K-05b

ELECTRICIAN TRAINING

SKILL DEVELOPMENT GUIDE

DUTY K: PLC (Modicon)
K-05b: Modify PLC Program

Issued 01/01/98

Task Preview

Modify PLC Program

The Modicon processor is connected to a P-series programmer allowing access to the machine program. The Learner performs modifications to the machine program due to machine or part breakdowns. Typical modifications include opening or closing a relay, changing the time on a timer, resetting the count on up and down counters, and energizing and de-energizing a coil.

The Learner must exercise extreme caution when modifying a program. Modifying a program incorrectly could result in unexpected damage to a part or movement of the machinery. After verifying the modifications have resolved a problem, the Learner must then backup the program.

How your skills will be checked

The Skill Check will require you to modify a PLC program. All tools, materials, and resources will be available. The Evaluator will verify that your demonstration meets the skill objective by observing or measuring each task standard. You must demonstrate safe work practices during the Skill Check. Contact your Evaluator whenever you are ready for the Skill Check.

Skill Objective

Upon notification of the need for a permanent or temporary modification to a machine program, modify the program.

Task Standards

1. Modification of the program results in the machine running according to specifications.

2. Temporary modifications are removed, and the program is modified or returned to the original condition.

What You Will Need

This section contains the safety information, tools, and resources you will need before modifying a PLC program.

- Follow all Caterpillar Facility Safety Standards when performing this task in the plant.
- You will perform this task online. Perform the steps carefully; mistakes could result in injury to personnel or damage to the equipment.
- Use caution when working around the PLC; high voltage is present on the inside of the PLC cabinet door and near the I/O chassis.

- P190 programmer (Typically used with the 184, 384, 484, 584, 884, and 984 processors.)
- P230 programmer (Used with the 984 processor and the 184, 384, 484, 584, and 884 processors in the P190 emulator mode.)
- PLC communication cable
- Tape Loader Tape (P190 only)
- Program Loader Tape (P190 only)
- Modicon Bus Plus (Used with all processors.)

- Basic Help Keys, available on programmer software
- Modsoft Programmer User's Manual (GM-MSFT-001 Rev. F)
- Modicon P230 Quick Key reference card
- Ladder Diagram printout
- Modbus Plus Data Highway Chart
- Machine Print

Task Steps

Modify PLC Program

NOTE: There are two sets of steps for modifying a program. The first set is for the P190 programmer and the second set is for the P230 programmer.

P190 PROGRAMMER

1. Locate the PLC unit number.

- Locate this number from the Modbus Plus Data Highway Chart.

2. Connect the data cable.

- Connect the dedicated data cord from the P190 programmer to the PLC Port 1. *See Figure 5-1.*

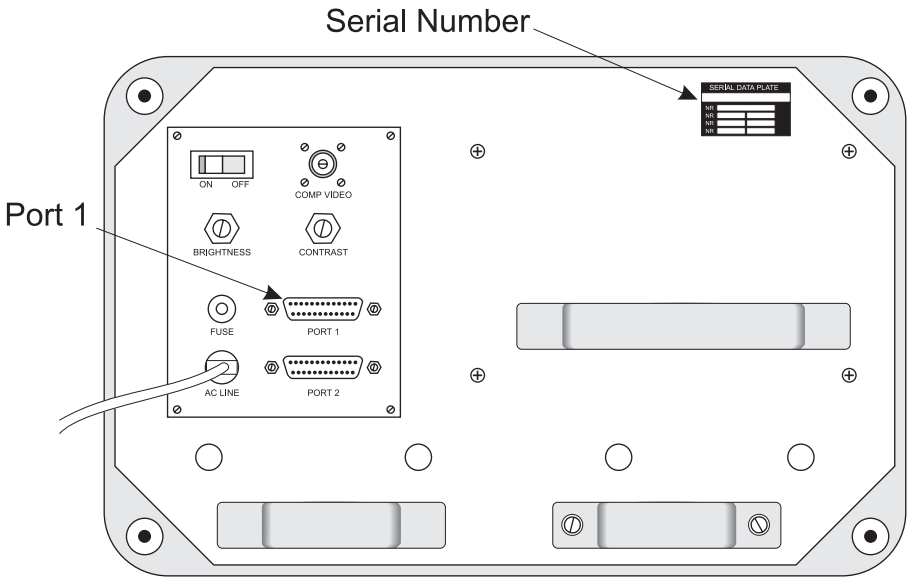

Figure 5-1
Data Communication Cable Hook-up on the P190 Programmer

3. Power up the unit.

WARNING! Do not place tapes on top of the programmer, they may be erased.

- Supply the P190 programmer with a power extension cord if necessary and plug in the programmer.
- Turn the power on by flipping the toggle switch located at the right rear of the unit near the top (when viewed from the front).

4. Load the tape.

- Insert the programmer tape into the tape drive slot. The tape loads automatically. *See Figure 5-2.*

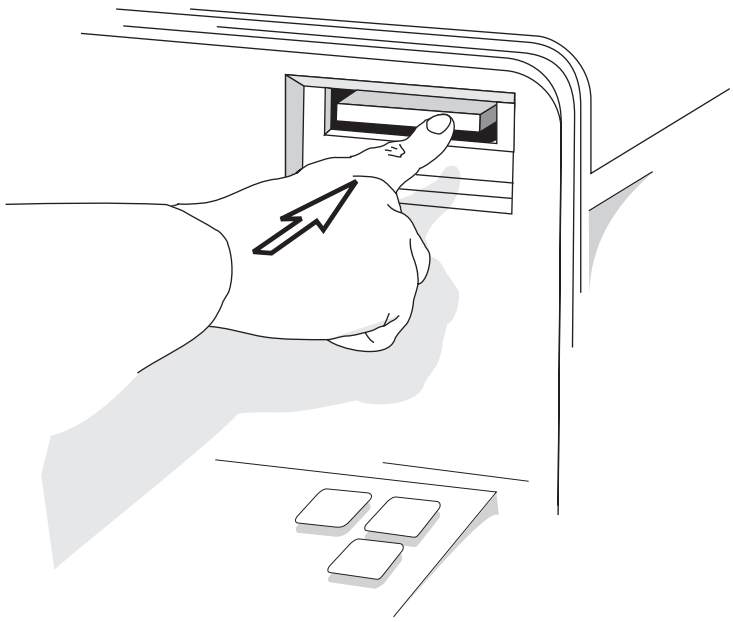

Figure 5-2
P190 Tape Drive Slot

5. Enter the AR: number.

- When the <Attach Unit> prompt appears on the software label keys, enter the unit number assigned from the Modbus Plus Data Highway Chart to the PLC on which you are working. *See Figure 5-3.*

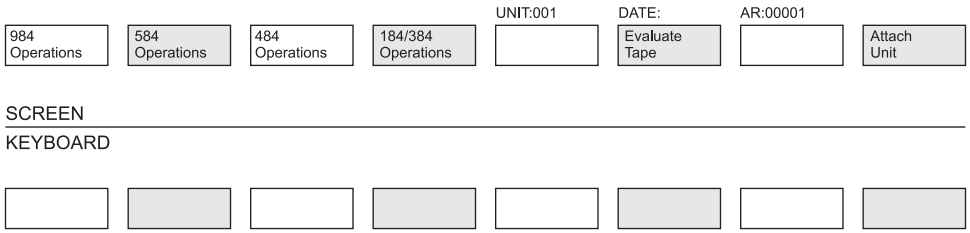

Figure 5-3
Software Label Keys: <ATTACH UNIT> prompt

6. Clear the screen.

- Press the <RESET/EXIT> function key.

7. Enter the network number.

- Locate the ID number of the device that is having problems.
- Locate the device on the machine print using the ID number.
- Get the register reference number from the machine print for the device.
- Locate the register reference number in the Ladder Diagram Cross Reference section at the back of the Ladder Diagram printout and find the corresponding network number.

8. Enter the network.

- Press the <ERASE/GET> function key when you enter the network.

9. Turn off the MEMORY PROTECT KEYLOCK. ***See Figure 5-4.***

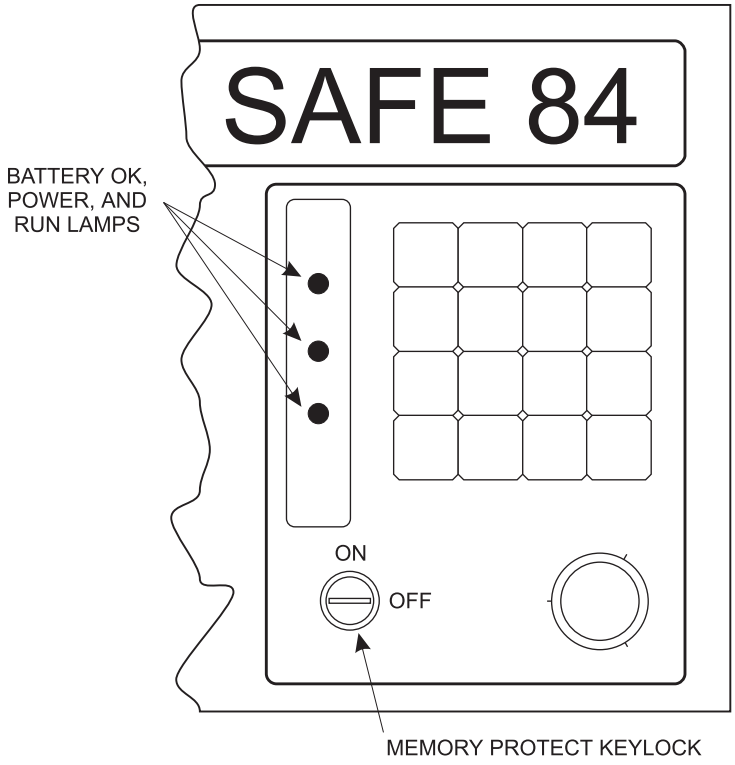

Figure 5-4
MEMORY PROTECT KEYLOCK for the 584 Processor

NOTE: If you do not turn off the MEMORY PROTECT KEYLOCK, an error message will display "Memory Protect must be off".

10. Modify the PLC program.

- Using the arrow keys, move the cursor to the desired node in the Ladder Diagram for modification.
- Use the software label keys and right and left arrow keys to select the commands needed to modify the program. *See Figure 5-5.*

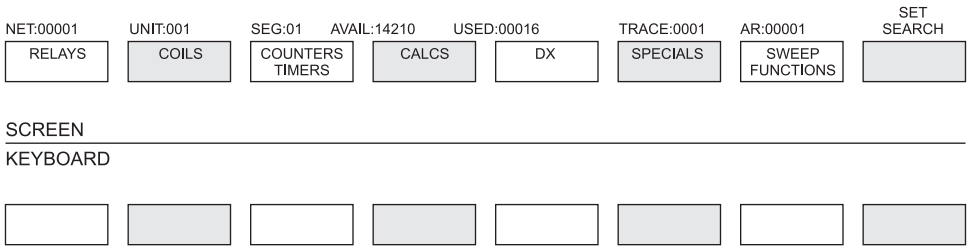

Figure 5-5
Modify PLC Program Software Label Keys

- The software label keys most often used when making modifications include RELAYS, COILS, COUNTERS/TIMERS, and sometimes CALCS.
- Edit the network by following prompts at the bottom of the screen.
- Changes are automatically written to the processor.
- Activate the coil to test the changes. When the coil is activated in the Ladder Diagram, the line that the coil is on will be highlighted.

WARNING! Verify that the modifications displayed on the screen are what you intended and in the right node or the machine could "wreck", causing injury to personnel or damage to the machine.

11. Exit the modify mode.

- Press the <Shift> key and the <RESET/EXIT> function key simultaneously.

12. Enter the initial <ATTACH> screen.

- Press the corresponding <LOG OUT> software label key.

13. Run the machine with the modified program.

- Verify that your changes in the program are correct by observing efficient machine performance.

14. Backup the modified program to tape.

P230 PROGRAMMER

1. **Power up the programmer.**

2. **Verify that the MEMORY PROTECT KEYLOCK is on.**

3. **Highlight the Modsoft directory.**

   - Use the arrow keys to move the cursor to the “Modsoft” directory.

4. **Move the cursor to the “File Area.”**

   - Use the <Tab> key to move from the directory area to the file area.

5. **Highlight the “Modsoft.exe” file.**

   - Use the arrow keys to move the cursor through the files.

6. **Press the <Enter> key.**

7. When the MODSOFT default screen displays, press the <Enter> key again. ***See Figure 5-6.***

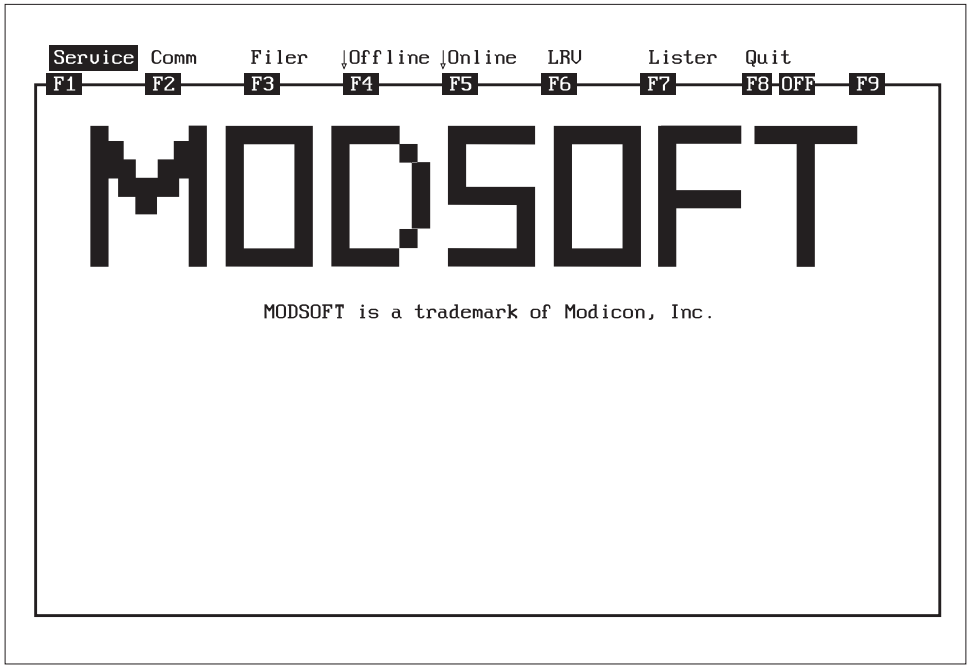

Figure 5-6
MODSOFT Default Screen

8. Move the cursor to the “COMBINED” menu. ***See Figure 5-7.***

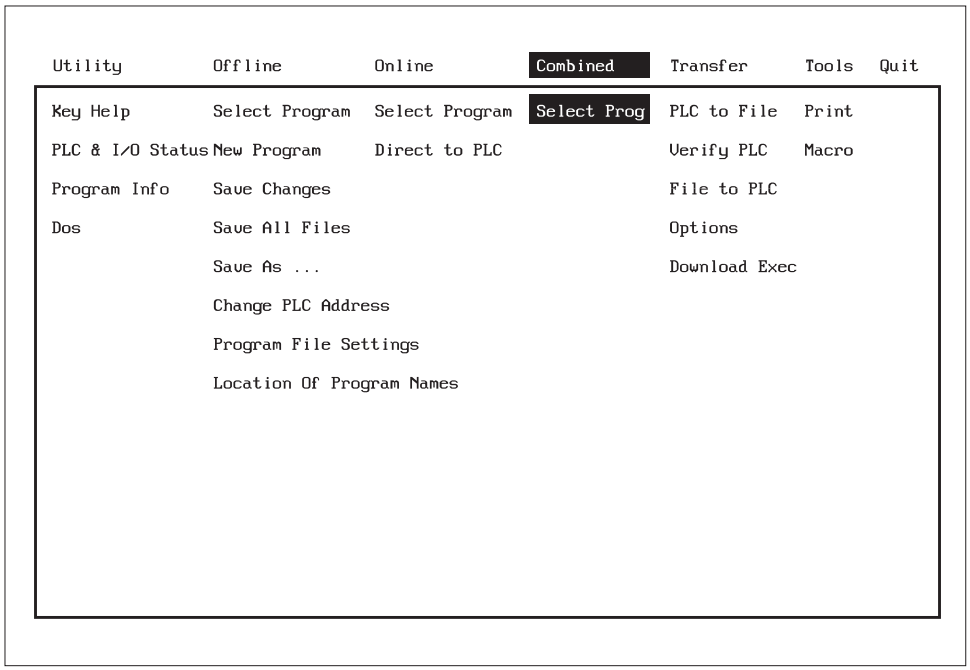

Figure 5-7
Main Menu Screen with Options Listed

- Use the right arrow key to highlight the “COMBINED” menu. Use the “COMBINED” option when you modify from the processor location and do not need to enter a remote address. The “COMBINED” option provides an automatic backup of the modified program to the hard drive.

9. Press the <Enter> key after highlighting the “Select Program” option.

- If this program is not listed, follow the routing process as demonstrated in Skill Development Guide, K-04: Connect and Operate Programmer, to enter a remote address from the “ONLINE” menu.

10. Turn the MEMORY PROTECT KEYLOCK off.

- Modifications to the program will not be written to the processor if the MEMORY PROTECT KEYLOCK is on.

11. At the Segment Status screen press <Enter>.

- The Ladder Diagram screen displays. *See Figure 5-8.*

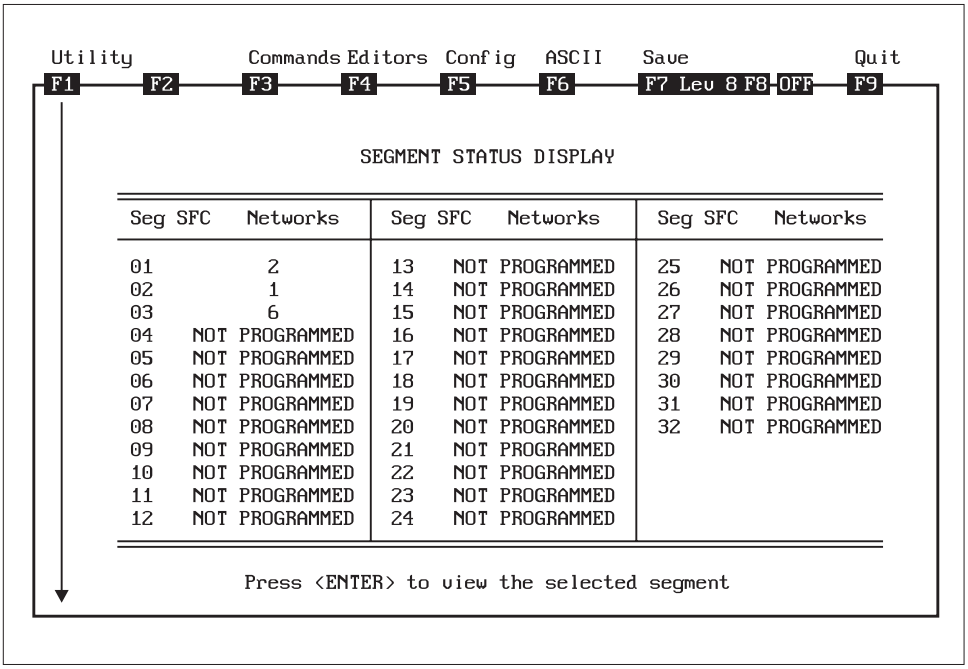

Figure 5-8
P230 Ladder Diagram Network Segment Status Display

12. Select the "Elements" menu. ***See Figure 5-9.***

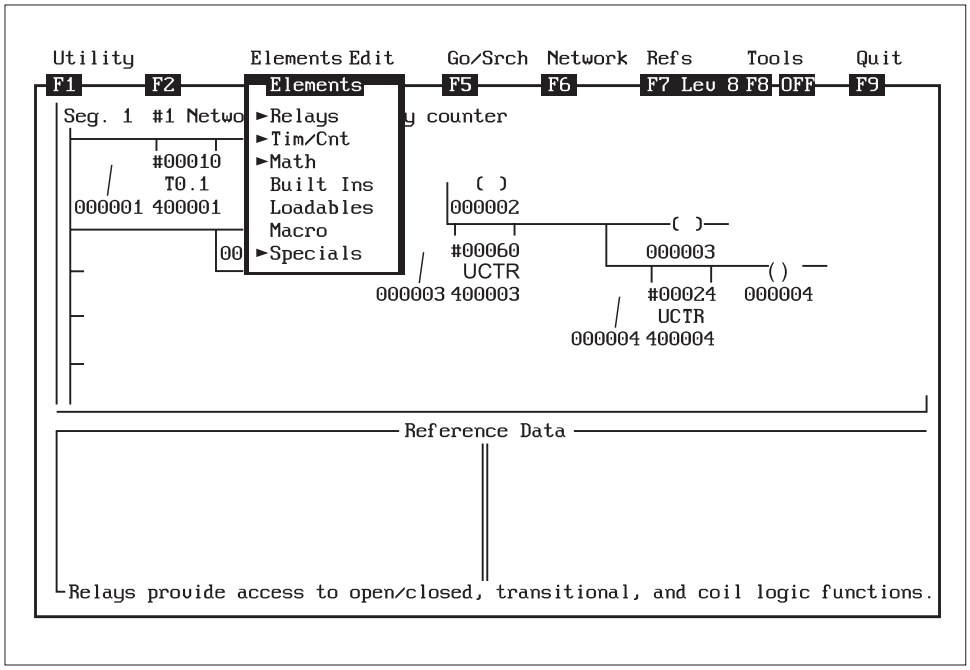

Figure 5-9
Ladder Diagram Screen with "Elements" Options Displayed

- Use the corresponding function keys (F1-F12) at the top of the screen to select the "Elements" menu.
- The Modicon Quick Key reference card is available for help on keystrokes.
- Perform most modifications from the "Elements" menu. Typical edits include RELAYS, COILS, TIME/CNTR, and CALCS functions.
- Knowledge of Ladder Logic is extremely important at this point.

13. Modify the program.

- Make the needed change to the machine program.

14. Verify that the changes made are correct.

- Activate the coil to test the changes.
- When the coil is activated, the logic ladder line that the coil is on will be highlighted.

15. Press the <Esc> key until the initial command screen displays.

16. Save the modifications.

- Press the <F7> function key to save modifications.
- Back up the software if you make modifications from the ONLINE menu.

Concept Check

Modify PLC Program

Answer the following questions to check your understanding of modifying a PLC program. Circle the correct answer in each question. Then compare your responses with the answers at the bottom of this page. Some of the questions may have more than one correct answer. If you have difficulty answering a question, review the Skill Development Guide or ask your Trainer for assistance.

1. Locate the PLC unit number on the

    a. machine print.

    b. Modbus Plus Data Highway Chart.

    c. Modbus Plus Connection Box.

    d. ladder printout.

2. Locate the network number for a device in the machine print.

    a. True

    b. False

3. When using the P230, in order to have an automatic backup copy of modifications, you should modify the program from the

    a. ONLINE Menu.

    b. Transfer Menu.

    c. OFFLINE Menu.

    d. Combine Menu.

4. When writing changes to a program, the MEMORY PROTECT KEYLOCK must be in the ON position.

    a. True

    b. False

5. Typical edits of the Ladder Diagram program include RELAYS, COILS, TIMERS, COUNTERS, and CALCS functions.

    a. True

    b. False

Answers: (1. b 2. b 3. d 4. b 5. a)

Next Step

If you are ready to demonstrate the task now, ask your Evaluator or Trainer to schedule the Skill Check. However, if you need to practice some of the steps first, continue to the next section.

Practice

The following practice will help prepare you for the Skill Check. Ask your Trainer to set up the practice for you. After you complete a practice, ask your Trainer to check your work.

Practice 1

Locate all PLCs and Programmers in the shop. Observe all Modicon PLC types and learn where the MEMORY PROTECT KEYLOCK on each of the units is located. Find the "Power On" or "Power" light on all PLCs. Identify the input/output (I/O) module "Active" lights on all PLC I/O module types. Be prepared to discuss the safe work practices that pertain to working around the PLC with a programmer in the shop.

Practice Objective 1

You should have become familiar with the location of all PLC units in the shop so that when called upon you can locate the nearest programmer to a machine. You should also have become familiar with the various types of Modicon PLCs in the shop including the 184, 384, 584, 884, and 984. The location of the MEMORY PROTECT KEYLOCK varies according to the unit but should be labeled and easy to locate for each unit. You should be able to identify the I/O boards and locate the "Active" lights on input and output boards.

Practice 2

Practice making modifications to a node in the machine programs with both types of programmers (P190 and P230) on the job site with you Trainer's supervision. Practice opening and closing a relay. Notice the "Active" lights on the I/O module flashing "on" and going "off" when you open and close a relay.

NOTE: Leave the MEMORY PROTECT KEYLOCK on so that modifications are not permanently written to the machine program; or if you must turn the MEMORY PROTECT KEYLOCK off to demonstrate the activity, verify that any changes to the program are changed back to the original program settings. Be able to discuss any safety-related issues when making a modification to a program.

Practice Objective 2

You should be able to enter a network and make changes to a specific node. With your Trainer's supervision, practice "forcing" an open relay closed and opening a closed relay. Point out the corresponding I/O board light as it opens and closes.

Practice 3

Practice making program modifications both ONLINE and in COMBINED form on the job site with your Trainer's supervision. Locate a remote address using the routing process as defined in Skill Development Guide "K-01: Connect and Operate Programmer." Be able to discuss safety issues when making ONLINE modifications.

Practice Objective 3

You should be able to locate a remote address in the ONLINE mode for modifications. Practice using the routing procedure as specified in Skill Development Guide "K-01: Connect and Operate Programmer."

Practice 4

Practice identifying the network number for a problem device. Be able to discuss safety issues when working around a machine.

Practice Objective 4

You should have located a "problem" device on a machine and noted its location ID number. Locate that device on the machine print and note the register reference number. Using the register reference number from the schematic, locate the device in the Ladder Cross Reference section of the Ladder Diagram printout and note the network reference number. The Ladder Cross Reference will tell you where the device is located in the Ladder Diagram. The network number will be the one you need when modifying the Ladder Diagram.

Next Step

Continue to practice until you are ready for the Skill Check. When you are ready to demonstrate the task, ask your Evaluator or Trainer to schedule the Skill Check.