UNIT 21
INSTRUCTOR'S MANUAL

TROUBLESHOOTING THE MB655

1. This unit is included to help students troubleshoot the system. It is also designed to introduce them to the skills needed to troubleshoot a malfunctioning PLC. It is in no way a complete guide to PLC troubleshooting. Nor should any of the troubleshooting instructions be interpreted as maintenance or repair instructions for the PLC itself. All specific questions about troubleshooting the system or the PLC itself should be directed to TII Technical Education Systems.

2. Because the information in this unit is designed as reference material to be used as needed, no Experiment is included.

UNIT 21

TROUBLESHOOTING THE MB655

Objective

Upon completion of this unit the student will be able to:

1. Identify simple power problems in the MB655.
2. Describe basic troubleshooting procedures.
3. Identify and use controller error codes.
4. Identify possible input and output problems.

Background

There are seven places a problem can occur in a PLC.

1. Input device;
2. Wiring between input device and input module;
3. Input module;
4. Processor;
5. Output module;
6. Wiring between output module and output device;
7. Output device.

The information which follows can help locate problems in the PLC training system. When an error occurs while verifying projects, the RSLogix 500 software displays an error message as shown here:

☐ —— ERRORS

    ☐ —— PROGRAM FILES

        ☐ —— FILE 2

RUNG 0 INS 0 : ERROR : (RUNG HAS NO INSTRUCTIONS)

Rung Number   **Instruction**   **Error Description**

Power Problems

Many problems are caused by a lack of electrical power to parts of the system. Table 21-1 lists several power problems, their likely causes and potential solutions.

Symptom	Possible Causes	Solution
Main power indicator does not light	System not plugged in	Plug system into wall outlet
	Main power fuse blown	Replace fuse with equivalent type fuse (1A fast blow)
	Indicator light broken	Contact TII
No power to inputs or outputs	24 volt fuse blown	Replace fuse with equivalent type fuse (1A fast-blow)
	Main power not on	Turn on main power switch
	Inputs and outputs not wired to power	Make sure all commons are properly wired to power strip
	Jumper cable broken	Test continuity of jumper cables
	24 volt power supply not working	Contact TII
Output light not working	Light bulb blown	Remove light cover and check bulb
	Light not wired properly	Check output wiring
	24 volt power supply not working	Check power supply
	Jumper cable broken	Test continuity of jumper cable
Input indicators not lighting	Input wired incorrectly	Check power wiring
	Jumper cable broken	Test continuity of jumper cable.
	24 volt power supply not working	Check power supply

Controller Faults

The Micrologix controller faults are divided into the following types:

- powerup errors
- going-to-run errors
- run errors
- download errors

Powerup Errors

Error Code (HEX)	Advisory message	Description	Recommended action
0001	DEFAULT PROGRAM LOADED	The default program is loaded to the controller memory. This occurs: • on power up if the power down occurred in the middle of a download • if the user program is corrupt at power up, the default program is loaded	• Re-download the program and enter the REM Run mode. • Contact your local TII representative if the error persists.
0002	UNEXPECTED RESET	The controller was unexpectedly reset due to a noisy environment or internal hardware failure. If the user program downloaded to the controller is valid, the initial data downloaded with the program is used. The Retentive Data Lost Bit (S:5/8) is set. If the user program is invalid, the default program is loaded.	• Refer to proper grounding guidelines in chapter 1. • Contact your local TII representative if the error persists.
0003	EEPROM MEMORY IS CORRUPT	The user program is corrupt and the default program is loaded.	• While power cycling to your controller, a noise problem may have occurred. Try cycling power again. Your program may be valid, but retentive Data will be lost. • Contact your local TII Representative if the error Persists.
0005	RETENTIVE DATA HAS BEEN COST	The data files (input, output, timer, counter, integer, binary, control, and status are corrupt.	• Cycle power on your unit. • Download your program and reinitialize any necessary data. • Start up your system.

Going-to-Run Errors

Error Code (Hex)	Advisory Message	Description	Recommended Action
0008	FATAL INTERNAL SOFTWARE ERROR	The controller software has detected an invalid condition within the hardware or software after completing power-up processing (after the first 2 seconds of operation).	• Cycle power on your unit. • Download your program and re-initialize any necessary data. • Start-up you system. • Contact your local TII representative if the Error persists.
0009	FATAL INTERNAL HARDWARE ERROR	The controller Software has detected an invalid condition within the hardware during power-up processing (within the first 2 seconds of operation).	• Cycle power on your unit. • Download your program and re-initialize any necessary data. • Start-up your system. • Contact your local TII representative if the error persists.
0010	INCOMPATIBLE PROCESSOR	The downloaded program Is not configured for a micro controller	If you want to use a micro controller with the program, reconfigure your controller with MPS or APS (choose Bul. 1761).
0016	STARTUP PROTECTION AFTER POWERLOSS: S:1/9 IS SET	The system has powered up in the REM Run Mode. Bit S:1/13 is set and the user-fault routine is run before beginning the first scan of the program.	• Either reset Bit S:1/9 if this is consistent with your application requirements, and change the mode back to REM Run, or • Clear S:1/13, the major fault Bit.
0018	USER PROGRAM IS INCOMPATIBLE WITH OPERATING SYSTEM	An Incompatible program was downloaded. Either the program does not have the correct number of files or it does not have the correct size data files. The default program Is loaded.	• Check the configuration and make sure the correct processor is selected. • If you want to use a micro controller with the program, reconfigure your controller with MPS or APS (choose Bul. 1761).

Run Errors

Error Code (Hex)	Advisory Message	Description	Recommended Action
0004	RUNTIME MEMORY INTEGRITY ERROR	While the controller was in the RUN mode or any test mode, the ROM or RAM became corrupt. If the user program Is valid, the program and Initlal data downloaded tot he controller is used and the Retentive Data Lost Bit (S:5/8) is set. If the user program Is Invalid, error 0003 occurs.	• Cycle power on your unit. • Download your program and re-initlalize any necessary data. • Start-up your system. • Contact your local TII representative if the error persists.
0020	MINOR ERROR AT END OF SCAN, SEE S:3	A minor fault bit (bits 0-7) in S:5 was set at the end of scan.	Enter the status file display, clear the fault and retum to REM Run mode.
0022	WATCHDOG TIMER EXPIRED, SEE S:3	The program scan time exceeded the watchdog timeout value (S:3H).	• Verify if the program is caught In a loop and correct the problem. • Increase the watchdog timeout value in the status file.
0024	INVALID STI INTERRUPT SETPOINT, SEE S:30	An invalid STI interval exists (not between 0 and 255).	Set STI interval between the values of 0 and 255.
0025	TOO MANY JSRs IN STI SUBROUTINE	There are more than 3 subroutines nested in the fault routine (file 3).	Correct the user program to meet the requirements and restrictions for the JSR instruction, then reload the program and enter the REM Run mode.
002A	INDEXED ADDRESS TOO LARGE FOR FILE	The program is referencing through Indexed addressing an element beyond a file boundary.	Correct the user program to not go beyond file boundaries.
002B	TOO MANY JSRs IN HSC	There are more than 3 subroutines nested in the high-speed counter routine (file 4).	Correct the user program to meet the requirements and restrictions for the JSR instructions, then reloads the program and enter the REM Run mode.
0030	SUBROUTINE NESTING EXCEEDS LIMIT OF 8	There are more than 8 subroutines nested in the main program file (file 2)	Correct the user program to meet the requirements and restrictions for the maln program file, the reload the program and enter the REM Run mode.
0031	UNSUPPORTED INSTRUCTION DETECTED	The program contains an instruction(s) that is not supported by the micro controller. For example MSG, SVC, or PID.	Modify the program so that all Instructions are supported by the controller, then reload the program and enter the REM Run mode.
0032	SQO/SQC CROSSED DATA FILE BOUNDARIES	A sequencer instruction length/position parameter points past the end of a data file.	Correct the program to ensure that the length and position parameters do not point past the data file. Reload the program and enter the REM Run mode.

Run Errors (Continued)

Error Code (HEX)	Advisory Message	Description	Recommended Action
0033	BSL/BSR/FFL/FFU/LFL/LFU CROSSED DATA FILE BOUNDARIES	The length parameter of a BSL, BSR, FFL, FFU, LFL, of LFU Instruction points past the end of a data file.	Correct the program to ensure that the length and position parameters do not point past the data file. Reload the program and enter the REM Run mode.
0034	NEGATIVE VALUE IN TIMER PRESET OR ACCUMULATOR	A negative value was loaded to a timer preset or accumulator.	If the program is moving values tot he accumulated or preset word of the timer, make certain these values are not negative. Correct the program, reload and enter the REM Run mode.
0035	ILLEGAL INSTRUCTION (TND) IN INTERRUPT FILE	The program contains a Temporary End (TND) instruction in file 3, 4, or 5 when it is being used as an interrupt subroutine.	Correct the program, reload and enter the REM Run mode.
0037	INVALID PRESET LOADED TO HIGH-SPEED COUNTER	Either a zero (0) or a negative high preset was loaded to counter (C5:0) when the HSC was an Up counter or the high preset was lower than or equal to the low preset when the HSC was a Bi-directional counter.	• Check to make sure the presets are valid. • Correct the program, reload, and enter the REM Run mode.
0038	SUBROUTINE RETURN INSTRUCTION (RET) IN PROGRAM FILE 2	A RET instruction is the main program file (file 2).	Remove the RET instruction, reload the program and enter the REM Run mode.
0040	OUTPUT VERIFY WRITE FAILURE	When outputs were written and read back by the controller, the read failed. This may have been caused by noise.	• Refer to proper grounding guidelines In chapter 1. • Start-up your system. • Contact your local TII representative if the error persists.
0041	EXTRA OUTPUT BIT(S) TURNED ON	An extra output bit was set when the extra output select (S:0/8) bit in the status file was reset. For 16-point controllers this includes bits 6-15. For 32-point controllers this includes bits 12-15.	• Set S:0/8 or change your applIcation to *prevent* these bits from being turned on. • Correct the program, reload, and enter the REM Run mode.

Download Error

Error Code (HEX)	Advisory Message	Description	Recommended Action
0018	USER PROGRAM IS INCOMPATIBLE WITH OPERATING SYSTEM	An incompatible program was downloaded. Either the program does not have the correct number of files or it does not have the correct size data files. The default program is loaded.	• Check the configuration and make sure the correct processor is selected. • If you want to use a micro controller with the program, reconfigure your controller with MPS or APS (choose Bul. 1761).

Identifying Controller Faults

While a program is executing, a fault may have occurred within the operating system or your program. When a fault occurs, you have various options to determine what the fault is and how to correct it. This section describes how to clear faults and provides a list of possible advisory messages with recommended corrective actions.

Clearing Controller Faults

There are three ways you can clear a fault:

- manually, by viewing the fault display: Go Online, Select Comms; then, Manually Clear the Fault
- automatically, using the fault override bit (S:1/8) or the Run Always bit (S:1/12) and cycling power
- implementing the user-fault routine and clearing bit S:1/13 within it

Input Problems

There are four places in which a problem can occur in the input section:

1.   Input devices;
2.   Input module;
3.   Wiring between input module and input devices, and;
4.   Input power source.

The table below provides indicator status information and possible associated problems. Note that an input indicator LED illuminates when power is applied to that input terminal by an input device.

Input Device	LED Indicator	⊣⊢	⊣/⊢	Source of problem
Closed ON	On	On	Off	Normal
Closed ON	On	Off	On	1. Processor input circuitry fault. 2. Processor/programmer communication fault.
Closed ON	Off	Off	On	1. Wiring/power to processor input circuitry fault. 2. Processor input fault
Open OFF	Off	Off	On	Normal
Open OFF	Off	On	Off	Processor input circuitry fault
Open OFF	On	On	Off	Short circuit in input device or wiring

Input Troubleshooting Guide

Should the problem be in the processor itself, and not in the external wiring, contact TII- Systems for assistance.

Output Problems

Output problems can be diagnosed with the assistance of the force function. Use the force function as described. Use the force function as described in UNIT 13 to change the status of the output elements in a program. The table below provides possible problems associated with the various indicator conditions. Note that the output indicator lights up when the output element in the program has been activated. It does not indicate the status of the output device.

Output Device	LED Indicator	Element Status	Source of Problem
Off	Off	Off	Normal
Off	Off	On	Output Module Bad
Off	On	On	1. Device wired improperly 2. No power to device 3. Device bad
On	Off	Off	1. Output module bad 2. Device wired improperly
On	Off	On	LED Burnt out
On	On	Off	1. Output module bad 2. Device wired incorrectly
On	On	On	Normal

Output Troubleshooting Guide

To troubleshoot a PLC system properly, it is necessary to use a volt/ohm meter or continuity tester. These devices are readily available and can be learned about from many sources, including electronics instructors. If your troubleshooting efforts with the MB 650 are not successful, contact TII for assistance. Pay especially careful attention to the construction of the circuits on the panel.

Because of the nature of the content of this unit, there will be no lab experiment. Please complete this unit by answering the questions which follow.

Questions

1. What can happen when a fuse blows on the MB 650?

   If it is the main power fuse, all power is lost to the system panel. If it is the 24 VDC fuse by the on-board power supply, no power will be provided to the common connections. The input and output devices will not operate, either directly or when controlled by the PLC.

2. What would make you suspect that the MB 650 is having power problems?

   The main power light goes out. There is no power to the input or output devices, or the input and output devices are not working. The input indicator lights on the controller body do not illuminate during program operation.

3. You have entered a program and switch into RUN mode. You press your start Switch and nothing happens. What do you do? Be thorough.

   Check for error codes being displaced. Review program for errors

   Check for power supply problems and test electrical connections. Monitor for

   controller, input and output problems. Test inputs and outputs with force on and

   force off commands.