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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**

Selecting Your Hardware Components

This chapter provides general information on what your SLC 500 controller can do, an overview of the modular control system, and special considerations for controller installations. It also explains how to select:

- chassis.
- modular processors.
- discrete I/O modules.
- specialty I/O modules.
- power supplies.
- enclosures.
- operator interfaces.
- memory modules.
- isolation transformers.

This chapter does not provide you with all the information that you need to select a complete SLC 500 control system. To do this, we recommend that you use the latest version of the system overview, SLC 500 Programmable Controllers and I/O Modules, publication 1747-SG001.

European Union Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is 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.

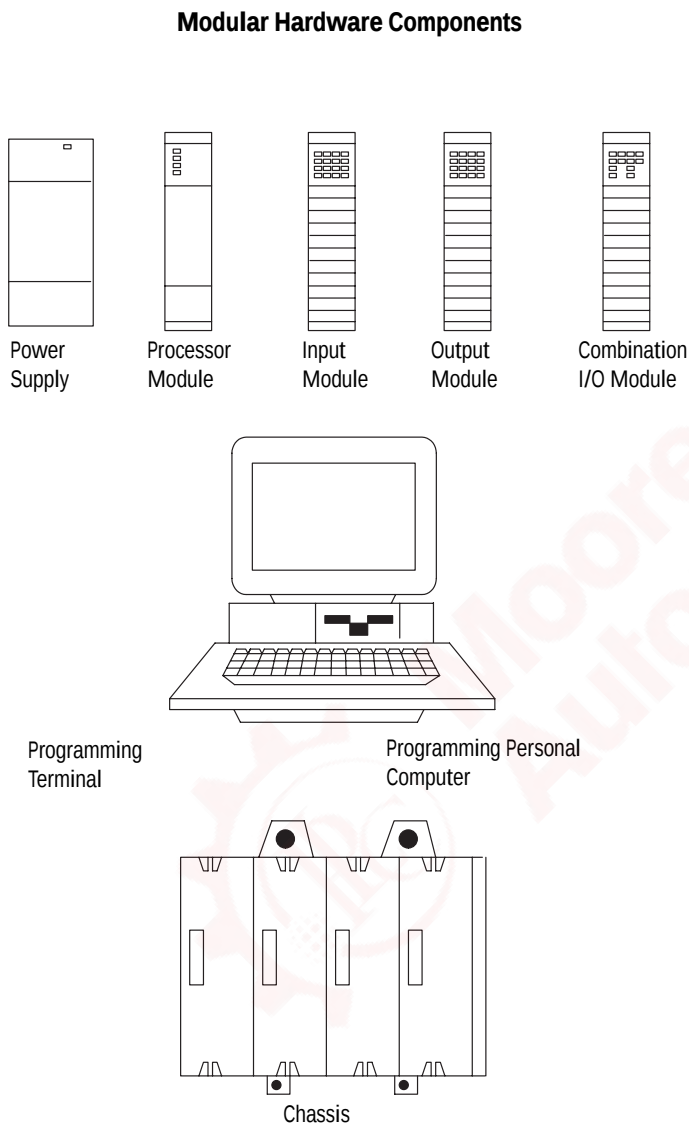
Low Voltage Directive

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.

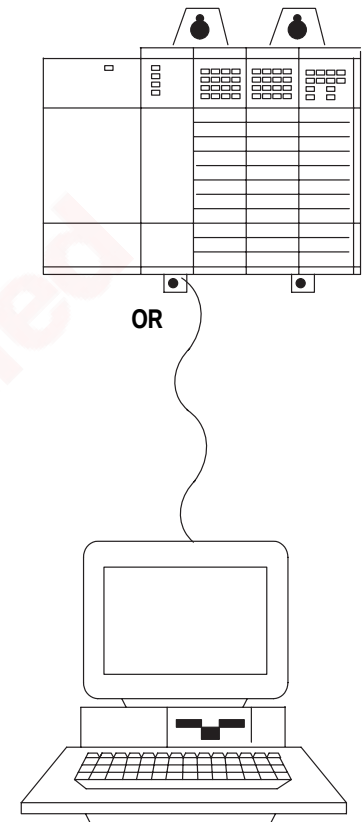
For specific information required by EN61131-2, see the appropriate sections in this publication, as well as the Industrial Automation Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1.

Overview of Your Modular Control System

The basic modular controller consists of a chassis, power supply, processor (CPU), Input/Output (I/O modules), and an operator interface device for programming and monitoring. The figure below shows typical hardware components for a modular controller.



Modular Controller



Selecting Discrete I/O Modules

There are three types of discrete I/O modules: input, output, and combination. They are available in a wide variety of densities including 4, 8, 16, and 32 point and can interface to ac, dc, and TTL voltage levels. Output modules are available with solid-state ac, solid-state dc, and relay contact type outputs.

For a complete listing of discrete I/O modules and specifications, contact your Allen-Bradley sales office for the latest selection guide, publication 1747-SG001.

Selecting Specialty I/O Modules

The SLC 500 family offers specialty I/O modules that enhance your control system. Modules range in function from analog interface to motion control, from communication to high-speed counting.

For a complete listing of specialty I/O modules and their specifications, contact your Allen-Bradley sales office for the latest selection guide, 1747-SG001.

Selecting Power Supplies

To select a power supply, you need:

- power supply specifications.
- power supply worksheet, one for each chassis.
- SLC 500 Systems Selection Guide, publication 1747-SG001.

When configuring a modular system, you must have a power supply for each chassis. Careful system configuration will result in the best performance. Excessive loading of the power supply outputs can cause a power supply shutdown or premature failure.

There are three different ac power supplies and four dc power supplies. For ac power supplies, the 120/240V selection is made by a jumper. Place the jumper to match the input voltage.

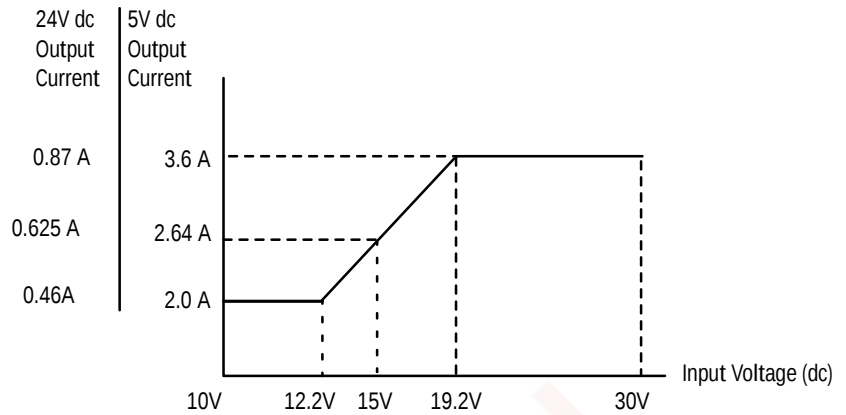
ATTENTION



Ensure that the power supply jumper is in the correct position before supplying power to the SLC 500 system or personal injury or damage to the system may result.

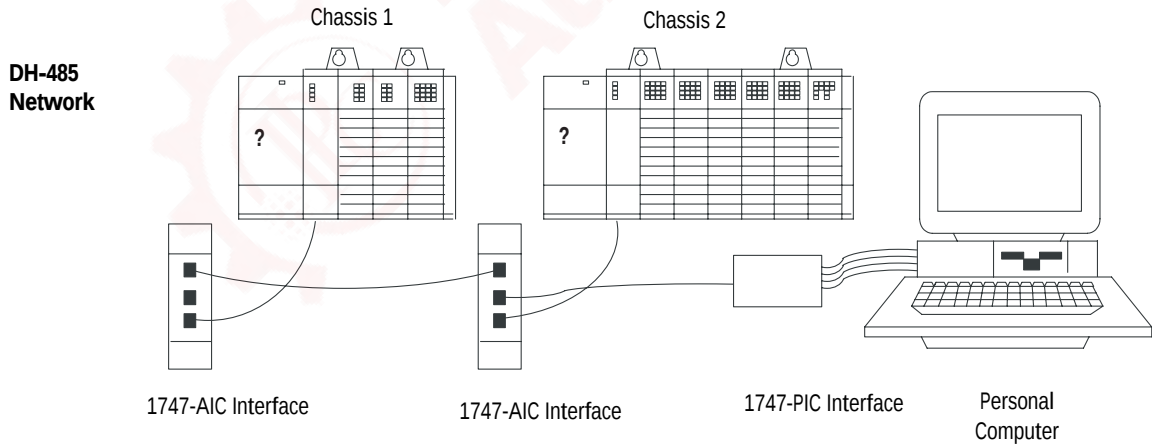
SLC power supplies have an status indicator that illuminates when the power supply is functioning properly.

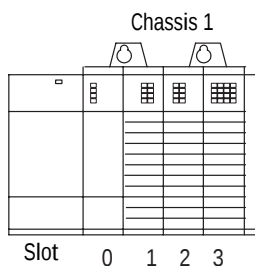
1746-P7 Current Capacity



Example for Selecting Power Supplies

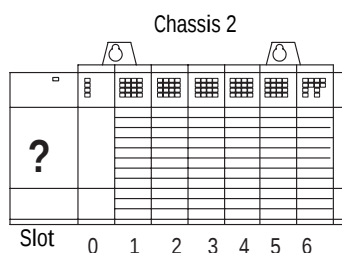
Select a power supply for chassis 1 and chassis 2 in the control system below.





Slot Numbers	Description	Cat. No.	Power Supply at 5V dc (Amps)	Power Supply at 24V dc (Amps)
0	Processor unit	1747-L511	0.090	0.000
1	Input module	1747-IV8	0.050	0.000
2	Transistor output module	1746-OB8	0.135	0.000
3	Triac output module	1746-OA16	0.370	0.000
Peripheral device	Isolated link coupler	1747-AIC	0.000	0.085
Total Current:			0.645	0.085 ⁽¹⁾

⁽¹⁾ The 1746-P1 power supply is sufficient for Chassis #1. The internal current capacity for this power supply is 2 A at 5V dc, 0.46 A at 24V dc.



Slot Numbers	Description	Cat. No.	Power Supply at 5V dc (Amps)	Power Supply at 24V dc (Amps)
0	Processor unit	1747-L514	0.090	0.000
1	Output module	1746-OW16	0.170	0.180
2	Combination module	1746-IO12	0.090	0.070
3, 4, 5, 6	Analog output modules	1746-NO4I	0.220 (4 x 0.055)	0.780 (4 x 0.195)
Peripheral device	Isolated link coupler	1747-AIC	0.000	0.085
Peripheral device	Interface converter	1746-PIC	Not applicable	Not applicable
Total Current:			0.570	1.115 ⁽¹⁾

⁽¹⁾ The 1746-P4 power supply is sufficient for Chassis #2. The internal current capacity for this power supply is 10 A at 5V dc, 2.88 A at 24V dc; not to exceed 70 W.

Example Worksheet for Selecting a 1746 Power Supply

If you have a multiple chassis system, make copies of the Power Supply Worksheet found on page 230.

For a detailed list of device load currents, refer to the SLC 500 Modular Chassis and Power Supplies Technical Data, publication 1746-TD003.

TIP

Consider future system expansion when selecting a power supply.

Procedure									
1. For each slot of the chassis that contains a module, list the slot number, the catalog number of the module, and its 5V and 24V maximum currents. Also include the power consumption of any peripheral devices that may be connected to the processor other than a DTAM or PIC device—the power consumption of these devices is accounted for in the power consumption of the processor.									
Chassis Number		1	Maximum Currents		Chassis Number		2	Maximum Currents	
Slot Number		Cat. No.	at 5V dc	at 24V dc	Slot Number		Cat. No.	at 5V dc	at 24V dc
Slot	0	1747-L511	0.090 A	0.000 A	Slot	0	1747-L514	0.090 A	0.000 A
Slot	1	1746-IV8	0.050 A	-	Slot	1	1746-OW16	0.170 A	0.180 A
Slot	2	1746-OB8	0.135 A	-	Slot	2	1746-NO4I	0.055 A	0.195 A
Slot	3	1746-OA16	0.370 A	-	Slot	3	1746-NO4I	0.055 A	0.195 A
Slot					Slot	4	1746-NO4I	0.055 A	0.195 A
Slot					Slot	5	1746-NO4I	0.055 A	0.195 A
Slot					Slot	6	1746-IO12	0.090 A	0.070 A
Slot					Slot				
Peripheral Device		1747-AIC	-	0.085 A	Peripheral Device		1747-AIC	-	0.085 A
Peripheral Device					Peripheral Device				
2.Add the loading currents of all the system devices at 5 and 24V dc to determine the Total Current.			0.645 A	0.085 A	2.Add the loading currents of all the system devices at 5 and 24V dc to determine the Total Current.			0.570 A	1.115 A
3.For 1746-P4 power supplies, calculate the total power consumption of all system devices. If you are not using a 1746-P4 power supply, go to step 4.									
Current			Multiply by = Watts		Current			Multiply by = Watts	
Total Current at 5V dc		0.645 A	5V	3.225 W	Total Current at 5V dc		0.570 A	5V	2.850 W
Total Current at 24V dc		0.085 A	24V	2.040 W	Total Current at 24V dc		1.115 A	24V	26.76 W
User Current at 24V dc		0.500 A	24V	12.00 W	User Current at 24V dc		0.500 A	24V	12.00 W
Add the Watts values to determine Total Power				17.26 W	Add the Watts values to determine Total Power				41.61 W
(cannot exceed 70 Watts)					(cannot exceed 70 Watts)				
4.Choose the power supply from the list of catalog numbers shown below. Compare the Total Current required for the chassis with the Internal Current capacity of the power supplies. Be sure that the Total Current consumption for the chassis is less than the Internal Current Capacity for the power supply, for both 5V and 24V loads.									
Cat. No.		Internal Current Capacity		Cat. No.		Internal Current Capacity			
		at 5V dc	at 24V dc			at 5V dc	at 24V dc		
1746-P1		2.0 A	0.46 A	1746-P1		2.0 A	0.46 A		
1746-P2		5.0 A	0.96 A	1746-P2		5.0 A	0.96 A		
1746-P3		3.6 A	0.87 A	1746-P3		3.6 A	0.87 A		
1746-P4 (see step 3)		10.0 A	2.88 A	1746-P4 (see step 3)		10.0 A	2.88 A		
1746-P5		5.0 A	0.96 A	1746-P5		5.0 A	0.96 A		
1746-P6		5.0 A	0.96 A	1746-P6		5.0 A	0.96 A		
1746-P7 ⁽¹⁾	12V dc input	2.0 A	0.46 A	1746-P7 ⁽¹⁾	12V dc input	2.0 A	0.46 A		
	24V dc input	3.6 A	0.87 A		24V dc input	3.6 A	0.87 A		
Required Power Supply		1746-P1		Required Power Supply		1746-P4			

⁽¹⁾ See 1746-P7 current capacity graph on page 37.

Selecting Enclosures

The enclosure protects the equipment from atmospheric contamination. Standards established by the National Electrical Manufacturer's Association (NEMA) define enclosure types, based on the degree of protection an enclosure will provide. Use a fan to circulate the air of sealed enclosures that use convection cooling to dissipate heat. Select a NEMA-rated enclosure that suits your application and environment. The enclosure should be equipped with a disconnect device. To calculate the heat dissipation of your controller, see appendix H.

Selecting Operator Interfaces

Use an operator interface to program and/or monitor your SLC 500 controller. You can choose from several Allen-Bradley operator interface devices.

Programming with a Personal Computer

Contact Rockwell Software or your local Allen-Bradley distributor for specifications and availability of software packages available to program the SLC 500 Modular Controllers.

AIC+ Advanced Interface Converter (1761-NET-AIC)

The AIC+ advanced interface converter provides communication links between various networked devices. It has three communication ports: one for DH-485 and two for RS-232. The AIC+ converter is compatible with a variety of SLC and MicroLogix controllers and peripherals.

1747-PIC RS-232/DH485 Interface Converter

For communication with a SLC 5/01, SLC 5/02, or SLC 5/03 processor, you can use an RS-232/DH-485 interface converter (catalog number 1747-PIC) between the computer and SLC controller. The converter includes a 279.4 mm (11 in.) ribbon cable, already attached to the converter, for connection to the computer serial port and a catalog number 1746-C10 cable for connection to the controller.

If you are using an SLC 5/03, SLC 5/04, or SLC 5/05 processor, you do not need the 1747-PIC interface. You can program via the RS-232 channel using DF1 full-duplex protocol or DH485 protocol and RS-232 program cable (catalog number 1747-CP3).

1747-UIC USB to DH485 Interface Converter

For communication with an SLC 5/01 through SLC 5/05 processor, you can connect the 1747-UIC interface between the computer's USB port and the SLC controller. The 1747-UIC interface features an RS-232 port for communication with SLC 5/03 and later processors and an RS-485 port for communication with SLC 5/03 and previous processors.

Monitoring with a Data Table Access Module

The Data Table Access Module (DTAM) is a plant floor device that lets you access data file information, change operating modes, monitor and clear processor faults, and transfer the user program between RAM and an EEPROM memory module with any SLC 5/01, SLC 5/02, or SLC 5/03 (except for the 1747-L533 processor) processor. You cannot use it to create new programs. Important features of DTAM include:

- shorthand addressing, which provides easier access to data files.
- display prompts in six, user-selectable languages: English, French, German, Italian, Spanish, and Japanese.
- UL listed to US and Canadian Safety Standards.
- NEMA type 12 and 13 enclosures.
- point-to-point interface to an SLC family processor, or as a network device on a DH-485 network.

Monitoring with a PanelView or PanelView Plus Operator Terminal

The PanelView or PanelView Plus operator terminals provide operator interface capabilities in space-saving, flat-panel designs. Offering optimum viewing angles, these electronic operator interfaces feature pixel graphics and high-performance functionality in both color and monochrome displays. The PanelView operator terminals let you enter input by using function keys or a touch screen, depending upon the model.

All PanelView and PanelView Plus operator terminals are available with DF1 or DH-485 (RS-232) communication capability, letting them communicate directly with channel 0 on an SLC 5/03, SLC 5/04, or SLC 5/05 processor. The larger versions also offer DH-485 (RJ-45), DH+, Remote I/O, Ethernet, DeviceNet, and ControlNet network connectivity.

Selecting a Memory Module for the SLC 5/01 and SLC 5/02 Processors

You can plug these optional EEPROM (Electrically Erasable Programmable Read Only Memory) memory modules into the SLC 500 controller. With a memory module, you can:

- save the contents of the processor RAM for storage purposes.
- load the contents of the EEPROM memory into the processor RAM.

Adapter sockets (catalog number 1747-M5) are required when inserting EEPROMs or UVPROMs into the programming and erasing equipment.

To program a memory module, see your programming software user manual.

EEPROM Memory Modules

These optional memory modules provide a non-volatile memory back-up in a convenient modular form. The modules plug into a socket on the processor.

You can store (save) your program in the EEPROM by inserting it into the processor and programming software to download the program.

You can use an EEPROM module as a master, or you can use an archived processor file as the source by using the software PROM translator utility.

Adapter sockets are required when inserting memory modules into commercially available PROM programmer. The memory module fits into the adapter socket and then into a PROM programmer.

ATTENTION

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



Memory Module Compatibility

Cat. No.	Description	Use with this processor type		
		SLC 5/01		SLC 5/02
		1747-L511	1747-L514	1747-L524
1747-M1	1 K User Words EEPROM	X	X	X
1747-M2	4 K User Words EEPROM	X	X	X
1747-M5	Adapter Socket	X	X	X

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:

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

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.

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