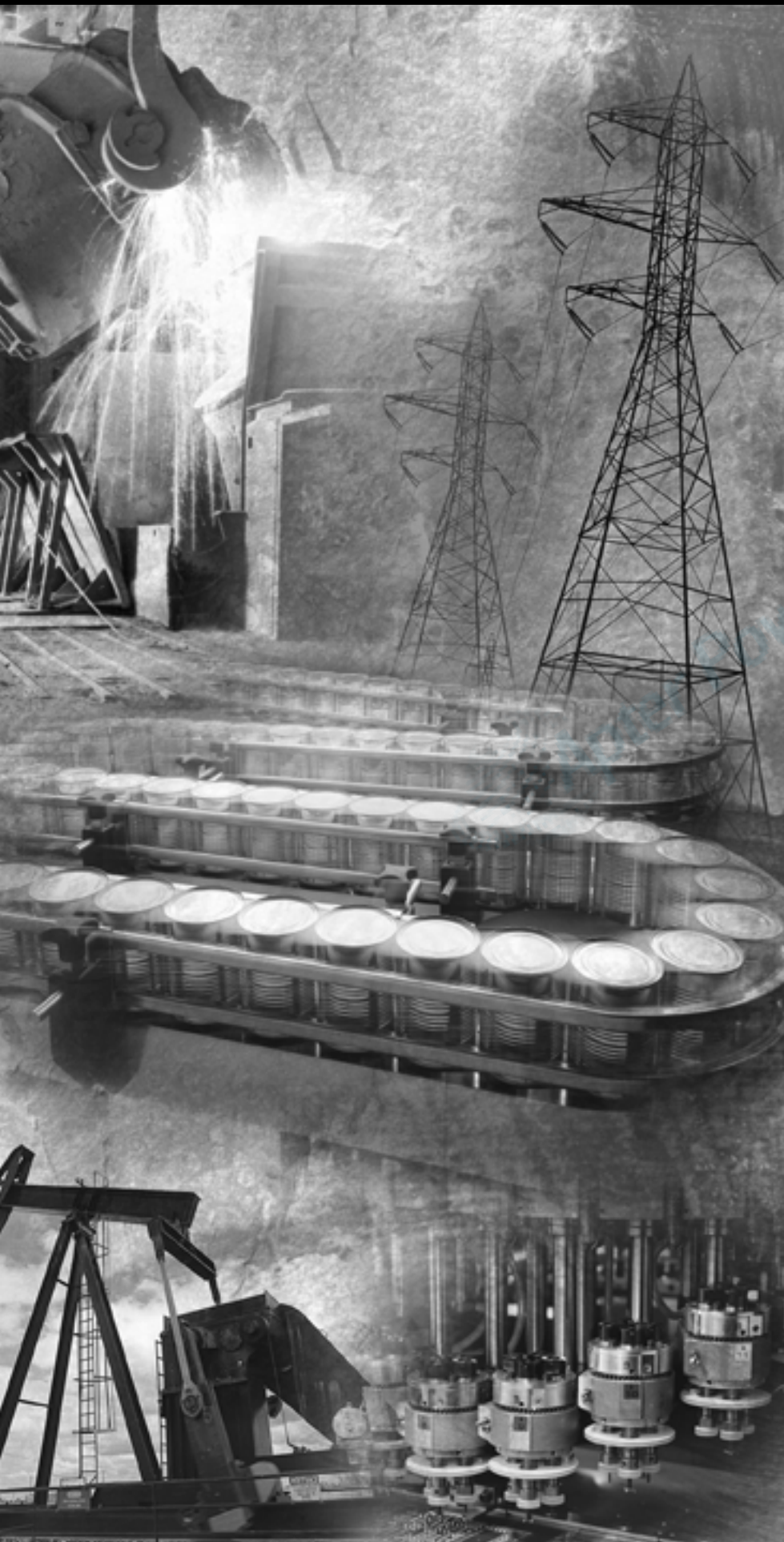




Allen-Bradley

SLC 500 Modular Hardware Style

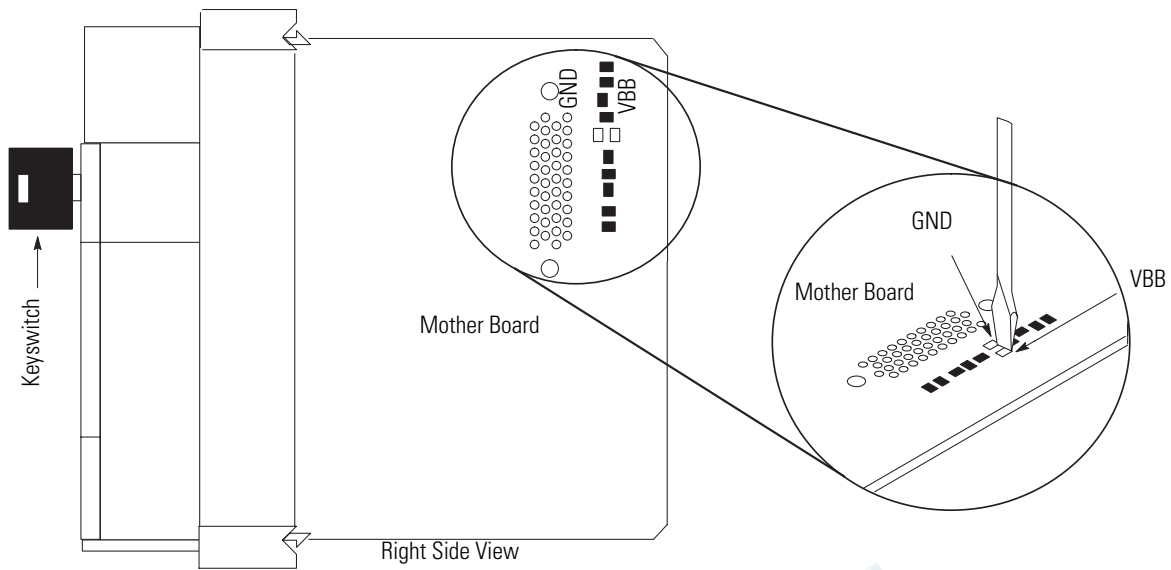
Catalog Numbers

**1747-L511, 1747-L514, 1747-L524,
1747-L531, 1747-L532, 1747-L533,
1747-L541, 1747-L542, 1747-L543,
1747-L551, 1747-L552, 1747-L553**

User Manual

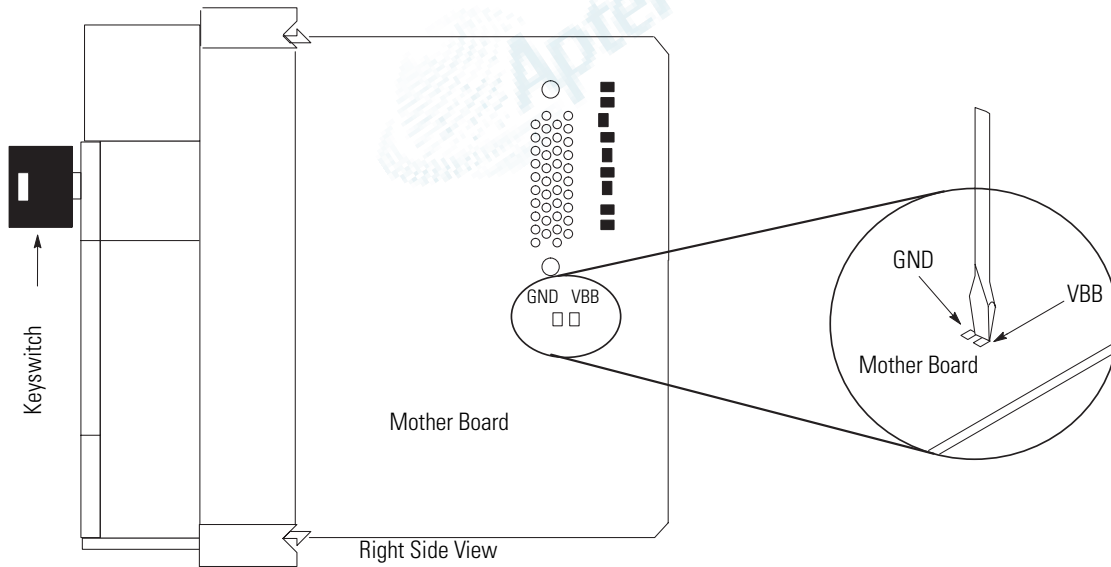
**Rockwell
Automation**

SLC 5/03 Processors (1747-L531, 1747-L532, and 1747-L533)



SLC 5/04 Processors (1747-L541, 1747-L542, and 1747-L543)

SLC 5/05 Processors (1747-L551, 1747-L552, and 1747-L553)



programmer. The 1747-M15 Series B adapter socket **is required** for use with the memory module (catalog number 1747-M13).

ATTENTION


Make sure the adapter is inserted properly in the programming equipment or damage could result.

See the table below for details on the Flash EPROM and adapter socket.

Memory Module Compatibility

Cat. No.	Description	Use with this processor type		
		SLC 5/03	SLC 5/04	SLC 5/05
		1747-L531, 1747-L532, 1747-L533	1747-L541, 1747-L542, 1747-L543	1747-L551, 1747-L552, 1747-L553
1747-M13	Supports up to 64 K of user-memory backup	X (Series C OS302 or later)	X (Series C OS401 or later)	X (Series C OS501 or later)

To program a memory module, refer to your programming software user manual or help resource. Follow this procedure to program a memory module.

1. Set the memory module configuration bits (S:1/10 to S:1/12) in your offline program file. Refer to SLC 500 Instruction Set Reference Manual, publication 1747-RM001, for details on the Memory Module Configuration Bits.
2. Download your program file to your processor.
3. Go online with the processor and burn the program to the EEPROM memory module (per the instructions outlined in your programming software user manual or help resource).

EEPROM Burning Options

You can burn a program into an EEPROM memory module using a processor that is the same or different from the one used to run the program. When burning EEPROMs, keep the following conditions in mind:

- The processor burning the EEPROM must be of the same type and have the same OS version or lower than the target processor.

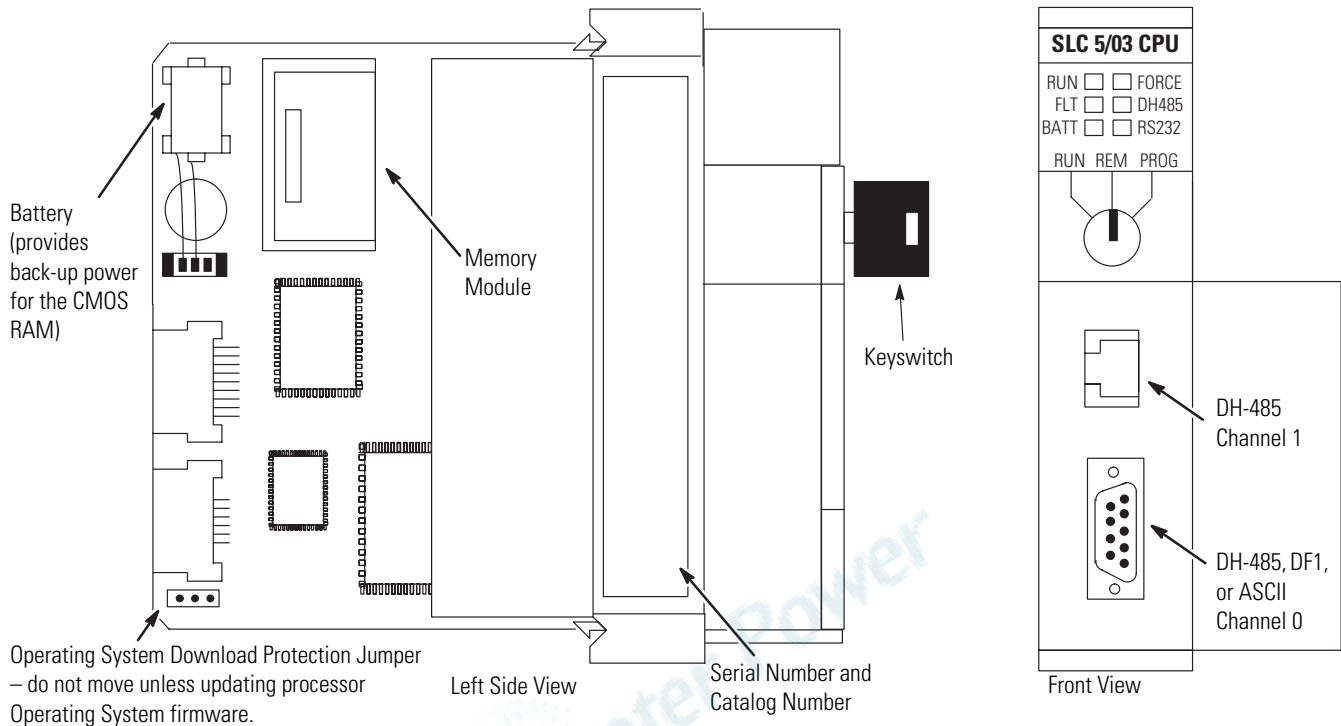
SLC 5/03 Processor Hardware Features

The SLC 5/03 processor offers:

- program memory size of 8 K, 16 K, 32 K.
- control of up to 4096 input and output points.
- online programming (includes runtime editing).
- built-in DH-485 channel.
- built-in RS-232 channel, supporting:
 - DF1 full-duplex for point-to-point communication; remotely via a modem, or direct connection to programming or operator interface devices. (Use a 1747-CP3 cable for direct connection.).
 - DF1 radio modem for radio modem (peer-to-peer) communication.
 - DF1 half-duplex master/slave for SCADA type (point-to-multipoint) communication.
 - DH-485 (Serves as a second DH-485 channel. Use a 1761-NET-AIC interface with a 1747-CP3, 1761-CBL-AC00, or 1761-CBL-AP00 cable to connect to the DH-485 network.).
 - Modbus RTU Master communication with Modbus RTU slave devices.
 - ASCII I/O for connection to other ASCII devices, such as bar code readers, serial printers, and weigh scales.
- channel-to-channel passthru (DH-485 to DF1 full-duplex, DF1 half-duplex Master, DF1 radio modem, or DH-485).
- remote I/O passthru.
- DeviceNet passthru.
- built-in real-time clock/calendar.
- 2 ms Selectable Timed Interrupt (STI).
- 0.50 ms Discrete Input Interrupt (DII).
- advanced math features - trigonometric, PID, exponential, floating-point, and the compute instruction.
- indirect addressing.
- logical ASCII addressing in PLC-5 type messages.
- flash PROM provides firmware upgrades without physically changing EPROMS.
- optional flash EPROM memory module available.
- keyswitch - RUN, REMote, PROGram (clear faults).
- battery-backed RAM.
- additional instructions such as swap and scale with parameters (SLC 5/03 OS302 processor or later).
- multi-point list (SLC 5/03 OS302 processor or later).
- UL listed to US and Canadian Safety Standards, CE compliant, C-Tick marked.

The figure on page 87 shows some of the hardware components of the SLC 5/03 processors (1747-L531, 1747-L532, and 1747-L533).

SLC 5/03 Hardware Components



The table below provides a general explanation of each processor status indicator on the SLC 5/03 processor.

SLC 5/03 Status Indicators

Processor Status Indicator ⁽¹⁾⁽²⁾	When It Is	Indicates that
RUN (Color: green)	On (steady)	The processor is in the Run mode.
	Flashing (during operation)	The processor is transferring a program from RAM to the memory module.
	Off	The processor is in a mode other than Run.
FLT (Color: red)	Flashing (at power up)	The processor has not been configured.
	Flashing (during operation)	The processor detects a major error either in the processor, chassis or memory.
	On (steady)	A fatal error is present (no communication).
	Off	There are no errors.
BATT (Color: red)	On (steady)	The battery voltage has fallen below a threshold level, or the battery is missing or not connected.
	Off	The battery is functional.

Processor Status Indicator ⁽¹⁾⁽²⁾	When It Is	Indicates that
FORCE (Color: amber)	Flashing	One or more input or output addresses have been forced to an On or Off state but the forces have not been enabled.
	On (steady)	The forces have been enabled.
	Off	No forces are present or enabled.
DH-485 (Color: green)	On (steady)	The Communication Active bit (S:1/7) is set in the System Status file and the processor is actively communicating on the DH-485 network.
	Flashing	The processor is trying to establish communication, but there are no other active nodes on the DH-485 network.
	Off	A fatal error is present (no communication).
RS-232 (Color: green)	On (flashing) DF1/Modbus RTU Master/ASCII mode	The SLC 5/03 processor is transmitting on the network.
	Off DF1/Modbus RTU Master/ASCII mode	The SLC 5/03 processor is not transmitting on the network.
	On (steady) DH-485 mode	The Communications Active bit (S:33/4) is set in the System Status file and the processor is actively communicating on the DH-485 network.
	Flashing DH-485 mode	The processor is trying to establish communication, but there are no other active nodes on the DH-485 network.
	Off DH-485 mode	A fatal error is present (no communication).

⁽¹⁾ If the status indicators on the SLC 5/03 processor turn on in a predefined sequence, the SLC 5/03 processor is in the process of downloading a new operating system.

⁽²⁾ See chapter 10 for more information on status indicator status.

Install Your Memory Module

Always turn off power to the controller before removing the processor or inserting or removing the memory module. This guards against possible damage to the module and also undesired processor faults. Memory modules are mounted in carriers or have connectors that are keyed to guard against improper installation.

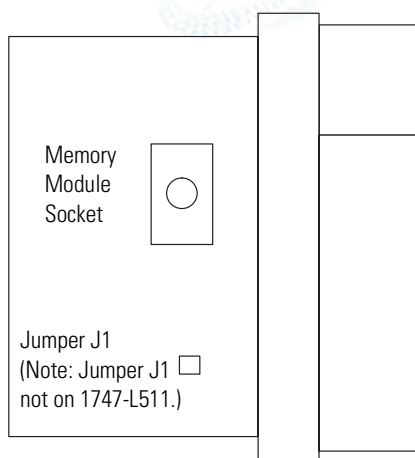
ATTENTION



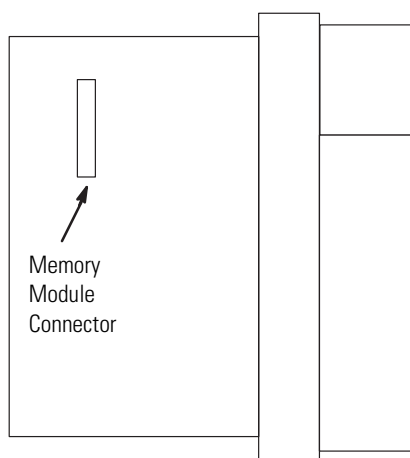
To avoid potential damage to the memory modules, handle them by the ends of the carrier or edges of the plastic housing. Skin oil and dirt can corrode metallic surfaces, inhibiting electrical contact. Also, do not expose memory modules to surfaces or areas that may typically hold an electrostatic charge. Electrostatic charges can alter or destroy memory.

1. If the processor module is installed in the chassis, remove the module by pressing the retainer clips at both the top and bottom of the module and sliding it out.
2. Locate the socket (or connector if you have an SLC 5/03, SLC 5/04, or SLC 5/05 processor) on the processor board. Then place the memory module into the socket or onto the connector and press firmly in place.

Side View of SLC Processor
1747-L511, 1747-L514, and 1747-L524



Side View of SLC Processor
1747-L531, 1747-L532, 1747-L533, 1747-L541, 1747-L542,
1747-L543, 1747-L551, 1747-L552, and 1747-L553



Troubleshooting the SLC 5/03, SLC 5/04, and SLC 5/05 Processors

Between the time you apply power to an SLC 5/03, SLC 5/04, or SLC 5/05 processor and the communication are established via a connected programming device, the only form of communication between you and the processor is through the status indicator display.

When power is applied, all of the status indicators flash on and then off while the processor conducts hardware tests. This is part of the normal powerup sequence. Following the selftest by the processor, all the status indicators again flash on momentarily. If a user program is in a running state, the RUN status indicator will be on. If a fault exists within the processor, the FLT status indicator is on.

Follow these steps to receive the maximum benefit of this troubleshooting section.

1. Identify the status of your processor status indicators. See chapter 5 for description of status indicators and their different states.
2. Using the tables on the following pages, match your processor and power supply status indicators with the status indicators in the first column.
3. Once the status indicators are matched to the appropriate table, move across the table identifying error description and probable causes.
4. Then follow the recommended action steps for each probable cause until the cause is identified.
5. If recommended actions do not identify the trouble cause, contact your local Rockwell Automation sales office or distributor.

Clearing SLC 5/03, SLC 5/04, and SLC 5/05 Processor Faults Using the Keyswitch

Toggle the keyswitch from RUN to PROG and then back to RUN; this will clear some faults. If the keyswitch is left in the RUN position, the processor mode cannot be changed from a programmer/operator interface device. If you return the keyswitch to the REM position, you

can then use a programmer/operator interface device to change the processor mode.

ATTENTION



If you clear a processor fault using the keyswitch, the processor immediately enters the Run mode.

Identifying SLC 5/03, SLC 5/04, and SLC 5/05 Processor Errors

The following status indicators and tables provide you with information regarding error messages, possible cause(s) for the error, and recommended action to resolve the error.

SLC 5/03, SLC 5/04, and SLC 5/05 Processor Errors

If the status indicators indicate	The following error exists	Probable Cause	Recommended Action
- All status indicators are off - Status of any Communication status indicator does not matter	Inadequate system power	No line power.	1. Verify proper line voltage and connections on the power terminals. 2. Verify proper 120/240V power supply jumper selection. See page 106.
		Power supply fuse blown.	1. Check the incoming power fuse, check for proper incoming power connections. Replace fuse. 2. If fuse blows again, replace the power supply. See page 139 on fuse replacement.
		Power supply overload.	1. Remove line power to power supply. remove several output modules from the chassis. wait five minutes. reapply power. 2. If condition reoccurs, re-calculate module configuration power required and verify proper power supply selection. See page 36. This problem can occur intermittently if power supply is slightly overloaded when output loading and temperature varies.
		Defective power supply.	1. Recheck other probable causes. 2. Monitor the line power to chassis power supply for possible transient or shorting. 3. Replace the power supply.

SLC 5/03, SLC 5/04, and SLC 5/05 Processor Errors

If the status indicators indicate	The following error exists	Probable Cause	Recommended Action
- Power status indicator is on - CPU Fault status indicator is flashing - All other status indicators are off - Status of any Communication status indicator does not matter	CPU major fault	Initial CPU factory power-up condition.	- See page 121 and follow the start-up procedures. - Clear processor memory to get rid of the flashing CPU Fault status indicator.
		Hardware/software major fault detected. (erratic, repetitive power cycling can cause a processor major hardware fault)	- If the error occurred during the download of a new program to the processor, check the position of the J4 jumper. See page 159. If the jumper is not in the protected position: - Place the jumper in the protected position - Re-download a valid user program to the processor - Use programmer to monitor and clear the fault (or if keyswitch in REM position): - Monitor Status File word S:6 for major error code. - Refer to your programming software documentation or the SLC 500 Instruction Set Reference Manual, publication 1747-RM001, for error codes and additional troubleshooting information. - Remove hardware/software condition causing fault. - Clear Status File S:1/13 major error bits, if set. - Clear Status File S:5 major error bits, if set. - Clear Status File S:6 major error code (optional). - Attempt to put processor in run mode. If unsuccessful, repeat recommended action steps above. - Use the keyswitch to clear the fault. Toggle the keyswitch to PROG and back to RUN. (See page 149). If fault occurs again, use programmer to get error code and determine the source of the problem.

Identifying SLC 5/03, SLC 5/04, and SLC 5/05 Processor Communication Errors

SLC 5/03, SLC 4/04, and SLC 5/05 Communication Errors

If the status indicators indicate	The following error exists	Probable Cause	Recommended Action
- Power status indicator is on - DH-485, DH+, or ENET status indicator is off - FLT status indicator is off or flashing - Status of Run, Force, Batt, and RS232 status indicators do not matter	Fatal error and no communication	Inadequate system power.	1. Check line power. 2. Check 120/240V power supply jumper selection. See page 106. Also, see the recommended actions for inadequate system power on page 150.
		Communication channel is shut down.	Check communication channel configuration with your programming software. Also, see page 161 to return the processor to initial factory conditions.
		Communication channel is damaged.	Replace the processor.
- Power status indicator is on - RS232 status indicator is off - FLT status indicator is off or flashing - Status of Run; Force; DH-485, DH+, or ENET; or Batt status indicators do not matter	Fatal error and no communication	Inadequate system power.	1. Check line power. 2. Check 120/240V power supply jumper selection. See page 106. Also, see the recommended actions for inadequate system power on page 150.
		Communication channel is shut down.	Check communication channel configuration with your programming software. Also, see page 161 to return the processor to initial factory conditions.
		communication channel is damaged.	Replace the processor.
		Channel configured for DF1 or User mode.	See your programming software documentation for channel configuration information.

Returning the SLC 5/03, SLC 5/04, and SLC 5/05 Processors to Initial Factory Conditions

We **only** recommend this procedure if the communication channels have been shut down due to the configuration parameters, or if you absolutely cannot establish communication with the processor.

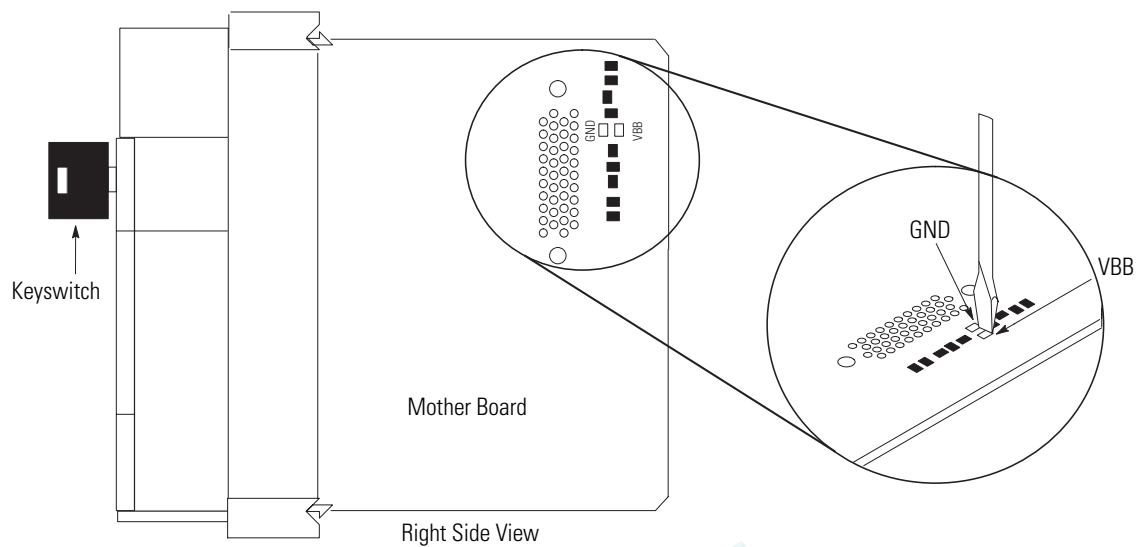
WARNING

If you return the processor to the initial factory conditions, the user program is lost and communication configurations are returned to their default settings.

Follow this procedure to return the processor to initial factory conditions.

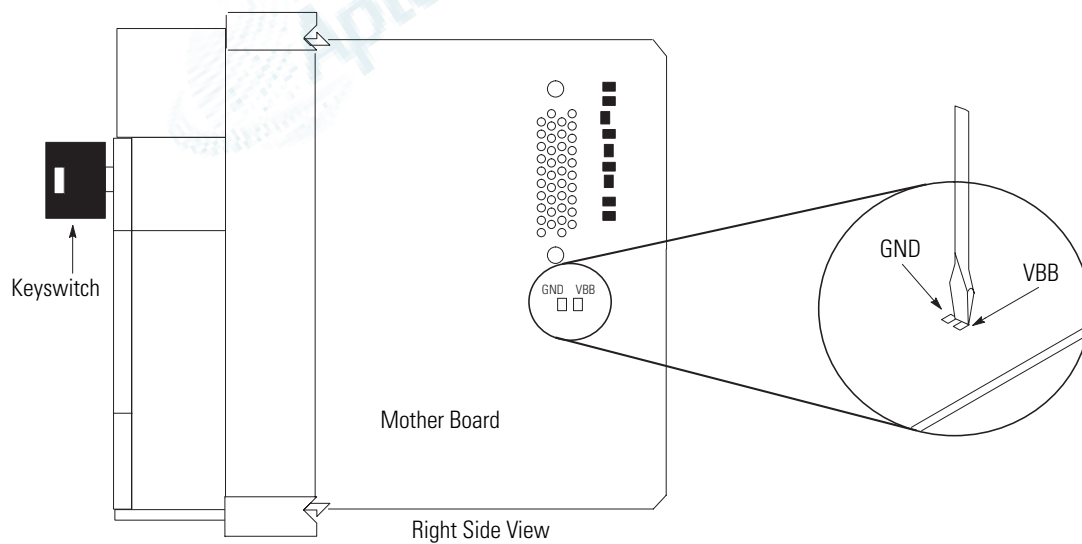
1. Remove power from the SLC 500 power supply.
2. Remove the processor from the chassis.
3. Disconnect the battery by removing the battery connector from its socket.
4. Locate the VBB and GND connections on the right side of the motherboard.
5. Place a small bladed screwdriver across the VBB and GND connections and hold for 60 seconds. This returns the processor to the initial factory conditions.

SLC 5/03 (1747-L531, 1747-L532 and 1747-L533) Processors



SLC 5/04 (1747-L541, 1747-L542, and 1747-L543)

SLC 5/05 (1747-L551, 1747-L552, and 1747-L553) Processors



Processor General Specifications

The table below lists general specifications for SLC 500 modular processors.

Attribute (1747-)	SLC 5/01		SLC 5/02	SLC 5/03			SLC 5/04			SLC 5/05		
	L511	L514	L524	L531	L532	L533	L541	L542	L543	L551	L552	L553
Program memory (words)	1 K	4 K	4 K	8 K	16 K	32 K	16 K	32 K	64 K	16 K	32 K	64 K
I/O capacity	3940 discrete		4096 discrete									
Remote I/O capacity	Not applicable		Processor memory and chassis power limit up to 4096 inputs and 4096 outputs									
Chassis/slots, max	3 Chassis/30 Slots of I/O											
Standard RAM	Capacitor - 2 weeks ⁽²⁾ optional lithium battery - 5 years Lithium battery 2 years Capacitor - 30 minutes minimum											
Memory back-up options	EEPROM			Flash EPROM								
Status indicators	Run CPU Fault Forced I/O Battery Low		Run CPU Fault Forced I/O Battery Low COMM	Run CPU Fault Forced I/O Battery Low RS-232 DH-485			Run CPU Fault Forced I/O Battery Low RS-232 DH+			Run CPU Fault Forced I/O Battery Low RS-232 Ethernet		
Power supply loading	90 mA at 5V dc			500 mA at 5V dc			1A at 5V dc			1A at 5V dc		
	0 mA at 24V dc			175 mA at 24V dc			0 mA at 24V dc ⁽⁴⁾			0 mA at 24V dc		
Clock/calendar accuracy ⁽¹⁾	Not applicable			±54 sec./month at 25 °C (77 °F); ±81 sec./month at 60 °C (140 °F)								
Program scan hold-up time after loss of power	20 ms...3 s (dependent on power supply loading)											
Noise immunity	NEMA Standard ICS 2-230											
Temperature rating	operating: 0 °C...60 °C (32 °F...140°F); storage: -40 °C...85 °C (-40 °F...185 °F)											
Humidity	5 to 95% without condensation											
Shock, operating	30 g											
Vibration	Displacement: .015 in., peak-to-peak at 5...57 Hz											
	Acceleration: 2.5 g at 57...2000 Hz											

Power Supply Worksheet

Power Supply Loading

Use the table below to calculate the power supply loading for each chassis in your SLC modular application.

Hardware Component	Cat. No.	Maximum Current (A)	
		at 5V dc	at 24V dc
Processors	1747-L511	0.090	0
	1747-L514	0.090	0
	1747-L524	0.090	0
	1747-L531	0.500	0.175
	1747-L532	0.500	0.175
	1747-L533	0.500	0.175
	1747-L541	1.000	0
	1747-L542	1.000	0
	1747-L543	1.000	0
	1747-L551	1.000	0
	1747-L552	1.000	0
	1747-L553	1.000	0
Digital Input Modules	1746-IA4	0.035	-
	1746-IA8	0.050	-
	1746-IA16	0.085	-
	1746-IB8	0.050	-
	1746-IB16	0.050	-
	1746-IB32 ⁽¹⁾	0.050	-
	1746-IC16	0.050	-
	1746-IG16	0.140	-
	1746-IH16	0.085	-
	1746-IM4	0.035	-
	1746-IM8	0.050	-
	1746-IM16	0.085	-
	1746-IN16	0.085	-
	1746-ITB16	0.050	-
	1746-ITV16	0.085	-
	1746-IV8	0.050	-
	1746-IV16	0.085	-
	1746-IV32 ⁽¹⁾	0.050	-

Power Supply Loading Reference Table

Use the table to calculate the power supply loading and heat dissipation for each chassis in your SLC modular application.

Hardware Component	Cat. No.	Watts per Point	Minimum Watts	Total Watts
Processors	1747-L511	NA	1.75	1.75
	1747-L514	NA	1.75	1.75
	1747-L524	NA	1.75	1.75
	1747-L531	NA	2.90	2.90
	1747-L532	NA	2.90	2.90
	1747-L533	NA	2.90	2.90
	1747-L541	NA	4.00	4.00
	1747-L542	NA	4.00	4.00
	1747-L543	NA	4.00	4.00
	1747-L551	NA	4.00	4.00
	1747-L552	NA	4.00	4.00
	1747-L553	NA	4.00	4.00
Digital Input Modules	1746-IA4	0.270	0.175	1.30
	1746-IA8	0.270	0.250	2.40
	1746-IA16	0.270	0.425	4.80
	1746-IB8	0.200	0.250	1.90
	1746-IB16	0.200	0.425	3.60
	1746-IB32 ⁽¹⁾	0.200	0.530	6.90
	1746-IC16	0.220	0.425	3.95
	1746-IG16	0.020	0.700	1.00
	1746-IH16	0.320	0.217	5.17
	1746-IM4	0.350	0.175	1.60
	1746-IM8	0.350	0.250	3.10
	1746-IM16	0.350	0.425	6.00
	1746-IN16	0.350	0.425	6.00
	1746-ITB16	0.200	0.425	3.625
	1746-ITV16	0.200	0.425	3.625
	1746-IV8	0.200	0.250	1.90
	1746-IV16	0.200	0.425	3.60
	1746-IV32 ⁽¹⁾	0.200	0.530	6.90