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Installation Instructions

Digital I/O Modules

Input Module Catalog Numbers: 1746-IA4, 1746-IA8, 1746-IA16, 1746-IB8, 1746-IB16, 1746-IC16, 1746-IG16, 1746-IH16, 1746-IM4, 1746-IM8, 1746-IM16, 1746-IN16, 1746-ITB16, 1746-ITV16, 1746-IV8, 1746-IV16

Output Module Catalog Numbers: 1746-OA8, 1746-OA16, 1746-OAP12, 1746-OB8, 1746-OB6EI, 1746-OB16, 1746-OB16E, 1746-OBP8, 1746-OBP16, 1746-OG16, 1746-OV8, 1746-OV16, 1746-OVP16, 1746-OW4, 1746-OW8, 1746-OW16, 1746-OX8

Combination Input/Output Module Catalog Numbers: 1746-IO4, 1746-IO8, 1746-IO12, 1746-IO12DC

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you to identify a hazard, avoid a hazard, and recognize the consequences.
SHOCK HAZARD 	Labels may be located on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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Overview

In addition to providing the module's electrical specifications, this document tells you how to:

- install the module into a chassis.
- wire the module's terminal block.
- install the Octal Filter Label.

Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or nonhazardous locations only. The following warning statement applies to use in hazardous locations.

WARNING



EXPLOSION HAZARD

Substitution of components may impair suitability for Class I, Division 2.

Do not replace components or disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

Do not connect or disconnect components unless power has been switched off or the area is known to be nonhazardous.

All wiring must comply with N.E.C. article 501-4(b).

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Environnements Dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe I, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

WARNING



DANGER D'EXPLOSION

La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe I, Division 2.

Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.

Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.

Install and Remove the Module

ATTENTION



Never install, remove, or wire modules with power applied to chassis.

IMPORTANT

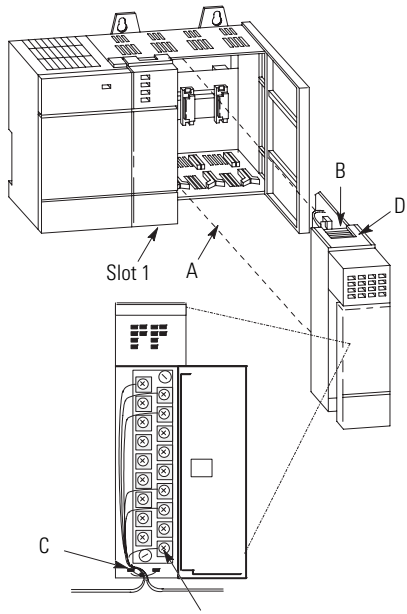
The first slot of the chassis is reserved for the processor or the 1747-ASB module.

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Follow these steps to install the module.

1. Disconnect power.
2. Align the circuit board of module with the chassis card guide. (A)
3. Slide the module into the chassis until the bottom tabs lock into place. (B)
4. Route the wires down and away from the module, securing them with the wire tie. (C)
5. Cover all unused slots with Card Slot Filler, catalog number 1746-N2, to keep the chassis free from debris.
6. To remove the module, press and hold the module release located on each self-locking tab, and slide the module out of the chassis slot. (D)

Module Installation



Octal Label Kit Installation (for PLC processors only)

The octal label kit consists of an octal filter label and a door label. Use these octal labels to replace the decimal labels that are attached to the I/O modules.

TIP

The octal label kit can be obtained from your Allen-Bradley distributor. The octal kit is ordered based on the catalog number of the I/O module.

Please refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for a listing of octal label kit catalog numbers.

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ATTENTION



Do not touch or remove the terminal block when the SLC 500 system is powered. Contact with ac line potential may cause injury to personnel.

Apply the Octal Filter Label

1. Remove the octal filter label from its paper carrier.
2. Align the octal filter label numbers horizontally to the module color bar and over the decimal filter numbers.

   Refer to page 8 for filter label placement.
3. Apply the octal label to the filter.
4. Press firmly to be sure that the label adheres properly.

Apply the Octal Door Label

1. Remove the octal door label from its paper carrier.
2. Align the octal label directly over the decimal door label on the inside of the door.

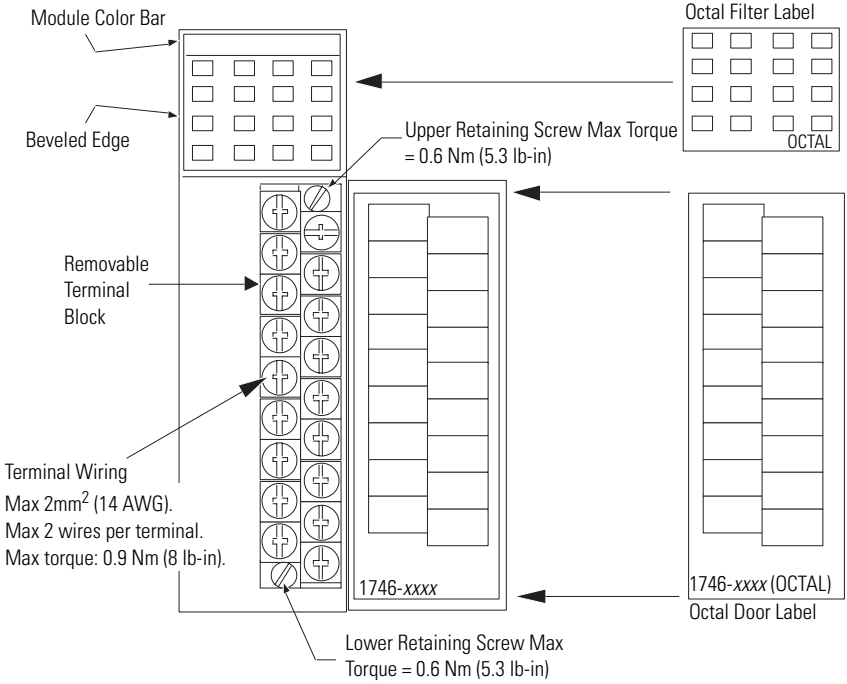
   Refer to page 8 for door label placement.
3. Press firmly to be sure that the label adheres properly.

Removable Terminal Blocks

Colored terminal blocks are removable by loosening the upper and lower retaining screws. Black terminal blocks are not removable.

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Installing Octal Labels



Fuse Protection and Blown Fuse Diagnostics

This section describes fusing characteristics for the following modules:

- 1746-OBP16
- 1746-OVP16
- 1746-OAP12

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Fuse Protection (1746-OBP16 and 1746-OVP16 modules)

The fuse on the 1746-OBP16 and 1746-OVP16 modules (shown on page 10) provides short-circuit protection for 13 mm^2 (16 AWG) or larger wiring to external loads. In the event of a short circuit on an output channel, it is likely that the transistor associated with that channel will be damaged. In this event the module should be replaced or the load moved to a spare output channel.

The fuse does not provide overload protection. In the event of an overload on an output channel, it is likely that the fuse will not blow and the transistor associated with that channel will be damaged. To provide overload protection for your application, user-supplied fuses should be installed externally and properly sized to match your individual load characteristics.

Fuse Protection (1746-OAP12 modules)

A fuse is provided on each common of the 1746-OAP12 module (shown on page 11) for a total of two fuses. The fuses are designed to protect the module from short-circuit conditions. The fuse does not provide overload protection. In the event of an overload on an output channel, it is likely that the fuse will not blow and the output device associated with that channel will be damaged. To provide overload protection for your application, user-supplied fuses should be installed externally. The recommended fuse for overload protection is SAN-O HT. Select the fuse rating according to your load. Do not use HT fuses rated higher than 2.0 Amps.

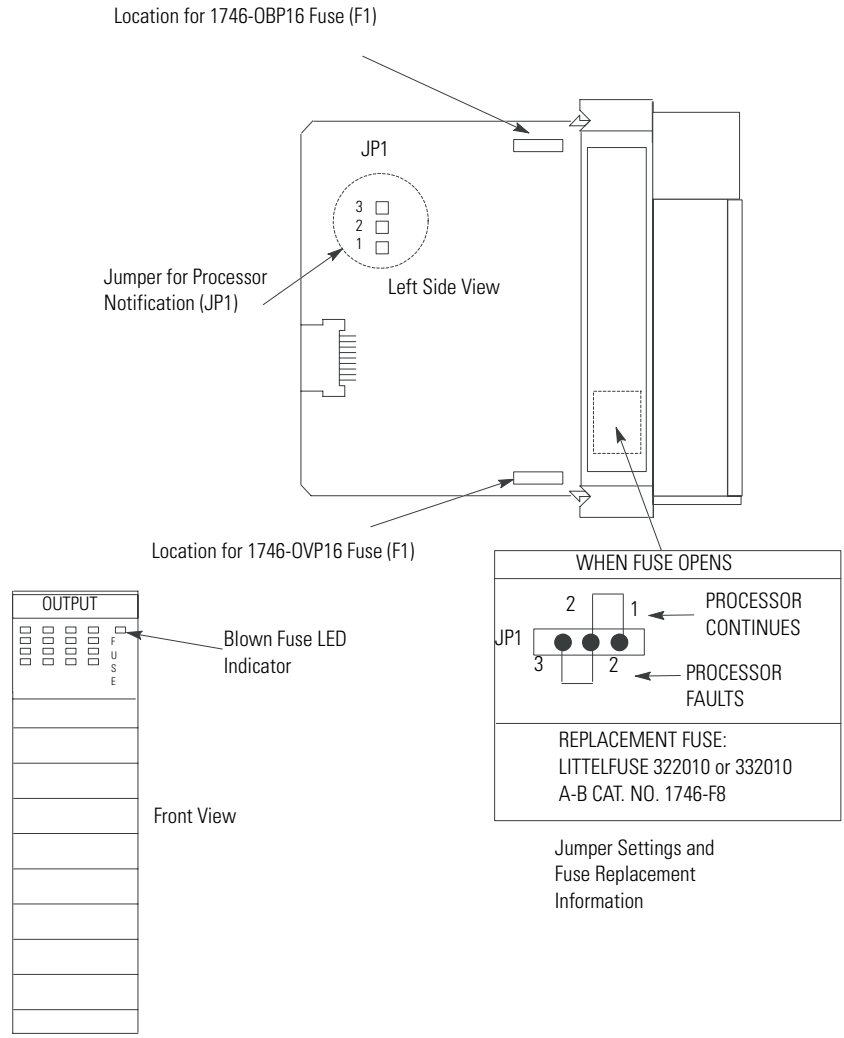
Blown Fuse Diagnostics

If the fuse blows on the 1746-OBP16, 1746-OVP16, or 1746-OAP12 module, the following occurs:

- The blown fuse LED indicator will illuminate, provided power (5V dc via backplane and load power via external supply) is applied to the module.
- A processor error will occur if JP1 connects pins 2 and 3. (See figures on page 10 and page 11.)

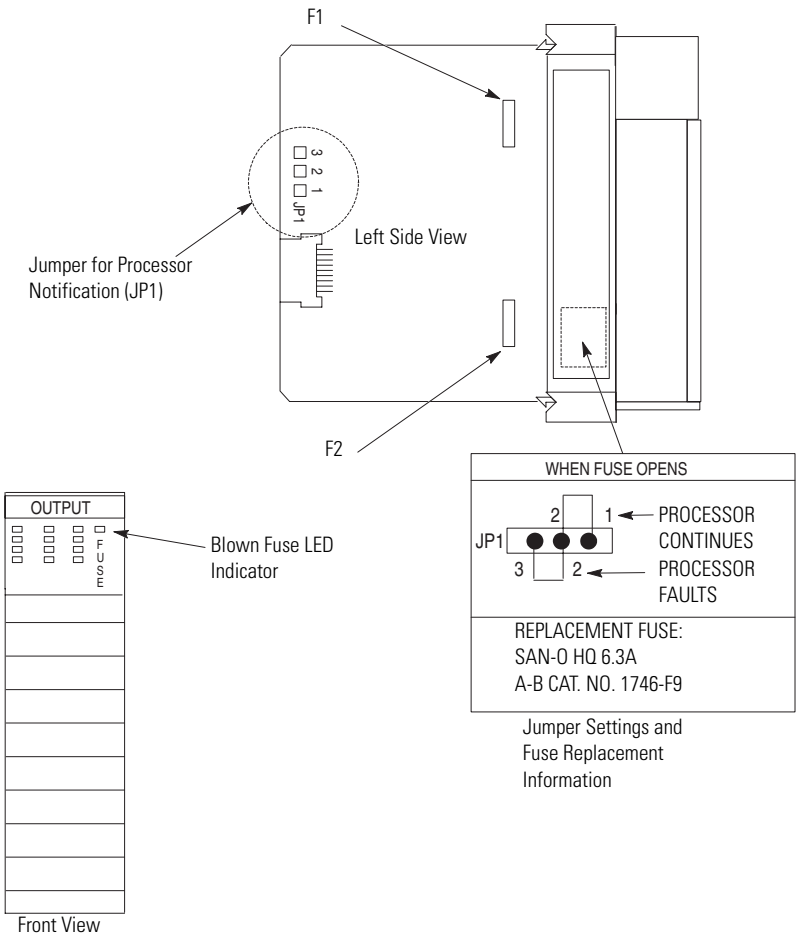
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Location of Jumpers and Fuses for 1746-OBP16 and 1746-OVP16 Modules



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Location of Jumpers and Fuses for 1746-OAP12 Module

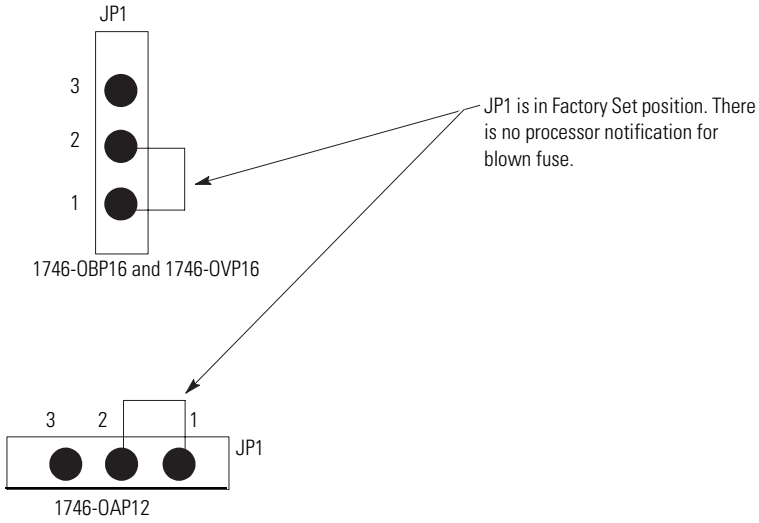


Processor Operation in Case of Blown Fuse - Processor Continues

The factory set position for JP1 is shown on page 12. For this JP1 configuration, the processor operation will continue if the module fuse blows.

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JP1 Factory Set Position (no processor notification)



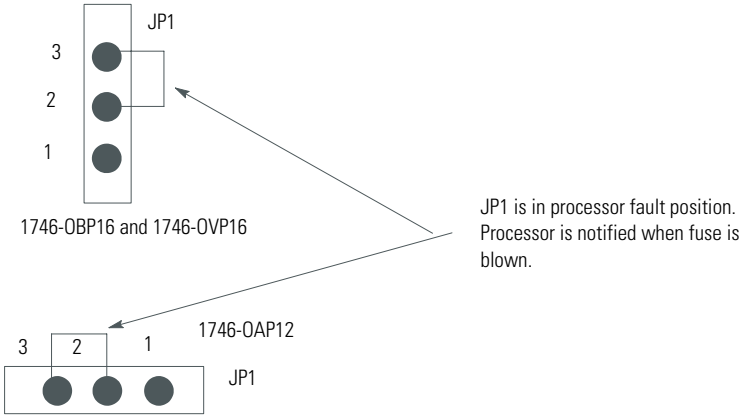
Processor Operation in Case of Blown Fuse - Processor Faults

The Processor Fault position for JP1 is shown on the following page. For this JP1 configuration, the processor generates a nonrecoverable error for all SLC 500 processors. For a nonrecoverable error, note the following:

- Processor operation halts and the processor fault light flashes.
- All outputs are reset to OFF.
- The processor major fault bit S:1/13 is set.
- Monitor processor status file word S:6 for error code *xx*58 for SLC 500 and 5/01 processors, and error code *xx*60 for SLC 5/02 and later processors.

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JP1 in Processor Fault Notification Position



IMPORTANT When using SLC 5/02 processor and later processors, a User-fault routine cannot be used to clear the major fault bit.

ATTENTION



For 1746-OBP16 and 1746-OVP16 modules, all outputs on the module are OFF if the fuse blows. For the 1746-OAP12 module, all outputs on the same common as the blown fuse are OFF. If processor operation is allowed to continue after a blown fuse, extreme care should be taken to be sure the safety of personnel and guard against equipment damage.

For additional information on processor fault codes and User-fault routines refer to the following publications:

- Your programming device's reference manual
- HHT User Manual, publication 1747-NP002:
  - Chapter 28, Troubleshooting Faults
  - Chapter 29, Understanding the Fault Routine

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This table defines operation of all SLC 500 processors in the case of a blown fuse in 1746-OBP16, 1746-OVP16, and 1746-OAP12 modules.

Processor Operation After a Blown Fuse (1746-OBP16, 1746-OVP16, and 1746-OAP12 modules)

JP1 Set to Processor Continues	JP1 Set to Processor Faults
No error. Processor continues with 1746-OBP16 and 1746-OVP16 outputs de-energized. 1746-OAP12 outputs, on the same common as the blown fuse, are de-energized.	Nonrecoverable error. Processor operations stop and all outputs reset to OFF.

Recovery From Blown Fuse/Processor Fault/Processor Shutdown

Processor operation will stop under the following conditions:

- The output module fuse blows due to a short circuit.
- JP1 is set to the Processor Faults position (pins 2 and 3 connected).

If the above conditions occur, the following procedures should be used for recovery.

1. Follow fuse replacement procedures shown on page 15.
2. Clear the processor major fault bit S:1/13.
3. Clear processor status file S:6 major error code (optional).
4. Return the processor to Run mode.

For additional information on processor fault codes and clearing processor fault bits, refer to the following user manuals:

- Your programming device's reference manual
- HHT User Manual, publication 1747-NP002
  - Chapter 28, Troubleshooting Fault
  - Chapter 29, Understanding the Fault Routine

Replacement Fuse Recommendations

Use the following replacement fuses:

- 1746-OBP16 and 1746-OVP16 modules - Littelfuse #322010,10A or #332010,10A. This fuse is required to maintain UL/CSA rating. Replacement Fuse Kit is catalog number 1746-F8 (five fuses per kit).

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- 1746-OAP12 module - Use SAN-O HQ 6.3A for replacement. This fuse is required to maintain UL/CSA rating. Replacement Fuse Kit is catalog number 1746-F9 (five fuses per kit).

Replace Fuses

ATTENTION



Never install, remove, or wire modules with power applied to chassis.

1. Remove SLC 500 system power and correct the conditions causing the short circuit.
2. Remove the output module from the chassis.
3. Remove the fuse.
   - 1746-OBP16 and 1746-OVP16 modules: Use a wide-tipped, slotted-head screwdriver to remove the blown fuse. Slide the screwdriver tip under the fuse and use a twisting motion to pry the fuse from the fuse clip. Use care so that the printed circuit board and surrounding electronics are not damaged.
   - 1746-OAP12 module: A fuse holder is provided with each fuse. Simply grasp the fuse holder with needle-nose pliers, or your fingers, and pull it out.
4. Replace the fuse.
   - 1746-OBP16 and 1746-OVP16 modules: Center the replacement fuse over the fuse clip and press down. If you use a tool to press the fuse in place, apply pressure to the metal end caps only, not the center of the fuse.
   - 1746-OAP12 module: Insert a new fuse into the fuse holder, align the fuse holder on fuse clips, and press down.
5. Replace the output module in the chassis.
6. Restore SLC 500 system power.
7. Clear processor fault bits as indicated in the steps provided on page 14.

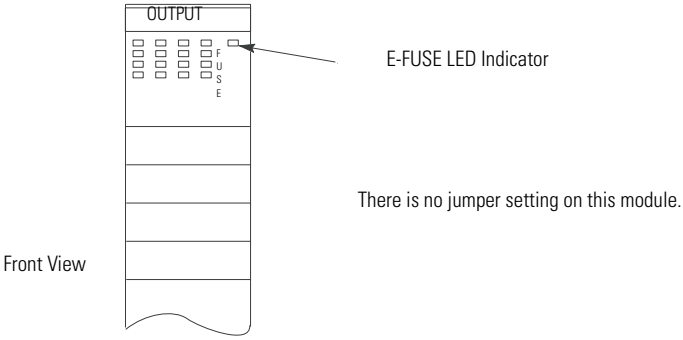
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Electronically Protected Modules (1746-OB6EI and 1746-OB16E)

The electronic protection of the 1746-OB6EI and 1746-OB16E modules have been designed to provide protection for the modules from short circuit and overload current conditions. The protection is based on a thermal cut-out principle. In the event of a short circuit or overload current condition on an output channel, that channel will limit current within milliseconds after its thermal cut-out temperature has been reached. All other channels continue to operate as directed by the CPU (processor) module.

IMPORTANT The modules do not provide protection against reverse polarity wiring or wiring to ac power sources. Electronic protection is not intended to replace fuses, circuit breakers, or other code-required wiring protection devices.

E-FUSE LED Indicator



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Auto Reset Operation

IMPORTANT

The 1746-OB6EI and 1746-OB16E modules perform auto-reset under overload conditions. When an output channel overload occurs, that channel will limit current within milliseconds after its thermal cut-out temperature has been reached. While in current limit, the output channel can cool below the thermal cut-out temperature allowing the module to auto-reset and resume control of the output channel as directed by the processor until the thermal cut-out temperature is again reached.

Removing power from an overloaded output channel would also allow the output channel to cool below the thermal cut-out temperature, allowing auto-reset to occur when power is restored. The output channel would operate as directed by the processor until the thermal cut-out temperature is again reached.

To avoid auto-reset of an output channel under overload conditions, an external mechanical fuse can be used to open the circuit when overloaded.

Short Circuit/Overload Current Diagnostics

If a short circuit or overload current condition occurs on an output channel:

- the E-FUSE LED indicator will illuminate provided that power is applied to the module. Power required: 5V dc via backplane and load power via an external supply.
- all other channels continue to operate as directed by the CPU (processor) module.

Recovery from Channel Shutdown

1. Remove the SLC 500 system power and correct the conditions causing the short circuit or overload current condition.

2. Restore the SLC 500 system power.

   The module automatically resets and resumes control of the output channel and associated load.

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Wiring Diagrams

The wiring diagrams in these installation instructions are examples only. It is not necessary to connect an I/O device to each and every I/O module terminal.

Labeling for SLC/PLC Systems

In this document, 16-point I/O module wiring diagrams include both decimal and octal numbers for I/O addressing and wire identification (see figure below). To wire your 16-point I/O module when used in a SLC system, use the decimal numbers in the upper left portion of each box. When used in a PLC system, use the octal numbers in the lower right portion of the box.

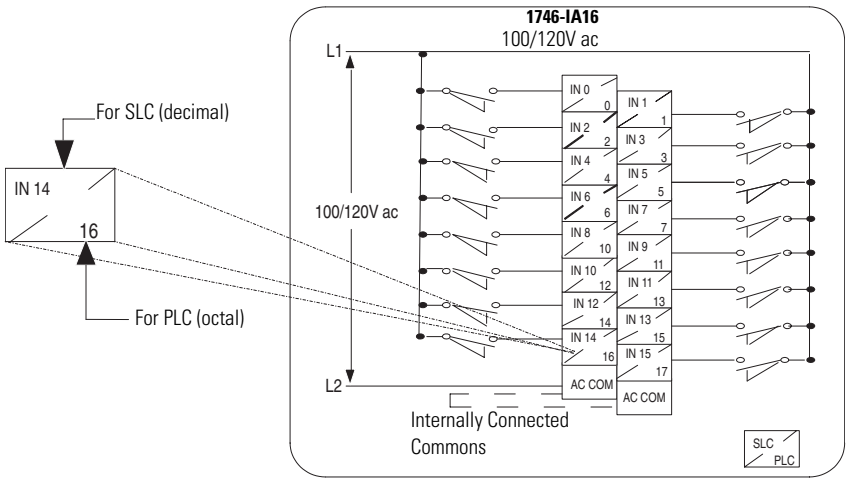
As shipped from the factory, the I/O module has a decimal address label on the inside of its door. A separate octal conversion kit can be ordered, to allow you to convert your module to the octal system.

TIP You can order the octal label kit from your Allen-Bradley Distributor. The octal kit is ordered based on the catalog number of the I/O module.

Please refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for a listing of octal label kit catalog numbers.

IMPORTANT Be sure the octal labels are used with your PLC system. Directions on how to install the labels are included with the kit and on page 6 of this document.

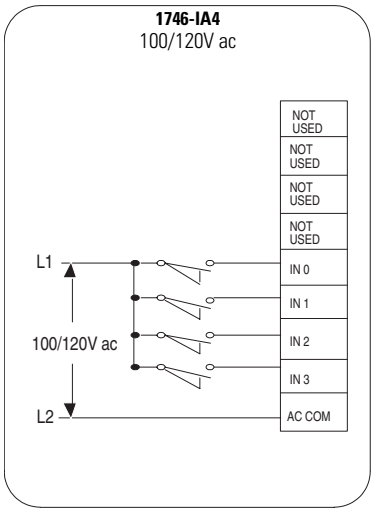
Decimal and Octal Labeling for 16-point I/O Modules

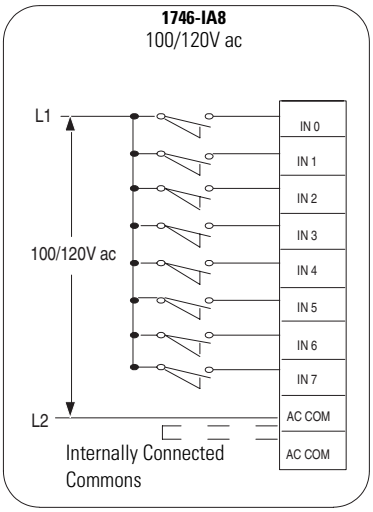


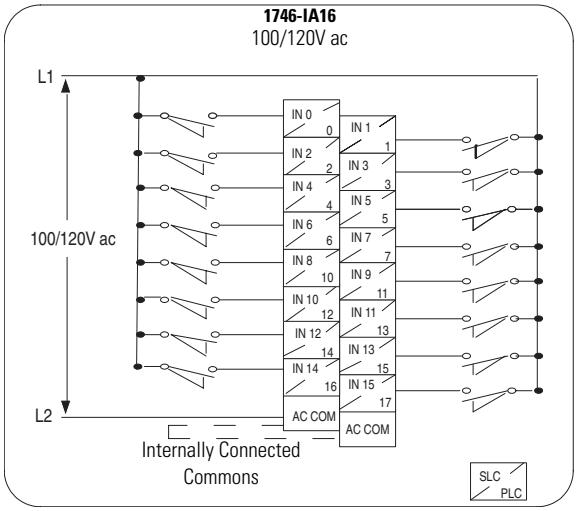
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Input Modules - ac

Wiring Diagrams (1746-IA4, 1746-IA8, 1746-IA16)

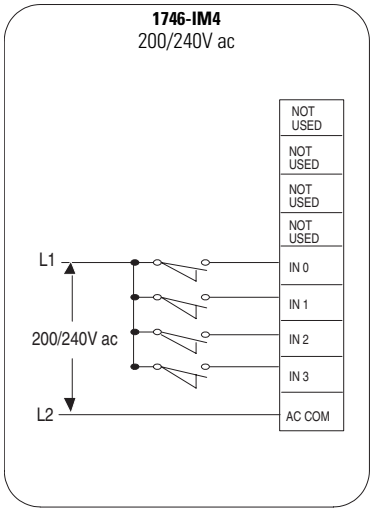


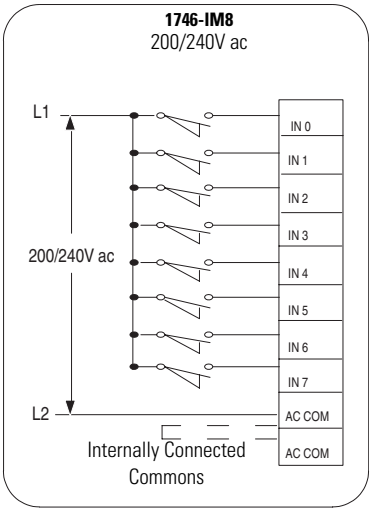


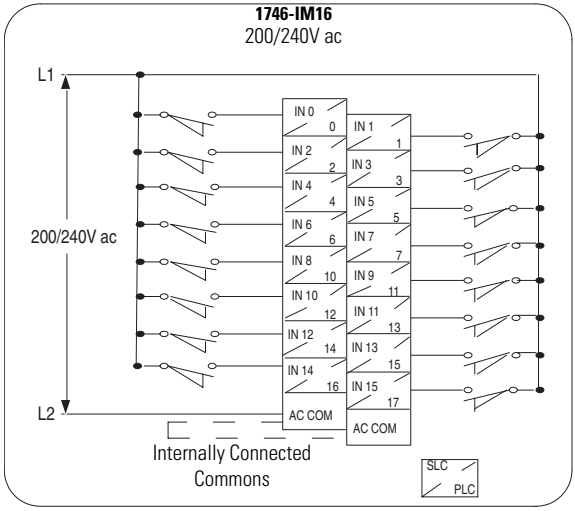


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Wiring Diagrams (1746-IM4, 1746-IM8, 1746-IM16)



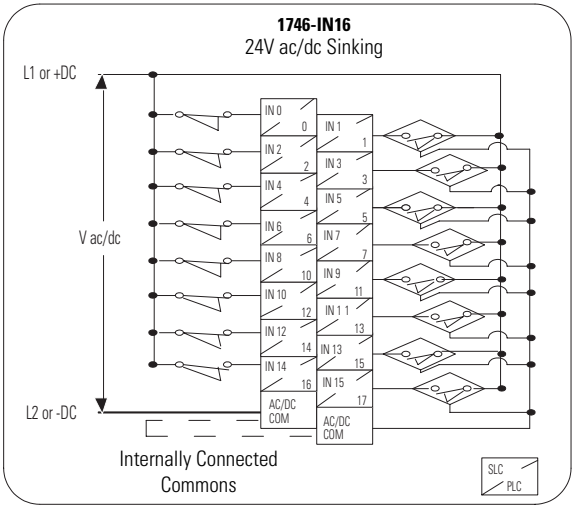




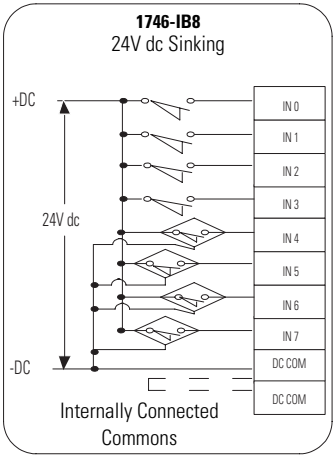
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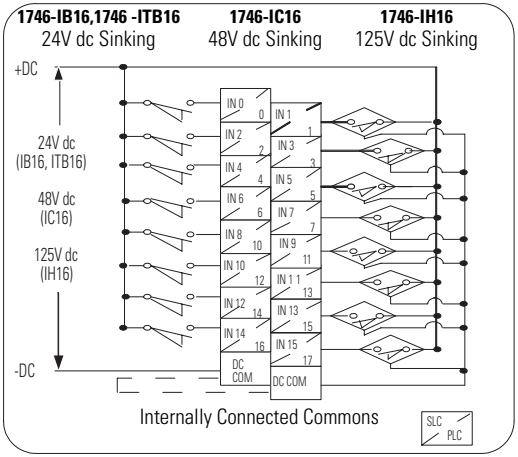
Input Modules - dc

Wiring Diagram (1746-IN16)



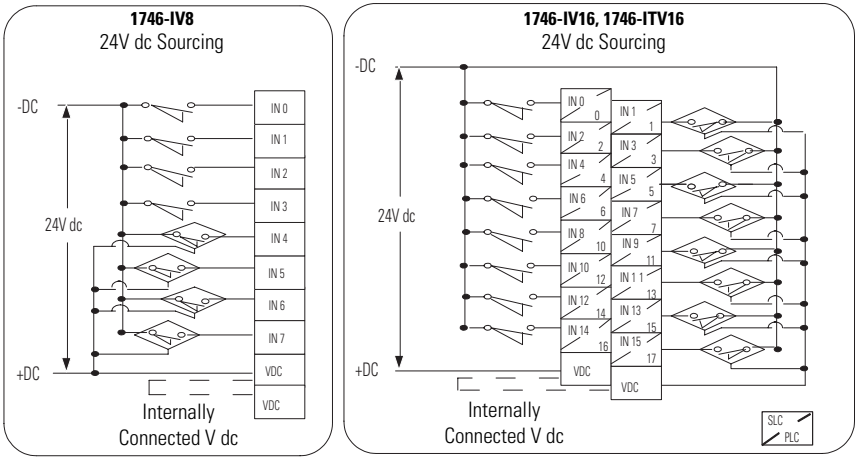
Wiring Diagram (1746-IB8, 1746-IB16, 1746-ITB16, 1746-IC16, 1746-IH16)



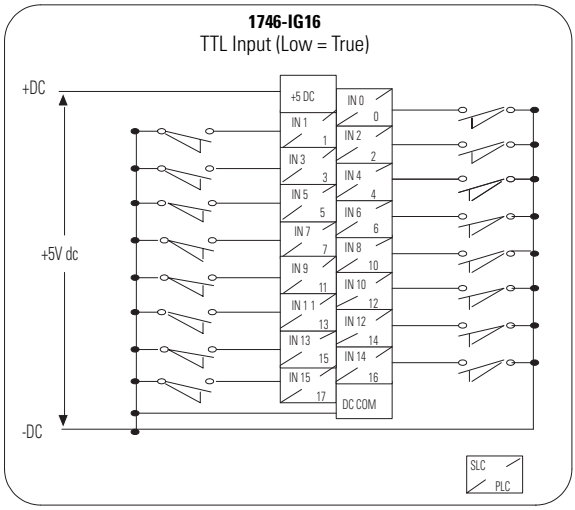


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Wiring Diagram (1746-IV8, 1746-IV16, 1746-ITV16)



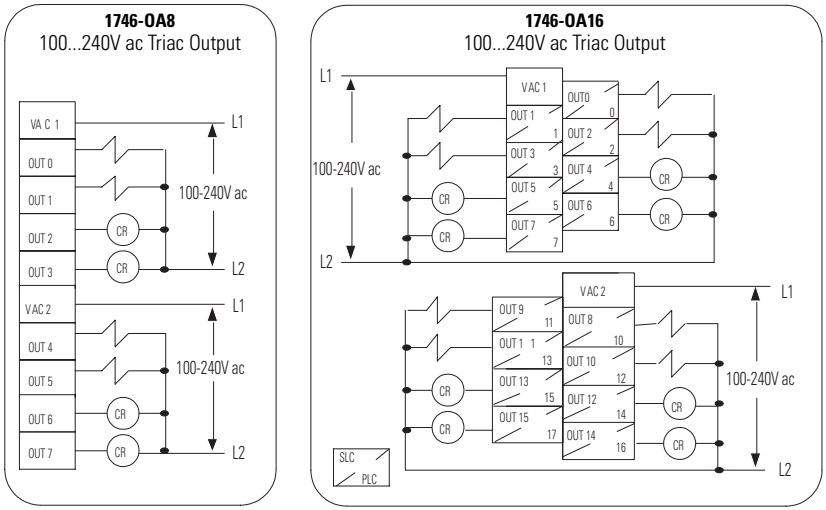
Wiring Diagram (1746-IG16)



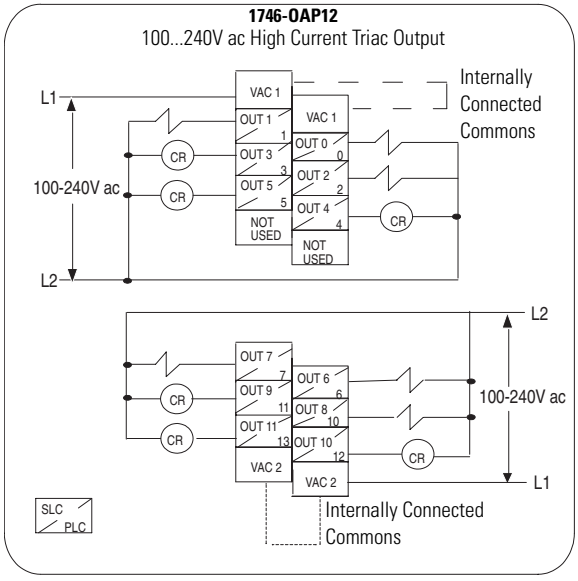
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Output Modules - ac

Wiring Diagrams (1746-OA8, 1746-OA16)



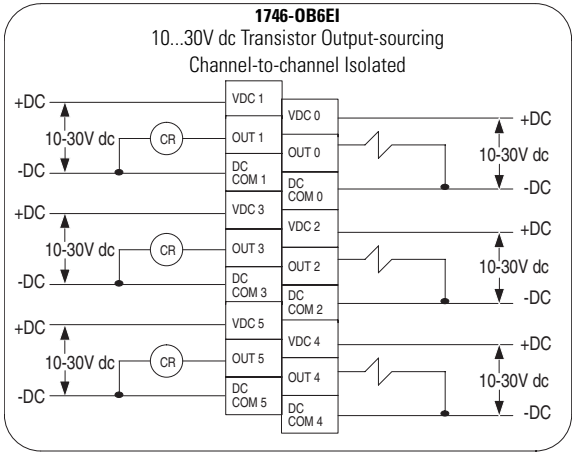
Wiring Diagram (1746-OAP12)



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Output Modules - dc

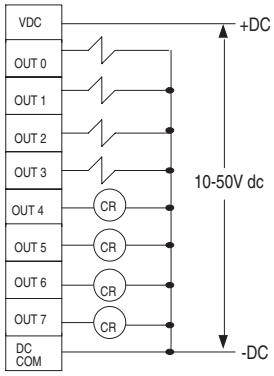
Wiring Diagrams (1746-OB6EI)



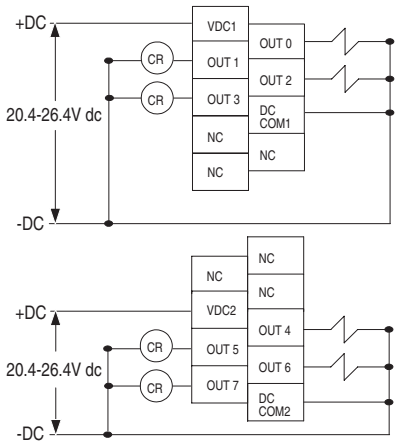
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Wiring Diagrams (1746-OB8, 1746-OBP8, 1746-OB16, 1746-OB16E, 1746-OBP16)

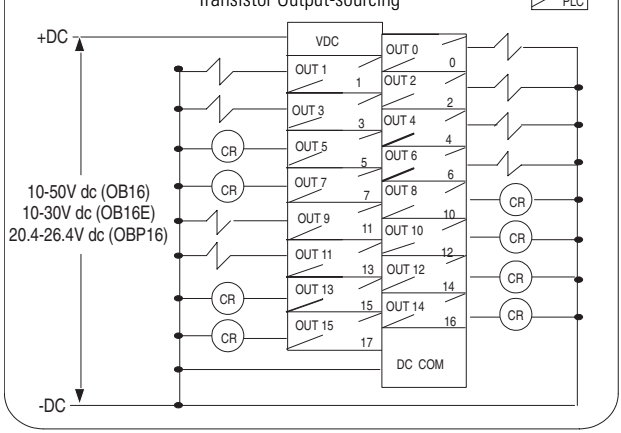
1746-OB8
10...50V dc Transistor Output-sourcing



1746-OBP8
20.4...26.4V dc Transistor Output-sourcing

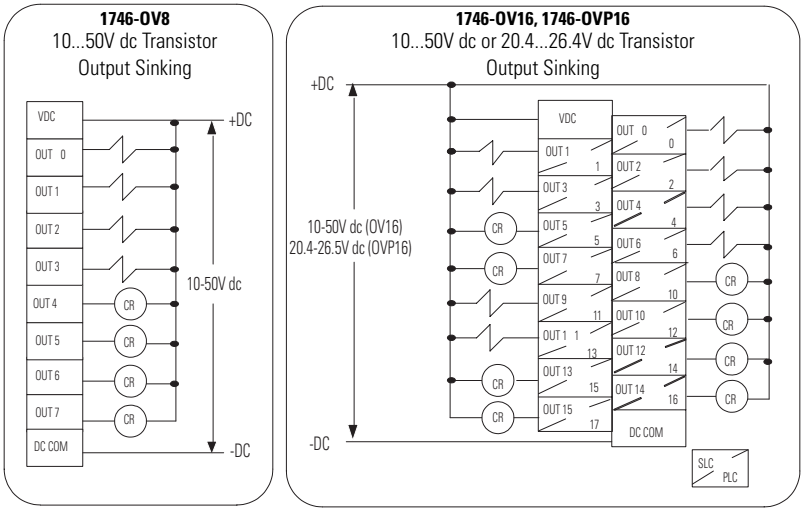


1746-OB16, 1746-OB16E, 1746-OBP16
10...50V dc, 10...30V dc, 20.4...26.4V dc
Transistor Output-sourcing

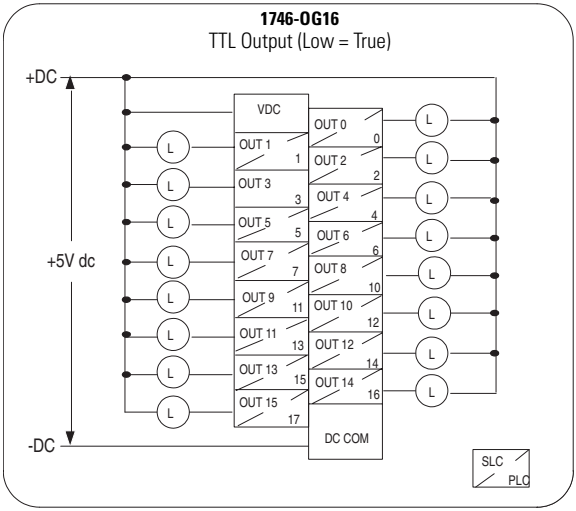


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Wiring Diagrams (1746-OV8, 1746-OV16, 1746-OVP16)



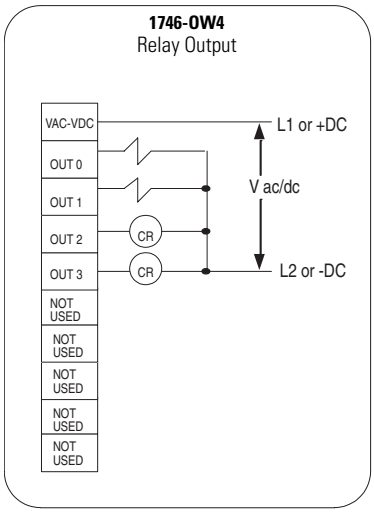
Wiring Diagrams (1746-OG16)

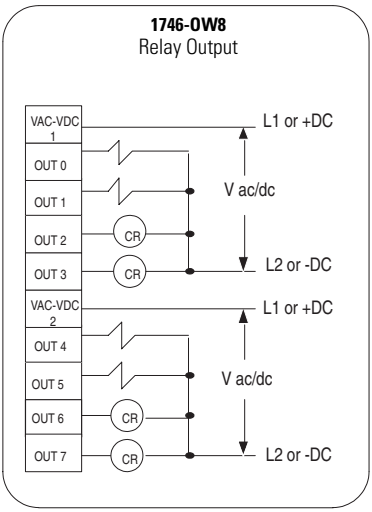


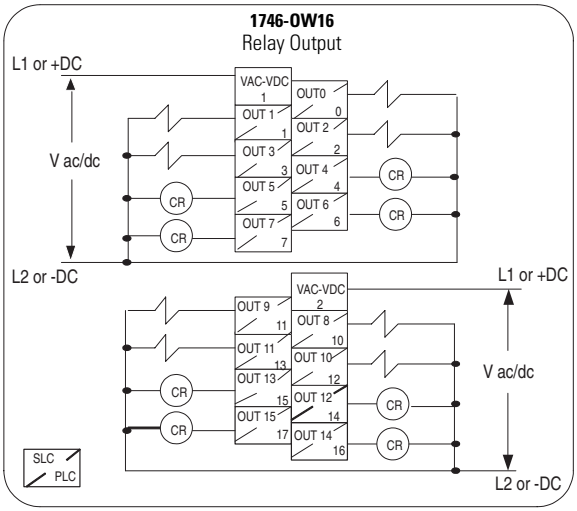
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Relay Contact Output Modules

Wiring Diagrams (1746-OW4, 1746-OW8, 1746-OW16)

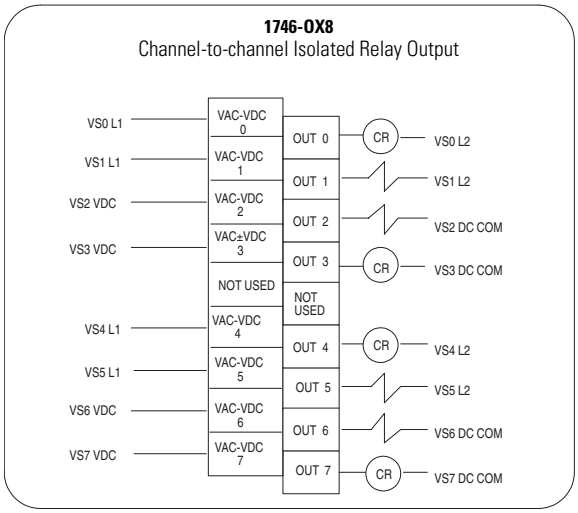






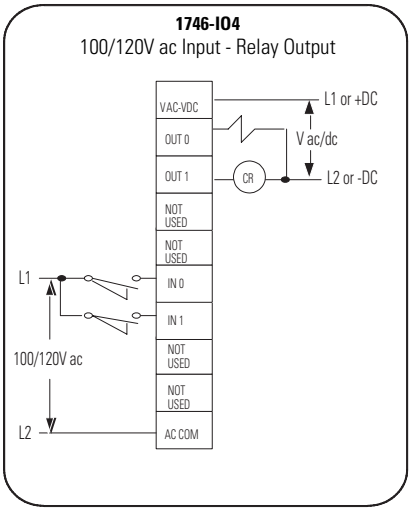
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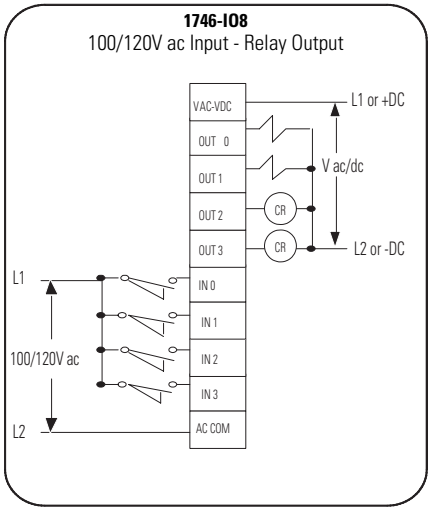
Wiring Diagram (1746-OX8)



Input/Output Combination Modules

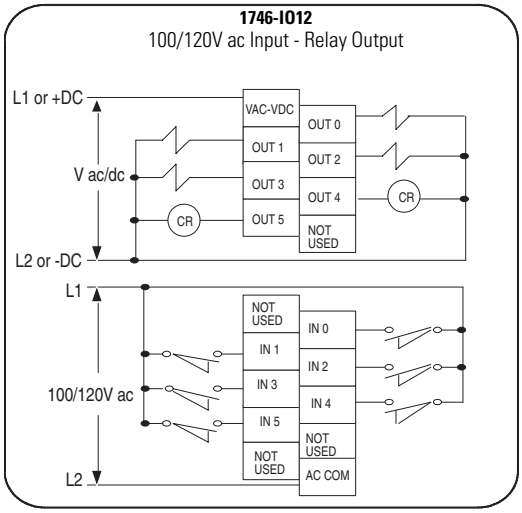
Wiring Diagram (1746-IO4, 1746-IO8)



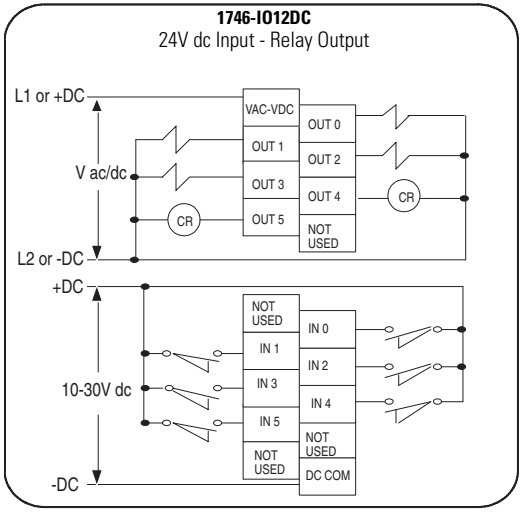


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Wiring Diagram (1746-IO12)



Wiring Diagram (1746-IO12DC)



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Specifications

General I/O

Attribute	Value
Temperature, operating	0...60 °C (32...140 °F)[3]
Temperature, storage	-40...85 °C (-40...185 °F)
Operating humidity	5...95% (noncondensing)
Noise immunity	NEMA standard ICS 2-230
Vibration, operating	Displacement 0.015 in. peak at 5...57 Hz Acceleration 2.5 g at 57...2000 Hz
Shock, operating	30 g (all modules except relay contact) 10 g (relay contact modules: 1746-OW, 1746-OX, and combination I/O modules)
Isolation[1]	1500V
Agency certification	UL listed CSA certified or C-UL approved as indicated by product marking CE compliant for all applicable directives when product or packaging is marked C-Tick marked for all applicable acts
Hazardous environment class[2]	Class I, Division 2 Hazardous Environment UL-A196, CSA, C-UL

(1) Electro-optical isolation between I/O terminals and control logic.

(2) Some modules are classified Class 1, Division 2 by CSA only or C-UL only as shown in the specification table for the respective module.

(3) Temperature is for air surrounding the SLC 500 system. Temperature range exceptions are indicated with certain modules.

Heat Dissipation

The following tables contain values for the heat dissipated by each I/O module. Use them to calculate the total amount of heat dissipated by your SLC 500 control system. For details on how to calculate total heat dissipation, refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011. Please note the following definitions:

- Watts per point - the heat dissipation that can occur in each field wiring point when energized at nominal voltage.
- Minimum Watts - the amount of heat dissipation that can occur when there is no field power present.

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- Total Watts - the Watts per point multiplied by the number of points, plus the minimum Watts (with all points energized).

Input Module Heat Dissipation

Catalog Numbers	Watts per Point	Min Watts	Total Watts
1747-IA4	0.27	0.175	1.30
1746-IA8	0.27	0.250	2.40
1746-IA16	0.27	0.425	4.80
1746-IB8	0.20	0.250	1.90
1746-IB16	0.20	0.425	3.60
1746-IC16	0.22	0.425	3.95
1746-IG16	0.02	0.700	1.00
1746-IH16	0.32	0.217	5.17
1746-IM4	0.35	0.175	1.60
1746-IM8	0.35	0.250	3.10
1746-IM16	0.35	0.425	6.00
1746-IN16	0.35	0.425	6.00
1746-ITB16	0.20	0.425	3.60
1746-ITV16	0.20	0.425	3.60
1746-IV8	0.20	0.250	1.90
1746-IV16	0.20	0.425	3.60

Output Module Heat Dissipation

Catalog Numbers	Watts per Point	Min Watts	Total Watts
1746-OA8	1.000	0.925	9.00
1746-OA16	0.462	1.850	9.30
1746-OAP12	1.000	1.850	10.85
1746-OB6EI	0.440	0.230	2.90
1746-OB8	0.775	0.675	6.90
1746-OB16	0.388	1.400	7.60
1746-OB16E	0.150	0.675	3.07
1746-OBP8	0.300	0.675	3.08
1746-OBP16	0.310	1.250	6.26
1746-OG16	0.033	0.900	1.50
1746-OV8	0.775	0.675	6.90
1746-OV16	0.388	1.400	7.60
1746-OVP16	0.310	1.250	6.26
1746-OW4	0.133	1.310	1.90
1746-OW8	0.138	2.590	3.70
1746-OW16	0.033	5.170	5.70
1746-OX8	0.825	2.590	8.60

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Combination Input/Output Module Heat Dissipation

Catalog Numbers	Watts per Point	Minimum Watts	Total Watts
1746-IO4	0.27 per input point 0.133 per output point	0.75	1.60
1746-IO8	0.27 per input point 0.133 per output point	1.38	3.00
1746-IO12	0.27 per input point 0.133 per output point	2.13	4.60
1746-IO12DC	0.20 per input point 0.133 per output point	1.84	3.90

Input Modules - ac

Specifications for Input Modules 1746-IA4, 1746-IA8, and 1746-IA16

Attribute		Value		
		1746-IA4	1746-IA8	1746-IA16[1]
Voltage category		100/120V ac signal input		
Number of inputs		4	8	16
Points per common		4	8	16
Voltage, operating		85...132V ac at 47...63 Hz		
Backplane current consumption	5V dc	0.035 A	0.050 A	0.085 A
	24V dc	0.0 A		
Signal delay, max		On = 35 ms Off = 45 ms		
Off-state voltage, max		30V ac		
Off-state current, max		2 mA		
Input current at 120V ac, nom		12 mA		
Inrush current, max[2]		0.8 A		
Inrush current time duration, max		0.5 ms		

(1) Removable terminal block.

(2) An ac input device must be compatible with SLC 500 input circuit inrush current. A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the ac input-circuit will be affected.

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Specifications for Input Modules 1746-IM4, 1746-IM8, and 1746-IM16

Attribute		Value		
		1746-IM4	1746-IM8	1746-IM16[1]
Voltage category		200/240V ac signal input		
Number of inputs		4	8	16
Points per common		4	8	16
Voltage, operating		170...265V ac at 47...63 Hz		
Backplane current consumption	5V dc	0.035 A	0.050 A	0.085 A
	24V dc	0.0 A		
Signal delay (max.)		On = 35 ms Off = 45 ms		
Off-state voltage, max		50V ac		
Off-state current, max		2 mA		
Input current at 240V ac, nom		12 mA		
Inrush current, max[2]		1.6 A		
Inrush current time duration, max		0.5 ms		

(1) Removable terminal block.

(2) An ac input device must be compatible with SLC 500 input circuit inrush current. A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the ac input circuit will be affected.

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Input Modules - dc

Specifications for Input Modules 1746-IB8, 1746-IB16, 1746-ITB16, and 1746-IC16

Attribute		Value			
		1746-IB8	1746-IB16[1]	1746-ITB16[1]	1746-IC16[1][2]
Voltage category		24V dc signal input (sinking)			48V dc signal input (sinking)
Number of inputs		8	16	16	16
Points per common		8	16	16	16
Voltage, operating		10...30V dc (sinking)			30...60V dc at 55 °C (131 °F) sinking 30...55V dc at 60 °C (140 °F) sinking
Backplane current consumption	5V dc	0.050 A			
	24V dc	0.0 A			
Signal delay, max		On = 8 ms Off = 8 ms	On = 8 ms Off = 8 ms	On = 0.3 ms Off = 0.5 ms[3]	On = 4 ms Off = 4 ms
Off-state voltage, max		5.0V dc			10.0V dc
Off-state current, max		1 mA	1 mA	1.5 mA	1.5 mA
Input current, nom		8 mA at 24V dc			4.1 mA at 48V dc

(1) Removable terminal block.

(2) Use ID Code 0509 when configuring your system with programming software or the HHT.

(3) Typical signal delay for these modules: ON = 0.1 ms, OFF = 0.25 ms at 24V dc.

Specifications for Input Modules 1746-IV8, 1746-IV16, and 1746-ITV16

Attribute		Value		
		1746-IV8	1746-IV16[1]	1746-ITV16[1]
Voltage category		24V dc signal input (sourcing)		
Number of inputs		8	16	16
Points per common		8	16	16
Voltage, operating		10...30V dc (sourcing)		
Backplane current consumption	5V dc	0.050 A	0.085 A	0.085 A
	24V dc	0.0 A		
Signal delay, max		On = 8 ms Off = 8 ms	On = 8 ms Off = 8 ms	On = 0.3 ms Off = 0.5 ms[2]
Off-state voltage, max		5.0V dc		
Off-state current, max		1 mA	1 mA	1.5 mA
Input current at 24V dc, nom		8 mA		

(1) Removable terminal block.

(2) Typical signal delay for these modules: ON = 0.1 ms, OFF = 0.25 ms at 24V dc.

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Specifications for Input Module 1746-IG16

Attribute		Value[1]
Voltage category		5V dc TTL signal input (sourcing)
Number of inputs		16
Points per common		16
Voltage, operating +5 V to DC COM		4.5...5.5V dc (sourcing) 50 mV peak to peak ripple (max)
Backplane current consumption	5V dc	0.140 A
	24V dc	0.0 A
Signal delay, max		On = 0.25 ms Off = 0.50 ms
Off-state voltage		2...5.5 V dc [2]
Off-state current, max		4.1 mA
Input current at 5V dc, nom		3.7 mA

(1) Removable terminal block.

(2) TTL inputs are inverted (-0.2...0.8V dc = low voltage = True = ON). Use a NOT instruction in your ladder program to convert to traditional True = High logic.

ATTENTION



To avoid potential damage to TTL modules, handle them by the ends of the module, not metallic surfaces. Electrostatic discharges can damage the module. take care to prevent exposure of terminals or components to electrostatic charges.

Careful wire routing within the enclosure helps cut down electrical noise between I/O lines. Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for recommended wiring procedures for TTL modules.

Limit cable length to 15 m (50 ft) per point for inputs in standard environments.

Refer to Allen-Bradley Programmable Controller Wiring and Grounding Guidelines, publication 1770-IN041, for complete information.

Specifications for Input Module 1746-IN16

Attribute		Value[1]
Voltage category		24V ac/dc Signal Input
Number of inputs		16
Points per common		16
Voltage, operating	dc	10...30V dc (sinking)
	ac	10...30V ac
Backplane current consumption	5V dc	0.085 A
	24V dc	0.0 A

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Specifications for Input Module 1746-IN16

Signal delay, max	dc	On = 15 ms Off = 15 ms
	ac	On = 25 ms Off = 25 ms
Off-state voltage, max	dc	3.0V dc
	ac	3.0V ac
Off-state current, max	dc	1 mA
	ac	1 mA
Input current, nom	dc	8 mA at 24V dc
	ac	8 mA at 24V ac
Inrush current, max		0.02 A (ac only)

(1) Removable terminal block.

Specifications for Input Module 1746-IH16

Attribute		Value(1)(2)(3)	
Voltage category		125V dc signal input (sinking)	
Number of inputs		16	
Points per common		16	
Voltage, operating		Range: 90...146V dc	Points ON Simultaneously, max: 6 at 146V dc and 30 °C (86 °F) 12 at 146V dc and 50 °C (122 °F) 14 at 132V dc and 55 °C (131 °F) 16 at 125V dc and 60 °C (140 °F)
Backplane current consumption	5V dc	0.085 A	
	24V dc	0.0 A	
Signal delay, max		On = 9 ms Off = 9 ms	
Off-state voltage, max		20.0V dc	
Off-state current, max		0.8 mA	
Input current, nom		2.15 mA at 125V dc	
		2.25 mA at 132V dc	

(1) Removable terminal block.

(2) Use ID Code 0507 when configuring your system with programming software or the HHT.

(3) If the input module is connected in parallel with an inductive load, use surge suppression across the load to protect the input module from damage caused by reverse voltage. Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on surge suppression.

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Output Modules - ac

Specifications for Output Modules 1746-OA8, 1746-OA16, and 1746-OAP12

Attribute		Value		
		1746-OA8	1746-OA16[1]	1746-OAP12[1][2][3]
Voltage category		120/240V ac signal input		
Number of outputs		8	16	12
Points per common		4	8	6
Voltage, operating		85...265V ac at 47...63 Hz		
Backplane current consumption	5V dc	0.185 A	0.370 A	0.370 A
	24V dc	0.0 A		
Signal delay, max resistive load.[4]		On = 1 ms Off = 11.0 ms		
Off-state leakage, max[5]		2 mA		
Load current, min		10 mA		
Continuous current per point[6]		1.0 A at 30 °C (86 °F) 0.50 A at 60 °C (140 °F)	0.50 A at 30 °C (86 °F) 0.25 A at 60 °C (140 °F)	2.0 A at 30 °C (86 °F) 1.25 A at 55 °C (131 °F) 1.0 A at 60 °C (140 °F)
Continuous current per module, max		8.0 A at 30 °C (86 °F) 4.0 A at 60 °C (140 °F)	8.0 A at 30 °C (86 °F) 4.0 A at 60 °C (140 °F)	9.0 A at 30 °C (86 °F) 6.8 A at 55 °C (131 °F) 6.0 A at 60 °C (140 °F)
On-state voltage drop, max		1.50V at 1.0 A	1.50V at 0.50 A	1.2V at 2.0 A
Surge current per point[7], max		10.0 A for 25 ms	10.0 A for 25 ms	17.0 A for 25 ms[8]

(1) Removable terminal block.

(2) A fused common and blown fuse LED indicator are provided on this module. See Fuse Protection and Blown Fuse Diagnostics.

(3) Use ID Code 2803 when configuring your system with programming software or the HHT.

(4) Triac outputs turn on at any point in the ac line cycle, and turn off at ac line zero cross.

(5) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. For 120V ac operation, use a 15 KΩ, 2 W resistor. For 240V ac operation, use a 15 KΩ, 5 W resistor.

(6) Recommended surge suppression: For triac outputs when switching 120V ac inductive loads, use Harris Metal-Oxide Varistor, model number V220MA2A. Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on surge suppression.

(7) Repeatability is once every 1 s at 30 °C (86 °F). Repeatability is once every 2 s at 60 °C (140 °F).

(8) Surge current = 35 A per common for 10 ms.

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Output Modules - dc

Specifications for Output Modules 1746-OB8, 1746-OB16, and 1746-OB16E

Attribute		Value		
		1746-OB8	1746-OB16[1]	1746-OB16E[1][2]
Number of outputs		8	16	16
Points per common		8	16	16
Voltage category		24V dc Signal Output		
Voltage, operating (V dc)		10...50 (source)		10...30 (source)
Backplane current consumption	5V dc	0.135 A	0.280 A	0.135 A
	24V dc	0.0 A		
Signal delay, max. resistive load.		On = 0.1 ms Off = 1.0 ms	On = 0.1 ms Off = 1.0 ms	On = 1.0 ms[3] Off = 1.0 ms
Off-state leakage, max[4]		1 mA		
Load current, min		1 mA		
Continuous current per point[5]		1.0 A at 30 °C (86 °F) 0.50 A at 60 °C (140 °F)	0.50 A at 30 °C (86 °F) 0.25 A at 60 °C (140 °F)	1.0 A at 30 °C (86 °F)[6] 0.50 A at 60 °C (140 °F)
Continuous current per module		8.0 A at 30 °C (86 °F) 4.0 A at 60 °C (140 °F)	8.0 A at 30 °C (86 °F) 4.0 A at 60 °C (140 °F)	8.0 A at 0...60 °C (32...140 °F)
On-state voltage drop, max		1.2V at 1.0 A	1.2V at 0.50 A	1.0V at 0.50 A
Surge current per point[7]		3.0 A for 10 ms	3.0 A for 10 ms	2.0 A for 10 ms[8]

(1) Removable terminal block.

(2) Use the following ID Code when configuring your system with programming software or the HHT: 1746-OB16E = 2920.

(3) Fast turn-off modules (1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16) provide fast OFF delay for inductive loads. Comparative OFF delay times for 1746-OB8/1746-OV8 and fast turn-off modules, when switching Bulletin 100-B110 (24W sealed) contactor, are: 1746-OB8/1746-OV8 OFF delay = 152 ms; fast turn-off modules OFF delay = 47 ms.

(4) To limit the effects of leakage current through solid state outputs, a loading resistor can be connected in parallel with your load. For transistor outputs, 24V dc operation, use a 5 KΩ, 1/2 W resistor.

(5) Recommended surge suppression: For transistor outputs when switching 24V dc inductive loads, use a 1N4004 diode reverse-wired across the load. Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on surge suppression.

(6) Fast off delay for inductive loads is accomplished with surge suppressors on the 1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16 modules. A suppressor at the load is not needed unless another contact is connected in series. If this is the case, a 1N4004 diode should be reverse wired across the load. This defeats the fast turn-off feature.

(7) Repeatability is once every 1 s at 30 °C (86 °F). Repeatability is once every 2 s at 60 °C (140 °F).

(8) Surge current = 32 A per module for 10 ms.

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ATTENTION



A transient pulse occurs in transistor outputs when the external dc supply voltage is applied to the output common terminals (for example, via the master control relay). This can occur regardless of the processor having power or not. For most applications, the energy of this pulse is not sufficient to energize the load.

Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on transient pulses and guidelines to reduce inadvertent processor operation.

Specifications for Output Modules 1746-OB6EI, 1746-OBP8, and 1746-OBP16

Attribute		Value		
		1746-OB6EI(1)(2)	1746-OBP8(1)(2)(3)	1746-OBP16(1)(2)(4)(5)
Number of outputs		6	8	16
Points per common		Individually Isolated	4	16
Voltage category		24V dc Signal Output		
Voltage, operating (V dc)		10...30 (source)	20.4...26.4 (source)	
Backplane current consumption	5V dc	0.046 A	0.135 A	0.250 A
	24V dc	0.0 A		
Signal delay, max Resistive load		On = 1.0 ms(6) Off = 2.0 ms	On = 1.0 ms(6) Off = 2.0 ms	On = 0.1 ms(6) Off = 1.0 ms
Off-state leakage, Max(7)		1 mA		
Load current, Min		1 mA		
Continuous current per point(8)(9)		2.0 A at 0 to 60 °C (140 °F)	2.0 A at 0 to 60 °C (140 °F)	1.5 A at 30 °C (86 °F) 1.0 A at 60 °C (140 °F)
Continuous current per module		12.0 A at 0 to 60 °C (140 °F)	8.0 A at 0 to 60 °C (140 °F)	6.4 A at 0...60 °C (32...140 °F)
On-state voltage drop, max		1.0V at 2.0 A	1.0V at 2.0 A	1.0V at 1.0 A
Surge current per point(10)		4.0 A for 10 ms	4.0 A for 10 ms	4.0 A for 10 ms
Surge current per module(10)		24.0 A for 10 ms	32.0 A for 10 ms	32.0 A for 10 ms
Electronic protection		yes	no	no

(1) Removable terminal block.

(2) Use the following ID Code when configuring your system with programming software or the HHT: 1746-OB6EI = 2619, 1746-OBP8 = 2721 and 1746-OBP12 = 2921.

(3) An external fuse can be used to protect this module from short circuits. Recommended fuse is SANO MQ4-3.15A, 5x20 mm.

(4) A fused common and blown fuse LED indicator are provided on this module. See Fuse Protection and Blown Fuse Diagnostics.

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(5) Certified for Class 1, Division 2 hazardous location by CSA.

(6) Fast turn-off modules (1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16) provide fast OFF delay for inductive loads. Comparative OFF delay times for 1746-OB8/1746-OV8 and fast turn-off modules; when switching Bulletin 100-B110 (24W sealed) contactor, are: 1746-OB8/1746-OV8 OFF delay = 152 ms; fast turn-off modules OFF delay = 47 ms.

(7) To limit the effects of leakage current through solid state outputs, a loading resistor can be connected in parallel with your load. For transistor outputs, 24V dc operation, use a 5.6 KΩ, 1/2 W resistor.

(8) Recommended surge suppression: For transistor outputs when switching 24V dc inductive loads, use a 1N4004 diode reverse-wired across the load (also see footnote 9). Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on surge suppression.

(9) Fast off delay for inductive loads is accomplished with surge suppressors on the 1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16 modules. A suppressor at the load is not needed unless another contact is connected in series. If this is the case, a 1N4004 diode should be reverse wired across the load. This defeats the fast turn-off feature.

(10) Repeatability is once every 1 s at 30 °C (86 °F). Repeatability is once every 2 s at 60 °C (140 °F).

ATTENTION



A transient pulse occurs in transistor outputs when the external dc supply voltage is applied to the output common terminals (for example, via the master control relay). This can occur regardless of the processor having power or not. For most applications, the energy of this pulse is not sufficient to energize the load.

Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on transient pulses and guidelines to reduce inadvertent processor operation.

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Specifications for Output Modules 1746-OV8, 1746-OV16, and 1746-OVP16

Attribute		Value		
		1746-OV8	1746-OV16[1]	1746-OVP16[1][2][3][4]
Number of outputs		8	16	16
Points per common		8	16	16
Voltage category		24V dc Signal Output		
Voltage, operating (V dc)		10...50 (sink)		20.4...26.4 (sink)
Backplane current consumption	5V dc	0.135 A	0.270 A	0.250 A
	24V dc	0.0 A		
Signal delay, max. resistive load.		On = 0.1 ms Off = 1.0 ms		On = 0.1 ms[5] Off = 1.0 ms
Off-state leakage, max[6]		1 mA		
Load current, min		1 mA		
Continuous current per point[7]		1.0 A at 30 °C (86 °F) 0.50 A at 60 °C (140 °F)	0.50 A at 30 °C (86 °F) 0.25 A at 60 °C (140 °F)	1.5 A at 30 °C (86 °F)[8] 1.0 A at 60 °C (140 °F)
Continuous current per module		8.0 A at 30 °C (86 °F) 4.0 A at 60 °C (140 °F)		6.4 A at 0...60 °C (32...140 °F)
On-state voltage drop, max		1.2V at 1.0 A	1.2V at 0.5 A	1.0V at 1.0 A
Surge current per point[9]		3.0 A for 10 ms		4.0 A for 10 ms[10]

(1) Removable terminal block.

(2) A fused common and blown fuse LED indicator are provided on this module. See Fuse Protection and Blown Fuse Diagnostics.

(3) Use the following ID Code when configuring your system with programming software or the HHT: 1746-OVP16 = 2922.

(4) Certified for Class 1, Division 2 hazardous location by CSA.

(5) Fast turn-off modules (1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16) provide fast OFF delay for inductive loads. Comparative OFF delay times for 1746-OB8/1746-OV8 and fast turn-off modules; when switching Bulletin 100-B110 (24Ws sealed) contactor, are: 1746-OB8/1746-OV8 OFF delay = 152 ms; fast turn-off modules OFF delay = 47 ms.

(6) To limit the effects of leakage current through solid state outputs, a loading resistor can be connected in parallel with your load. For transistor outputs, 24V dc operation, use a 5.6 KΩ, 1/2 W resistor.

(7) Recommended surge suppression: For transistor outputs when switching 24V dc inductive loads, use a 1N4004 diode reverse-wired across the load (also see footnote 9). Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747UM011, for more information on surge suppression.

(8) Fast off delay for inductive loads is accomplished with surge suppressors on the 1746-OB6EI, 1746-OBP8 series B and later, 1746-OB16E series B and later, 1746-OBP16, and 1746-OVP16 modules. A suppressor at the load is not needed unless another contact is connected in series. If this is the case, a 1N4004 diode should be reverse wired across the load. This defeats the fast turn-off feature.

(9) Repeatability is once every 1 s at 30 °C (86 °F). Repeatability is once every 2 s at 60 °C (140 °F).

(10) Surge current = 32 A per module for 10 ms.

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ATTENTION



A transient pulse occurs in transistor outputs when the external dc supply voltage is applied to the output common terminals (for example, via the master control relay). This can occur regardless of the processor having power or not. For most applications, the energy of this pulse is not sufficient to energize the load.

Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on transient pulses and guidelines to reduce inadvertent processor operation.

Specifications for Output Module 1746-OG16

Attribute		Value[1]
Number of outputs		16
Points per common		16
Voltage category		5V dc TTL Signal Input (sinking)
Voltage, operating (VDC to DC COM)		4.5...5.5V dc[2] 50 mV peak to peak ripple (max.)
Backplane current consumption	5V dc	0.180 A
	24V dc	0.0 A
Signal delay, max resistive load		On = 0.25 mA Off = 0.50 mA
Off-state voltage		4.5...5.5V dc[2]
Off-state leakage, max		0.1 mA
Load current, min		0.15 mA
Continuous current per point		24 mA

(1) Removable terminal block.

(2) TTL outputs are inverted (0...0.4V dc = low voltage = True = ON). Use a NOT instruction in your ladder program to convert to traditional True = High logic.

ATTENTION



To avoid potential damage to TTL modules, handle them by the ends of the module, not metallic surfaces. Electrostatic discharges can damage the module. Take care to prevent exposure of terminals or components to electrostatic charges.

Careful wire routing within the enclosure helps cut down electrical noise between I/O lines. Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for recommended wiring procedures for TTL modules.

Limit cable length to 3 m (10 ft) per point for outputs in standard environments.

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Refer to Allen-Bradley Programmable Controller Wiring and Grounding Guidelines, publication 1770-IN041, for complete information.

Relay Contact Output Modules

Specifications for Output Modules 1746-OW4, 1746-OW8, 1746-OW16, and 1746-OX8

Attribute		Value			
		1746-OW4[1]	1746-OW8[1]	1746-OW16[1][2]	1746-OX8[1][2]
Number of outputs		4	8	16	8
Points per common		4	4	8	Individually Isolated
Voltage category		ac/dc Relay			
Operating voltage	5V dc	5...125			
	24V ac	5...265			
Backplane current consumption	5V dc	0.045 A	0.085 A	0.170 A	0.085 A
	24V dc	0.045 A	0.090 A	0.180 A	0.090 A
Signal delay, max Resistive load		On = 10.0 ms Off = 10.0 ms			
Off-state leakage, max		0 mA			
Load current, min		10 mA at 5V dc			
Continuous current per point[3]		See relay contact ratings. (Table and Table on page 44)			
Continuous current per module		8.0 A ac 8.0 A /Common	16.0 A ac 8.0 A /Common	16.0 A ac 8.0 A /Common	[4]

[1] Certified for Class 1, Division 2 hazardous location by CSA.

[2] Removable terminal block.

[3] Recommended surge suppression: For relay contact outputs, refer to the SLC 500 Modular Hardware User Manual, publication 1747-UM011. Connecting surge suppressors across your external inductive load will extend the life of SLC 500 relay contacts.

[4] The continuous current per module must be limited so the module power does not exceed 1440VA.

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Relay Contact Ratings

Relay Contact Rating Table for Output Modules 1746-OW4, 1746-OW8, and 1746-OW16

Voltages		Amperes[2]		Amperes[2] Continuous	Volt-Amperes	
		Make	Break		Make	Break
Volts (ac), max	120	15	1.5	2.5	1800	180
	240	7.5	0.75			
Volts (dc), max	125	0.22[3]		1.0	28	
	24	1.2[3]		2.0	28	

Relay Contact Rating Table for Output Module 1746-OX8

Voltages		Amperes[1]		Amperes Continuous[2]	Volt-Amperes	
		Make	Break		Make	Break
Volts (ac), max	120	30	3.0	5.0	3600	360
	240	15	1.5			
Volts (dc), max	125	0.22[3]		1.0	28	
	24	1.2[3]		2.0	28	

(1) Recommended surge suppression: For relay contact outputs, refer to the SLC 500 Modular Hardware User Manual, publication 1747-UM011. Connecting surge suppressors across your external inductive load will extend the life of SLC 500 relay contacts.

(2) The continuous current per module must be limited so the module power does not exceed 1440 VA.

(3) For dc voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28VA by the applied dc voltage. For example, 28VA/48V dc = 0.58 A. For dc voltage applications less than 14V, the make/break ratings for relay contacts cannot exceed 2 A.

Input/Output Combination Modules

Specifications for Combination Modules 1746-IO4, 1746-IO8, 1746-IO12, and 1746-IO12DC

Attribute	Value			
	1746-IO4[1][2]	1746-IO8[1][2]	1746-IO12[1][3][4]	1746-IO12DC[3][5][6][7]
Points per module	2 inputs 2 outputs	4 inputs 4 outputs	6 inputs 6 outputs	6 inputs 6 outputs
Points per common	2	4	6	6
Voltage category (inputs)	120V ac			24V dc
Voltage, operating (inputs)	85...132V ac			10...30V dc
Voltage category (outputs)	100/120V ac Relay contact output			

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Specifications for Combination Modules 1746-IO4, 1746-IO8, 1746-IO12, and 1746-IO12DC

Voltage, operating (outputs)		5...265V ac 5...125V dc			
Backplane current consumption	5V dc	0.030 A	0.060 A	0.090 A	0.080 A
	24V dc	0.025 A	0.045 A	0.070 A	0.060 A

(1) Certified for Class 1, Division 2 hazardous location by CSA.

(2) See specifications for catalog numbers 1746-IA4 and 1746-OW4. Continuous Current per 1746-IO4 Module is 4.0 A. Continuous Current per 1746-IO8 Module is 8.0 A.

(3) Removable terminal block.

(4) See specifications for catalog numbers 1746-IA16 and 1746-OW16. Continuous Current per 1746-IO12 Module is 8.0 A.

(5) See specification for catalog numbers 1746-IB16 and 1746-OW16. Continuous Current per 1746-IO12DC Module is 8.0 A.

(6) Certified for Class 1, Division 2 hazardous location by C-UL.

(7) Use the following ID Code when configuring your system with programming software or the HHT: 1746-IO12DC = 1512.

TIP Combination I/O modules (Catalog Numbers 1746-IO4, 1746-IO8, 1746-IO12 and 1746-IO12DC):

For the first several seconds of any power-up or when power is applied to a rack that is not under processor control, the output LED indicators of the combination IO modules in the rack will be illuminated.

Racks are not under processor control if one of the following conditions exist:

- Modular Hardware Style (only): Processor is absent from the rack or the rack interconnect cable is not properly connected.
- Modular Hardware Style and Fixed Hardware Style: The processor does not have the firmware PROM installed or the processor is not functioning properly.

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Notes:

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For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3434 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

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