Installation Instructions

Allen-Bradley

SLC 500 Digital I/O Modules

Input 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 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 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://www.rockwellautomation.com/literature/) 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.

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

Overview

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

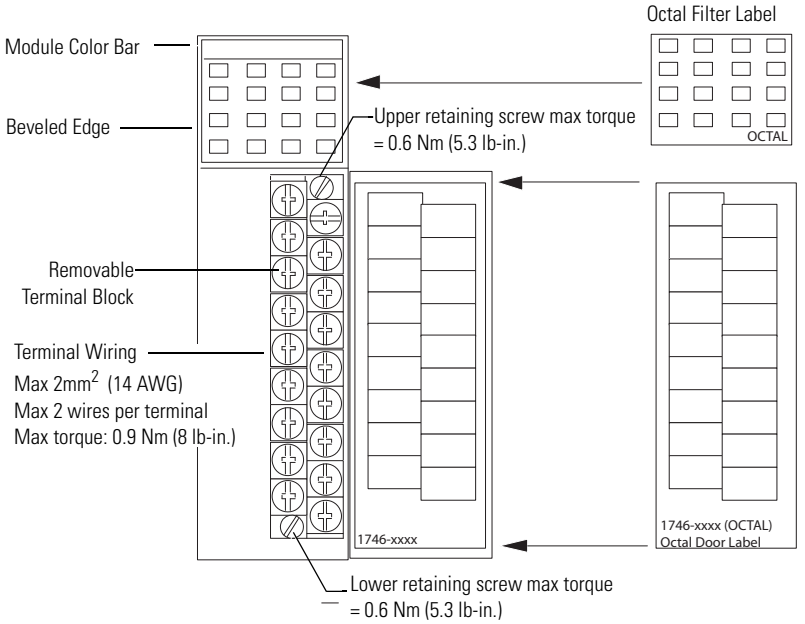
- install the module into a chassis.
- wire the module's terminal block.
- install the Octal Filter Label.

North American Hazardous Location Approval

The following modules are North American Hazardous Location approved: 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, 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, 1746-IO4, 1746-IO8, 1746-IO12, 1746-IO12DC.

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous 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.	Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.
EXPLOSION HAZARD • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of any component may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous.	**RISQUE D'EXPLOSION** • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de tout composant peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Installing Octal Labels



Fuse Protection and Blown Fuse Diagnostics

This section describes fusing characteristics for the following modules:

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

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

The fuse on the 1746-OBP16 and 1746-OVP16 modules (shown on Location of Jumpers and Fuses for 1746-OBP16 and 1746-OVP16 Modules on page 9) 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 Location of Jumpers and Fuses for 1746-OAP12 Module on page 10) 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.

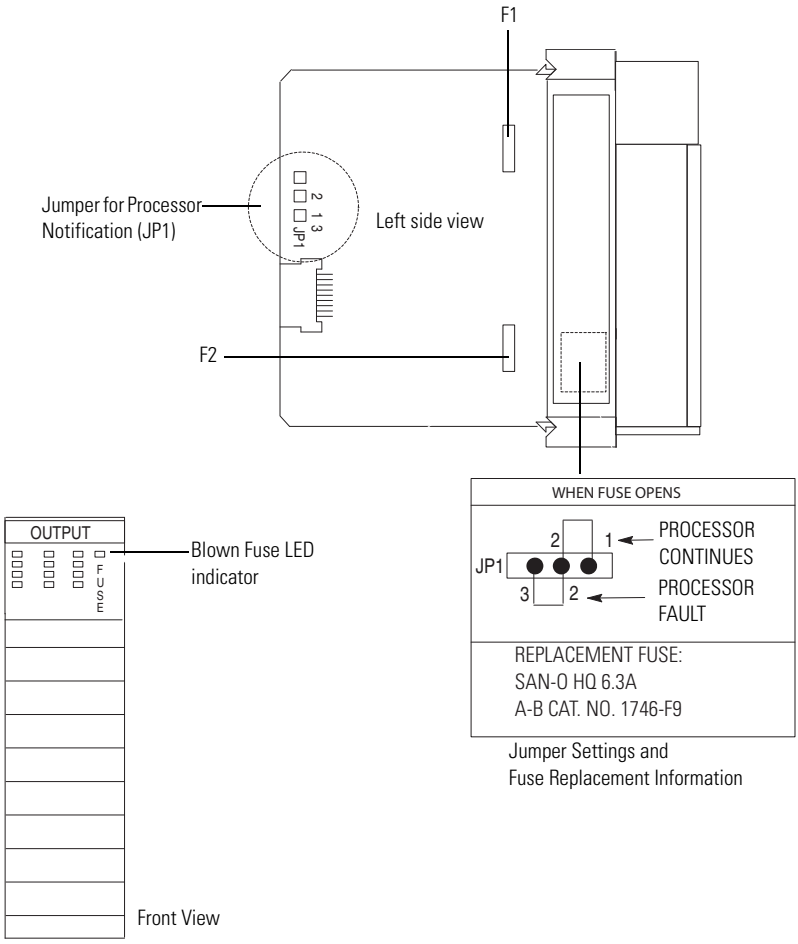
The recommended fuse for overload protection is SAN-O HT. Select the fuse rating according to your load. Do not use HT fuses rated higher than 2.0 Amps.

Blown Fuse Diagnostics

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

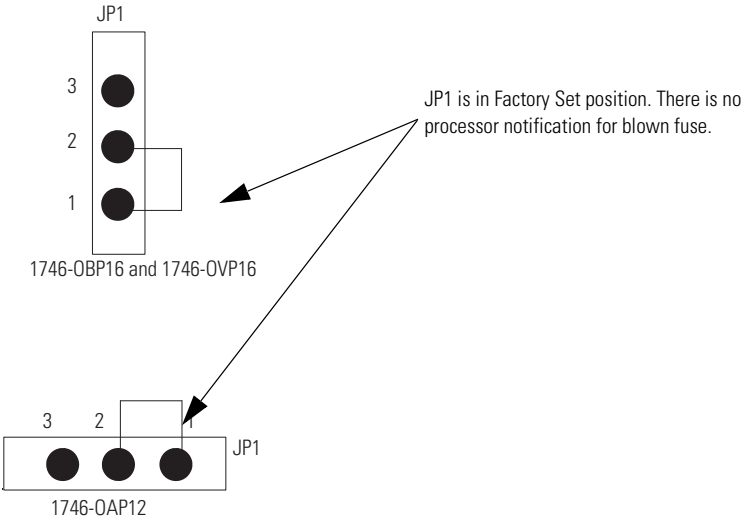
- The blown fuse LED indicator will illuminate, provided power (5V DC via backplane and load power via external supply) is applied to the module.
- A processor error will occur if JP1 connects pins 2 and 3. (See figures on page 9 and page 10.)

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 in the following diagram. For this JP1 configuration the processor operation will continue if the module fuse blows.

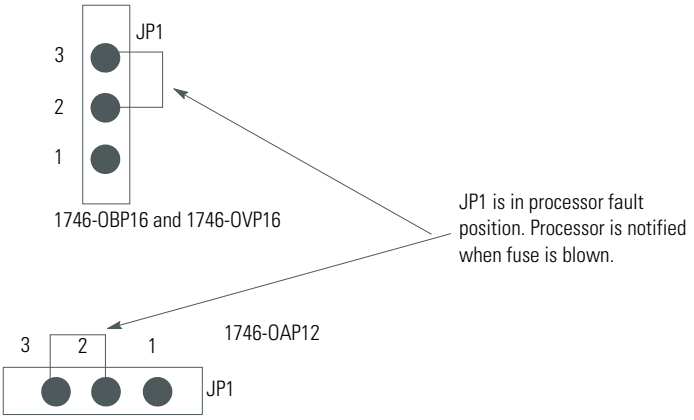


Processor Operation in Case of Blown Fuse – Processor Faults

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 xx58 for SLC 500, and SLC 5/01 processors, and error code xx60 for SLC 5/02 and later processors.

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

The following 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 described on page 14.
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).
- 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 13.

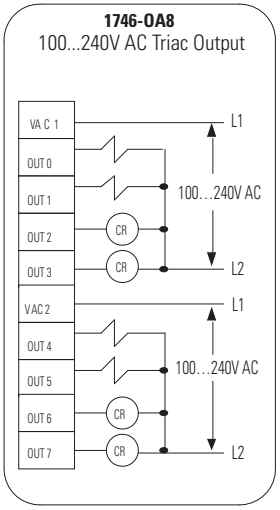
Electronically Protected Modules (1746-OB6EI and 1746-OB16E)

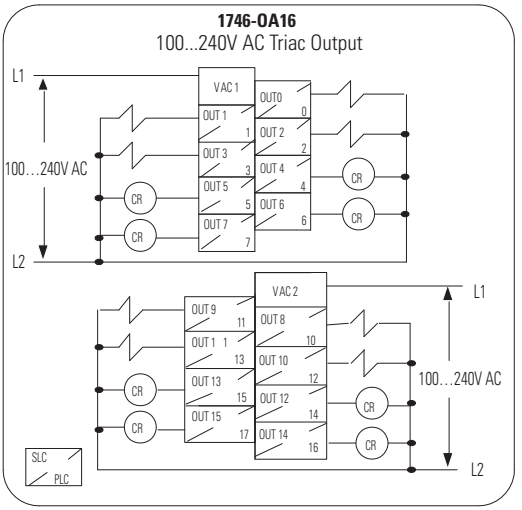
The electronic protection of the 1746-OB6EI and 1746-OB16E modules have been designed to provide protection for the modules from short circuit and overload current conditions. The protection is based on a thermal cut-out principle. In the event of a short circuit or overload current condition on an output 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.

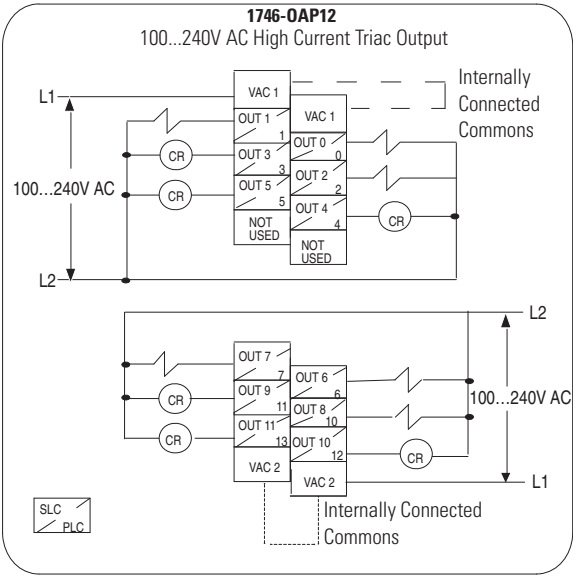
AC Output Modules Wiring Diagrams

1746-OA8, 1746-OA16





1746-OAP12



Input Modules Heat Dissipation

Catalog Numbers	Watts per Point	Minimum 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 Modules Heat Dissipation

Catalog Numbers	Watts per Point	Minimum 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

Specifications – 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 @ 146V DC and 30 °C (86 °F) 12 @ 146V DC and 50 °C (122 °F) 14 @ 132V DC and 55 °C (131 °F) 16 @ 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 @ 125V DC	
		2.25 mA @ 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.

AC Output Modules

Specifications – 1746-OA8, 1746-OA16, and 1746-OAP12

Attribute		Value		
		1746-OA8	1746-OA16[5]	1746-OAP12[5][6][7]
Voltage category		120/240V AC signal input		
Number of outputs		8	16	12
Points per common		4	8	6
Voltage, operating		85...265V AC @ 47...63 Hz		
Backplane current consumption	5V DC	0.185 A	0.370 A	0.370 A
	24V DC			
Signal delay, max resistive load[1]		On = 1 ms Off = 11.0 ms		
Off-state leakage, max[2]		2 mA		

Specifications – 1746-OA8, 1746-OA16, and 1746-OAP12

Attribute	Value		
	1746-OA8	1746-OA16(5)	1746-OAP12(5)(6)(7)
Load current, min	10 mA		
Continuous current per point(3)	1.0 A @ 30 °C (86 °F) 0.50 A @ 60 °C (140 °F)	0.50 A @ 30 °C (86 °F) 0.25 A @ 60 °C (140 °F)	2.0 A @ 30 °C (86 °F) 1.25 A @ 55 °C (131 °F) 1.0 A @ 60 °C (140 °F)
Continuous current per module, max	8.0 A @ 30 °C (86 °F) 4.0 A @ 60 °C (140 °F)	8.0 A @ 30 °C (86 °F) 4.0 A @ 60 °C (140 °F)	9.0 A @ 30 °C (86 °F) 6.8 A @ 55 °C (131 °F) 6.0 A @ 60 °C (140 °F)
On-state voltage drop, max	1.50V @ 1.0 A	1.50V @ 0.50 A	1.2V @ 2.0 A
Surge current per point(4), max	10.0 A for 25 ms	10.0 A for 25 ms	17.0 A for 25 ms(8)

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

(2) 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.

(3) 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.

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

(5) Removable terminal block.

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

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

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

DC Output Modules

Specifications – 1746-OB8, 1746-OB16, and 1746-OB16E

Attribute		Value		
		1746-OB8	1746-OB16(4)	1746-OB16E(4)(5)
Voltage category		24V DC Signal Output		
Number of outputs		8	16	16
Points per common		8	16	16
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 = 1 ms Off = 1.0 ms	On = 0.1 ms Off = 1.0 ms	On = 1.0 ms(6) Off = 1.0 ms
Off-state leakage, max(1)		1 mA		
Load current, min		1 mA		