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.

Environment and Enclosure

ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for additional installation requirements.
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

Prevent Electrostatic Discharge

ATTENTION: This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

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.

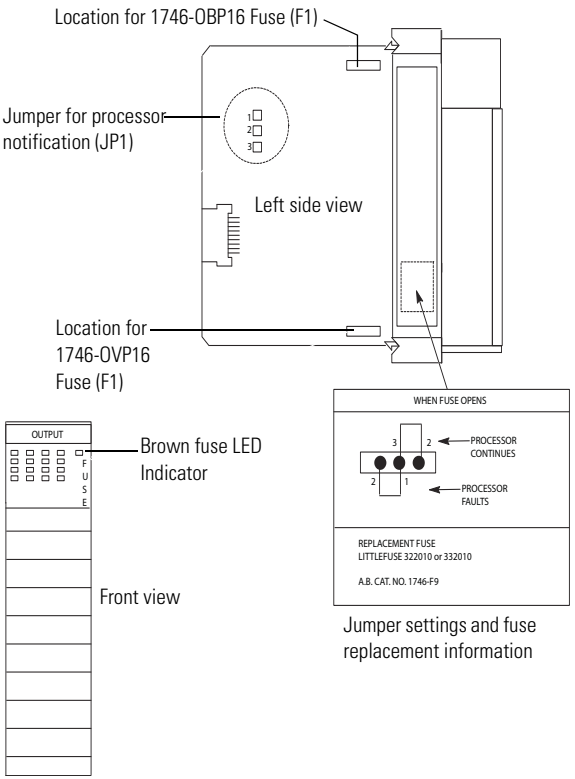
The recommended fuse for overload protection is SAN-O HT. Select the fuse rating according to your load. Do not use HT fuses rated higher than 2.0 Amps.

Blown Fuse Diagnostics

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

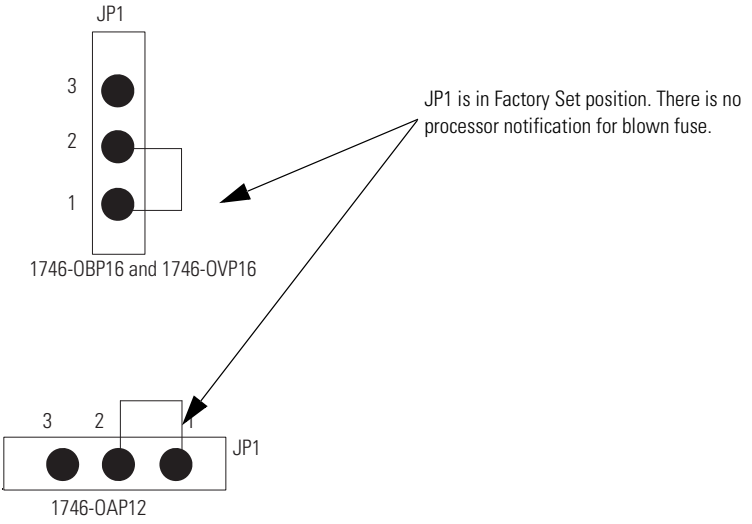
- The blown fuse LED indicator will illuminate, provided power (5V DC via backplane and load power via external supply) is applied to the module.
- A processor error will occur if JP1 connects pins 2 and 3. (See figures on page 9 and page 10.)

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



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.

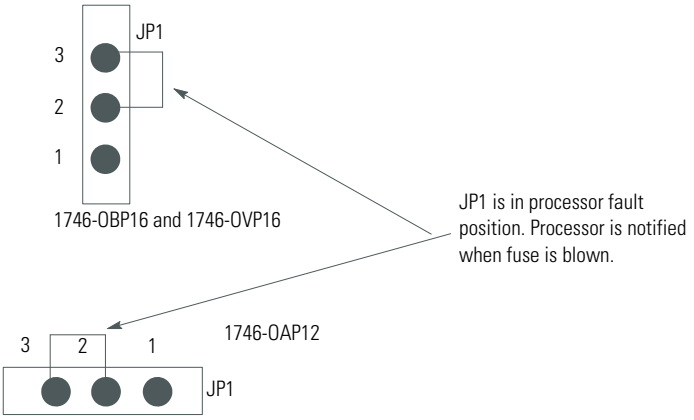


Processor Operation in Case of Blown Fuse – Processor Faults

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.

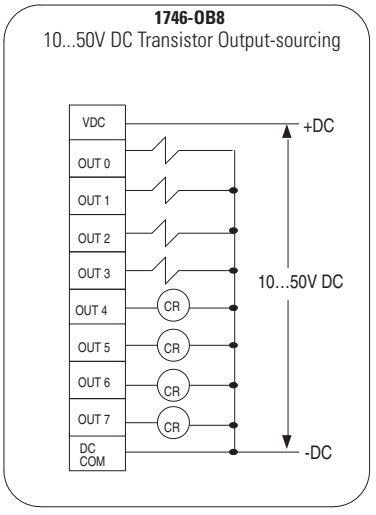
1. Remove SLC 500 system power and correct the conditions causing the short circuit.
2. Remove the output module from the chassis.
3. Remove the fuse.
   - 1746-OBP16 and 1746-OVP16 modules: Use a wide-tipped, slotted-head screwdriver to remove the blown fuse. Slide the screwdriver tip under the fuse 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.

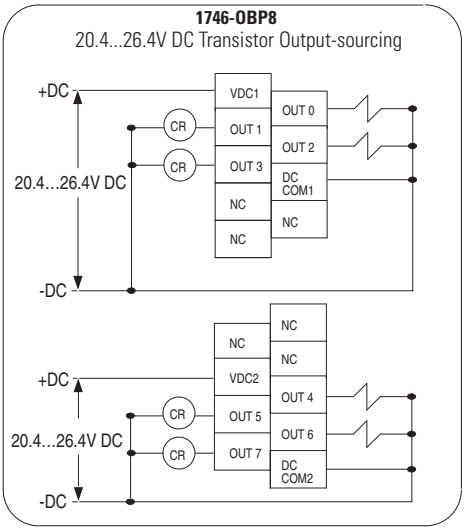
Electronically Protected Modules (1746-OB6EI and 1746-OB16E)

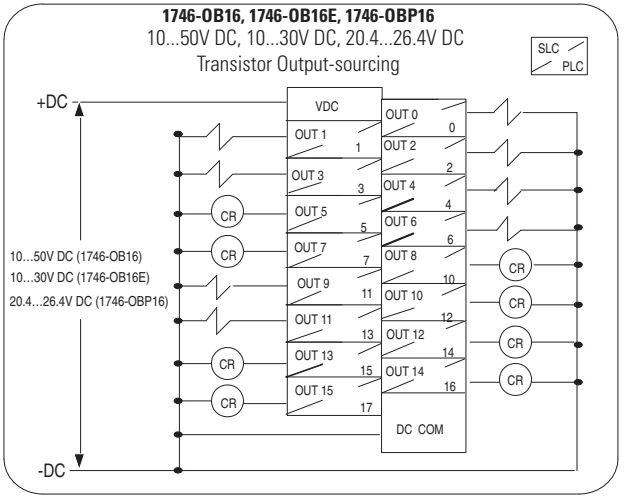
The electronic protection of the 1746-OB6EI and 1746-OB16E modules have been designed to provide protection for the modules from short circuit and overload current conditions. The protection is based on a thermal cut-out principle. In the event of a short circuit or overload current condition on an output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

1746-OB8, 1746-OBP8, 1746-OB16, 1746-OB16E, 1746-OBP16







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-OB8, 1746-OB16, and 1746-OB16E

Attribute	Value		
	1746-OB8	1746-OB16[4]	1746-OB16E[4][5]
Continuous current per point[2]	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)	1.0 A @ 30 °C (86 °F)[7] 0.50 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)	8.0 A @ 0...60 °C (32...140 °F)
On-state voltage drop, max	1.2V @ 1.0 A	1.2V @ 0.50 A	1.0V @ 0.50 A
Surge current per point[3]	3.0 A for 10 ms	3.0 A for 10 ms	2.0 A for 10 ms[8]

(1) 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.

(2) 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.

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

(4) Removable terminal block.

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

(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) 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.

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

ATTENTION: A transient pulse occurs in transistor outputs when the external DC supply voltage is applied to the output common terminals (for example, through 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 – 1746-OB6EI, 1746-OBP8, and 1746-OBP16

Attribute	Value		
	1746-OB6EI[5][6]	1746-OBP8[5][6][8]	1746-OBP16[5][6][9][10]
Voltage category	24V DC Signal Output		
Number of outputs	6	8	16
Points per common	Individually isolated	4	16

Specifications – 1746-OB6EI, 1746-OBP8, and 1746-OBP16

Attribute		Value		
		1746-OB6EI[5][6]	1746-OBP8[5][6][8]	1746-OBP16[5][6][9][10]
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 [7] Off = 2.0 ms	On = 1.0 ms[7] Off = 2.0 ms	On = 0.1 ms[7] Off = 1.0 ms
Off-state leakage, max[1]		1 mA		
Load current, min		1 mA		
Continuous current per point[2][3]		2.0 A @ 0…60 °C (140 °F)	2.0 A @ 0…60 °C (140 °F)	1.5 A @ 30 °C (86 °F) 1.0 A @ 60 °C (140 °F)
Continuous current per module		12.0 A @ 0…60 °C (140 °F)	8.0 A @ 0…60 °C (140 °F)	6.4 A @ 0...60 °C (32...140 °F)
On-state voltage drop, max		1.0V @ 2.0 A	1.0V @ 2.0 A	1.0V @ 1.0 A
Surge current per point[4]		4.0 A for 10 ms	4.0 A for 10 ms	4.0 A for 10 ms
Surge current per module[4]		24.0 A for 10 ms	32.0 A for 10 ms	32.0 A for 10 ms
Electronic protection		Yes	No	No

(1) 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.

(2) Recommended surge suppression: For transistor outputs when switching 24V dc inductive loads, use a 1N4004 diode reverse-wired across the load (also see footnote 3). Refer to the SLC 500 Modular Hardware Style User Manual, publication 1747-UM011, for more information on surge suppression.

(3) 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.

(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) 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.

(7) 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.

(8) An external fuse can be used to protect this module from short circuits. Recommended fuse is SANO MQ4-3.15A, 5 x 20 mm.

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

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

(8) 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.

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

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 – 1746-OG16

Attribute		Value(1)
Voltage category		5V DC TTL Signal Input (sinking)
Number of outputs		16
Points per common		16
Voltage, operating (V DC 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
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.