

Chapter 7

On-Line Editing

After you have put your Hot Standby System in operation, you may occasionally need to edit the ladder logic to modify application functions. This chapter considers editing procedures for Hot Standby Systems. First, consider three general guidelines for on-line editing:

- ▣ Changes in ladder logic can make the control system behave differently. Always use care when making on-line editing changes.
- ▣ We recommend that one Modbus port be set aside for programming and not used for networking—refer to Chapter 2 regarding Modbus port address handling. If you are unable to use a dedicated Modbus port for programming, make sure that you are aware of the individual Modbus port addresses at all times.
- ▣ You can make minor changes to ladder logic while the system is on-line and controlling your application, but if you need to make *major* changes, we recommend that you shut down the application first.



Caution If you are changing the 984 Configuration or Traffic Cop, you must first shut down your control system.

On-line Editing Procedures with Modbus

Procedure Editing Ladder Logic on a Hot Standby System

- Step 1** Verify that both controllers are running, one in the primary mode and one in the standby mode.
- Step 2** Connect a programming panel—e.g., a P190 or P230—to a Modbus port on the *primary* controller—which is running application logic.
- Step 3** Load the 984 Tape Loader tape or disk file. Do not stop the controller before proceeding. Record your application program with a [DUMP 984] operation.
- Step 4** Place the S911 keyswitch on the *standby* controller in the OFFLINE position.
-  **Note** The primary controller will function as a standalone until the editing task is complete.
- Step 5** Load the 984 Programmer tape or disk file.
- Step 6** Carefully edit the selected networks of the primary controller according to design requirements.
-  **Caution** To help protect against damage to application I/O devices, use care in editing application logic. Untested logic changes can have unexpected consequences.
- Step 7** Verify that the application responds correctly to the changes.
- Step 8** Repeat steps 6 and 7 until all changes are complete.
- Step 9** Load the 984 Tape Loader tape or disk file. Record your application program with a **DUMP 984** operation. This copy will supersede your previous backup copy.
- Step 10** Connect the programming panel to the *standby* controller at Modbus port 1. Make sure the controller is in the STOP mode before proceeding.
- Step 11** Load the application program to the standby controller with a [LOAD 984] operation.
- Step 12** Start the controller.
- Step 13** Turn the S911 keyswitch to RUN, and verify proper LED indications against Table 4.

Table 4 Hot Standby Normal Indications

| Module | Led Indicator | Primary Controller | Standby Controller |
|----------------------------|----------------------|---------------------------|---------------------------|
| S911 | READY | ON | ON |
| | COMM ERROR | OFF | OFF |
| | PRIMARY | ON | OFF |
| | STANDBY | OFF | ON |
| S908/S929 | READY | ON | ON |
| | COMM ACTIVE | ON | Blinking |
| | COMM ERROR | OFF | OFF |
| C916/C924 | RUN | ON | ON |
| | READY/SAFE 84 | OFF | OFF |
| 984-680/-685/ -780/-785 | RUN | ON | ON |
| | READY | ON | ON |
| | POWER OK | ON | ON |

On-line Editing Procedures with Modbus Plus



Note Because Modbus Plus addresses are set by hardware switches and not controlled by software, the procedures for loading and modifying a program in a 984 Hot Standby Controller configuration are different than in a standard Modbus network implementation.

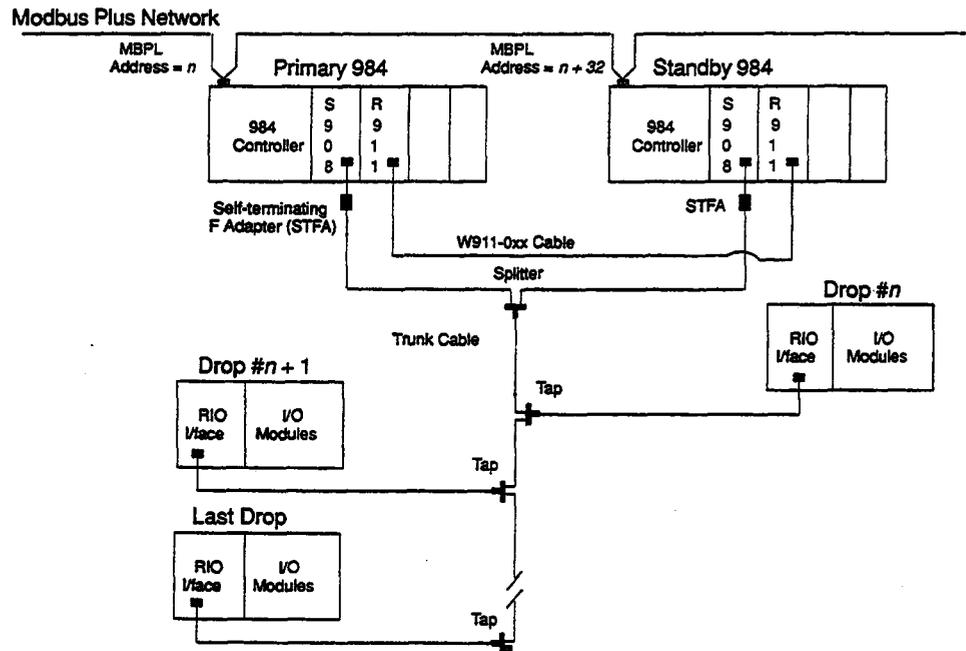


Figure 11 Hot Standby Control on Modbus Plus

Procedure Initial Load Procedure

- Step 1** Set the Modbus Plus address switches identically on the primary and standby controllers (at address 32 or lower) and connect all cables.
- Step 2** Connect *only one* of the programmable controllers to the Modbus Plus network.
- Step 3** Download the control program into this controller.
- Step 4** Start the controller—it should come up as the primary Hot Standby controller. When its RUN light illuminates, disconnect the Modbus Plus connector.
- Step 5** Connect the second programmable controller to the Modbus Plus network.

Step 6 Download the control program into this controller and then start the controller. When its **RUN** light illuminates, the panel software (e.g., Modsoft) will return Modbus Error Code 818:

Modbus Plus: Remote PLC not listening for call

This is a normal response. The Modbus Plus address on this standby controller is now offset 32 addresses higher than the address you specified for the primary controller, while the program panel messages contain the address of the primary controller.

Step 7 Reconnect the primary controller to the Modbus Plus network. Both controllers should now be running and connected to Modbus Plus – i.e., the Modbus Plus LED on each unit should be blinking six times per second.

Procedure How to Modify a Program in a Hot Standby System



Caution Always work with the program uploaded—i.e., saved—from the standby controller. Never upload the program from the primary controller once the system is in operation.

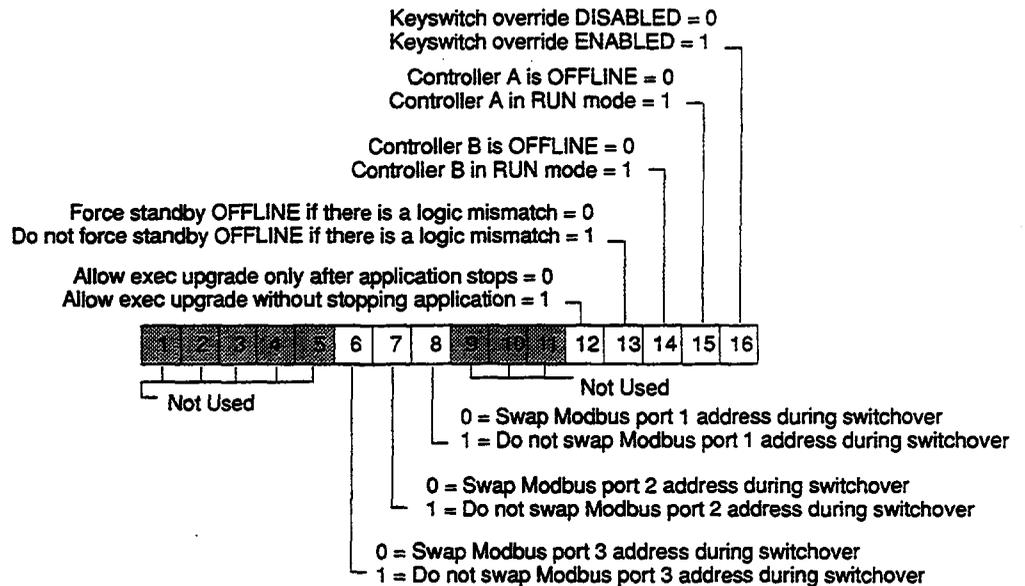


Figure 12 Hot Standby Command Register

Step 1 Make sure that bit 13 in the HSBY command register is set to 1 in both the primary and the standby controllers. Setting this bit equal to 1 causes the system to ignore changes to logic, a condition that would normally cause the standby to go OFFLINE; ignore differences in logic. Changes may be made to either controller in the ONLINE mode if bit 13 in the HSBY command register is set to 1.

- Step 2** Set the program panel routing path to the address of the standby controller—i.e., 32 addresses higher than the address of the primary controller. You must work with the standby controller, using its Modbus Plus address.
- Step 3** Upload the program from the standby controller to the programming panel.
- Step 4** Make the desired modifications to the standby program, then download the modified program back to the standby controller.
- Step 5** Once the controller has resumed its ONLINE standby functions, force a failure in the primary controller—i.e., cause a switchover. This can be done by switching the primary unit to OFFLINE.
- Step 6** The controller that was previously the primary controller now has the standby address. Download the modified program to the new standby controller and restart it.
- Step 7** When the standby controller goes ONLINE in standby mode, the system is again redundant with the modified program installed. You may then wish to reset bit 13 in the HSBY command register to 0, its default setting.

Chapter 8

Locating Startup Errors

When you power up your Hot Standby System, the LEDs on the remote I/O processing modules and S911 Hot Standby modules display light patterns that tells you that the system is running properly or that some error has occurred. Error display patterns are described in the *984 Hot Standby Installation and Maintenance Manual* (GM-S911-001).

If, after carefully rechecking the hardware and software, you are unable to pinpoint the source of a startup error, you can access memory bits in the controller that indicate very specific startup error conditions. These startup error bits are the eight least significant bits in a word at a memory location.

This chapter describes a procedure you can follow to access these error codes.

Procedure for Locating Startup Error Codes

Procedure Accessing Startup Error Codes

- Step 1** Connect a programming panel—e.g., a P190 or P230—to the controller flashing an error pattern. Load the Utility tape or disk file into the programmer.
- Step 2** Set the assembly register (AR) to 00001, press [ATTACH], then press **EXIT**.
- Step 3** Press [EXAMINE MEMORY], bring the cursor down to the AR line, and enter 0032 into the AR. Press **GET**.

This gets you to memory location 0032. A hexadecimal number will appear on the screen associated with that memory location. The number may vary depending on the type of programmable controllers your 984 Hot Standby System uses; call the number *nnnn* hex.

- Step 4** Apply the following formula to *nnnn* hex:

$$nnnn \text{ hex} - 8000 \text{ hex} + 29 \text{ hex}$$

Make the result of this calculation a five-digit hexadecimal number by placing F in the most significant position.

- Step 5** Enter this five-digit hexadecimal number into the AR, and press **GET**. A hexadecimal number associated with this memory location appears on the screen.
- Step 6** Convert the hexadecimal number on the screen to its binary representation. The eight least significant bits contain the startup error codes.
- Step 7** Compare the bit values against those in Table 5. A "1" at any of these bit locations indicates that an error condition exists.

Table 5 Startup

| Bit # | Set to 0 | Set to 1 |
|-------|----------|------------------------------------|
| 8 | No error | Traffic Cop checksum error |
| 7 | No error | Segment Scheduler checksum error |
| 6 | No error | Configuration table checksum error |
| 5 | No error | Toggle switch position error |
| 4 | No error | UART error |
| 3 | No error | RAM address error |
| 2 | No error | RAM data error |
| 1 | No error | PROM checksum error |

An Example of a Startup Error Condition

Here is an example of how you might use this startup error procedure to diagnose a problem.

Error Display

You are trying to power up your Hot Standby system, but the COMM ERROR and the PRIMARY lights on your primary controller are flashing an error pattern. You check your hardware and software configurations, but the source of the error is not obvious.

Applying the Startup Error Procedure

- Connect your programming panel to the primary controller and load the panel with the Utility tape.
- Attach the tape, press **EXIT**, press [EXAMINE MEMORY], and bring your cursor down to the AR. You want to examine memory location 0032, so enter 32 into the AR and press **GET**. You see displayed on your screen:

0032 = 9300

- 9300 is a hexadecimal number. Subtract 8000 hex from 9300 hex, then add 29 hex to it. The result is *1329 hex*. Make this hexadecimal number five digits by adding F to the most significant location:

F1329

- Enter F1329 into the AR and press **GET**. You see displayed on your screen:

F1329 = 0050

- Convert 0050 hex into its binary representation:

0000/0000/0110/0000

- Now examine the eight least significant bits, and compare them against Table 5.

Interpreting the Startup Error Codes

Notice that 1's appears at the sixth and seventh bit locations. This tells you that you have checksum errors in the configuration table and the Segment Scheduler.