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.

- The program size cannot exceed the processor memory size. For instance, an SLC 5/01 4 K processor can burn an EEPROM for a SLC 5/01 1 K processor as long as the program does not exceed 1 K.
- The I/O and chassis configuration of the burning processor does not have to match the I/O configuration of the program being burned.
- You do not have to enter the Run mode before burning an EEPROM. If the run mode is entered and the chassis configuration does not match, a major fault will occur. If you burn an EEPROM while in the fault mode, the fault will also be saved in the EEPROM.

The following table summarizes the above conditions as to the type of processor you can use to burn EEPROMs for other processors.

EEPROM Burning Options

To burn EEPROMs for these processors												
Use these processors	**SLC 5/01 (1K)**	**SLC 5/01 (4K)**	**SLC 5/02 (4K)**	**SLC 5/03 (8K)**	**SLC 5/03 (16K)**	**SLC 5/03 (32K)**	**SLC 5/04 (16K)**	**SLC 5/04 (32K)**	**SLC 5/04 (64K)**	**SLC 5/05 (16K)**	**SLC 5/05 (32K)**	**SLC 5/05 (64K)**
SLC 5/01 (1K)	•	1 K max										
SLC 5/01 (4K)	1 K max	•										
SLC 5/02 (4K)			•									
SLC 5/03 (8K)				•	8 K max	8 K max						
SLC 5/03 (16K)				8 K max	•	16 K max						
SLC 5/03 (32K)				8 K max	16 K max	•						
SLC 5/04 (16K)							•	16 K max	16 K max			
SLC 5/04 (32K)							16 K max	•	32 K max			
SLC 5/04 (64K)							16 K max	32 K max	•			
SLC 5/05 (16K)										•	16 K max	16 K max
SLC 5/05 (32K)										16 K max	•	32 K max
SLC 5/05 (64K)										16 K max	32 K max	•

• valid combination

Selecting Isolation Transformers

If there is high frequency conducted noise in or around your distribution equipment, use an isolation transformer in the ac line to the power supply. This type of transformer provides isolation from your power distribution system and is often used as a step down transformer to reduce line voltage. Any transformer used with the controller must have a sufficient power rating for its load. This power rating is generally expressed in voltamperes (VA).

To select an appropriate isolation transformer, calculate the power required by the chassis power supply (or supplies if more than one chassis in system) and any input circuits and output loads that are connected through this transformer.

You can find the power requirement (VA rating) for the chassis power supplies in the specifications starting on page 177. The power requirement for the input circuits is determined by the number of inputs, the operating voltage, and the nominal input current. The power requirement for output loads is determined by the number of outputs, the load voltage, and load current.

For example, if you have a 1746-P1 power supply, a 16-point ac input module, catalog number 1746-IA16, (12 mA at 120V ac) and a 16-point ac triac output module, catalog number 1746-OA16, (0.5A at 120V ac), the power consumed would be:

$$135VA + (16)(120V)(0.012\ A) + (16)(120V)(0.5\ A) = 1118VA$$

IMPORTANT In this case, 0.5 A is the maximum rating of the triac output at 30 °C (86 °F). If the load draws less than 0.5 A, this figure may be reduced accordingly. The output portion of the VA calculation should reflect the current requirements of selected loads.

In general, we recommend that the transformer is oversized to provide some margin for line voltage variations and other factors. Typically a transformer that is 25% larger than the calculated VA is sufficient.

Most industrial environments are susceptible to power transients or spikes. To help insure fault-free operation and protection of equipment, use suppression devices on power line to the equipment in addition to the isolation equipment.

Special Considerations

The recommendations given previously provide favorable operating conditions for most controller installations. Some applications may involve adverse conditions, such as excessive line voltage variations and/of excessive noise, as described below. Additional measures can be taken to minimize the effect of these conditions.

Class I, Division 2 Applications

IMPORTANT When installing peripheral devices (for example, push buttons, lamps) into a hazardous environment, ensure that they are Class I, Division 2 certified, or determined to be safe for the environment.

Excessive Line Voltage Variations

The best solution for excessive line voltage variation is to correct any feeder problems in your distribution system. Where this does not solve the line variation problem, or in certain critical applications, use a constant voltage transformer. If you require a constant voltage transformer, connect it to the power supply **and** all input devices connected to the SLC 500 controller.

Connect output devices on the same power line, but their connection along the power line is normally made before the constant voltage transformer. A constant voltage transformer must have a sufficient power rating for its load.

Excessive Noise

When operating the SLC 500 controller in an environment with a high amount of electrical noise, give special consideration to the possibility of electrical interference.

The following reduces the effect of electrical interference.

- SLC 500 controller design features
- Proper mounting of controller within an enclosure
- Proper equipment grounding
- Proper routing of wires (power, communication, control lines)
- Proper suppression added to noise generating devices

Potential sources of noise include inductive loads, such as relays, solenoids, and motor starters when operated by hard contacts like push buttons or selector switches. Suppression may be necessary

when such loads are connected as output devices or when connected to the same supply line that powers the controller.

Lack of surge suppression on inductive loads may contribute to processor faults and sporadic operation. RAM can be corrupted (lost) and I/O modules may appear to be faulty or reset themselves.

For extremely noisy environments, use a memory module and program it for auto-loading on processor fault or power cycle for quick recovery.

Selecting Surge Suppressors

Most output modules have built-in surge suppression to reduce the effects of high voltage transients. However, you should use an additional suppression device if an output module is being used to control an inductive device such as:

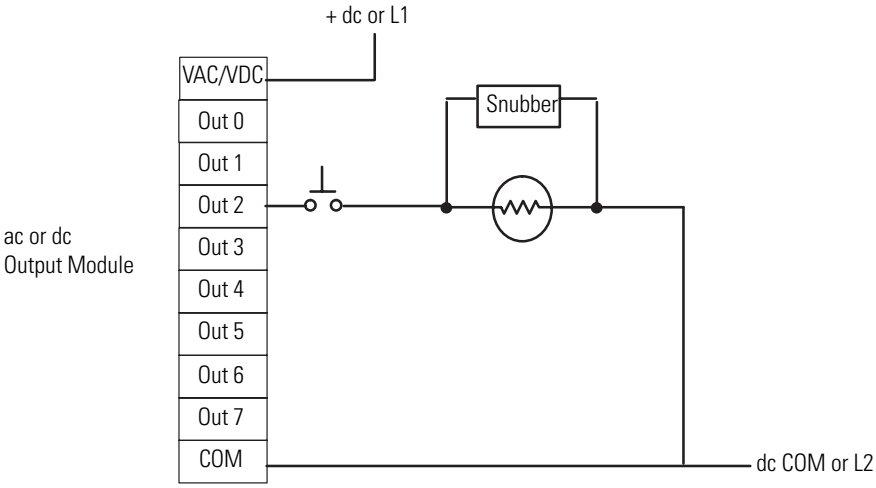
- relays.
- motor starters.
- solenoids.
- motors.

Additional suppression is especially important if your inductive device is in series with or parallel to a hard contact such as:

- push buttons.
- selector switches.

By adding a suppression device directly across the coil of an inductive device, you reduce the effects of voltage transients caused by interrupting the current to that inductive device and prolong the life of the switch contacts. You also prevent electrical noise from radiating into system wiring. The diagram below shows an output module with a suppression device.

Surge Suppression Diagram



If you connect an SLC 500 controller triac output to control an inductive load, use varistors to suppress noise. Choose a varistor that is appropriate for the application. We recommend the following surge suppressors for triac outputs when switching 120V ac inductive loads:

- Harris MOV, part number V220 MA2A
- Allen-Bradley MOV, catalog number 599-K04 or 599-KA04, Series C or later.

Consult the varistor manufacturer's data sheet when selecting a varistor for your application.

ATTENTION

Damage could occur to SLC 500 triac outputs if you use suppressors having RC networks and the triac load current is 15 mA or less.

Allen-Bradley surge suppressors recommended for use with Allen-Bradley relays, contactors, and starters are shown in the table below.

Devices Requiring Surge Suppression

Device	Coil Voltage	Suppressor Cat. No.
Bulletin 509 Motor Starter Bulletin 509 Motor Starter	120V ac 240V ac	599-K04 (1) 599-KA04(1)
Bulletin 100 Contactor Bulletin 100 Contactor	120V ac 240V ac	199-FSMA1 (2), 199-GSMA1() 199-FSMA2 (2)
Bulletin 709 Motor Starter	120V ac	1401-N10(2)
Bulletin 700 Type R, RM Relays	ac coil	none required

Devices Requiring Surge Suppression

Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	12V dc 12V dc	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	24V dc 24V dc	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	48V dc 48V dc	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	115-125V dc 115-125V dc	199-FSM10
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	230-250V dc 230-250V dc	199-FSMA11
Bulletin 700 Type N, P, or PK Relay	150V max, ac or dc	700-N24[2]
Miscellaneous electromagnetic devices limited to 35 sealed VA	150V max, ac or dc	700-N24[2]

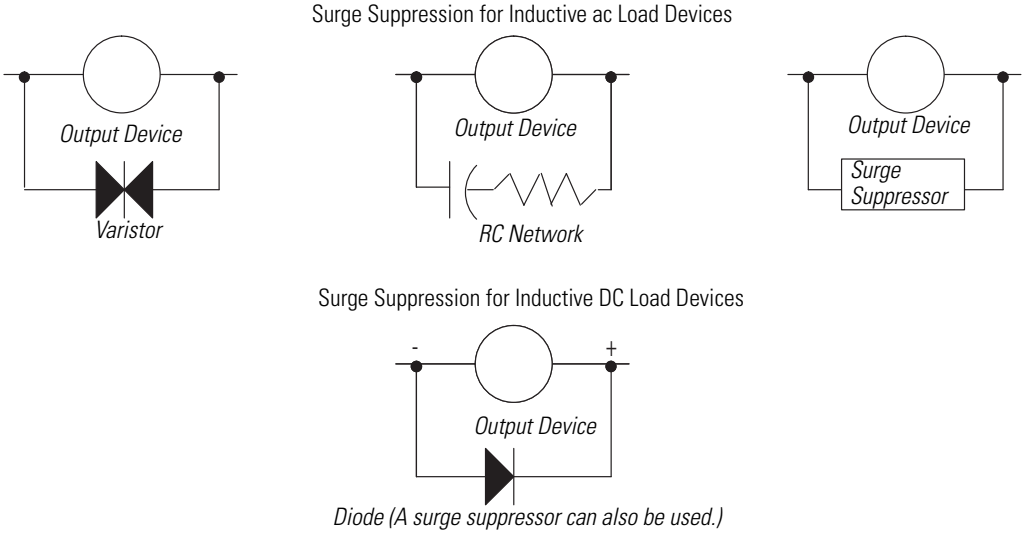
(1) Varistor

(2) RC Type – Damage could occur with SLC 500 triac outputs if you use suppressors having RC networks and the load current is 15 mA or less.

Selecting Contact Protection

Inductive load devices such as motor starters and solenoids may require the use of some type of surge suppression to protect the controller output contacts. Switching inductive loads without surge suppression can significantly reduce the lifetime of relay contacts.

Surge Suppression for Inductive Load Devices



Contact protection methods for inductive ac and DC output devices.

These surge suppression circuits connect directly across the load device. This reduces arcing of the output contacts. (High transient can cause arcing that occurs when switching off an inductive device.)

Suitable surge suppression methods for inductive ac load devices include a varistor, an RC network, or an Allen-Bradley surge suppressor. These components must be appropriately rated to suppress the switching transient characteristic of the particular inductive device.

For inductive dc load devices, a diode is suitable. A diode, catalog number 1N4004, is acceptable for most applications.

A surge suppressor can also be used. See the table on page 49.

Locate the suppression device as close as possible to the load device.

Transistor Output Transient Pulses

This section applies to the following SLC 500 fixed I/O processors and SLC 500 I/O modules that have transistor outputs.

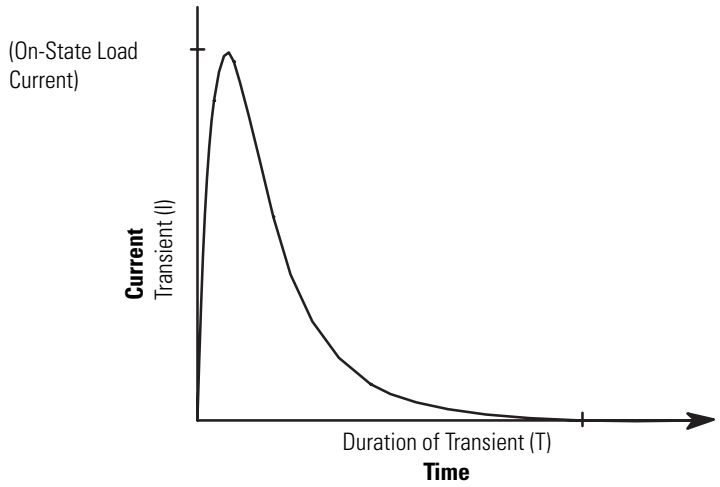
Fixed I/O processors with transistor outputs	I/O modules with transistor outputs	
• 1747-L20E	• 1746-OB8	• 1746-OBP16
• 1747-L20G	• 1746-OBP8	• 1746-OV16
• 1747-L20L	• 1746-OV8	• 1746-OVP16
• 1747-L20N	• 1746-OB16	• 1746-OB32
• 1747-L30L	• 1746-OB16E	• 1746-OB32E
• 1747-L40E	• 1746-OB16EI	• 1746-OV32
• 1747-L40L		

For the SLC 500 products listed above, the maximum duration of the transient pulse occurs when minimum load is connected to the output. However, for most applications the energy of the transient pulse is not sufficient to energize the load.

ATTENTION

A transient pulse occurs in transistor outputs when the external dc supply voltage is applied to the common output terminals (for example, via the master control relay). The sudden application of voltage creates this transient pulse. (See the following graph.) This condition is inherent in transistor outputs and is common to solid state devices. A transient pulse can occur regardless of the processor having power or not.

Transient Pulse

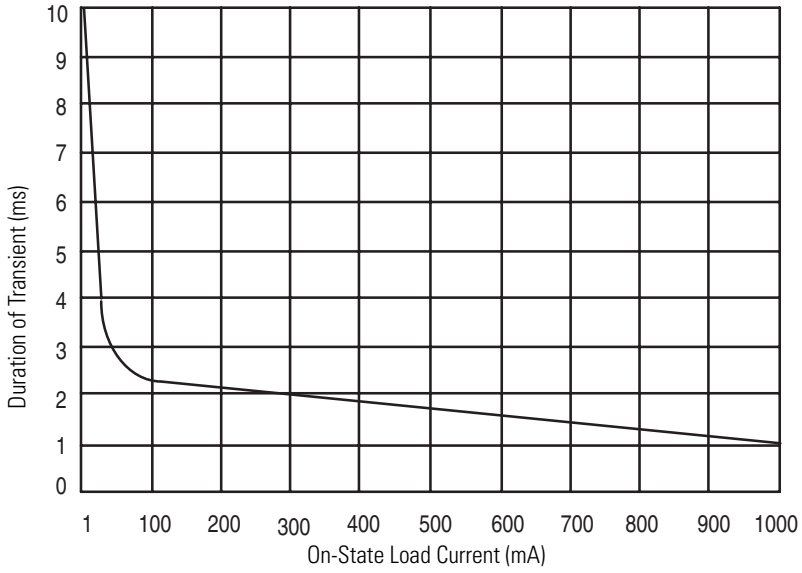


To reduce the possibility of inadvertent operation of devices connected to transistor outputs, adhere to the following guidelines:

- Either ensure that any programmable device connected to the transistor output is programmed to ignore all output signals until after the transient pulse has ended,
- Add an external resistor in parallel to the load to increase the on-state load current. The duration of the transient pulse is reduced when the on-state load current is increased.

The duration of the transient pulse is proportional to the load impedance. This is illustrated in the following graph.

Transient Pulse/Load Impedance Graph



EXAMPLE

Increasing the load current by 100 mA decreases the transient time from approximately 7 ms to less than 2.5 ms. To calculate the size of the resistor added in parallel to increase the current, use the following information:

24V = your applied voltage
Need 100 mA of load current to reduce the transient to <2.5 ms. (taken from graph).

R (W) = V (Volts)/I (Amps)

Resistor value (Ohms) = Applied voltage (Volts)/Desired current (Amps) = 24/0.1 = 240 W

P (Watts) = 1^2 (Amps) x R (W)

Actual Power (Watts) = (Desired Current)^2 x Resistor Value = (0.1)2 x 240 = 2.4 (Watts)

Resistor size = 2 x Actual power (Watts) = 4.8 W = approximately 5 W

Use a resistor rated for 240 W at 5 W to decrease the transient time from approximately 7 ms to less than 2.5 ms.

Notes:

System Installation Recommendations

To help you install the SLC 500 programmable controller as safely and securely as possible, follow the specific recommendations in this chapter. For general installation guidelines, also refer to the requirements specific to your region.

- *Europe:* Reference the standards found in EN 60204 and your national regulations.
- *United States:* Refer to article 70E of the National Fire Protection Association (NFPA). It describes electrical safety requirements for employee workplaces.

This chapter covers the following:

- System overview
- Typical installation
- Spacing your controllers
- Preventing excessive heat
- Grounding guidelines
- Master control relay
- Power considerations
- Safety considerations
- Preventive maintenance

System Overview

Refer to the following sections when planning your system layout.

Environment and Enclosure

ATTENTION

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 m (6561.7 ft) without derating.

This equipment is considered Group I, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for additional installation requirements pertaining to this equipment.

Hazardous Location Considerations

Products marked CL1, DIV 2, GP A, B, C, D are suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local authority having jurisdiction at the time of installation.

WARNING

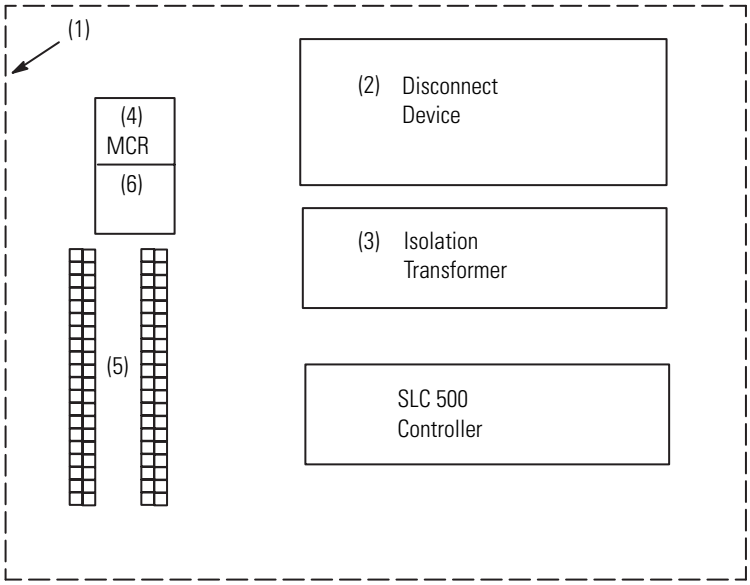
EXPLOSION HAZARD

- Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be non-hazardous. Secure any external connections that mate to this equipment using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- All wiring must comply with N.E.C. article 501-4(b).

Typical Installation

The figure below consists of some components that make up a typical installation.

1. NEMA-rated enclosure suitable for your application and environment that shields your controller from electrical noise and airborne contaminants.
2. Disconnect device, to remove power from the system
3. Fused isolation transformer or a constant voltage transformer, as your application requires
4. Master control relay/emergency-stop circuit
5. Terminal blocks or wiring ducts
6. Suppression devices for limiting EMI (electromagnetic interference) generation



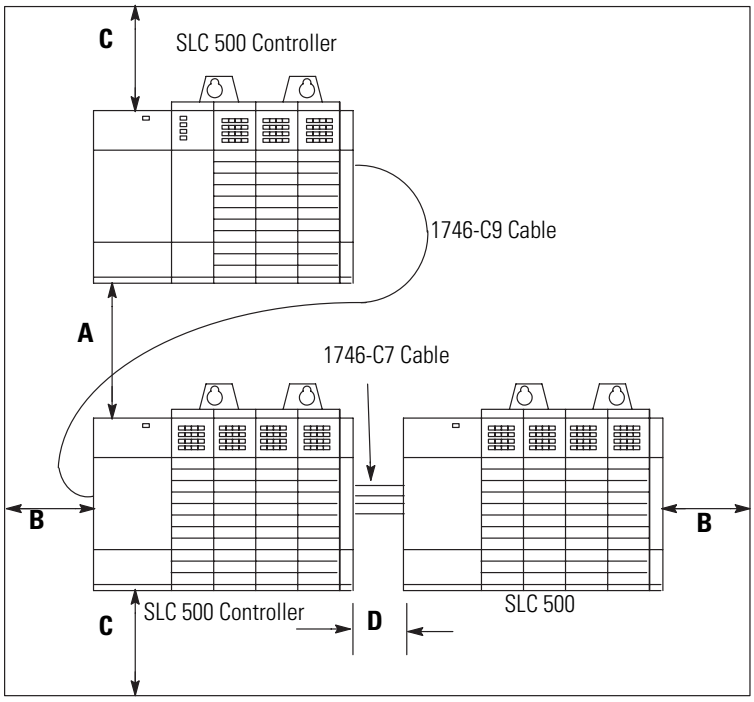
ATTENTION Vertical mounting is not recommended due to thermal considerations.

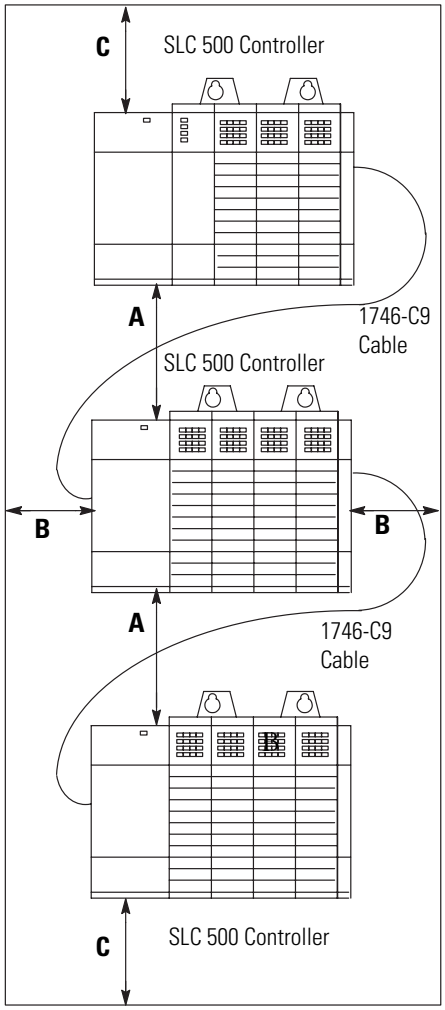
Spacing Your Controller

The figure on the following page depicts acceptable layouts. Follow the recommended minimum spacing to allow for convection cooling within the enclosure. Air temperature in the enclosure must be kept within a range of 0 °C...60 °C (32 °F...140 °F).

IMPORTANT Be careful of metal chips when drilling mounting holes for the controllers. Do not drill holes above a mounted SLC 500 controller.

IMPORTANT The 1746-C9 and 1746-C16 cables have a rigid, unbendable shrink wrap applied at the end of each connector, which provides strain relief. When using these cables, provide at least 101.6 mm (4 in.) of clearance at the side of the chassis to allow for proper bend radius of the cable.





Recommended Spacing

A. 15.3...20.0 cm (6...8 in.) when using the 1746-C9 cable. If you mount two 13-slot chassis above each other, the distance cannot exceed 10.2...12.7 cm (4...5 in.).

B. Greater than 10.2 cm (4 in.).

C. Greater than 15.3 cm (6 in.).

D. 6.35...10.2 cm (2.5...4 in.) when using the 1746-C7 cable. If you are using a 1746-P4 power supply, your maximum spacing is 6.35 cm (2.5 in.).

Preventing Excessive Heat

For most applications, normal convection cooling will keep the SLC 500 controller components within the specified operating range of 0 °C...60 °C (32 °F...140 °F). Proper spacing of components within the enclosure is usually sufficient for heat dissipation.

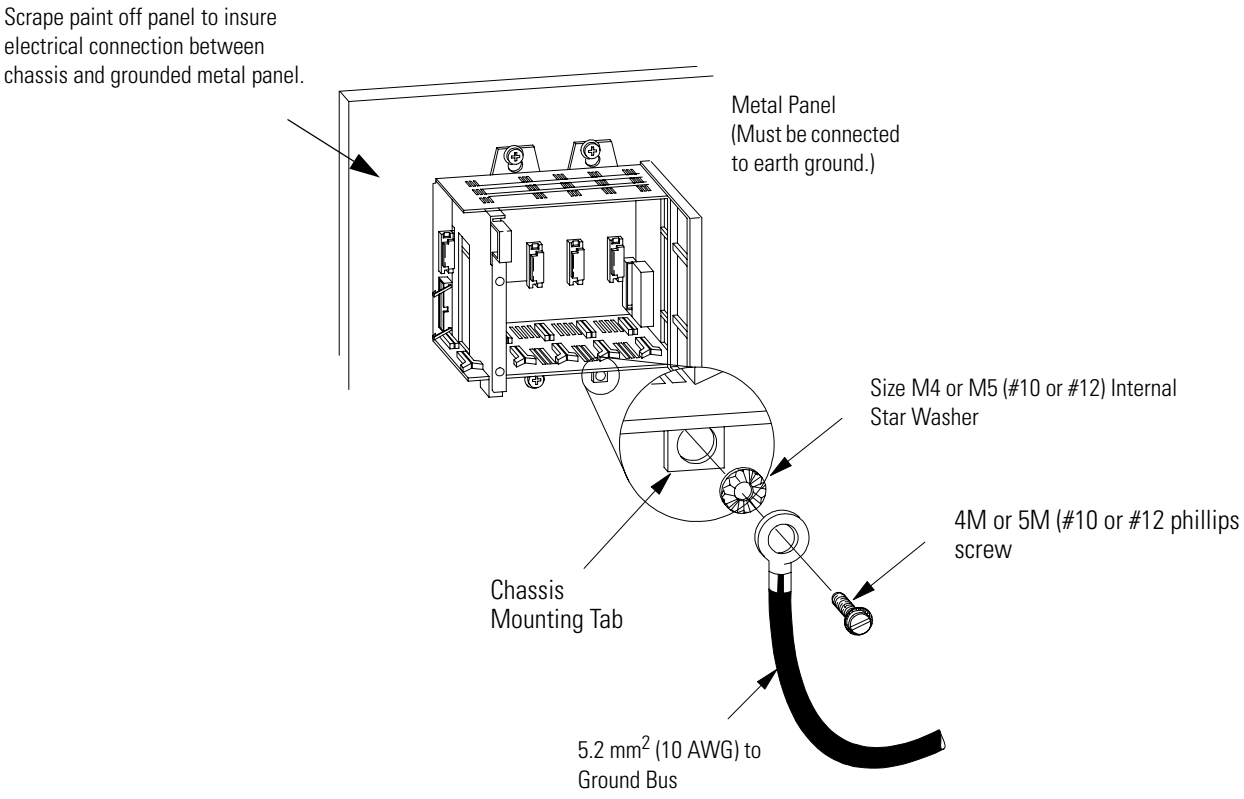
In some applications, a substantial amount of heat is produced by other equipment inside or outside the enclosure. In this case, place blower fans inside the enclosure to assist in air circulation and to reduce hot spots near the SLC 500 controller.

Additional cooling provisions might be necessary when high ambient temperatures are encountered.

IMPORTANT Do not bring in unfiltered outside air. It may introduce harmful contaminants of dirt that could cause improper operation or damage to components. In extreme cases, you may need to use air conditioning to protect against heat build-up within the enclosure.

Grounding Guidelines

In solid-state control systems, grounding helps limit the effects of electrical noise due to electromagnetic interference (EMI). The ground path for the SLC 500 controller and its enclosure is provided by the equipment grounding conductor.

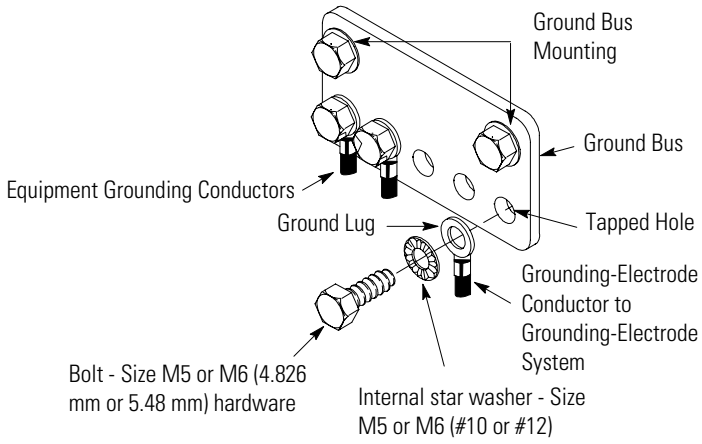


ATTENTION

The 1746 chassis, the enclosure, and other control devices must be properly grounded. All applicable codes and ordinances must be observed when wiring the SLC 500 controller system.

Connect Equipment Grounding Conductor to Ground Bus

Ground connections should run from the chassis and power supply on each SLC 500 controller and expansion unit to the ground bus. Exact connections will differ between applications.



- Use 2.54 cm (1 in.) copper braid or 5.2 mm^2 (#10 AWG) copper wire to connect each chassis, the enclosure, and a central ground bus mounted on the back-panel.
- Use a steel enclosure to guard against electromagnetic interference (EMI).
- Make sure the enclosure door viewing window is a laminated screen or a conductive optical substrate (to block EMI).
- Install a bonding wire for electrical contact between the door and the enclosure; do not rely on the hinge.

IMPORTANT Do not lay one ground lug directly on top of the other; this type of connection can become loose due to compression of the metal lugs. Place the first lug between a star washer and a nut with a captive star washer. After tightening the nut, place the second lug between the first nut and a second nut with a captive star washer.

Connect Ground Bus to Grounding-Electrode System

The grounding-electrode system is at earth-ground potential and is the central ground for all electrical equipment and ac power within any facility. Use a grounding-electrode conductor to connect the ground bus to the grounding-electrode system. Use at minimum 8.3 mm^2 (#8 AWG) copper wire for the grounding-electrode conductor to guard against EMI. The National Electrical Code specifies safety requirements for the grounding-electrode conductor.

Europe: Reference EN 60204 for safety information on grounding. Also, refer to Allen-Bradley Programmable Controller Grounding and Wiring Guidelines,

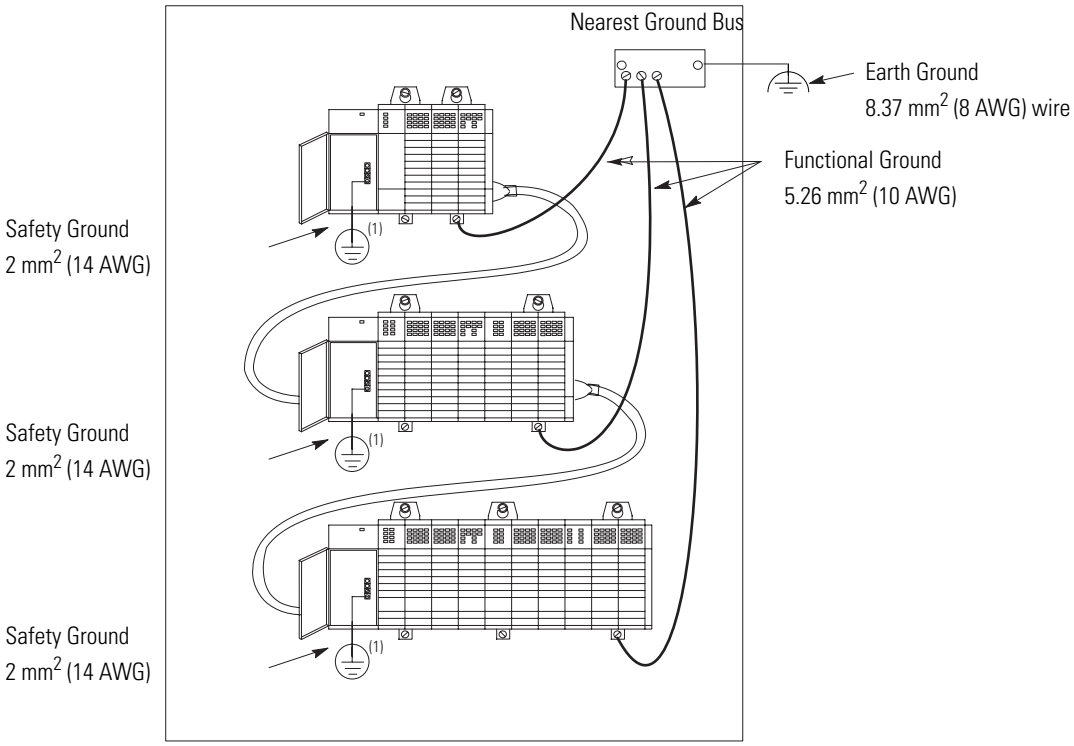
publication 1770-4.1, and System Design for Control of Electrical Noise, publication GMC-RM001.

United States: An authoritative source on grounding requirements for most installations is the National Electrical Code. Also, refer to Allen-Bradley Programmable Controller Grounding and Wiring Guidelines, publication 1770-4.1 and System Design for Control of Electrical Noise, publication GMC-RM001.

In addition to the grounding required for the SLC 500 controller and its enclosure, you must also provide proper grounding for all controlled devices in your application. Care must be taken to provide each device with an acceptable grounding path.

This figure shows you how to run ground connections from the chassis to the ground bus. The recommended grounding method is shown below. Using a ground bus reduces the electrical resistance at the connection.

Ground Connection Paths



(1) Keep safety ground connection to panel as short as possible.

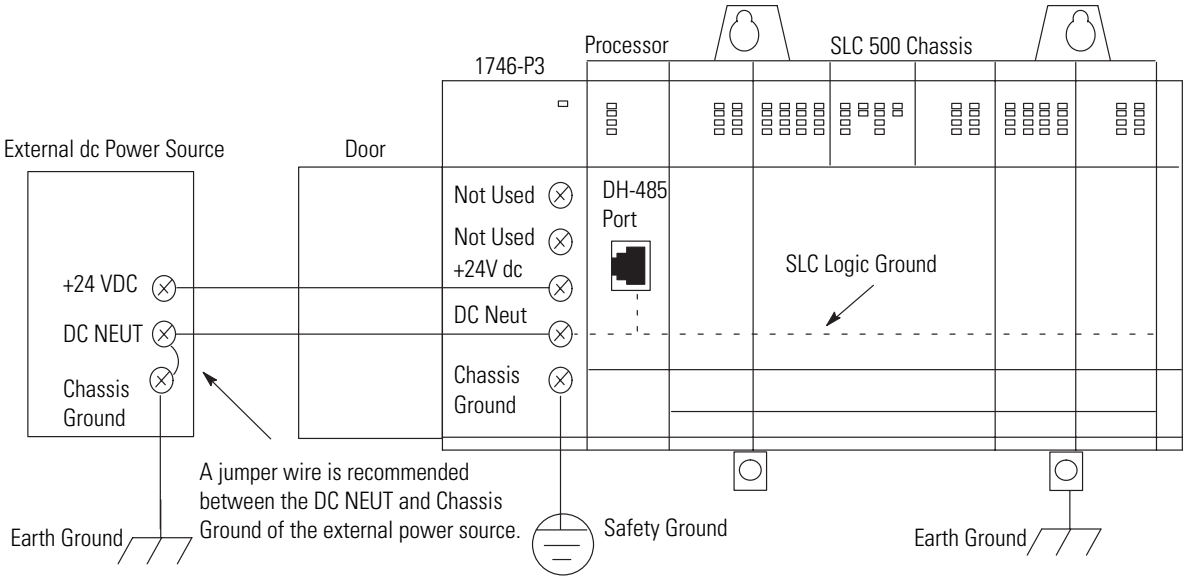
Special Grounding Considerations for dc Applications using 1746-P3 (previous to revision B)

This information describes special wiring considerations for the 1746-P3 power supply that is not labeled as revision (REV) B or later-.

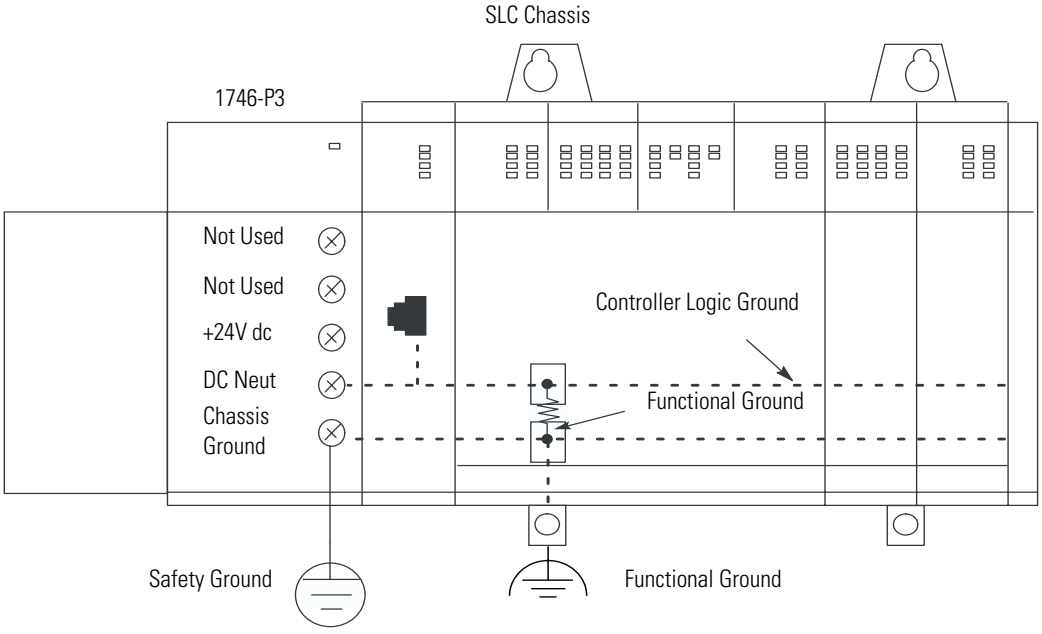
Keep wire length as short as possible.

ATTENTION

Any voltage applied to the 1746-P3 DC NEUT terminal will be present at the SLC logic ground and the processor DH-485 port. To prevent unwanted potentials across the logic ground of the controller and/or damage to the SLC chassis, the DC NEUTRAL of the external dc power source must be either isolated from the SLC chassis ground, or connected to earth ground.

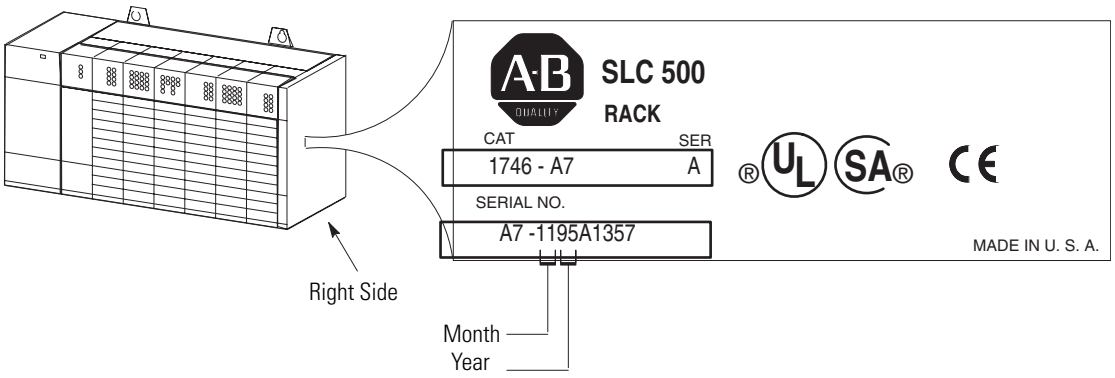


IMPORTANT SLC 500 series A chassis (1746-A4, 1746-A7, 1746-A10, and 1746-A13) manufactured before November 1992 have a resistor between the logic ground and chassis ground as the drawing on the following page illustrates. This resistor could be damaged if the wiring recommendation described within the attention box above is not followed. See the figure on the following page for the location of the resistor. SLC 500 series A chassis (1746-A4, 1746-A7, 1746-A10, and 1746-A13) with a manufacture date of November 1992 or later do not have this resistor. SLC 500 series B chassis have a 1 MW resistor that limits the current between logic ground and chassis ground.



Determining the Date of the SLC 500 Series A Chassis

The date of the chassis is found within the serial number imprinted on the chassis nameplate on the right side of the chassis.



Master Control Relay

A hard-wired master control relay (supplied by you) provides a convenient means for emergency controller shutdown. Since the master control relay allows the placement of several emergency-stop switches in different locations, its installation is important from a safety standpoint. Overtravel limit switches or mushroom head push buttons are wired in series so that when any of them opens, the master control relay is de-energized. This removes power to input and output device circuits.

ATTENTION Never alter these circuits to defeat their function, since serious injury and/or machine damage could occur.

IMPORTANT If you are using a dc power supply, interrupt the dc side rather than the ac side to avoid the additional delay of power supply turn-on and turn-off. The dc power supply should receive its power directly from the fused secondary of the transformer. Connect the power to the dc input and output circuits through a set of master control relay contacts.

Place the main power disconnect switch where operators and maintenance personnel have quick and easy access to it. If you mount a disconnect switch inside the controller enclosure, place the switch operating handle on the outside of the enclosure, so that you can disconnect power without opening the enclosure.

Whenever any of the emergency-stop switches are opened, power to input and output devices is stopped.

When you use the master control relay to remove power from the external I/O circuits, power continues to be provided to the controller's power supply so that diagnostic indicators on the processor can still be observed.

The master control relay is not a substitute for a disconnect to the controller. It is intended for any situation where the operator must quickly de-energize I/O devices only. When inspecting or installing terminal connections, replacing output fuses, or working on equipment within the enclosure, use the disconnect to shut off power to the rest of the system.

IMPORTANT The operator must not control the master control relay with the processor. Provide the operator with the safety of a direct connection between an emergency-stop switch and the master control relay.

Emergency-Stop Switches

Adhere to the following points concerning emergency-stop switches.

- Do not program emergency-stop switches in the controller program. Any emergency-stop switch should turn off all machine power by turning off the master control relay.
- Observe all applicable local codes concerning the placement and labeling of emergency-stop switches.
- Install emergency-stop switches and the master control relay in your system. Make certain that relay contacts have a sufficient rating for your application. Emergency-stop switches must be easy to reach. See the schematic on page 69.

Power Considerations

Refer to the following sections regarding power.

Common Power Source

All chassis power supplies should have the same power source as the input and output devices. This helps reduce the chance of electrical interference due to multiple sources and grounds as well as helps maintain system integrity if power is interrupted.

The processor detects the absence of power to any chassis in the system. If power to any chassis is lost (or not yet applied), the CPU FAULT status indicator turns on and all controller outputs in the local chassis are de-energized. Output states in any remote chassis are determined by configuration settings at that chassis.

This fault detection makes it necessary that you apply power to the expansion chassis before you apply power to the chassis containing the processor to avoid an unwanted fault. Of course, applying power in sequence is unnecessary if all chassis have a common power source.

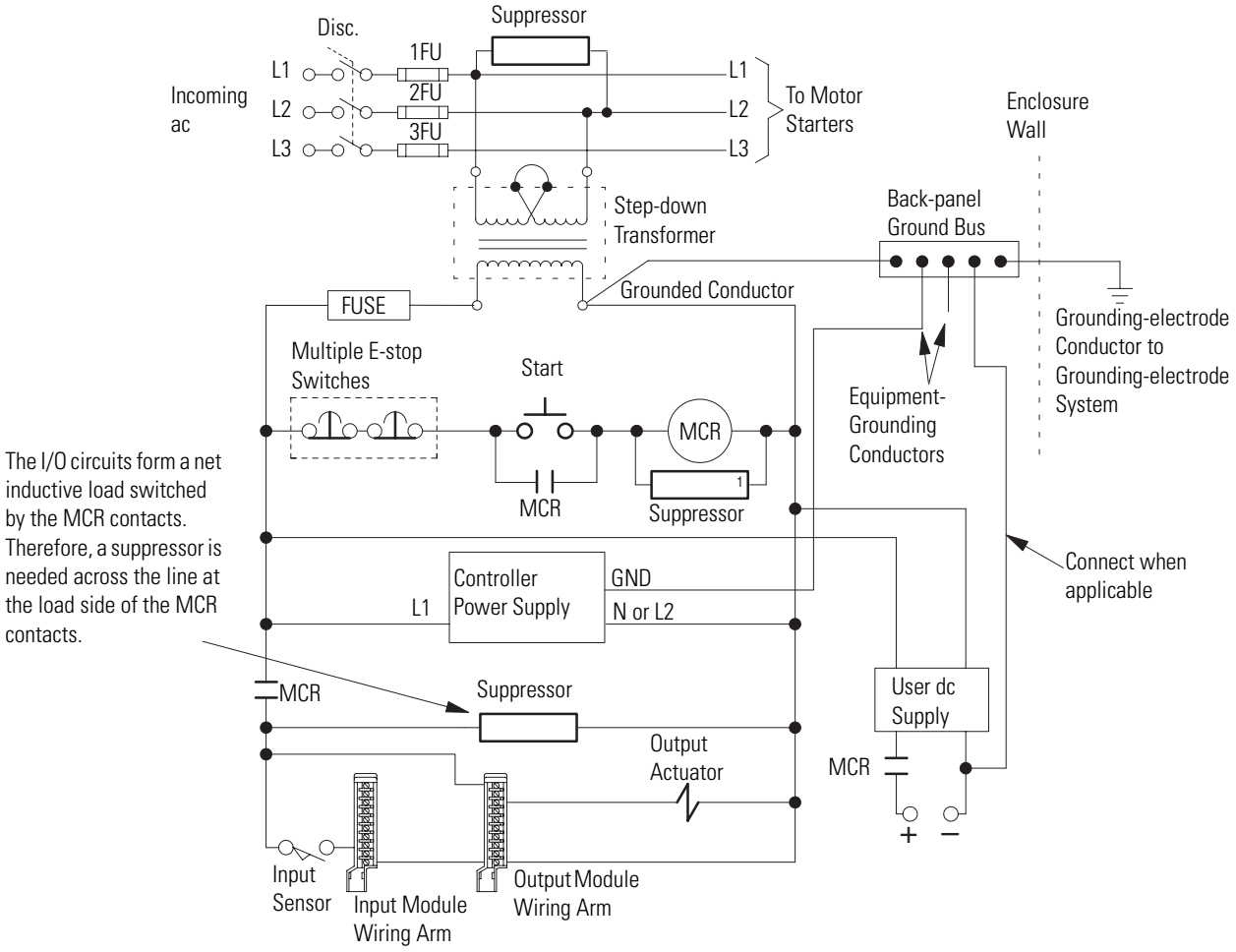
Isolation Transformer

In many industrial applications, a step-down transformer is required to reduce line voltage to 120 or 240V ac. This transformer also provides isolation to protect equipment from high voltage transients that may be generated on your power distribution system.

ATTENTION

Your SLC 500 power supply can be damaged by voltage surges when switching inductive loads such as motors, motor starters, solenoids, and relays. To avoid damage to your SLC 500 power supply in these applications, use an isolation transformer to isolate the power supply from harmful voltage surges.

Grounded ac Power-Distribution System with Master-Control Relay



Power Supply Required Input Voltage Characteristics

- The applied input voltage must be at or below 132V ac RMS (265V ac RMS in 240 Volt mode).
- Minimum acceptable value of the applied input voltage must be above 85V ac RMS (170V ac RMS in 240 Volt mode).
- The frequency of the applied voltage must be within 47...63 Hz.
- Both the positive and negative half cycles must be symmetrical and conform to these requirements.

Loss of Power Source

The chassis power supplies are designed to withstand brief power losses without affecting the operation of the system. The time the system is operational during power loss is called program scan hold-up time after loss of power. The duration of the power supply hold-up time depends on the number, type, and state of the I/O modules, but is typically 20 ms...3 s. When the duration of power loss reaches a limit, the power supply signals the processor that it can no longer provide adequate dc power to the system. This is referred to as a power supply shutdown. The power supply status indicator is turned off.

In multi-chassis systems, power outages of 20...300 ms in duration can cause a remote power fail error to occur. You can clear this error by cycling power to your system or by using a programming device.

Input States on Power Down

The power supply hold-up time as described above is generally longer than the turn-on and turn-off times of the input modules. Because of this, the input state change from On to Off that occurs when power is removed may be recorded by the processor before the power supply shuts down the system. Understanding this concept is important. Write the user program to take this effect into account. For example, hard-wire power to one spare input. In the user program, check to be sure that one input is on; otherwise, jump to the end of the program and avoid scanning the logic. Use of a common power source as recommended in the previous section is assumed.

Power Supply Undervoltage Operation

SLC 500 controllers continue to operate (hold-up) for a short period of time if the input voltage to the power supply drops below the recommended operating voltage range. The controller continues to scan the user program and control I/O during this time. CPU hold-up time is 20 ms...3 s depending on the power supply and loading.

SLC 500 controllers turn OFF (stop scanning and disable outputs) if input voltage to the power supply is removed or drops below the recommended operating range for a period exceeding the CPU hold-up time. The controller resumes operation automatically when the input voltage is restored to normal.

If the input voltage to the 1746-P7 power supply falls into a range of 4...9V for a period exceeding the CPU hold-up time, the controller turns OFF and will not turn back ON until the input voltage is increased to 11V dc.

SLC 500 Operation with 24V dc User Power Overcurrent Condition

Power Supply Cat. No.	SLC Operation	Recovery Procedure
1746-P1 series A (made in Japan)	power supply shutdown, CPU fault	Reload user program
1746-P1 series A (made in Malaysia - current production)	24V dc user shutdown, CPU continues	Correct overcurrent condition
1746-P2 series A and B	power supply shutdown, CPU fault	Reload user program
1746-P2 series C	24V dc user shutdown, CPU continues	Correct overcurrent condition
1746-P4 series A	power supply shutdown, CPU fault	Reload user program
1746-P5 series A	24V dc user shutdown, CPU continues	Correct overcurrent condition
1746-P6 series A	24V dc user shutdown, CPU continues	Correct overcurrent condition

ATTENTION

For 1746-P1 (made in Malaysia), 1746-P2 series C, 1746-P5 series A, and 1746-P6 series A power supply, to avoid unexpected operation due to 24V dc user power shutdown, monitor the 24V dc user output with a 24V dc input channel.

Safety Considerations

Safety considerations are an important element of proper system installation. Actively thinking about the safety of yourself and others, as well as the condition of your equipment, is of primary importance.

Disconnecting Main Power

Locate the main power disconnect switch where operators and maintenance personnel have quick and easy access to it. Ideally, the disconnect switch is mounted on the outside of the enclosure, so that it can be accessed without opening the enclosure. In addition to disconnecting electrical power, de-energize all other sources of power (pneumatic and hydraulic) before working on a machine or process controlled by an SLC controller.

Safety Circuits

Circuits installed on the machine for safety reasons, like overtravel limit switches, stop push buttons, and interlocks, should always be hard-wired directly to the master control relay. These devices must be wired in series so that when any one device opens, the master control relay is de-energized thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could result.

Power Distribution

There are some points about power distribution that you should be aware of. First, the master control relay must be able to inhibit all machine motion by removing power to the machine I/O devices when the relay is de-energized.

Second, if you are using a dc power supply, interrupt the load side rather than the ac line power. This avoids the additional delay of power supply turn-on and turn-off. The dc power supply should be powered directly from the fused secondary of the transformer. Power to the dc input and output circuits is connected through a set of master control relay contacts.

Periodic Tests of Master Control Relay Circuit

Any part can fail, including the switches in a master control relay circuit. The failure of one of these switches would most likely cause an open circuit, which would be a safe power-off failure. However, if one of these switches shorts

out, it no longer provides any safety protection. These switches should be tested periodically to assure they will stop machine motion when needed.

Preventive Maintenance

The printed circuit boards of the controller must be protected from dirt, oil, moisture and other airborne contaminants. To protect these boards, the controller must be installed in an enclosure suitable for the environment. The interior of the enclosure should be kept clean and the enclosure door should be kept closed whenever possible.

Regularly inspect your terminal connections for tightness. Loose connections may cause improper functioning of the controller or damage the components of the system.

ATTENTION

To ensure personal safety and to guard against damaging equipment, inspect connections with incoming power off.

The National Fire Protection Association (NFPA) provides recommendations for electrical equipment maintenance. Refer to article 70B of the NFPA for general requirements regarding safety related work practices.

Notes:

Mounting Your SLC 500 Control System

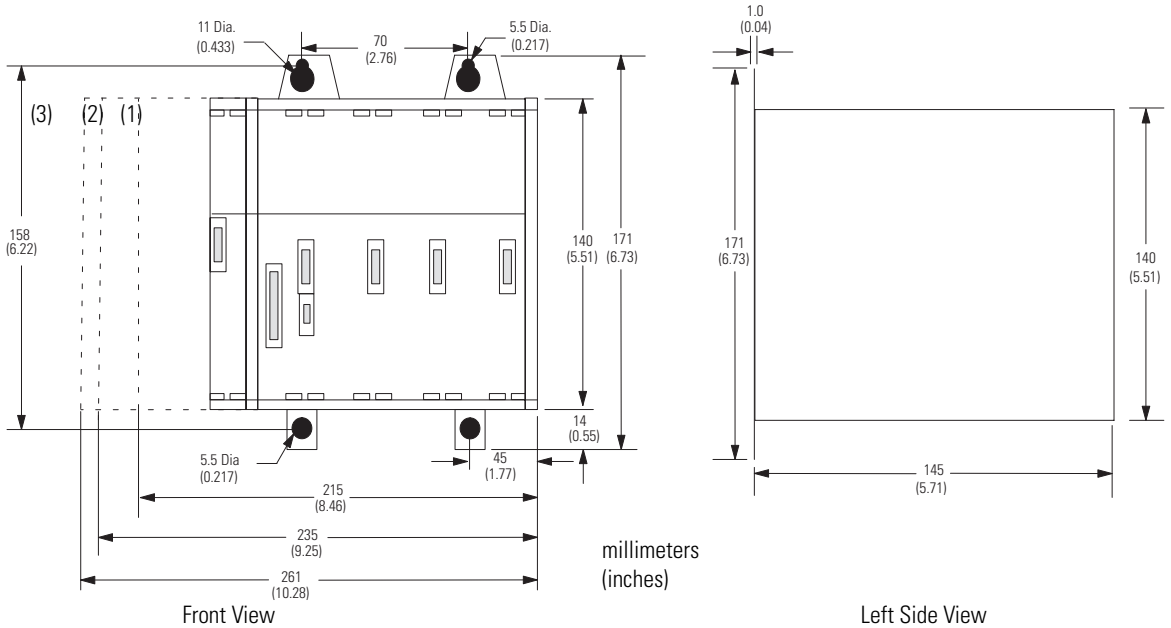
This chapter provides mounting dimensions for:

- 4, 7, 10, and 13-slot chassis.
- link coupler (AIC).
- Data Terminal Access Module (DTAM).
- DTAM Plus Operator Interface.
- DTAM Micro Operator Interface.
- AIC+ Advanced Interface Converter.
- DNI DeviceNet Network Interface.
- ENI EtherNet Network Interface.

Mounting Modular Hardware Style Units

You can mount the modular hardware style units directly to the back panel of your enclosure using the mounting tabs and #10 or #12 screws. The torque requirement is 3.4 Nm (30 lb-in) maximum.

4-slot Modular Chassis

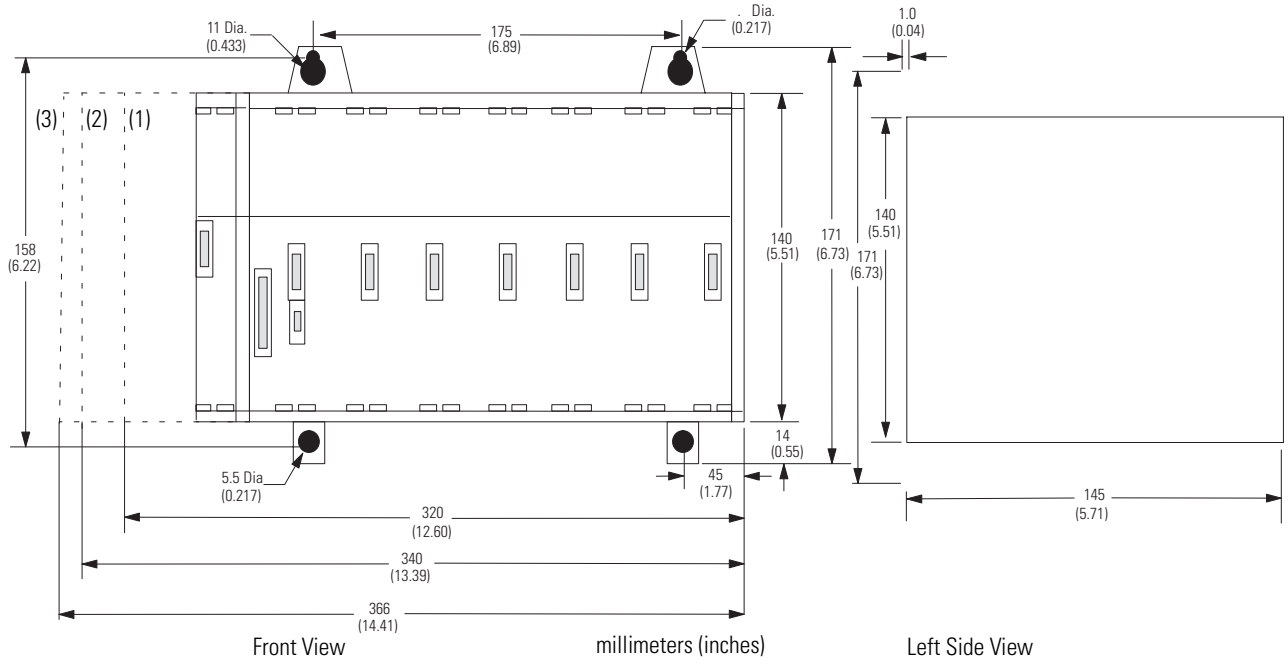


(1) Dimensions for 1746-P1 power supply.

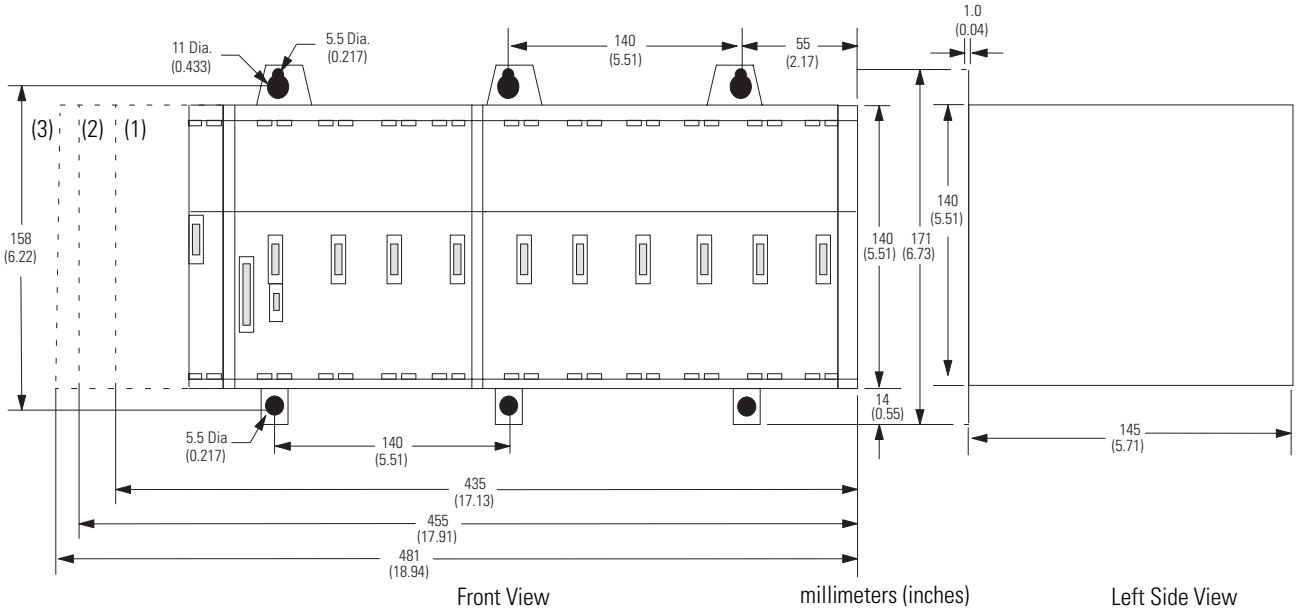
(2) Dimensions for 1746-P2, 1746-P3, 1746-P5, 1746-P6, and 1746-P7 power supplies.

(3) Dimensions for 1746-P4 power supply.

7-slot Modular Chassis



10-slot Modular Chassis

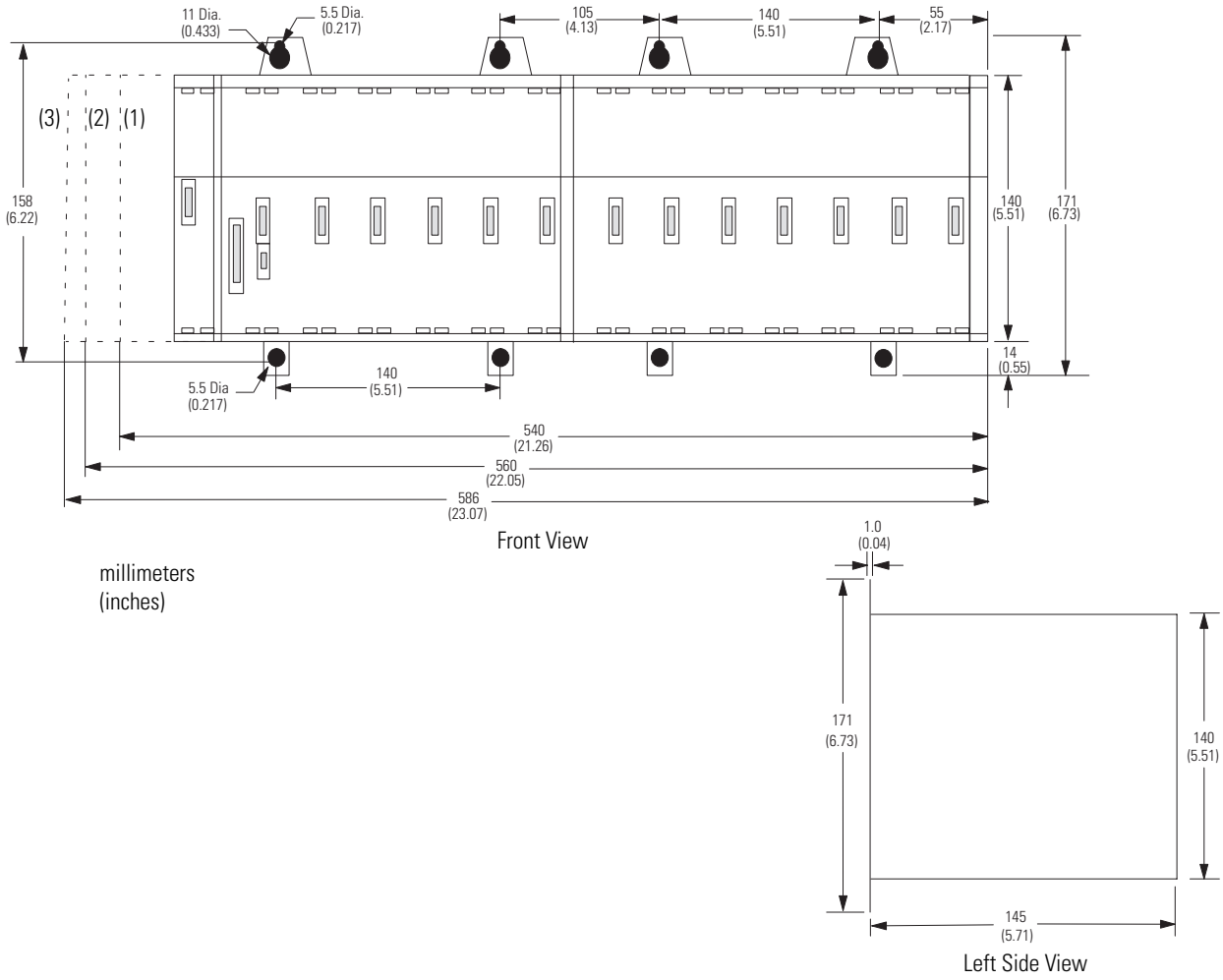


(1) Dimensions for 1746-P1 power supply.

(2) Dimensions for 1746-P2, 1746-P3, 1746-P5, 1746-P6, and 1746-P7 power supplies.

(3) Dimensions for 1746-P4 power supply.

13-slot Modular Chassis

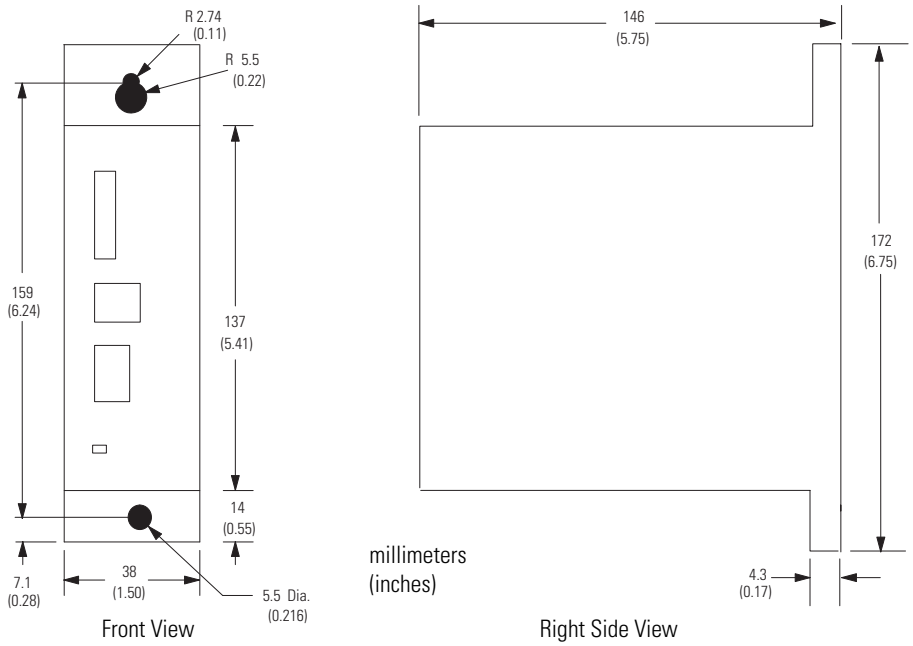


(1) Dimensions for 1746-P1 power supply.

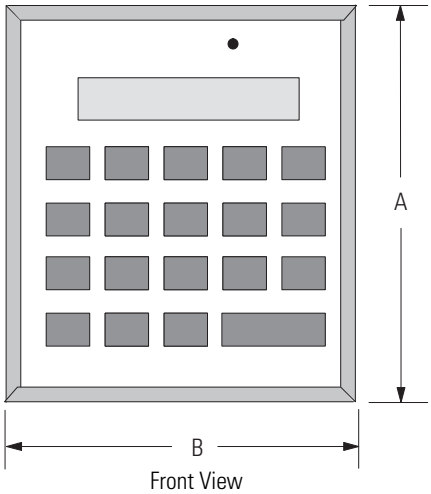
(2) Dimensions for 1746-P2, 1746-P3, 1746-P5, 1746-P6, and 1746-P7 power supplies.

(3) Dimensions for 1746-P4 power supply.

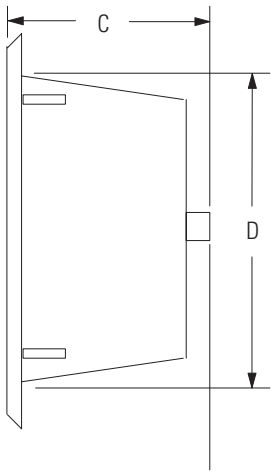
Link Coupler (AIC)



Data Table Access Module (DTAM, DTAM Plus, and DTAM Micro)



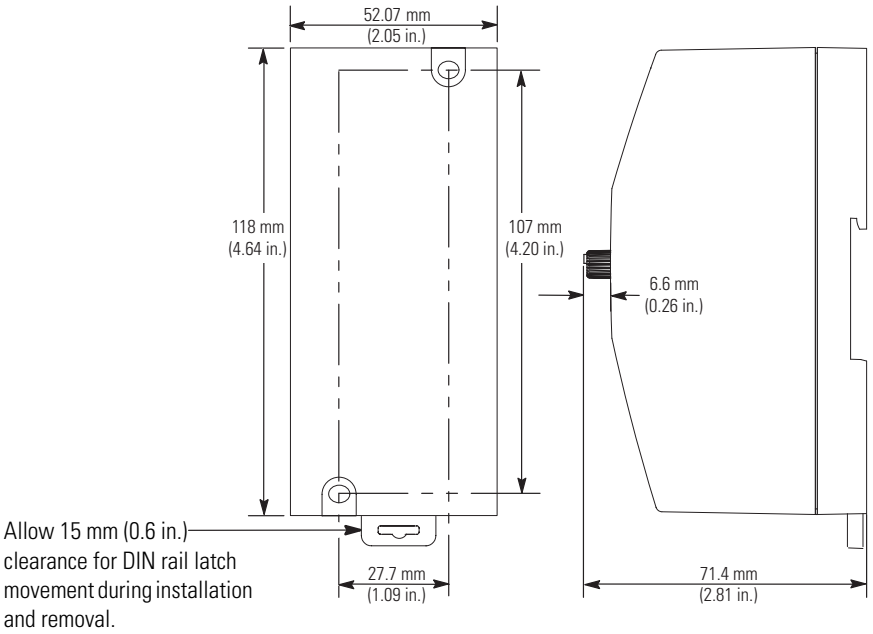
Front View



Right Side View

Data Table Access Module	Dimensions in millimeters (inches)			
	A	B	C	D
DTAM	152 (6.0)	140 (5.5)	69 (2.76)	127 (5.0)
DTAM Plus	215.9 (8.5)	165.1 (6.5)	45.7 (1.8)	193 (7.6)
DTAM Micro	137.2 (5.4	175.3 (6.9)	45.7 (1.8)	99.1 (3.9)

AIC+ Advanced Interface Converter (1761-NET-AIC)
DeviceNet Interface (1761-NET-DNI)
Ethernet Interface (1761-NET-ENI)



Identifying the Components of Your Processor

This chapter covers the following:

- SLC 5/01 hardware features
- SLC 5/02 hardware features
- SLC 5/03 hardware features
- SLC 5/04 hardware features
- SLC 5/05 hardware features
- Keyswitch for the SLC 5/03, SLC 5/04, and SLC 5/05 processors

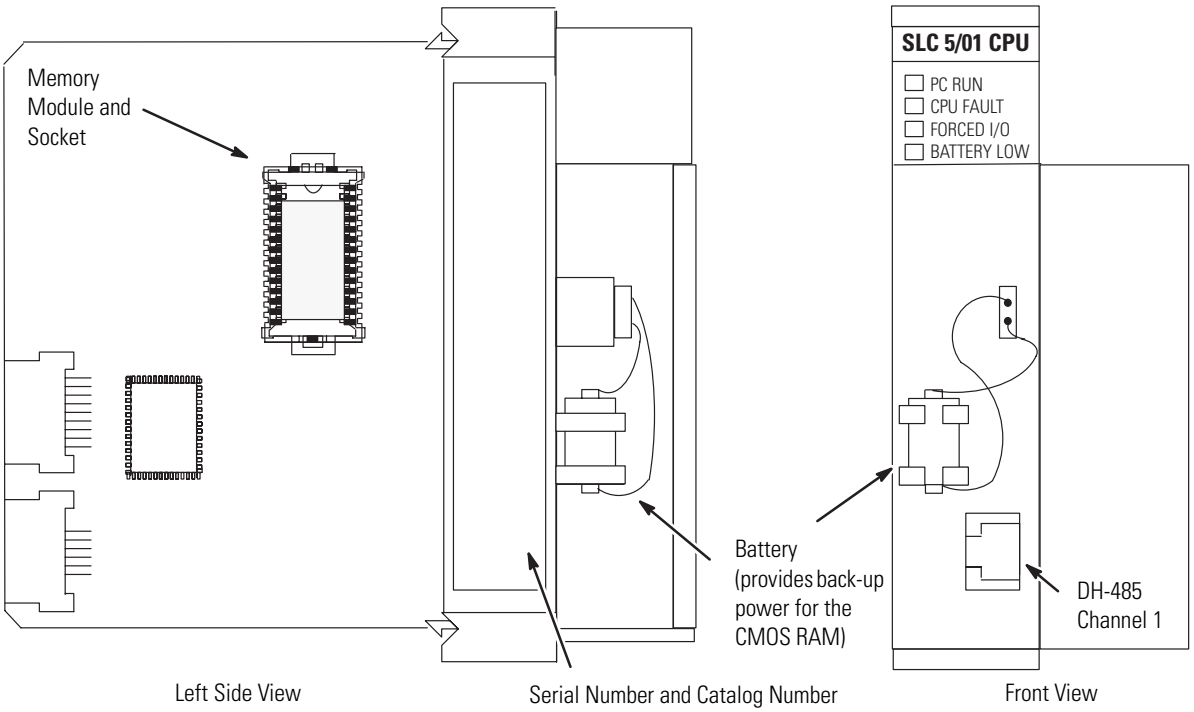
SLC 5/01 Processor Hardware Features

The SLC 5/01 processor provides:

- two choices of program memory size - 1 K or 4 K instructions.
- control of up to 3840 input and output points.
- powerful ladder logic programming instruction set.
- subroutines.
- a DH-485 communication channel (peer-to-peer communication response to message commands only).
- capacitor backup for the 1747-L511 module; battery backup for the 1747-L514 module.
- program using your programming software.
- UL listed to US and Canadian Safety Standards, CE compliant, C-Tick marked.

The figure on page 82 shows the hardware components of the SLC 5/01 processor (1747-L511 and 1747-L514).

SLC 5/01 Hardware Components



The table below provides a general explanation of the SLC 5/01 processor status indicators.

SLC 5/01 Status Indicators

Processor Status Indicator[1]	When It Is	Indicates that
PC RUN (Color: red)	On (steady)	The processor is in the Run mode.
	Off	The processor is in a mode other than Run.
CPU FAULT (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.
FORCED I/O (Color: red)	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.
BATTERY LOW (Color: red)	On (steady)	The battery voltage has fallen below a threshold level or the battery and the battery jumper are missing.
	Off	The battery is functional, or the battery jumper is present.

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

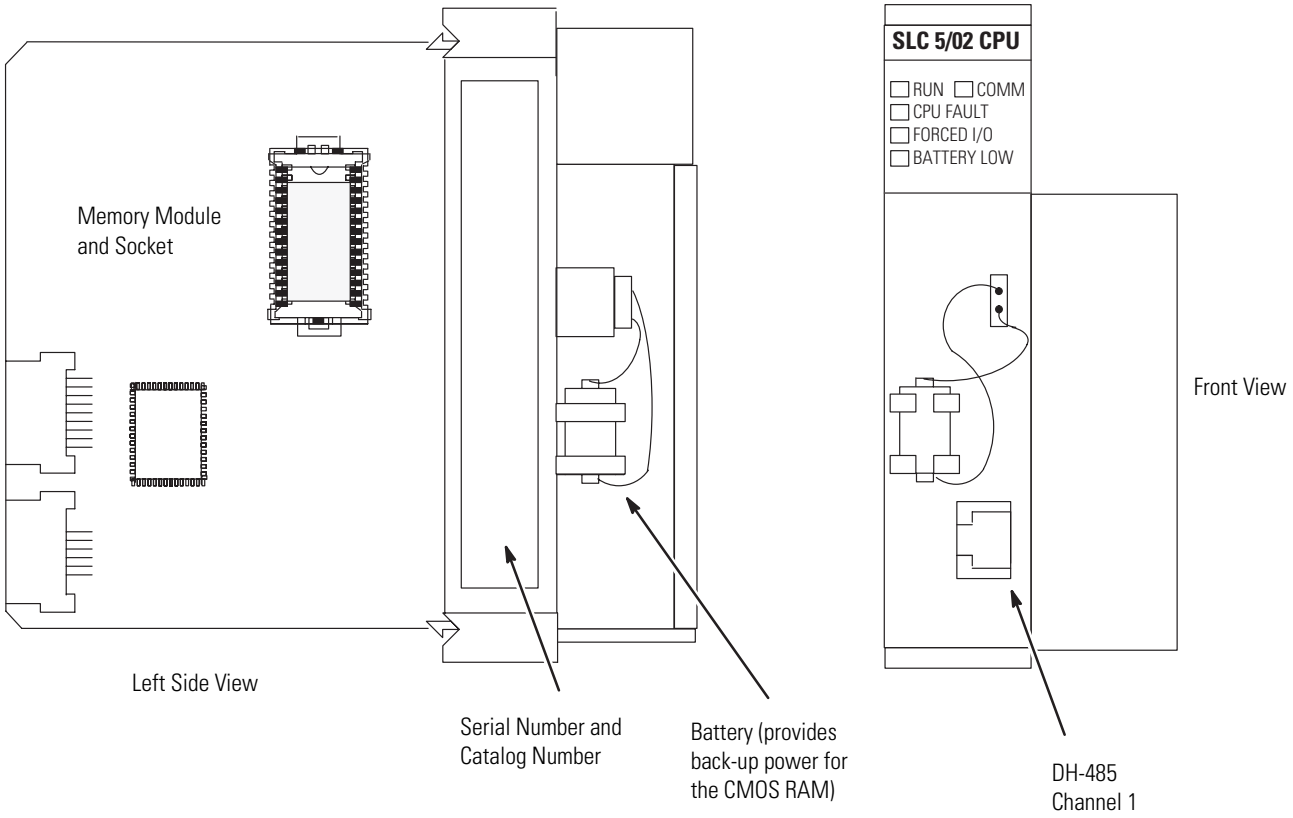
SLC 5/02 Processor Hardware Features

The SLC 5/02 processor offers an enhanced instruction set, increased diagnostic capabilities, and expanded communication capabilities beyond the SLC 5/01 processors and fixed controllers. The SLC 5/02 processor provides:

- program memory size of 4 K instructions.
- control of up to 4096 input and output points.
- PID - used to provide closed loop process control.
- indexed addressing.
- interrupt capability.
- user fault routines.
- ability to handle 32-bit signed math functions.
- built-in DH-485 communication channel (initiation of peer-to-peer communication).
- battery-backed RAM.
- communication status indicator; when on, the status indicator indicates that there is communication activity on the DH-485 network.
- program using your programming software.
- UL listed to US and Canadian Safety Standards, CE compliant, C-Tick marked.

The figure on page 84 shows some of the hardware components of the SLC 5/02 processor.

SLC 5/02 Hardware Components



The table below provides a general explanation of each processor status indicator (for both the SLC 5/02 series B and C processor).

SLC 5/02 Status Indicators

Processor Status Indicator[1]	When It Is	Indicates that
RUN (Color: red)	On (steady)	The processor is in the Run mode.
	Off	The processor is in a mode other than Run.
CPU FAULT (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, expansion chassis or memory.
	On (steady)	A fatal error is present (no communication).
	Off	There are no errors.
FORCED I/O (Color: red)	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.

Processor Status Indicator[1]	When It Is	Indicates that
BATTERY LOW (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.
COMM (Color: red)	On (steady)	The SLC 5/02 processor is connected to an active DH485 network.
	Off	The SLC 5/02 processor is not receiving data.

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

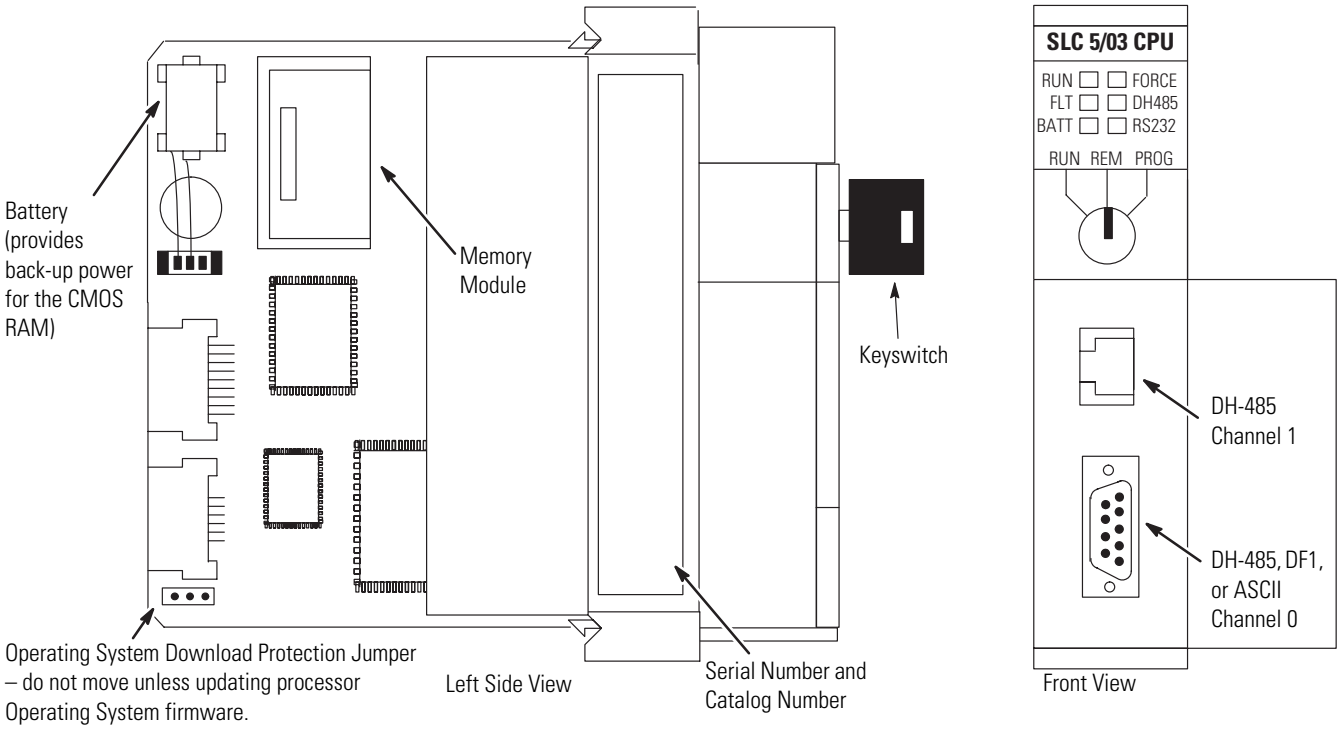
SLC 5/03 Processor Hardware Features

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.

SLC 5/04 Processor Hardware Features

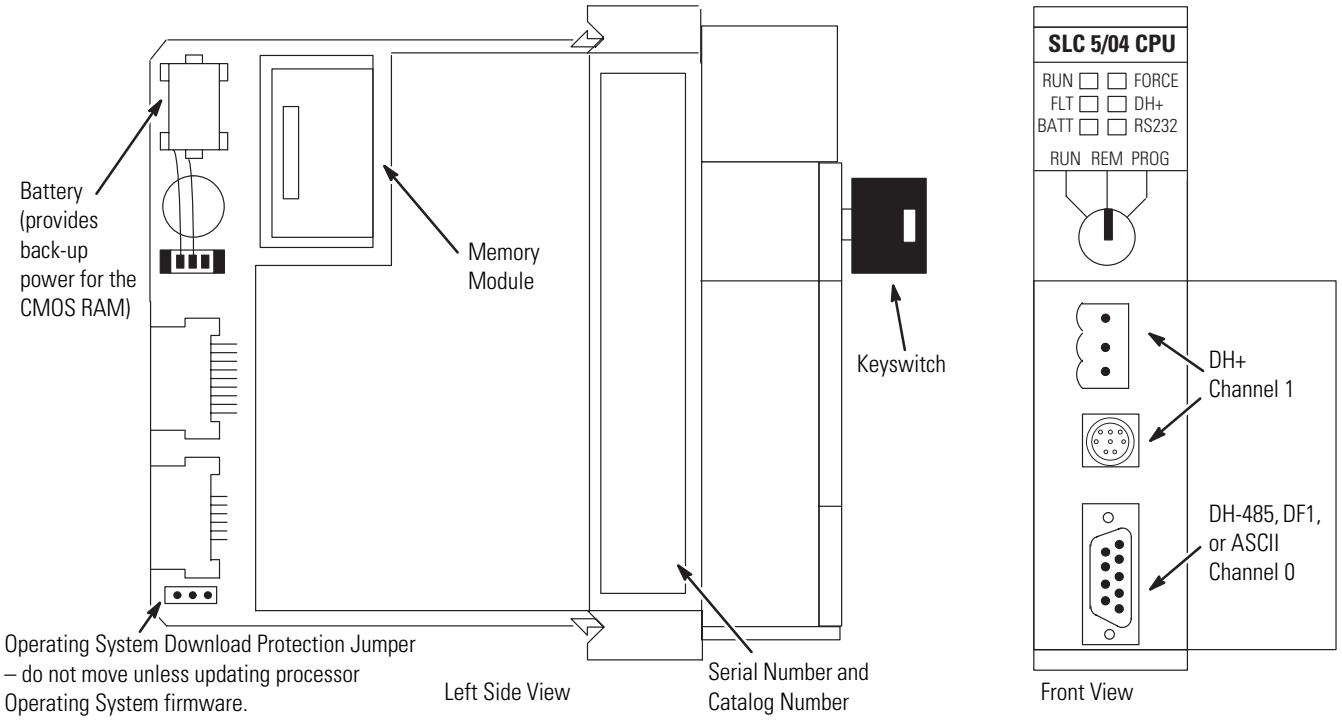
The SLC 5/04 processors offer:

- program memory sizes of 16 K, 32 K, or 64 K.
- high-speed performance - 0.90 ms/K typical.
- control of up to 4096 input and output points.
- online programming (includes runtime editing).
- built-in DH+channel, supporting:
  - high-speed communication (57.6 Kbaud, 115.2 Kbaud, and 230.4 Kbaud).
  - messaging capabilities with SLC 500, PLC-2, PLC-5, and ControlLogix processors.
- 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, 1761-CBL-AC00, or 1761-CBL-AC00 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 (Use a 1761-NET-AIC with a 1747-CP3 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+ 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.
- 1 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.

- multi-point list.
- UL listed to US and Canadian Safety Standards, CE compliant, C-Tick marked.

This figure below shows some of the hardware components of the SLC 5/04 processors (1747-L541, 1747-L542, or 1747-L543).

SLC 5/04 Hardware Components



The table below provides a general explanation of each processor status indicator on the SLC 5/04 processors.

SLC 5/04 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.

Processor Status Indicator[1][2]	When It Is	Indicates that
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.
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+ (Color: green or red)	On (steady)	The Communications Active bit (S:1/7) is set in the System Status file and the processor is actively communicating on the DH+ network.
	Flashing green	The processor is trying to establish communication, but there are no other active nodes on the DH+ network.
	Flashing red	There are duplicate nodes on the link with the same node address.
RS-232 (Color: green)	On (steady) DF1/Modbus RTU Master/ASCII mode	The SLC 5/04 processor is transmitting on the network.
	Off DF1/Modbus RTU Master/ASCII mode	The SLC 5/04 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 5/04 processor turn on in a predefined sequence, the SLC 5/04 processor is in the process of downloading a new operating system.

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

SLC 5/05 Processor Hardware Features

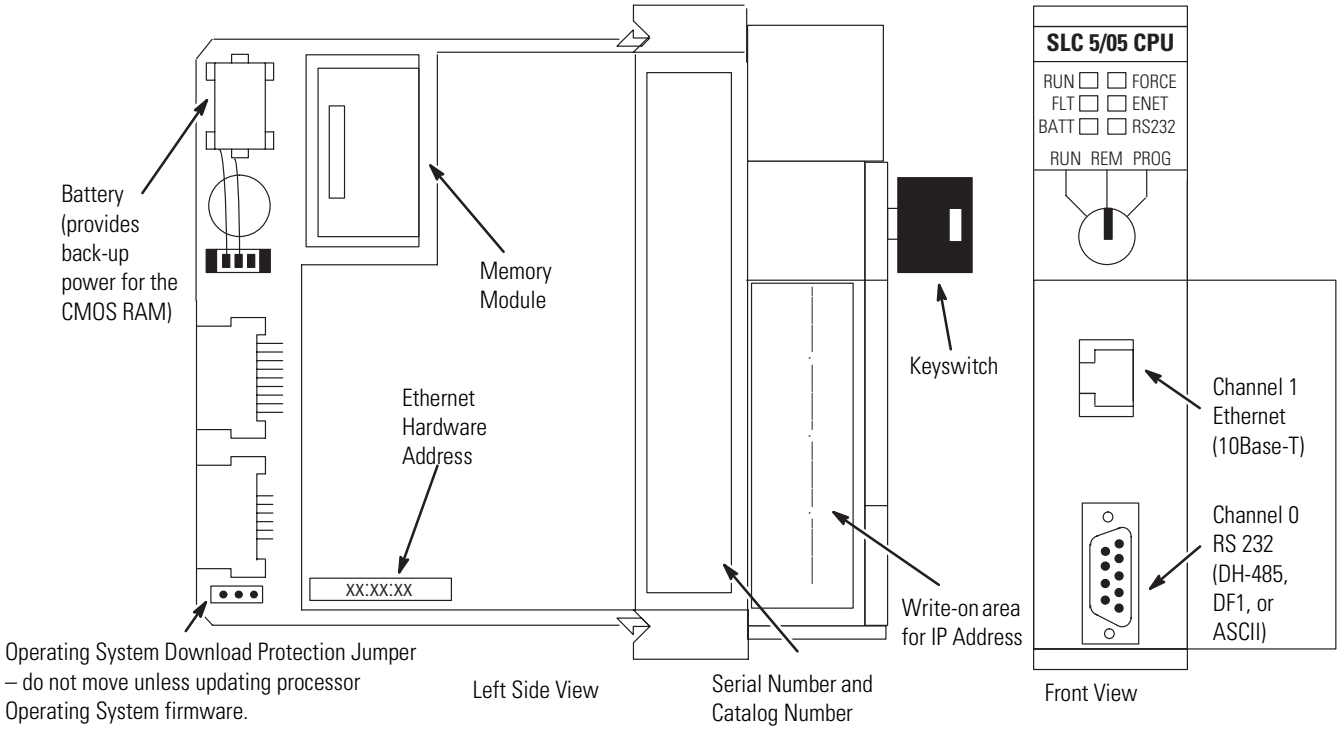
The SLC 5/05 processors offer:

- program memory sizes of 16 K, 32 K, or 64 K.
- high-speed performance - 0.90 ms/K typical.
- control of up to 4096 input and output points.
- online programming (includes runtime editing).
- built-in 10/100Base-T Ethernet channel, supporting:
  - high-speed computer communication using TCP/IP.
  - messaging capabilities with SLC 5/05, PLC-5, and ControlLogix processors on Ethernet.
  - SNMP for standard Ethernet network management.
  - BOOTP for optional dynamic IP address assignment.
- 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, 1761-CBL-AC00, or 1761-CBL-AP00 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 (Use a 1761-NET-AIC with a 1747-CP3 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 (Ethernet to DF1 full-duplex, DF1 half-duplex Master, DF1 radio modem, or DH-485).
- remote I/O and DeviceNet passthru.
- built-in real-time clock/calendar.
- 1 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 through the Ethernet port.
- optional flash EPROM memory module available.
- keyswitch - RUN, REMote, PROGram (clear faults).
- battery-backed RAM.
- additional instructions such as swap and scale with parameters

- multi-point list.
- UL listed to US and Canadian Safety Standards, CE compliant, C-Tick marked.

The figure below shows some of the hardware components of the SLC 5/05 processors (1747-L551, 1747-L552, and 1747-L553).

SLC 5/05 Hardware Components



The table below provides a general explanation of the processor status indicators.

SLC 5/05 Status Indicators

Processor Status Indicator	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.

Processor Status Indicator	When It Is	Indicates that
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.
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.
ENET Channel 1 (Color: green or red)	Solid green	The Ethernet port is functioning properly and is connected to an active Ethernet network.
	Flashing green	The Ethernet port is functioning properly, connected to an active Ethernet network, and is transmitting packets.
	Flashing red	A hardware or software fault has occurred and is being reported via a code. Contact Allen-Bradley for assistance.
	Off	No Ethernet connection or processor halted.
RS-232 Channel 0 (Color: green)	On (steady) DF1/Modbus RTU Master/ASCII mode	The SLC 5/05 processor is transmitting on the network.
	Off DF1/Modbus RTU Master/ASCII mode	The SLC 5/05 processor is not transmitting on the network.
	On (steady) DH-485 mode	The Channel 0 Communications Active bit (S:33/4) is set in the System Status file and the processor is actively communicating on the 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).

Keyswitch for the SLC 5/03, SLC 5/04, and SLC 5/05 Processors

The SLC 5/03, SLC 5/04, and SLC 5/05 processors include a 3-position keyswitch on the front panel that lets you select one of three modes of operation: RUN, PROGram, and REMote. You can remove the key in each of the three positions.

ATTENTION

Depending on the size of your user program, the processor can take up to 2.5 s to change modes when you change the position of the keyswitch from RUN to PROG or to REM. Do not use the keyswitch in place of a hardwired master control relay or an emergency-stop switch.

IMPORTANT

The SLC 5/01 and SLC 5/02 processors do not have a keyswitch. Therefore, all modes must be changed via the communication channels.

RUN Position

This position places the processor in the Run mode. The processor scans/executes the ladder program, monitors input devices, energizes output devices, and acts on enabled I/O forces. You can only change the processor mode by changing the keyswitch position. You cannot perform online program editing.

To change the processor mode to Run, toggle the keyswitch from PROG or REM to RUN. When the keyswitch is left in the RUN position, you cannot use a programmer/operator interface device to change the processor mode.

PROG Position

This position places the processor in the Program mode. The processor does not scan/execute the ladder program, and the controller outputs are de-energized. You can perform online program editing. You can only change the processor mode by changing the keyswitch position.

To change the processor mode to Program, toggle the keyswitch from REM or RUN to PROG. When the keyswitch is left in the PROG position, you cannot use a programmer/operator interface device to change the processor mode.

REM Position

This position places the processor in the Remote mode: either the REMote Run, REMote Program, or REMote Test mode. You can change the processor mode by changing the keyswitch position or by changing the mode from a programmer/operator interface device. You can perform online program editing in this position.

To change the processor mode to REM, toggle the keyswitch from RUN or PROG to REM. When the keyswitch is in the REM position, you can use a programmer/operator interface device to change the processor mode.

Installing Your Hardware Components

This chapter shows you how to install the following hardware components:

- Chassis
- Processor
- Modules
- Memory module
- Power supply
- Chassis interconnect cable

Compliance to European Union Directives

This product is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

The analog modules are tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2
  EMC – Generic Emission Standard, Part 2 - Industrial Environment

- EN 50082-2
  EMC – Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

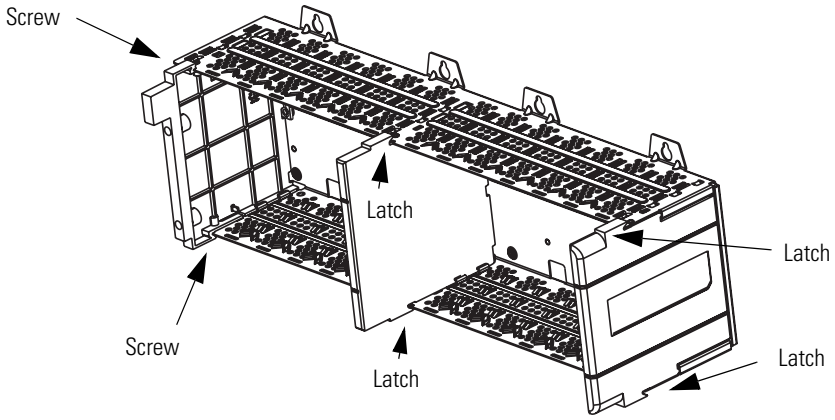
Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information required by EN61131-2, see the appropriate sections in this publication, as well as the industrial Automation, Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1.

Install Your Chassis

The power supply support panel (left end panel) has screws as indicated in the following illustration. The center and right end panels are held in position by a molded latch and do not require screws.

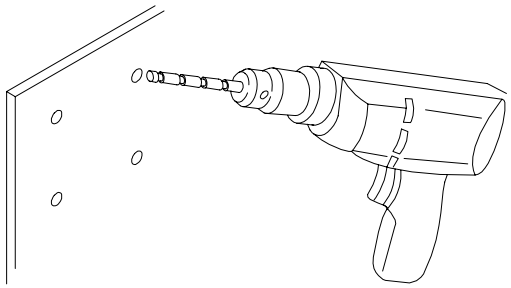


Perform this procedure to install your chassis.

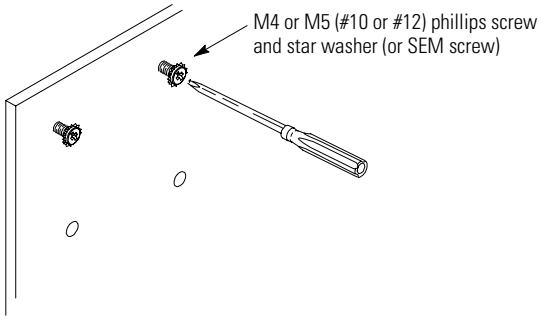
1. Drill holes in the back panel of the enclosure for chassis mounting tabs.

ATTENTION

Be careful of metal chips when drilling mounting holes for the SLC chassis. Do not drill holes above an SLC chassis if a processor and I/O modules are installed.



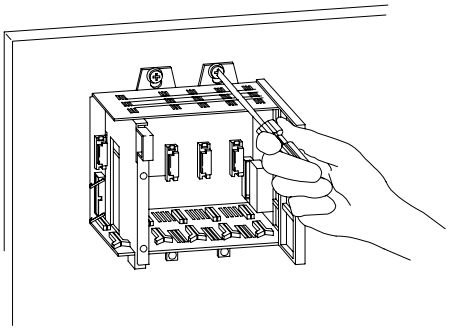
2. Install the hardware for the top mounting tabs.



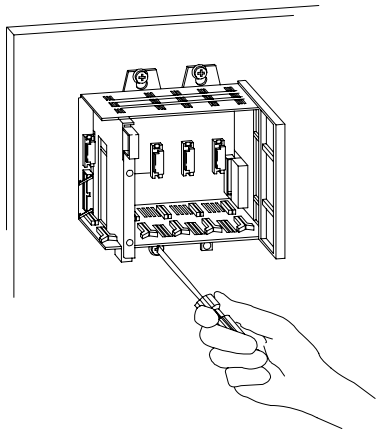
TIP Scrape paint off the back panel for an electrical connection between the chassis and back panel.

3. Slide the chassis over the installed hardware and tighten the screws.

ATTENTION If the chassis mounting tabs do not lay flat before the screws are tightened, use additional washers as shims so the chassis will not warp when tightening the screws. Warping the chassis could damage the backplane and cause poor connections.



4. Leaving far-left and far-right tabs open for grounding, install the remaining tab hardware (for a four-slot chassis, leave both tabs open).



Installing Your Processor

The processor always occupies the first slot of the first chassis. You can only install one processor per system.

ATTENTION

Never install, remove, or wire any module while power is applied. Also, do not expose processor modules to surfaces or other areas that may typically hold an electrostatic charge.

Electrostatic discharge can damage integrated circuits or semiconductors if you touch backplane connector pins. Follow these guidelines when you handle the power supplies.

- Touch a grounded object to discharge static potential.
- Do not touch the backplane connector or connector pins.
- Do not touch circuit components inside the power supply.
- Use a static-safe work station if available.
- Keep the power supplies in their static-shield packaging when not in use.

IMPORTANT

If the equipment is not installed and used as described in this manual, the protection provided by the equipment may be impaired.

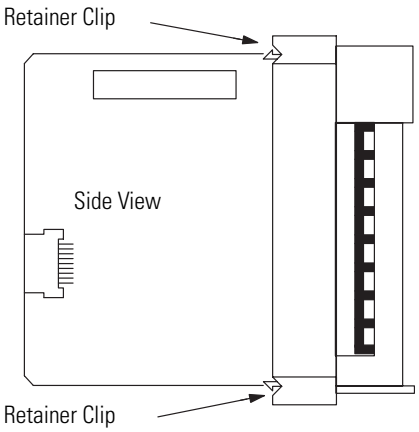
IMPORTANT

If your processor has a battery — the battery is an option for the SLC 5/01 (1747-L511) processor — make sure it is connected before installing your processor into the chassis. This provides memory backup for your processor should the controller power supply fail.

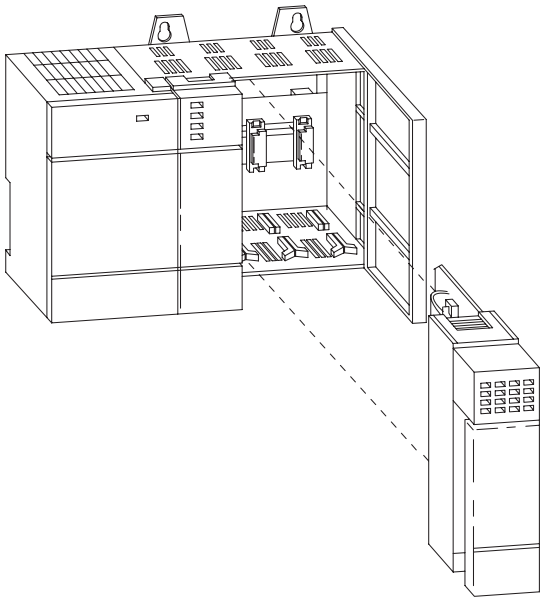
Install Modules

Follow the steps below to install your modules.

1. Align the circuit board of the module with the card guide in the chassis.



2. Gently slide the module in until both top and bottom retainer clips are secured.



3. Install a wire tie to secure your wiring and keep it neat. (If you feed the tie into one hole, it will be routed back out through the other.)

4. Cover any unused slots with card slot fillers (catalog number 1746-N2) to keep the chassis free from debris and dust.

5. To remove the module, press the retaining clips at the top and bottom of the module and slide the module out.

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.

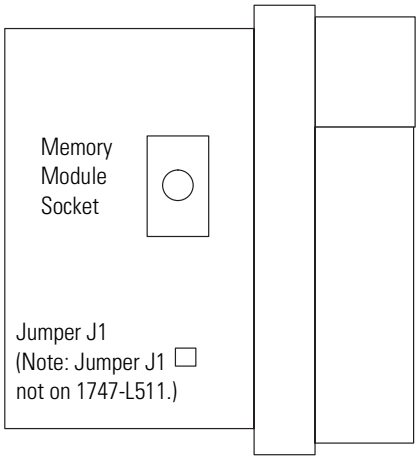
ATTENTION

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.

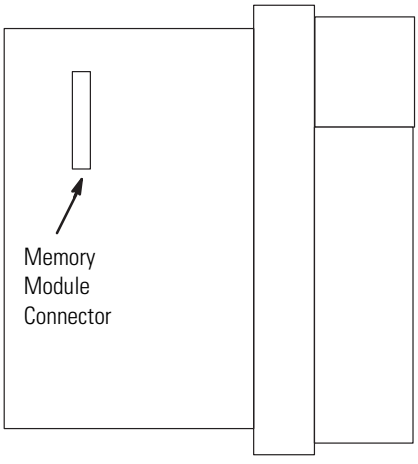
1. If the processor module is installed in the chassis, remove the module by pressing the retainer clips at both the top and bottom of the module and sliding it out.

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.

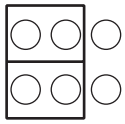
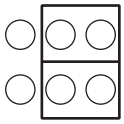
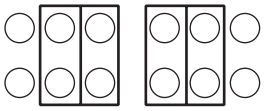
Side View of SLC Processor
1747-L511, 1747 -L514, and 1747-L524



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



3. Place jumper J1 as shown below.

Processor Type	1747-M1, -M2, -M3	1747-M4	Invalid Settings
1747-L514, 1747-L524			
1747-L511, 1747-L531, 1747-L532, 1747-I533, 1747-L541, 1747-L542, 1747-L543, 1747-L551, 1747-L552, 1747-L553	No Jumper J1	No Jumper J1	No Jumper J1

4. Install the processor module into the chassis.

5. Restore power to the controller.

Remove the Memory Module

Follow this procedure to remove the memory module.

1. Remove power and pull out the processor.

2. Grasp the carrier tabs (or connector for the SLC 5/03, SLC 5/04, and SLC 5/05 processor) with your thumb and index fingers, then gently but firmly lift upwards on either end of the memory module carrier.

3. When the end is partially raised, begin lifting the other end in the same manner. Repeat this until the memory module has been completely removed from the socket.

Install Your Power Supply

If you have multiple chassis configurations, install the chassis interconnect cable before installing the power supply.

See Install Your Chassis Interconnect Cable on page 108.

Also, the power supply terminals accept two 2 mm^2 (#14 AWG) wires and are marked as shown in the figure on page 106.