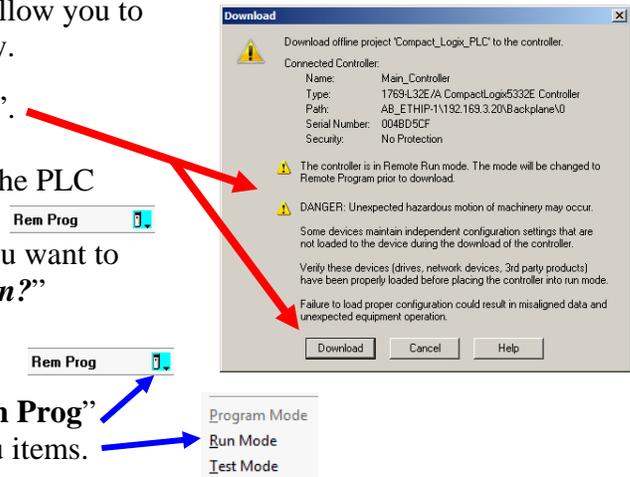
7. A “Download” window will appear that will allow you to transfer your program into the PLC's memory.

Read the warning and then click “Download”.

8. Once the *download* is complete, the status of the PLC will either switch to *Remote Program* mode or a warning window will appear asking if you want to “Change Controller mode to Remote Run?”

If that window appears, click “Yes”.

Otherwise, click the down-arrow next to “Rem Prog” and select “Run Mode” from the list of menu items.



This will cause the PLC to begin executing (running) the downloaded program.

9. Note – the VFD will typically display the **fault code “F048”** after you download a program into the PLC because the PLC stops communicating with the VFD when it is switched from Run ⇒ Program mode. Press the **red “Stop”** button on the VFD's panel to **Clear the Fault**.
10. RSLogix 5000 software should now be “Online” with the PLC such that the operational state of the PLC can be seen by viewing the ladder diagram:

Any **TRUE** logic instructions (XIO, XIC, etc.) and OTE output instructions in the diagram are highlighted in **green**. In addition, if the bit associated with the tag assigned to an OTL/OTU is currently a 1, then that OTL/OTU will also be highlighted in **green**.

Initially the Stop XICs, and the PowerFlex_40:O.Stop OTLs/OTUs should all be **green**.

Verify the Proper Operation of the Motor Control System

Verify the proper operation of the motor control system as described in the section titled:

“Information Regarding the Initial Operational Logic of the Motor Control System” (page 11).

While you are testing the system, pay attention to both the operation of the physical setup and the instructions displayed on the ladder diagram within the **RSLogix** window.

For example, **verify** that:

When you press the **Start** button, the contactor should immediately actuate and the first motor should accelerate quickly up to its synchronous speed. Simultaneously, the VFD should energize and raise its output frequency from 0Hz to 60Hz over a three second timespan, in-turn causing the second motor to accelerate much slower.

Ten seconds after you pressed **Start**, when **Run_Timer**'s accumulator reaches 10000, the VFD should begin to lower its output frequency from 60Hz back down to 0Hz and then energize, causing the second motor to stop rotating.

At this point, pressing **Stop** should cause the contactor to dropout and de-energize motor one.

If any errors are detected, go back "**Offline**" and trouble-shoot your ladder diagram.

Be sure to test to all of the system's specified operational characteristics. If anything is not working properly:

- Toggle the PLC from **Run Mode** ⇔ **Program Mode**
- Toggle **RSLogix** from **Program Mode** ⇔ **Offline**
- Troubleshoot your program and try again!

Note that, although this exercise led you step-by-step through the process of creating the entire ladder-logic program that will allow the PLC to control the system as described above, **upon completion of part E of this experiment**, you are encouraged to experimentally **modify your program** in order to vary the operation of the system.

Examples of potential modifications after you complete this entire exercise include:

- a) Modify the program such that both motors are de-energized when the timer is "done" counting, whether or not the operator presses the "Stop" button.
- b) An indicator lamp is wired to output port #1 of the PLC's output module. Modify the program to illuminate (energize) the indicator lamp whenever the first motor is energized.