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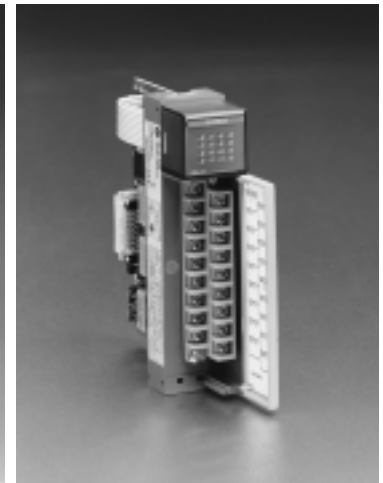
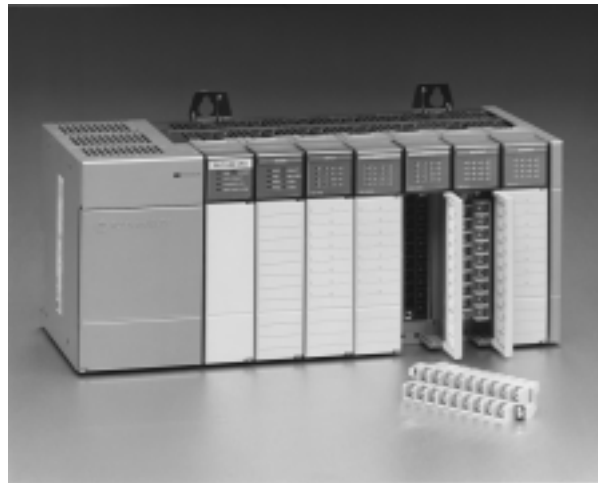
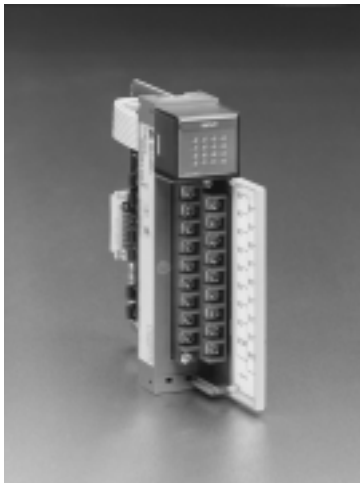
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# Discrete Input and Output Modules

(Catalog Numbers 1746-IA4, -IA8, -IA16, -IB8, -IB16, -IB32, -IC16, -IG16, -IH16, -IM4, -IM8, -IM16, -IN16, -ITB16, -ITV16, -IV8, -IV16, -IV32, -OA8, -OA16, -OAP12, -OB6EI, -OB8, -OB16, OB16E, -OB32, OB32E, -OBP8, -OBP16, -OG16, -OV8, -OV16, OV32, -OVP16, -OW4, -OW8, -OW16, -OX8, -IO4, -IO8, -IO12, -IO12DC)



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**Our wide variety of input, output, and combination modules makes the SLC 500™ family the smart choice for all of your small PLC applications.** I/O modules are available in a wide variety of densities including 4-, 8-, 16-, and 32-point and can interface to AC, DC, and TTL voltage levels. Output modules are available with solid state AC, solid state DC, and relay contact type outputs. For added flexibility, combination modules are also available in 2-input/2-output, 4-input/4-output, and 6-input/6-output versions.

**Designed and tested for industrial applications, our modules are of the highest quality.** The modules feature input filtering, optical isolation, and built-in surge protection to enhance the reliability of operation in noisy industrial environments.

**Class 1, Division 2 certified by UL and CSA. CE compliant.** All modules are UL 508 listed and CSA 22.2 142 approved and meet Class 1, Division 2 hazardous location requirements of both Underwriter’s Laboratory and the Canadian Standards Association (except for those noted in the module summary on page 2). For use within the European Union or EEA regions, most modules have been tested to meet Council Directive 89/336 Electromagnetic Compatibility (exceptions are listed on page 2).

## Discrete I/O Module Summary

	ID Code	Voltage Category	Catalog Number	Input/Output	I/O Points	Module Description	Page
AC Modules	100	100/120V ac	<b>1746-IA4</b>	Input	4	120V ac Input	15
	300	100/120V ac	<b>1746-IA8</b>	Input	8	120V ac Input	15
	500	100/120V ac	<b>1746-IA16</b>	Input	16	120V ac Input	15
	101	200/240V ac	<b>1746-IM4</b>	Input	4	240V ac Input	15
	301	200/240V ac	<b>1746-IM8</b>	Input	8	240V ac Input	15
	501	200/240V ac	<b>1746-IM16</b>	Input	16	240V ac Input	15
	2703	100/120V ac	<b>1746-OA8</b>	Output	8	120/240V ac Output	17
	2903	100/120V ac	<b>1746-OA16</b>	Output	16	120/240V ac Output	17
	2803	120/240V ac	<b>1746-OAP12<sup>(1)</sup></b>	Output	12	High Current 120/240V ac Output	17
DC Modules	306	24V dc	<b>1746-IB8</b>	Input	8	Current Sinking DC Input	19
	506	24V dc	<b>1746-IB16</b>	Input	16	Current Sinking DC Input	19
	706	24V dc	<b>1746-IB32<sup>(1)</sup></b>	Input	32	Current Sinking DC Input	19
	519	24V dc	<b>1746-ITB16</b>	Input	16	Fast Response DC Sinking Input	19
	509	48V dc	<b>1746-IC16</b>	Input	16	Current Sinking DC Input	22
	507	125V dc	<b>1746-IH16</b>	Input	16	Current Sinking DC Input	22
	320	24V dc	<b>1746-IV8</b>	Input	8	Current Sourcing DC Input	22
	520	24V dc	<b>1746-IV16</b>	Input	16	Current Sourcing DC Input	22
	720	24V dc	<b>1746-IV32<sup>(1)</sup></b>	Input	32	Current Sourcing DC Input	22
	518	24V dc	<b>1746-ITV16</b>	Input	16	Fast Response DC Sourcing Input	22
	515	5V dc/TTL	<b>1746-IG16<sup>(2)</sup></b>	Input	16	Current Sourcing TTL Input	27
	2619	24V dc	<b>1746-OB6EI</b>	Output	6	Isolated Sourcing DC Output	31
	2713	24V dc	<b>1746-OB8</b>	Output	8	Current Sourcing DC Output	28
	2913	24V dc	<b>1746-OB16</b>	Output	16	Current Sourcing DC Output	28
	2920	24V dc	<b>1746-OB16E<sup>(1)(3)</sup></b>	Output	16	Current Sourcing DC Output	31
	3113	24V dc	<b>1746-OB32<sup>(1)</sup></b>	Output	32	Current Sourcing DC Output	28
	3120	24V dc	<b>1746-OB32E<sup>(1)</sup></b>	Output	32	Current Sourcing DC Output	31
	2721	24V dc	<b>1746-OBP8<sup>(3)</sup></b>	Output	8	High Current Sourcing DC Output	31
	2921	24V dc	<b>1746-OBP16<sup>(1)</sup></b>	Output	16	High Current Sourcing DC Output	35
	2714	24V dc	<b>1746-OV8</b>	Output	8	Current Sinking DC Output	37
	2914	24V dc	<b>1746-OV16</b>	Output	16	Current Sinking DC Output	37
	3114	24V dc	<b>1746-OV32<sup>(1)</sup></b>	Output	32	Current Sinking DC Output	37
	2922	24V dc	<b>1746-OVP16<sup>(1)</sup></b>	Output	16	High Current Sinking DC Output	40
	2915	5V dc/TTL	<b>1746-OG16<sup>(2)</sup></b>	Output	16	Current Sinking TTL Output	41
AC/DC Modules	510	24V ac/dc	<b>1746-IN16</b>	Input	16	24V ac/dc Input	42
	2500	AC/DC Relay	<b>1746-OW4<sup>(1)</sup></b>	Output	4	Relay (Hard Contact) Output	43
	2700	AC/DC Relay	<b>1746-OW8<sup>(1)</sup></b>	Output	8	Relay (Hard Contact) Output	43
	2900	AC/DC Relay	<b>1746-OW16<sup>(1)</sup></b>	Output	16	Relay (Hard Contact) Output	43
	2701	AC/DC Relay	<b>1746-OX8<sup>(1)</sup></b>	Output	8	Isolated Relay Output	43
	800	In - 120V ac, Out - Relay	<b>1746-IO4<sup>(1)</sup></b>	Input/Output	2 In, 2 Out	Combination Input/Output	45
	1100	In - 120V ac, Out - Relay	<b>1746-IO8<sup>(1)</sup></b>	Input/Output	4 In, 4 Out	Combination Input/Output	45
	1500	In - 120V ac, Out - Relay	<b>1746-IO12<sup>(1)</sup></b>	Input/Output	6 In, 6 Out	Combination Input/Output	45
1512	In - 24V dc, Out - Relay	<b>1746-IO12DC<sup>(3)</sup></b>	Input/Output	6 In, 6 Out	Combination Input/Output	45	

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

(2) Not CE marked.

(3) These modules carry the C-UL mark and are certified by UL per CSA only.

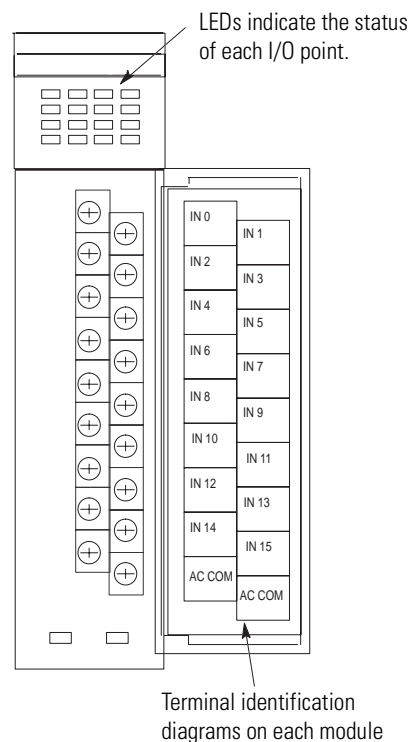
## Features and Benefits

**Select I/O modules to exactly match your application.** Combination modules allow you to have inputs and outputs in a single slot for efficient use of your chassis space.

**Expand the I/O capacity of your fixed controller system.** Two discrete I/O modules can be added to the fixed controller's 2-slot expansion chassis increasing the flexibility of the system.

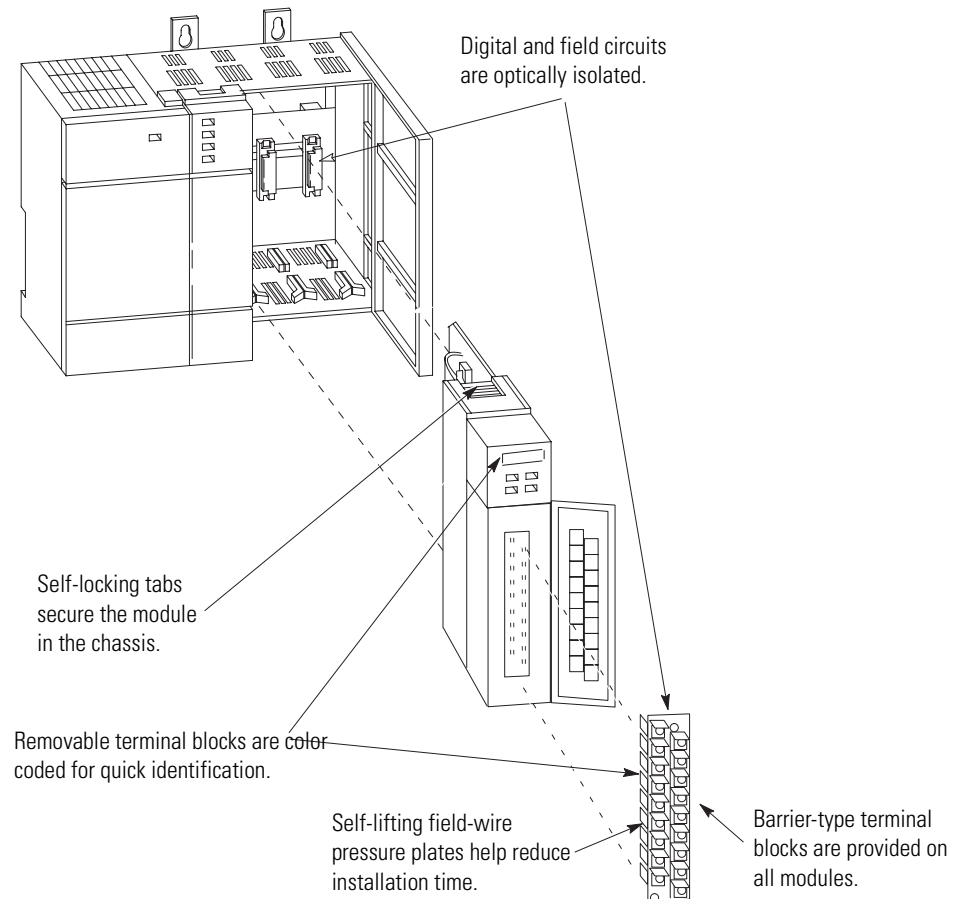
**All relay contacts are Silver Cadmium with Gold overlay.** Gold plating resists oxidation and tarnishing resulting from non-use. Silver Cadmium acts as an excellent conductor.

**High-density 32-Point DC I/O and fast response DC inputs are available.** These modules allow you to apply the SLC 500 processors in a broader spectrum of control applications.



**LEDs indicate the status of each I/O point.** LEDs illuminate to assist you in troubleshooting, when the proper signal is received at an input terminal, or when the processor applies power to an output terminal.

**Terminal identification diagrams on each module.** Terminal identification diagrams are located on each module, making terminal identification easier.



**Digital and field circuits are optically isolated.** All modules feature isolation between digital and field circuits, resulting in increased noise immunity and limited damage to your system due to an electrical malfunction of the field wiring.

**Self-lifting field-wire pressure plates cut installation time.** Wiring terminals have self-lifting pressure plates to secure two #14 AWG field wires.

**Removable terminal blocks help ease the wiring task.** Removable terminal blocks allow you to replace the module without rewiring it (not available on all modules).

**Removable terminal blocks are color coded for quick identification.** A matching color band is also provided on the front of the module to assist in matching the terminal block to the module.

**Barrier-type terminal blocks provided on all modules.** Each terminal block features a barrier on three sides of each terminal to help prevent accidental shorting of field wiring.

**Self-locking tabs secure the module in the chassis.** No tools are necessary to install or remove a module from the chassis. To install a module, you slide it into the chassis until it latches in place.

## I/O Module Operation

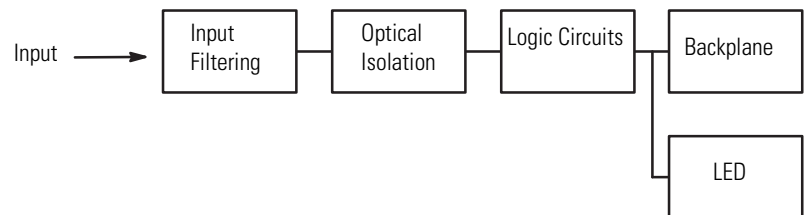
### Power Supply Requirements

Discrete modules receive power through the 1746 I/O chassis backplane from the associated chassis power supply. Refer to the individual module specifications for the current required from the power supply (in mA) to operate the module. You should total the current requirements for all the modules in the chassis to avoid overloading the power supply or the I/O chassis backplane.

### Input Modules

An input module responds to an input signal in the following manner:

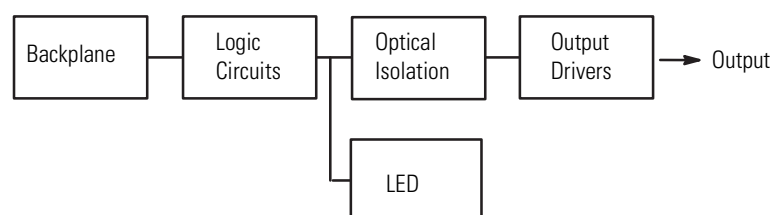
1. Input filtering limits the effect of voltage transients caused by contact bounce and/or electrical noise. If not filtered, voltage transients could produce false data. All input modules use input filtering.
2. Optical isolation shields backplane circuits and module logic circuits from possible damage due to electrical transients.
3. Logic circuits process the signal.
4. An input LED turns on or off indicating the status of the corresponding input device.



### Output Modules

An output module controls the output signal in the following manner:

1. Logic circuits determine the output status.
2. An output LED indicates the status of the output signal.
3. Optical isolation separates module logic and backplane circuits from the field signal.
4. The output driver turns the corresponding output on or off.



## Surge Suppression

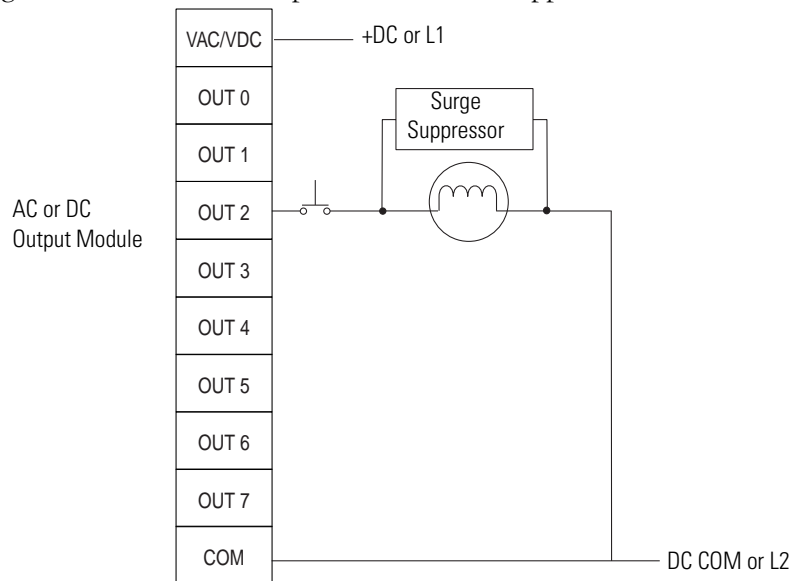
Most output modules have built-in surge suppression to reduce the effects of high-voltage transients. However, we recommend that you use an additional suppression device if an output module is being used to control an inductive device such as:

- relays
- motor starters
- solenoids
- motors

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

- push buttons
- selector switches

By adding a suppression device directly across the coil of an inductive device, you will reduce the effects of voltage transients caused by interrupting the current to that inductive device and prolong the life of the switch contacts. The diagram below shows an output module with a suppression device.



Recommended surge suppressors are provided in the specifications tables.

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**Important:** Adding a suppression device across your load will defeat the fast turn-off feature of the 1746-OB6EI, -OB16E Series B and later, -OB32E, -OBP8 Series B and later, -OBP16, and -OVP16 DC output modules. Refer to pages 31, 35, and 40 for more information about suppression when using the 1746-OB6EI, -OB16E, -OB32E, -OBP8, -OBP16, and -OVP16, respectively.

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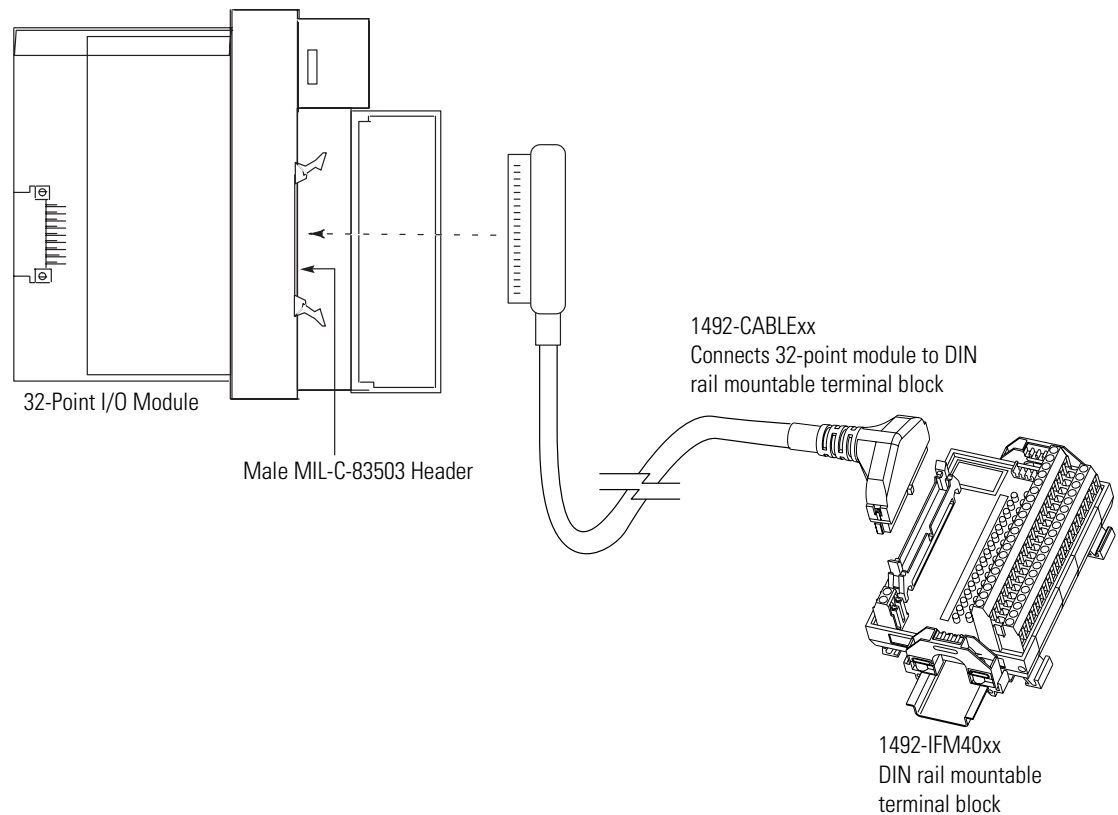
## Enhanced Discrete I/O Modules

### 32-Point Modules (1746-IB32, -IV32, -OB32, OB32E, -OV32)

The 32-point I/O modules allow you to reduce panel space requirements by wiring 32 DC input or 32 DC output devices to a module residing in one slot. These modules can be used with both modular chassis systems or fixed controllers.

The 32-point modules come equipped with a 40-pin male connector on the front instead of screw terminals. This connector is designed to accept your cable fitted with the 1746-N3 mating connector. One 1746-N3 connector and 45 crimp-type contacts are packaged with each module. The other end of the cable can be wired to a user-supplied terminal block.

As an alternative, 1492 prewired cables, purchased separately, can be used to connect the 32-point modules to 1492 interface modules. For more information, refer to the *Accessories* section on page 50.



## Fast Response Input Modules (1746-ITB16, -ITV16)

The fast-response DC input modules provide 16 input points and are designed for high-speed applications requiring fast response to input signals from DC sensing devices. When used with an SLC 5/03™ or higher processor and the Discrete Input Interrupt (DII) instruction (100 µsec polling), pulses can be read up to a frequency of 1K Hz. (It is 2K Hz if the input signals are from a gray code encoder.) Recommended wiring to an Allen-Bradley 845D Absolute Gray Code Encoder is provided on page 27.

Both sinking and sourcing versions of the fast response input module are available.

## High-Current Solid-State Output Modules (1746-OAP12, -OB6EI, -OBP8, -OBP16, -OVP16)

High-current solid-state output modules expand application coverage for the SLC 500 by providing the following enhanced functionality:

- increased current rating
- fuse protection and diagnostics
- high-speed switching
- excellent reliability

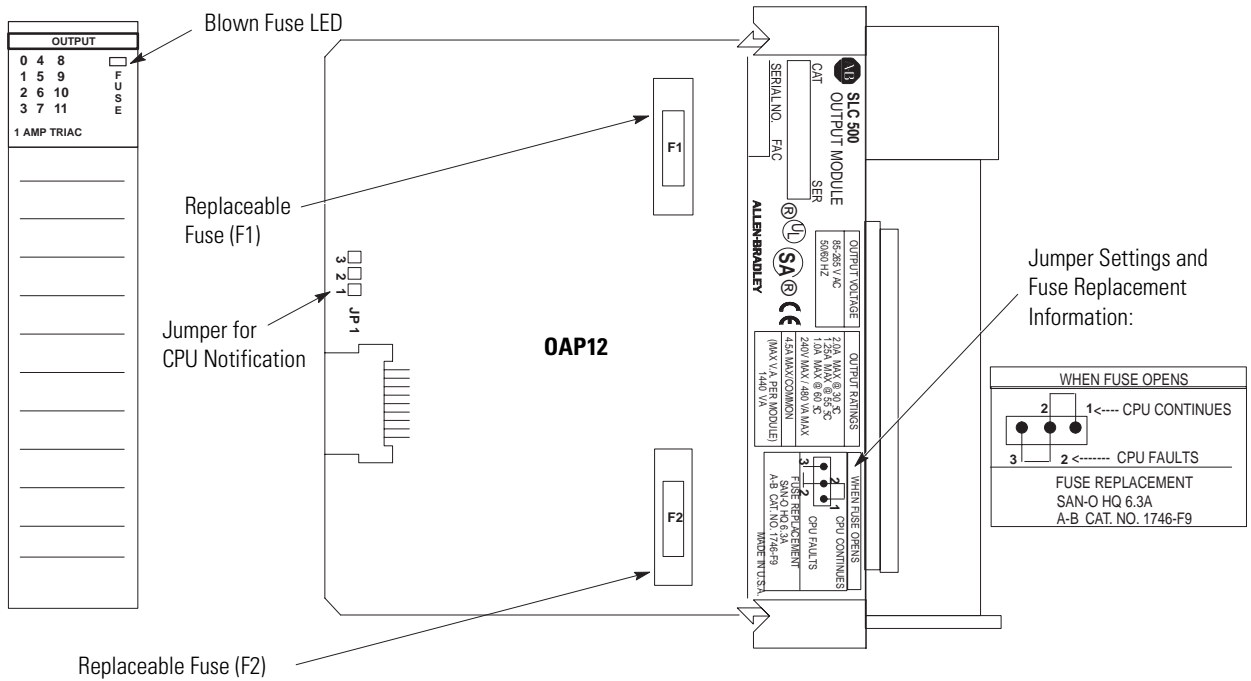
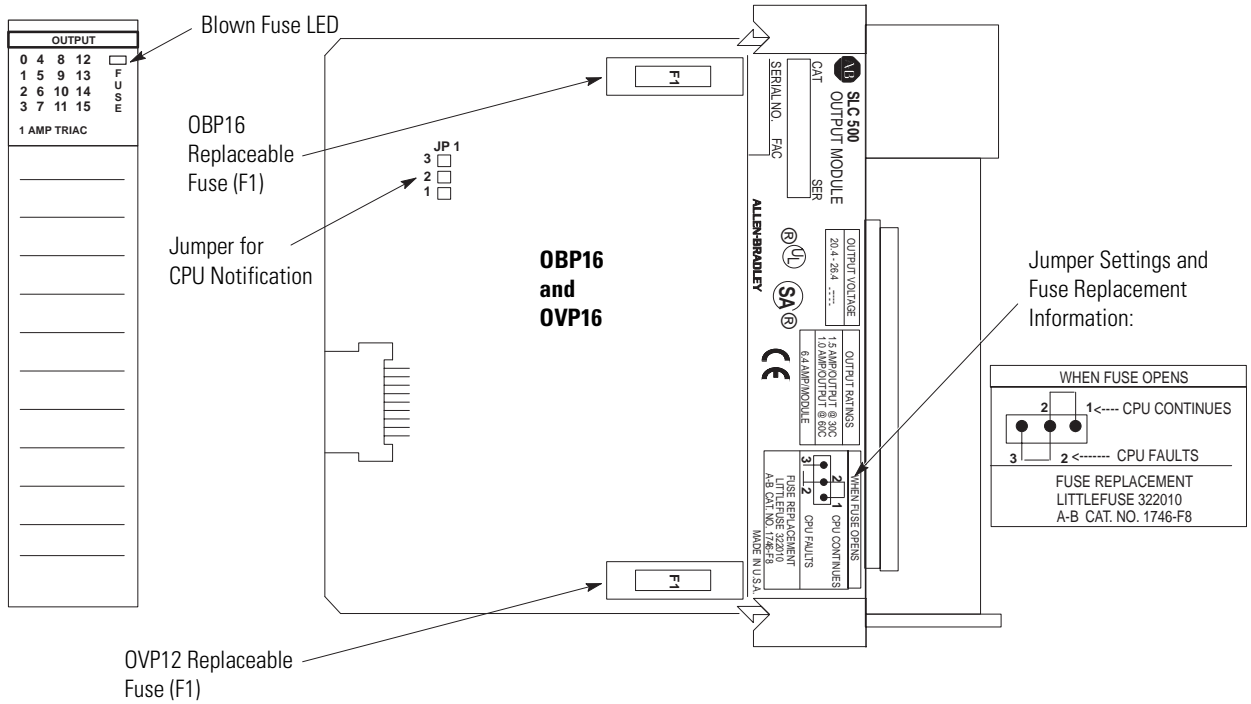
The high-current solid-state output modules expand application coverage in automotive, packaging, and material handling applications by allowing the SLC 500 processor to directly control solenoids, contactors, motors, and motor starter loads (up to size 5) with continuous current requirements of up to 1A at 60°C (1746-OAP12, -OBP16, -OVP16) and 2.0A at 60°C (1746-OB6EI, -OBP8).

1746-OAP12, -OBP16, and -OVP16 modules also provide fuse protection and blown fuse diagnostics for increased up-time. The ac output module includes two replaceable fuses (one per common), which protect the module in the event of short circuits.

1746-OBP16 and -OVP16 output modules include a replaceable fuse on the common providing short-circuit protection for wiring (16 AWG or larger) to external loads. A jumper can be set on these modules to provide CPU notification and system shutdown if the module fuse blows. The modules also include a blown fuse LED to assist I/O troubleshooting.

Inductive load turn-off time for 1746-OBP8 (Series B and later), -OBP16, and -OVP16 DC output modules is reduced by 70% over standard 1746 DC output modules, allowing fast application cycle times.

Innovative heat sink design for the OAP12 allows heat to be dissipated through the chassis frame metal, providing cool operation and excellent reliability.



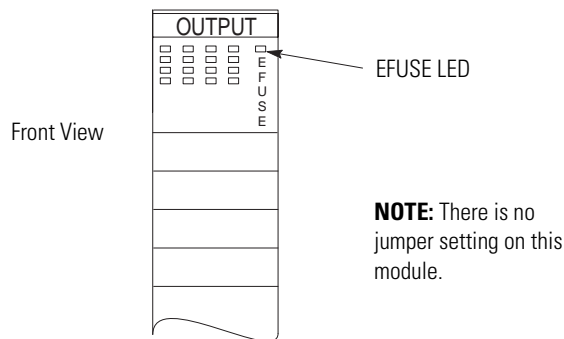
## Electronically Protected Output Modules (1746-OB6EI, -OB16E, and -OB32E)

The 1746-OB6EI, -OB16E, and OB32E are designed to electronically protect the module from a short-circuit or overload condition. The protection is based on a thermal cut-out principle. In the event of a short circuit or overload on an output channel, that channel limits the current within milliseconds after its thermal cut-out temperature is reached. All other channels continue to operate as directed by the processor.

These modules lower maintenance costs by eliminating the need to replace damaged modules and blown fuses. After the short-circuit or overload condition is corrected, restore power and the module automatically resets and resumes control of the output channel.

The modules provide a broad voltage range of 10 to 30V dc and a current rating of 2A at 60°C (1746-OB6EI), 0.5A at 60°C (1746-OB16E), and 0.5A at 30°C/ 0.25A at 60°C (1746-OB32E) making them the perfect solution for controlling 12V dc and 24V dc solenoid and lamp loads. The modules are also equipped with an LED indicator that illuminates when the short circuit or overload condition occurs to expedite the troubleshooting process.

Inductive load turn-off time for 1746-OB6EI and -OB16E (Series B and later), output modules is reduced by 70% over standard 1746 DC output modules, allowing fast application cycle times.




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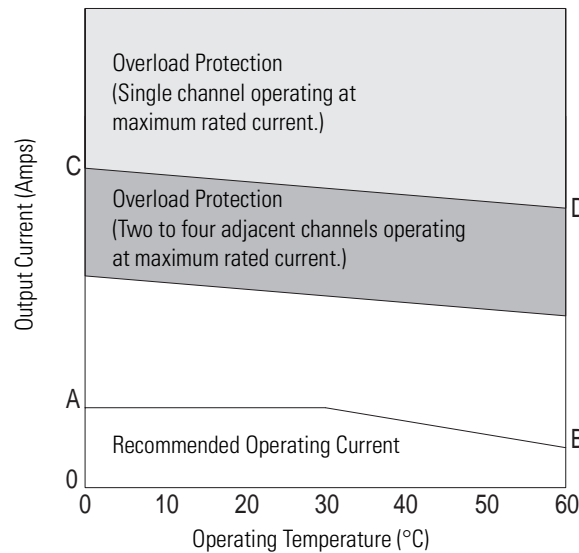
**Important:** The modules do not provide protection against reverse polarity wiring or wiring to AC power sources. Electronic protection is not intended to replace fuses, circuit breakers, or other code-required wiring protection devices.

---

### Overload Protection (1746-OB6EI, -OB16E, and -OB32E)

The chart and table below describe overload protection for the 1746-OB6EI, -OB16E, and -OB32E. The electronic protection is based on a thermal cut-out temperature, which is reached more quickly (at lower overload current) when two to four adjacent channels are operating. The adjacent channel groupings are:

- 1746-OB6EI: The channels on this modules are not grouped in sets. However, channels which are directly adjacent to one another will also allow the thermal cut-out temperature to be reached more quickly.
- 1746-OB16E: 0-3, 4-7, 8-11, and 12-15
- 1746-OB32E: 0-3, 4-7, 8-11, 12-15, 16-19, 20-23, 24-27, and 28-31



Catalog Number	Recommended Operating Current		Overload Protection	
	at 0°C (32°F)	at 60°C (140°F)	at 0°C (32°F)	at 60°C (140°F)
1746-OB6EI	A = 2A	B = 2A	C = 5.5A	D = 4.5A
1746-OB16E	A = 1A	B = 0.5A	C = 4A	D = 3.5A
1746-OB32E	A = 0.5A	B = 0.25A	C = 2A	D = 1A

**Important:** The 1746-OB6EI, -OB16E, and OB32E perform auto-reset under overload conditions. When an output channel overload occurs as described above, that channel limits current within milliseconds after its thermal cut-out temperature is 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 also allows the output channel to cool below the thermal cut-out temperature, allowing auto-reset to occur when power is restored. The output channel operates 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, use an external mechanical fuse to open the circuit when overloaded.

## Terms and Symbols Used in the Specification Tables and Wiring Diagrams

### Terms

**Backplane Current Draw** — the amount of current the module requires from the backplane. The sum of the backplane current draw for all modules in a chassis is used to select the appropriate chassis power supply.

**Continuous Current Per Module** — the maximum current for each module. The sum of the output current for each point should not exceed this value.

**Continuous Current Per Point** — the maximum current each output is designed to continuously supply to a load.

**Inrush Current** — the temporary surge current drawn when an input is initially energized.

**Minimum Load Current** — the lowest amount of current the output is designed to operate at. Operating at or below this value is not recommended.

**Nominal Input Current** — the current drawn at nominal input voltage.

**Off-State Current** — for input circuits, the maximum amount of leakage current allowed from an input device that will keep the SLCT<sup>™</sup> input circuits in their off state.

**Off-State Leakage** — for output circuits, the maximum amount of current present at the output terminal when the output circuit is in its off state.

**Off-State Voltage (max)** — the maximum input voltage level detected as an off condition by the input module.

**On-State Voltage Drop** — the voltage developed across the output driver circuit during the on state at maximum load current.

**Operating Voltage** — for inputs, the voltage range needed for the input to be in the on state. For outputs, the allowable range of user-supplied voltage.

**Points per Common** — the number of input or output points connected to a single return (common) or supply (Vcc).

**Signal Delay** — for inputs, the response time required to transmit the circuit status from the field logic to the digital logic. For outputs, the time required to transmit the circuit status from digital logic to the output driver.


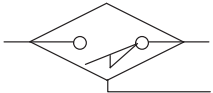



**Sinking/Sourcing** — describes a current signal flow relationship between field input and output devices in a control system and their power supply. Sourcing I/O modules supply (or source) current to sinking field devices. Sinking I/O modules receive (or sink) current from sourcing field devices.

**Surge Current** — the temporarily large current drawn by an inductive output device when it is initially energized.

**Surge Current Per Point** — the maximum amplitude and duration (pulse) of current an output can provide to an inductive output device.

**Voltage Category** — the nominal voltage used to describe the module.

## I/O Wiring Symbols

Symbol	Device Name
	2-wire Input Device
	3-wire Input Device
	Solenoid Output
	Contact Relay Output
	TTL Logic Output

**Related Publications:** Detailed wiring diagrams for 1746 input modules and Allen-Bradley Series 9000 Photoelectric Sensors are provided in publication 42GR-7.4.

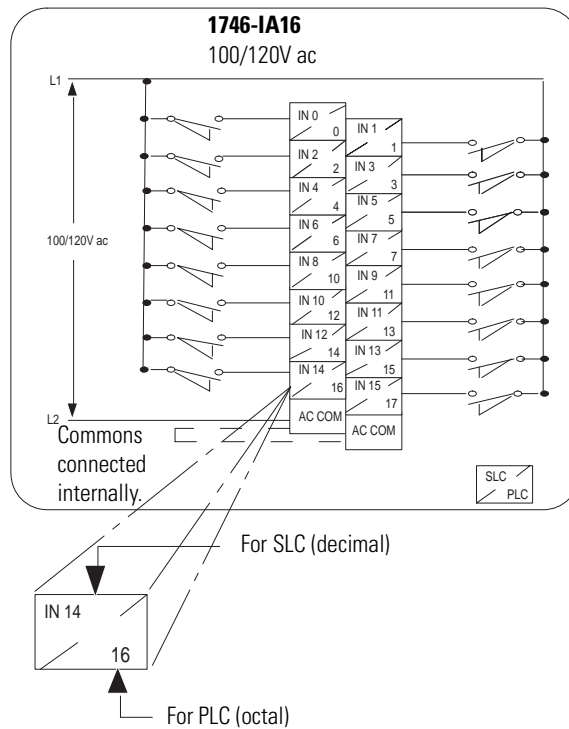
**Important:** The wiring diagrams in this document are examples only. It is not necessary to connect an I/O device to every terminal on an I/O module's terminal block.

### Wiring Diagrams

The 16-point I/O module wiring diagrams include both decimal and octal numbers for I/O addressing and wire identification. (See figure below.) Use the decimal numbers in the upper left portion of each box to wire your 16-point I/O module to an SLC system. Use the octal numbers in the lower right portion of the box for a PLC® system. (As shipped from the factory, the I/O module has a decimal address label on the inside of its door.) An octal label kit is included with your 16-point I/O modules or you can order a separate octal conversion kit to allow you to convert your module to the octal system.

**Important:** PLC systems use the octal labels. (See figure below.)

Directions on how to install the labels are included in publication number 1746-5.3, *Discrete I/O Modules Installation Instructions*. These instructions are provided in a kit that is shipped with each discrete I/O module.



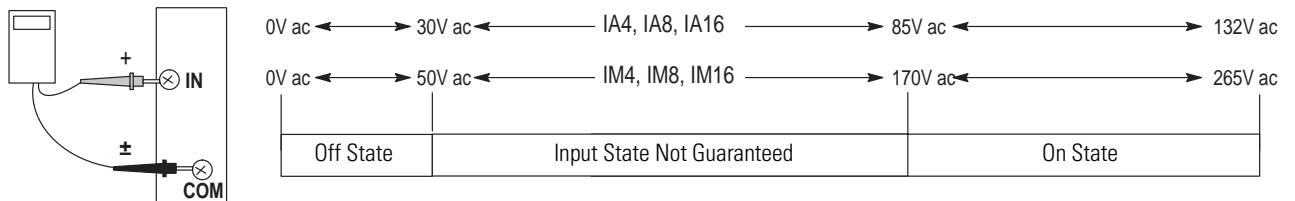
# Specifications, Wiring, and AC Input Modules (1746-IA4, -IA8, -IA16, -IM4, -IM8, -IM16) Circuit Diagrams

Specification		Catalog Number					
		1746-IA4	1746-IA8	1746-IA16 (RTB)	1746-IM4	1746-IM8	1746-IM16 (RTB)
<b>Voltage Category</b>		100/120V ac			200/240V ac		
<b>Operating Voltage</b>		85 to 132V ac at 47 to 63 Hz			170 to 265V ac at 47 to 63 Hz		
<b>Number of Inputs</b>		4	8	16	4	8	16
<b>Points per Common</b>		4	8	16	4	8	16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.035A	0.050A	0.085A	0.035A	0.050A	0.085A
	<b>24V dc</b>	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
<b>Signal Delay (max.)</b>		on = 35 ms off = 45 ms			on = 35 ms off = 45 ms		
<b>Off-State Voltage (max.)</b>		30V ac			50V ac		
<b>Off-State Current (max.)</b>		2 mA			2 mA		
<b>Nominal Input Current</b>		12 mA at 120V ac			12 mA at 240V ac		
<b>Inrush Current<sup>(1)</sup> (max.)</b>		0.8A			1.6A		
<b>Inrush Current Time Duration<sup>(1)</sup> (max.)</b>		500 μsec.			500 μsec.		

(1) 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 are affected.

RTB = Removable Terminal Block.

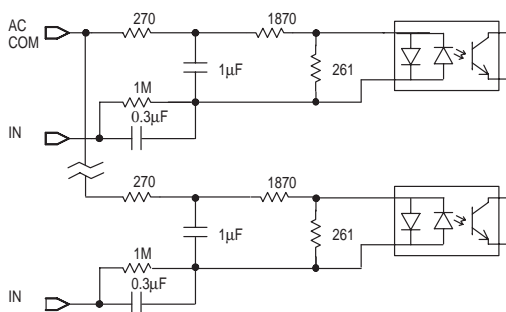
### On/Off-State Voltage Range



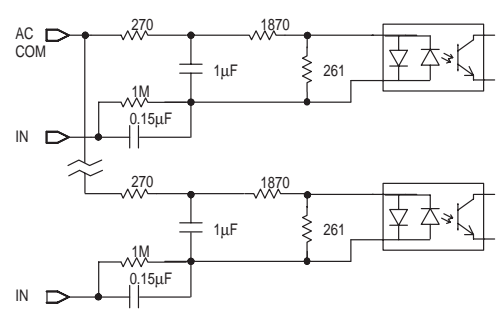
(Measure voltage from common terminal to input terminal.)

### Circuit Diagrams

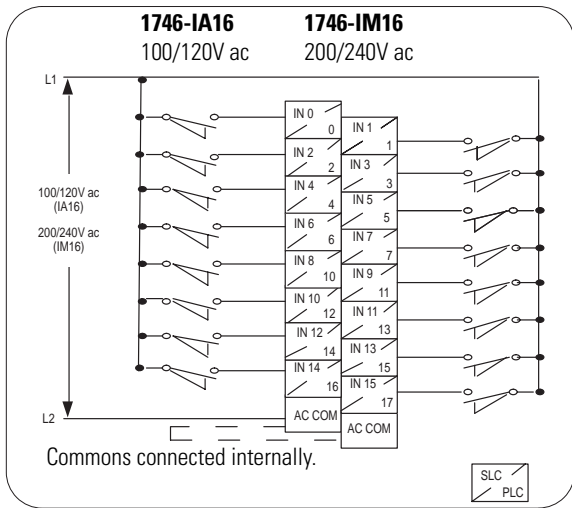
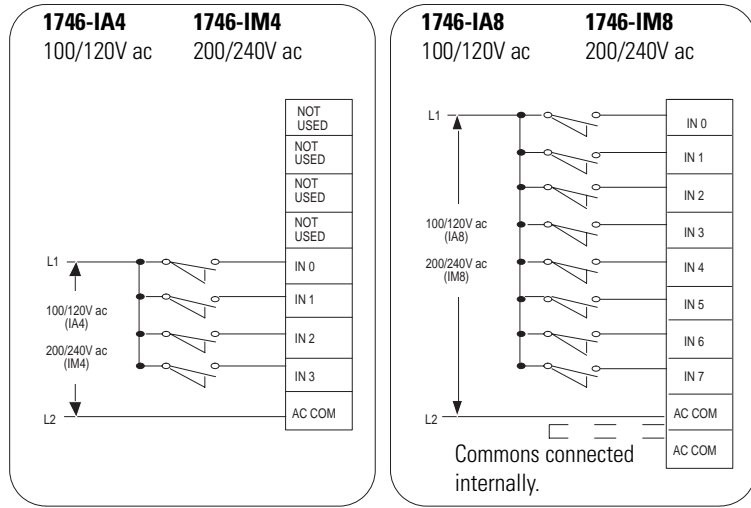
1746-IA4, IA8, IA16



1746-IM4, IM8, IM16



Wiring Diagrams



## AC Output Modules (1746-0A8, -0A16, -0AP12)

Specification		Catalog Number		
		1746-0A8 <sup>(1)</sup>	1746-0A16 <sup>(1)</sup> (RTB)	1746-0AP12 <sup>(1)(2)</sup> (RTB)
<b>Voltage Category</b>		120/240V ac		
<b>Operating Voltage</b>		85 to 265V ac at 47 to 63 Hz		
<b>Number of Outputs</b>		8	16	12
<b>Points per Common</b>		4	8	6
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.185A	0.370A	0.370A
	<b>24V dc</b>	0.0A	0.0A	0.0A
<b>Signal Delay (max.)(Resistive Load)</b>		on = 1 ms off = 11 ms		
<b>Off-State Leakage<sup>(3)</sup> (max.)</b>		2 mA		
<b>Load Current (min.)</b>		10 mA		
<b>Continuous Current (max.)</b>	<b>Per Point<sup>(4)</sup></b>	1.0A at 30°C 0.50A at 60°C	0.50A at 30°C 0.25A at 60°C	2.0A at 30°C 1.25A at 55°C 1.0A at 60°C
	<b>Per Module</b>	8.0A at 30°C 4.0A at 60°C	8.0A at 30°C 4.0A at 60°C	9.0A at 30°C 6.0A at 60°C
<b>On-State Voltage Drop (max.)</b>		1.50V at 1A	1.50V at 0.50A	1.2V at 2.0A
<b>Surge Current per Point<sup>(5)</sup> (max.)</b>		10.0A for 25 ms	10.0A for 25 ms	per point - 17.0A for 25 ms per common - 35.0A for 10 ms

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

(2) A fused common and blown fuse LED are provided on this module. (Fuses are designed to protect the module.) For replacement fuse, use catalog number 1746-F9 or SAN-0 HQ 6.3A.

(3) To limit the effects of leakage current through triac outputs, a loading resistor can be connected in parallel with your load. For typical 120V ac applications, use a 15k ohm, 2W resistor. For typical 240V ac applications, use a 15k ohm, 5W resistor.

(4) Recommended surge suppression for triac outputs when switching 120V ac inductive loads is Harris MOV part number V220MA2A. See page 6 for more information on surge suppression.

(5) Repeatability is once every 1 second at 30°C. repeatability is once every 2 seconds at 60°C.

RTB = Removable Terminal Block.

### Operating Voltage Range

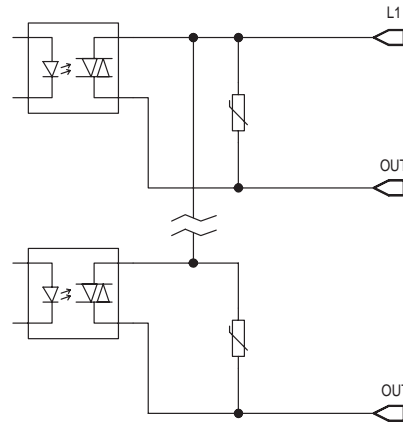


(Voltage is applied between L1 and L2.)

**Important:** If you measure the voltage at an output terminal that is not connected to a load or is connected to a high-impedance load, you may measure as much as 100V ac even though the output is off.

Circuit Diagrams

1746-OA8, OA16

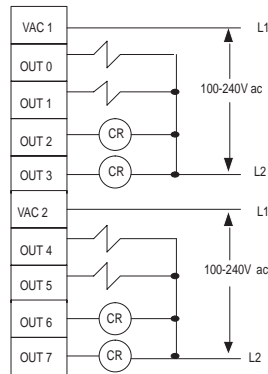


1746-OAP12

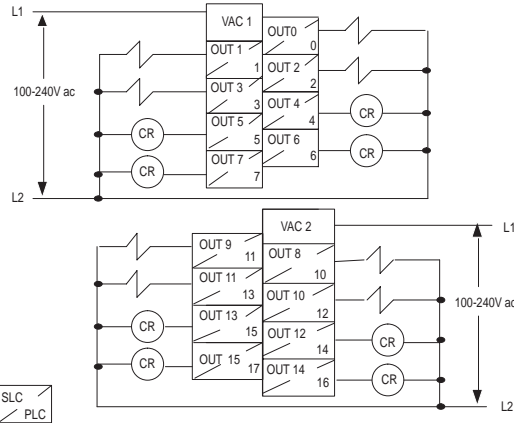


Wiring Diagrams

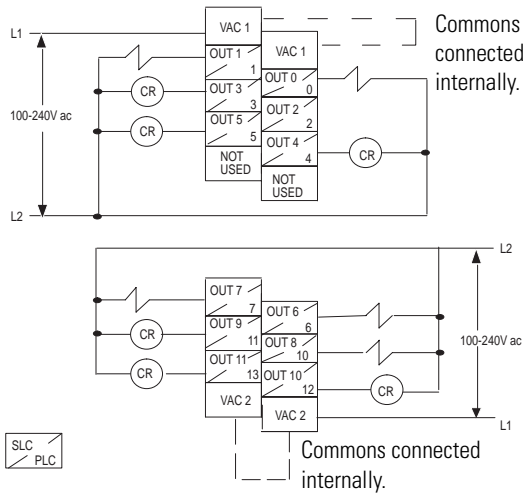
1746-OA8  
100-240V ac TRIAC OUTPUT



1746-OA16  
100-240V ac TRIAC OUTPUT



1746-OAP12  
100-240V ac HIGH CURRENT TRIAC OUTPUT



### Sinking DC Input Modules (1746-IB8, -IB16, -ITB16, -IB32)

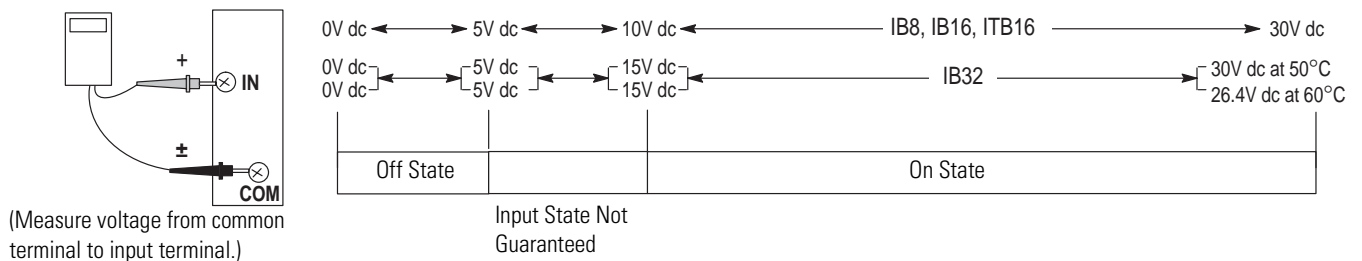
Specification	Catalog Number			
	1746-IB8	1746-IB16 (RTB)	1746-ITB16 (RTB) (Fast Response)	1746-IB32 <sup>(1)</sup>
<b>Voltage Category</b>	24V dc sink			
<b>Operating Voltage</b>	10 to 30V dc sink			15 to 30V dc at 50°C sink 15 to 26.4V dc at 60°C sink
<b>Number of Inputs</b>	8	16	16	32
<b>Points per Common</b>	8	16	16	8
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.050A	0.085A	0.050A
	<b>24V dc</b>	0.0A	0.0A	0.0A
<b>Signal Delay (max.)</b>	on = 8 ms off = 8 ms	on = 8 ms off = 8 ms	on = 0.3 ms <sup>(2)</sup> off = 0.5 ms	on = 3 ms off = 3 ms
<b>Off-State Voltage (max.)</b>	5V dc	5V dc	5V dc	5V dc
<b>Off-State Current (max.)</b>	1 mA	1 mA	1.5 mA	1.6 mA
<b>Nominal Input Current</b>	8 mA at 24V dc			

(1) Series A, B, and C 32-point input modules are fused to protect external wiring, one fuse per common. These fuses are non-replaceable and are rated at 2.5A. Series D 32-point input modules are not fused.

(2) Typical signal delay for these modules: on = 0.10 ms, off = 0.25 ms at 24V dc.

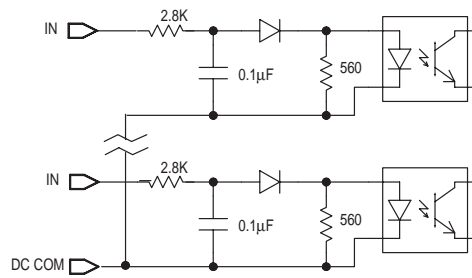
RTB = Removable Terminal Block.

#### On/Off-State Voltage Range

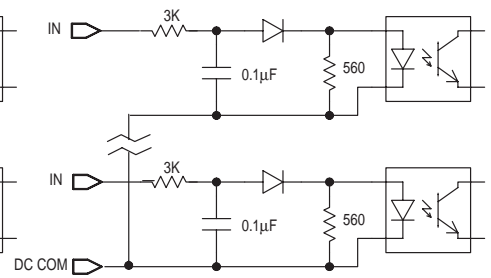


Circuit Diagrams

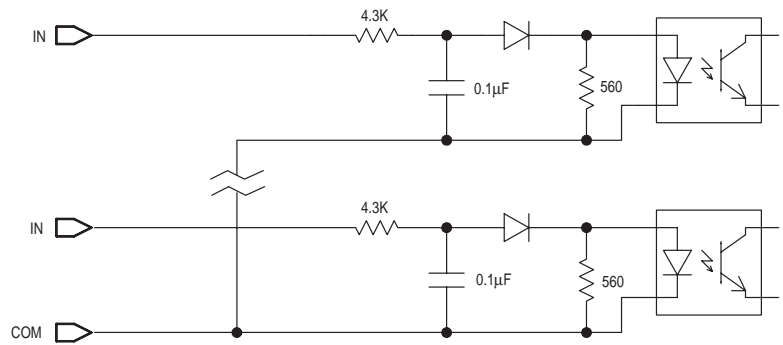
1746-ITB16



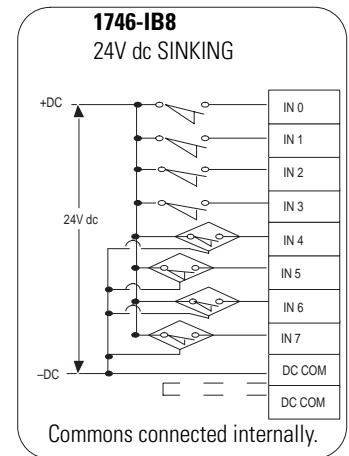
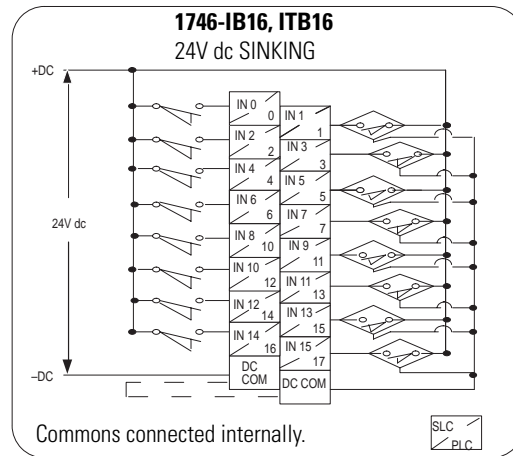
1746-IB8, IB16

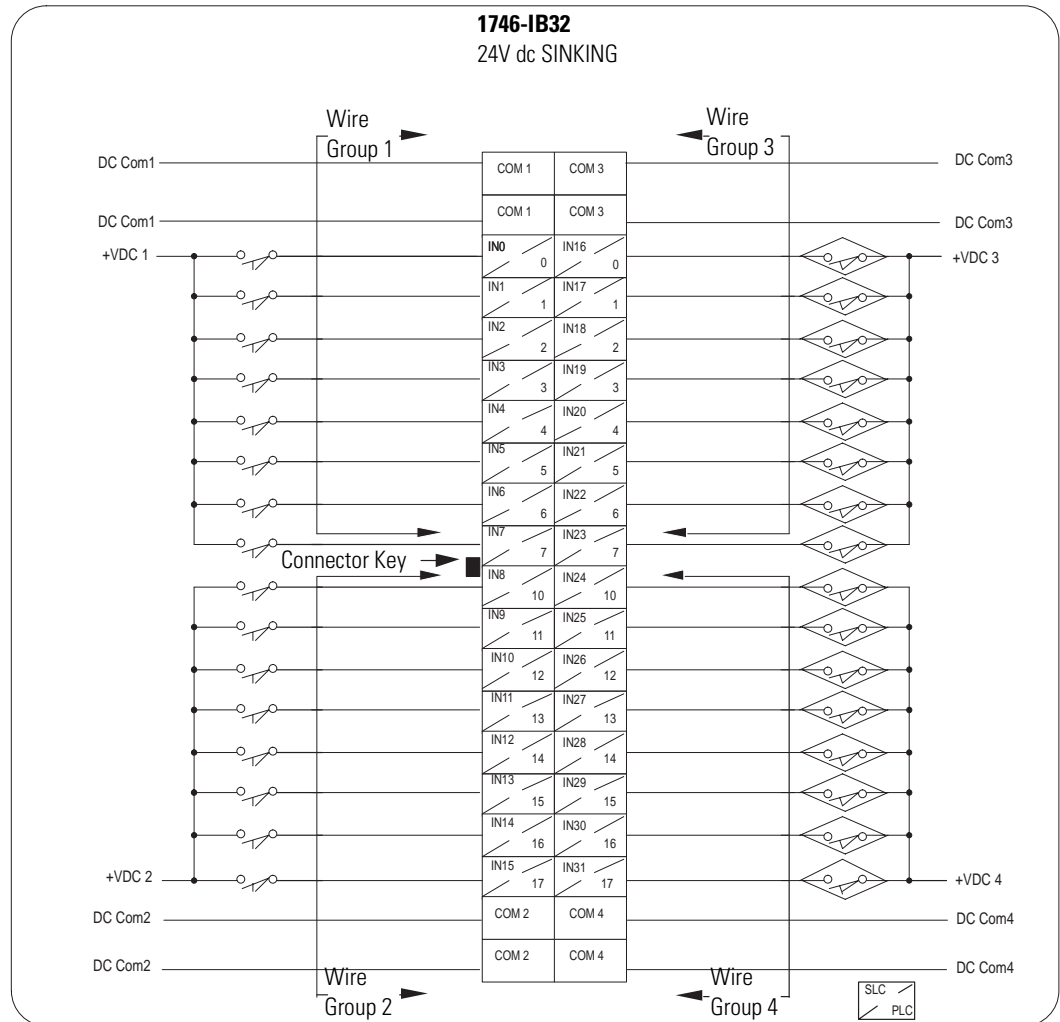


1746-IB32



Wiring Diagrams





**Important:** The dc com pins on the 1746-IB32 input module are isolated between the four groups and the two com pins in each group are connected internally. Use a 1492 terminal block to maintain group isolation provided by 32-point I/O modules. Consult 1492 documentation or your Allen-Bradley Sales Office for additional information.

The 1746 32-point modules include a keyed 40-pin female connector and crimp-type pins for connection to I/O wiring. In addition, 1492 prewired cables and interface modules can be used for connecting external I/O. (See pages 7 and 50.)

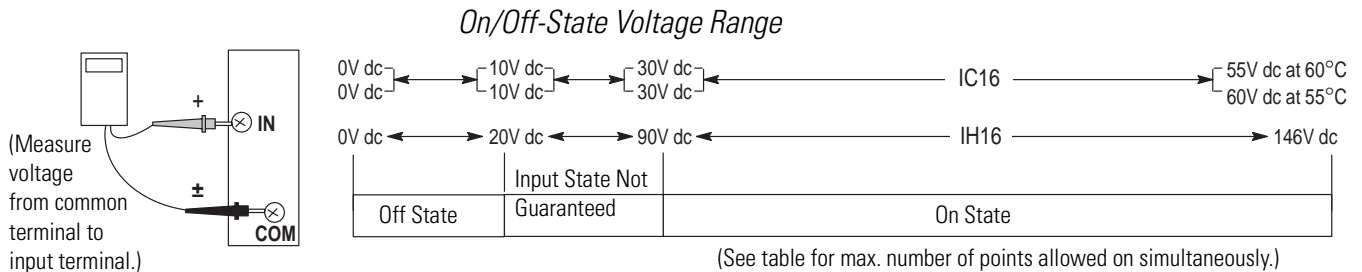
The maximum user cable length is dependent on how much voltage drop [current x (ohms/ft.) x (feet)] the user's system can tolerate. The user's system should take into account the minimum turn-on voltage required by external loads connected to the 32-point output modules and all of the voltage drops associated with wiring to and from the load, terminal blocks, power sources, and the module itself.

### Sinking DC Input Modules (1746-IC16, -IH16)

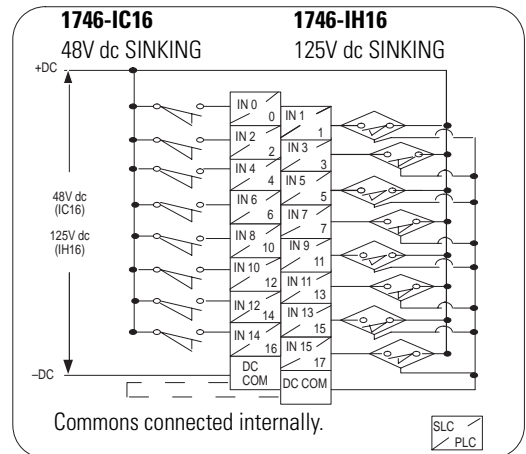
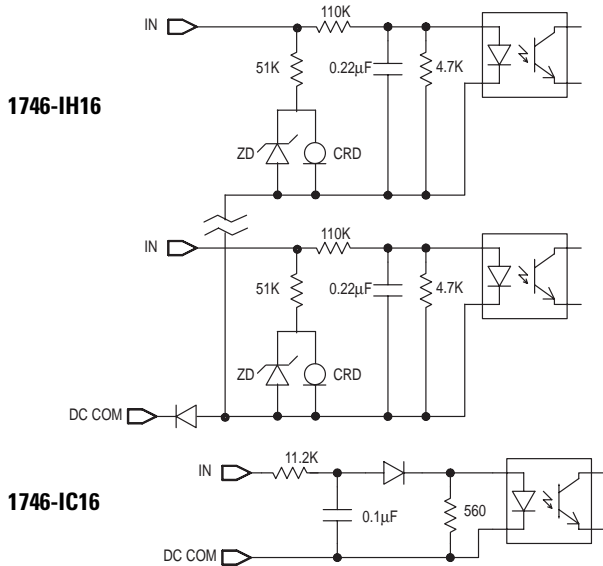
Specification	Catalog Number 1746-IC16 (RTB)	Catalog Number 1746-IH16 <sup>(1)</sup> (RTB)
<b>Voltage Category</b>	48V dc sink	125V dc sink
<b>Operating Voltage</b>	30 to 60V dc at 55°C sink 30 to 55V dc at 60°C sink	90 to 146V dc sink Max. Points on Simultaneously: 16 at 146V dc and 30°C 12 at 146V dc and 50°C 14 at 132V dc and 55°C 16 at 125V dc and 60°C
<b>Number of Inputs</b>	16	16
<b>Points per Common</b>	16	16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.085A
	<b>24V dc</b>	0.0A
<b>Signal Delay (max.)</b>	on = 4 ms / off = 4 ms	on = 9 ms / off = 9 ms
<b>Off-State Voltage (max.)</b>	10V dc	20V dc
<b>Off-State Current (max.)</b>	1.5 mA	0.8 mA
<b>Nominal Input Current</b>	4.1 mA at 48V dc	2.15 mA at 125V dc / 2.25 mA at 132V dc

(1) 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.

RTB = Removable Terminal Block.



### Circuit and Wiring Diagrams



### Sourcing DC Input Modules (1746-IV8, -IV16, -ITV16, -IV32)

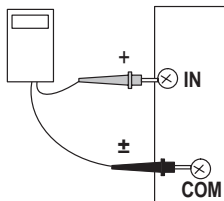
Specification	Catalog Number			
	1746-IV8	1746-IV16 (RTB)	1746-ITV16 (Fast Response) (RTB)	1746-IV32 <sup>(1)</sup>
<b>Voltage Category</b>	24V dc source			
<b>Operating Voltage</b>	10 to 30V dc source			15 to 30V dc at 50°C source 15 to 26.4V dc at 60°C source
<b>Number of Inputs</b>	8	16	16	32
<b>Points per Common</b>	8	16	16	8
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.050A	0.085A	0.085A
	<b>24V dc</b>	0.0A	0.0A	0.0A
<b>Signal Delay (max.)</b>	on = 8 ms / off = 8 ms		on = 0.3 ms / off = 0.5 ms <sup>(2)</sup>	on = 3 ms / off = 3 ms
<b>Off-State Voltage (max.)</b>	5.0V dc	5.0V dc	5.0V dc	5.0V dc
<b>Off-State Current (max.)</b>	1 mA	1 mA	1.5 mA	1.6 mA
<b>Nominal Input Current</b>	8 mA at 24V dc			

(1) Series A, B, and C 32-point input modules are fused to protect external wiring, one fuse per common. These fuses are non-replaceable and are rated at 2.5A. Series D 32-point input modules are not fused.

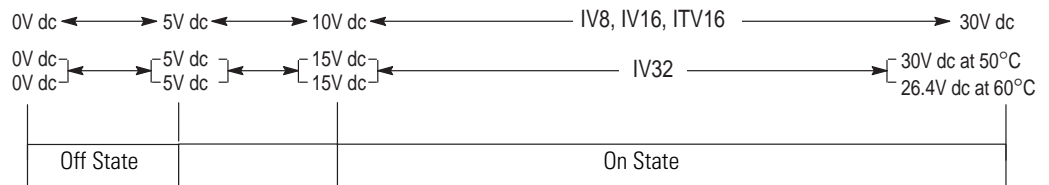
(2) Typical signal delay for these modules: on = 0.100 ms, off = 0.25 ms for 24V dc.

RTB = Removable Terminal Block.

#### On/Off-State Voltage Range



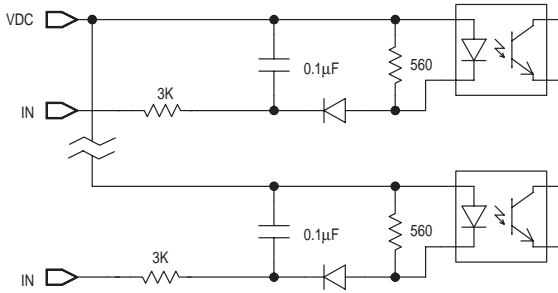
(Measure voltage from common terminal to input terminal.)



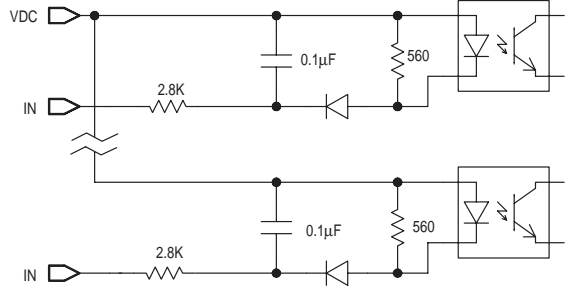
Input State Not Guaranteed

*Circuit Diagrams*

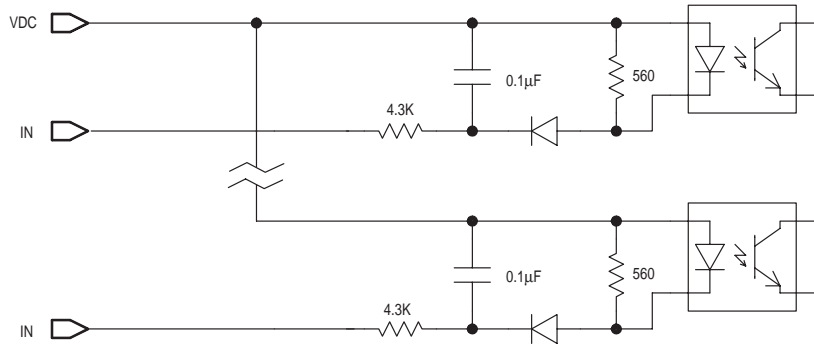
**1746-IV8, IV16**



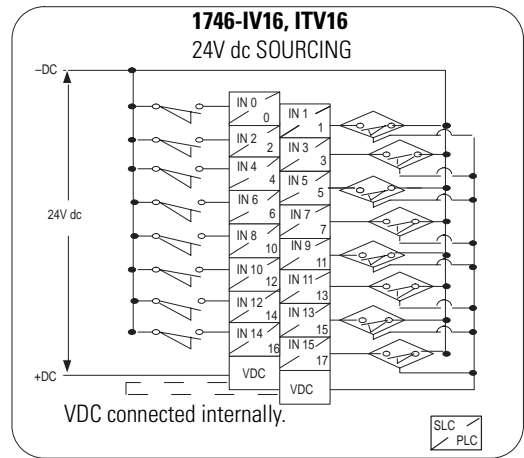
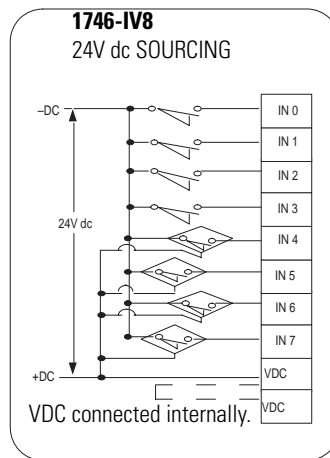
**1746-ITV16**

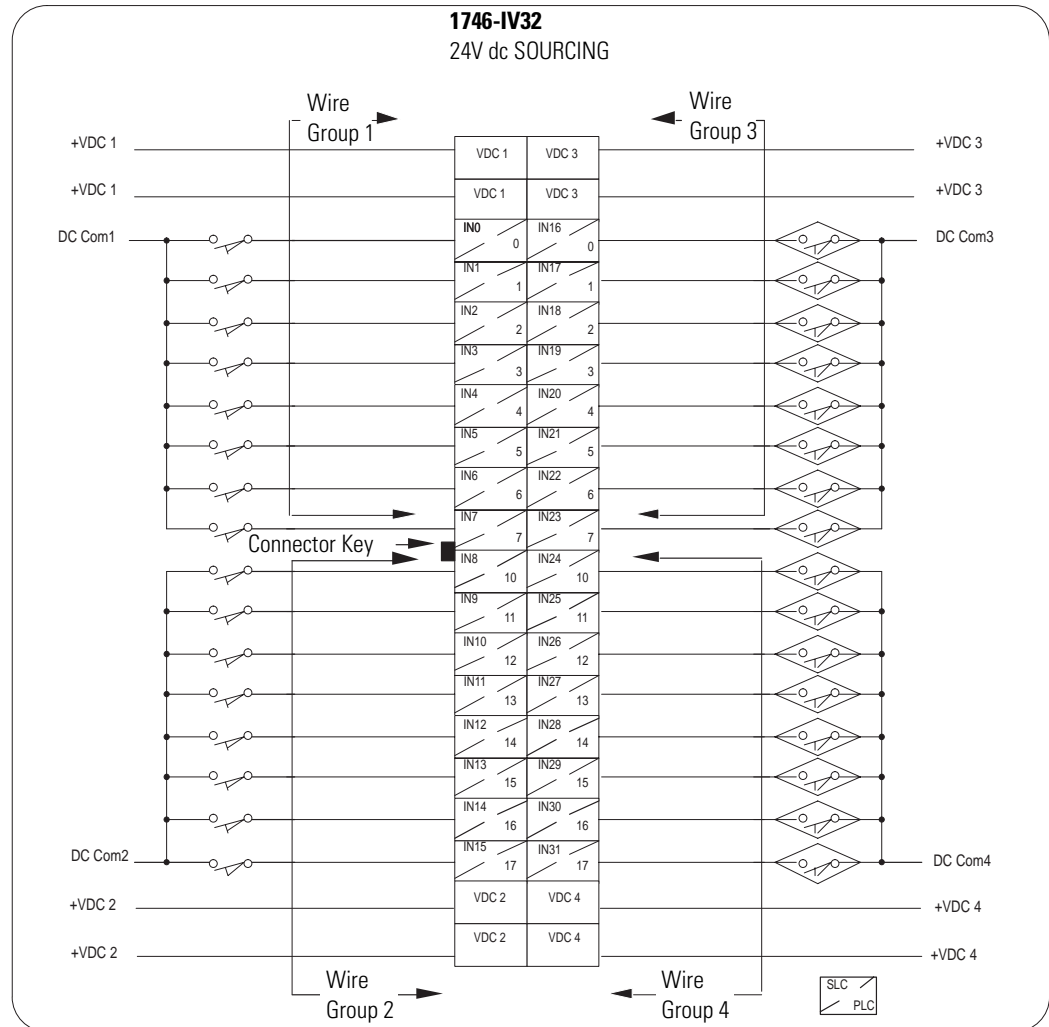


**1746-IV32**



*Wiring Diagrams*



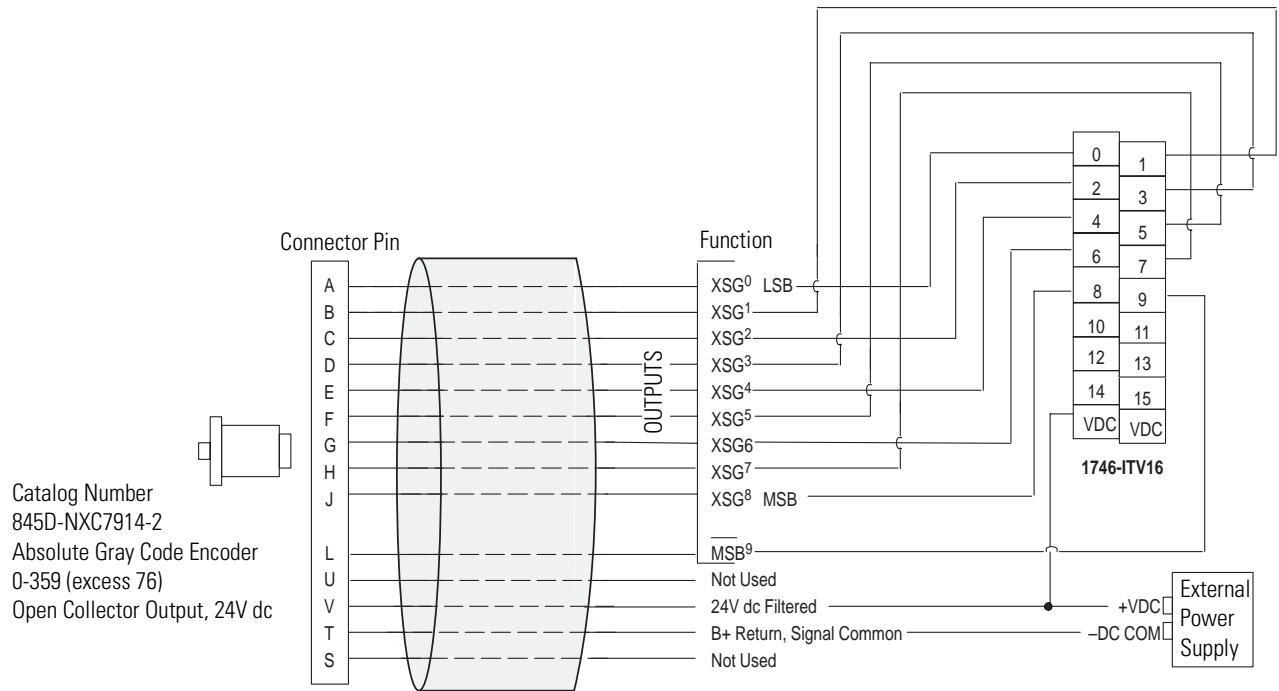


**Important:** The V dc pins on the 1746-IV32 input module are isolated between the four groups and the two V dc pins in each group are connected internally. Use a 1492 terminal block to maintain group isolation provided by 32-point I/O modules. Consult 1492 documentation or your Allen-Bradley Sales Office for additional information.

The 1746 32-point modules include a keyed 40-pin female connector and crimp-type pins for connection to I/O wiring. In addition, 1492 prewired cables and interface modules can be used for connecting external I/O. (See pages 7 and 50.)

The maximum user cable length is dependent on how much voltage drop [current x (ohms/ft.) x (feet)] the user's system can tolerate. The user's system should take into account the minimum turn-on voltage required by external loads connected to the 32-point output modules and all of the voltage drops associated with wiring to and from the load, terminal blocks, power sources, and the module itself.

845D Absolute Gray Code Encoder to 1746-ITV16



**Note:** Terminals 8 and 9 can be interchanged to select CW vs. CCW direction. Refer to your encoder installation manual for recommended cable type and length.

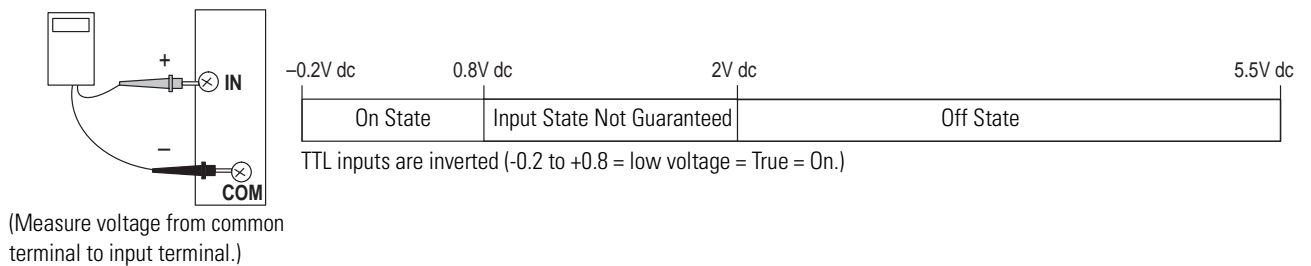
### Sourcing TTL Input Module (1746-IG16)

Specification		Catalog Number
		<b>1746-IG16 (RTB)</b>
<b>Voltage Category</b>		5V dc TTL source
<b>Operating Voltage</b>		4.5 to 5.5V dc source 50 mV peak-to-peak ripple max.
<b>Number of Inputs</b>		16
<b>Points per Common</b>		16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.140A
	<b>24V dc</b>	0.0A
<b>Signal Delay (max.)</b>		on = 0.25 ms off = 0.50 ms
<b>Off-State Voltage (max.)</b>		2.0V dc <sup>(1)</sup>
<b>Off-State Current (max.)</b>		4.1 mA
<b>Nominal Input Current</b>		3.7 mA at 5V dc

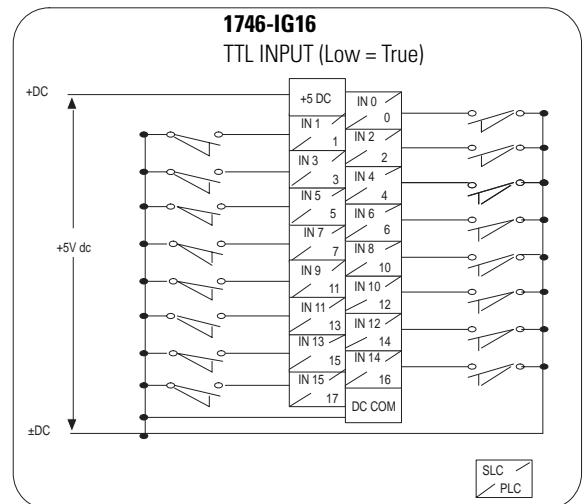
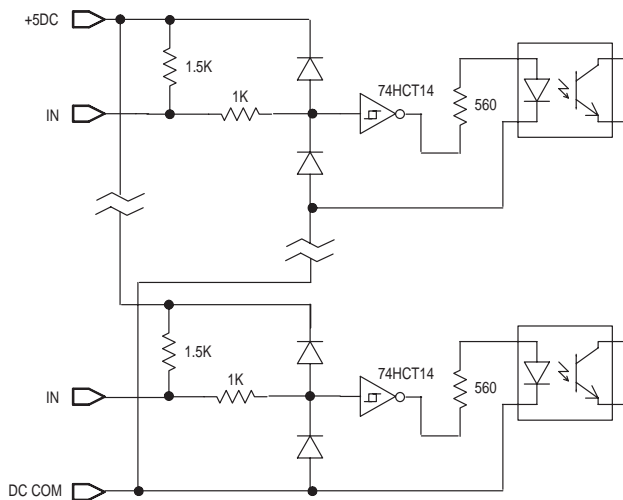
(1) TTL inputs are inverted (-0.2 to +0.8 = low voltage = True = on). Use a NOT instruction in your program to convert to traditional True = High logic.

RTB = Removable Terminal Block.

#### On/Off-State Voltage Range



#### Circuit and Wiring Diagrams



## Sourcing DC Output Modules (1746-OB8, -OB16, -OB32)

Specification	Catalog Number		
	1746-OB8	1746-OB16 (RTB)	1746-OB32 Series D <sup>(1)</sup>
<b>Voltage Category</b>	24V dc		
<b>Operating Voltage</b>	10 to 50V dc source		5 to 50V dc source
<b>Number of Outputs</b>	8	16	32
<b>Points per Common</b>	8	16	16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.135A	0.280A
	<b>24V dc</b>	0.0A	0.0A
<b>Signal Delay (max.) (Resistive Load)</b>	on = 0.1 ms off = 1.0 ms	on = 0.1 ms off = 1.0 ms	on = 0.1 ms off = 1.0 ms
<b>Off-State Leakage<sup>(2)</sup> (max.)</b>	1 mA		
<b>Load Current (min.)</b>	1 mA		
<b>Continuous Current (max.)</b>	<b>Per Point<sup>(3)</sup></b>	1A at 30°C 0.50A at 60°C	0.50A at 30°C 0.25A at 60°C
	<b>Per Module</b>	8A at 30°C 4A at 60°C	8A at 30°C 4A at 60°C
<b>On-State Voltage Drop (max.)</b>	1.2V at 1.0A	1.2V at 0.5A	1.2V at 0.5A
<b>Surge Current<sup>(5)</sup> (max.)</b>	3A for 10 ms	3A for 10 ms	1A for 10 ms

(1) Series A, B, and C 32-point output modules are fused to protect external wiring, one fuse per common. These fuses are non-replaceable and are rated at 2.5A. Series D modules are not fused and have a higher current rating than Series A, B, and C.

(2) To limit the effects of leakage current, a loading resistor can be connected in parallel with your load. For 24V dc operation use a 5.6k ohm, ½W resistor.

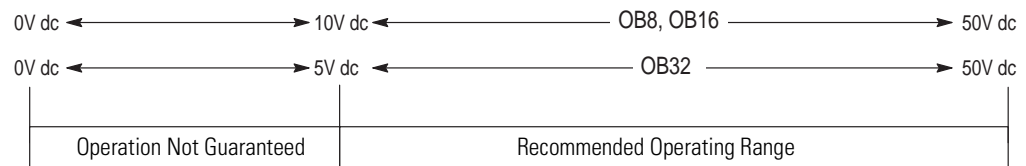
(3) Recommended surge suppression for switching 24V dc inductive loads is a 1N4004 diode that is reverse wired across the load. See page 6 for more information on surge suppression.

(4) To attain the maximum Continuous Current per common rating of 4A for an OB32 Series D module, both V dc connections in a wire group must be connected to your DC source.

(5) Repeatability is once every second at 30°C. Repeatability is once every 2 seconds at 60°C.

RTB = Removable Terminal Block.

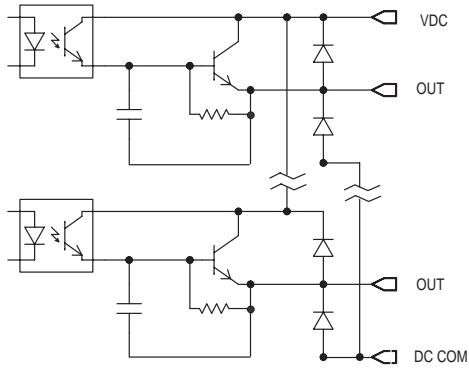
### Operating Voltage Range



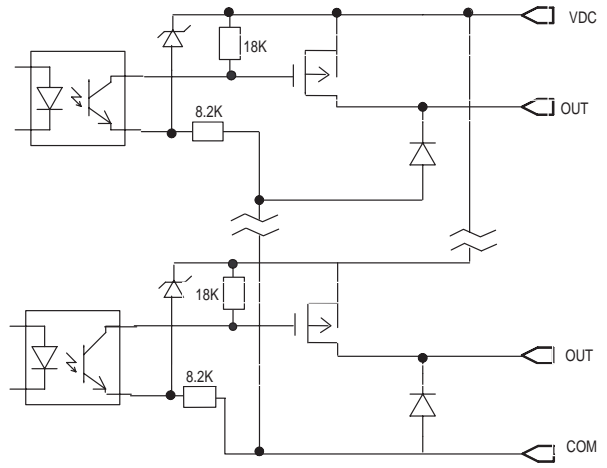
(Voltage is applied between +VDC and DC common.)

*Circuit Diagrams*

**1746-OB8, OB16**

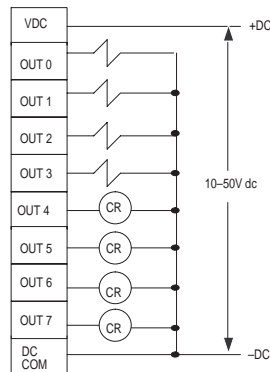


**1746-OB32**

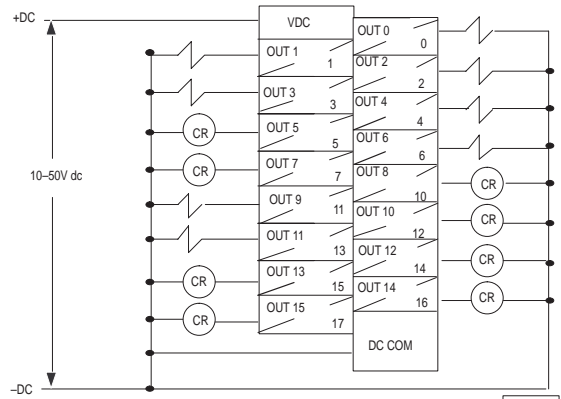


*Wiring Diagrams*

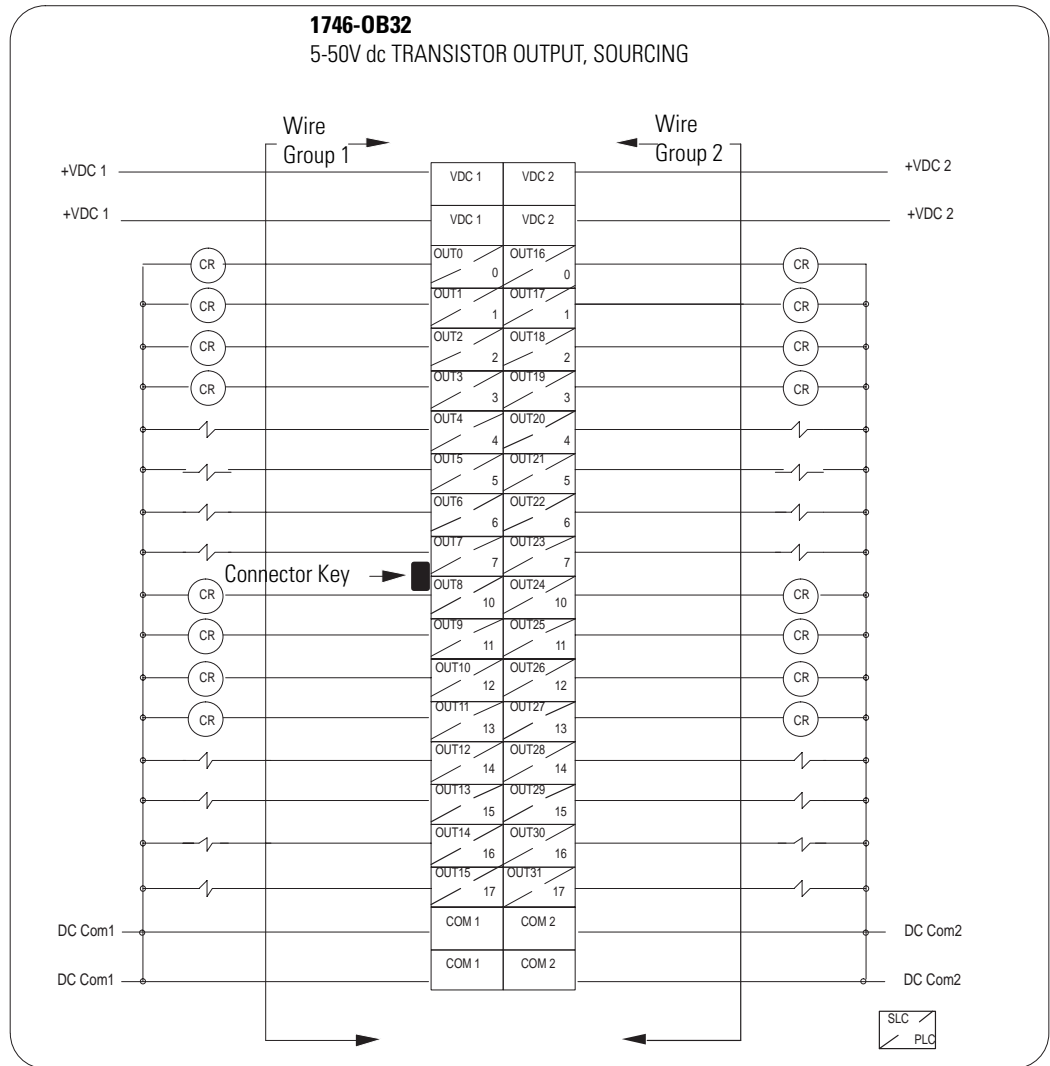
**1746-OB8**  
10-50V dc TRANSISTOR OUTPUT  
SOURCING



**1746-OB16**  
10-50V dc TRANSISTOR OUTPUT, SOURCING



SLC / PLC



**Important:** The V dc and dc Com pins on the 1746-OB32 output module are isolated between the two groups and the two dc Com pins in each group are connected internally. Both V dc pins on the 1746-OB32 must be connected to the dc power source if current for a common group is expected to exceed 2 Amps. Use a 1492 terminal block to maintain group isolation provided by 32-point I/O modules. Consult 1492 documentation or your Allen-Bradley Sales Office for additional information.

The 1746 32-point modules include a keyed 40-pin female connector and crimp-type pins for connection to I/O wiring. In addition, 1492 prewired cables and interface modules can be used for connecting external I/O. (See pages 7 and 50.)

The maximum user cable length is dependent on how much voltage drop [current x (ohms/ft.) x (feet)] the user's system can tolerate. The user's system should take into account the minimum turn-on voltage required by external loads connected to the 32-point output modules and all of the voltage drops associated with wiring to and from the load, terminal blocks, power sources, and the module itself.

## Electronically Protected Sourcing DC Output Modules (1746-OB6EI, -OB16E, -OB32E)

Specification		Catalog Number		
		1746-OB6EI (RTB)	1746-OB16E (RTB)	1746-OB32E
Voltage Category		24V dc		
Operating Voltage		10 to 30V dc source		
Number of Outputs		6	16	32
Points per Common		Individually Isolated	16	16
Backplane Current Draw	5V dc	0.046A	0.135A	0.190A
	24V dc	0.0A	0.0A	0.0A
Signal Delay (max.) (Resistive Load) <sup>(1)</sup>		on = 1.0 ms off = 2.0 ms	on = 1.0 ms off = 1.0 ms	on = 1.0 ms off = 2.0 ms
Off-State Leakage <sup>(2)</sup> (max.)		1 mA		
Load Current (min.)		1 mA		
Continuous Current (max.)	Per Point	2.0A at 0 to 60°C	1.00A at 30°C 0.50A at 60°C	0.50A at 30°C 0.25A at 60°C
	Per Module	12.0A at 0 to 60°C	8A at 0 to 60°C	8A at 0 to 60°C 4A at 0 to 60°C per common <sup>(3)</sup> 2A at 0 to 60°C per common pin
On-State Voltage Drop (max.)		1.0V at 2A	1.0V at 0.5A	1.2V at 0.5A
Surge Current <sup>(4)</sup> (max.)	Per Point	4.0A for 10 ms	2A for 10 ms	1.0A for 10 ms
	Per Module	24.0A for 10 ms	32A for 10 ms	32A for 10 ms
Electronic Protection		yes - See page 10 for more information on the electronically protected modules.		

(1) Fast turn-off modules (1746-OB6EI, -OBP8 Series B and later, -OB16E Series B and later, -OBP16, and -OVP16) provide fast OFF delay for inductive loads. Fast turn-off delay for inductive loads is accomplished with surge suppressors on this module. 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. Comparative OFF delay times for 1746-OB8/-OV8 and fast turn-off modules, when switching Bulletin 100-B110 (24W sealed) contactor, are: 1746-OB8/-OV8 OFF delay = 152 ms; fast turn-off modules OFF delay = 47 ms.

(2) To limit the effects of leakage current, a loading resistor can be connected in parallel with your load. For 24V dc operation use a 5.6k ohm, ½W resistor.

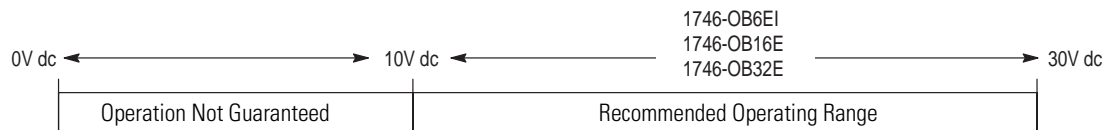
(3) To attain the maximum Continuous Current per common rating of 4A for an OB32 Series D module, both V dc connections in a wire group must be connected to your DC source.

(4) Repeatability is once every second at 30°C. Repeatability in once every 2 seconds at 60°C.

RTB = Removable Terminal Block.

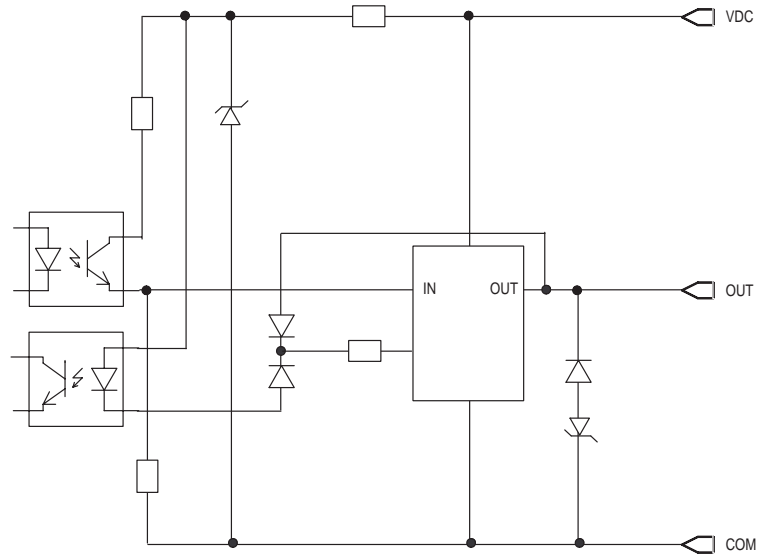
### Operating Voltage Range

(Voltage is applied between +VDC and DC common.)

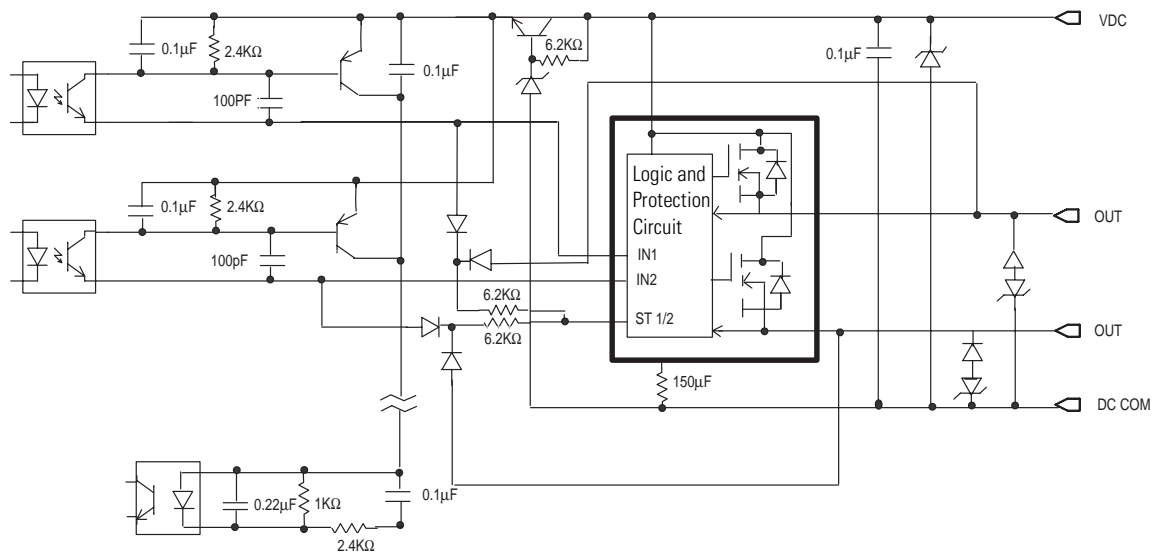


*Circuit Diagrams*

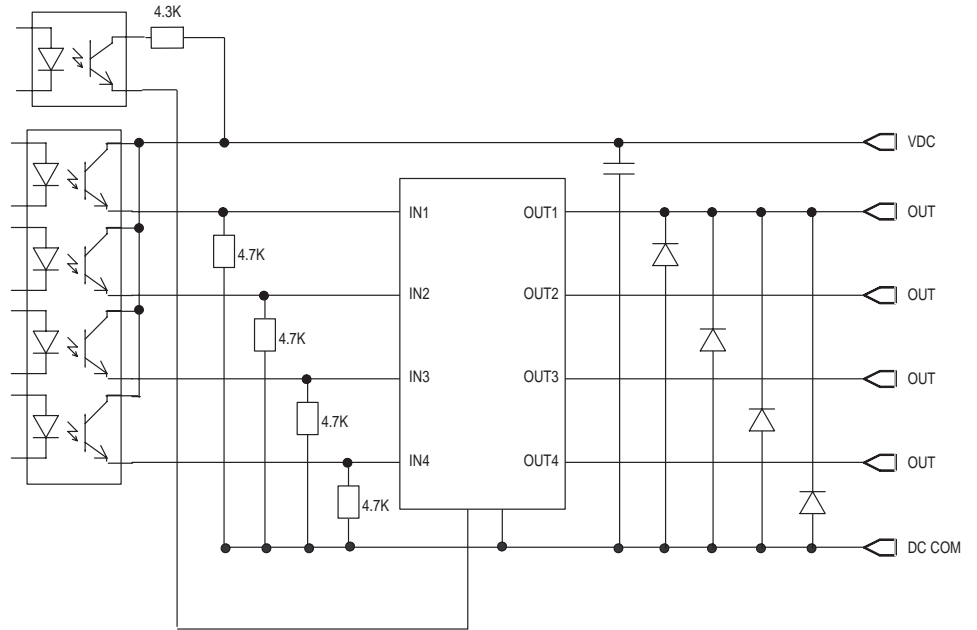
**1746-OB6EI**



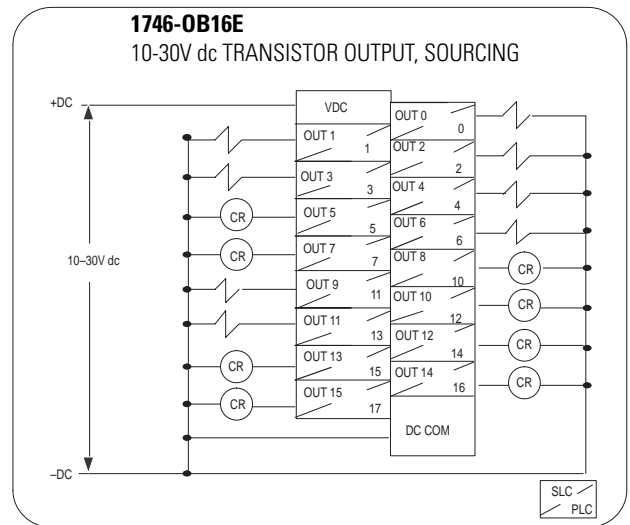
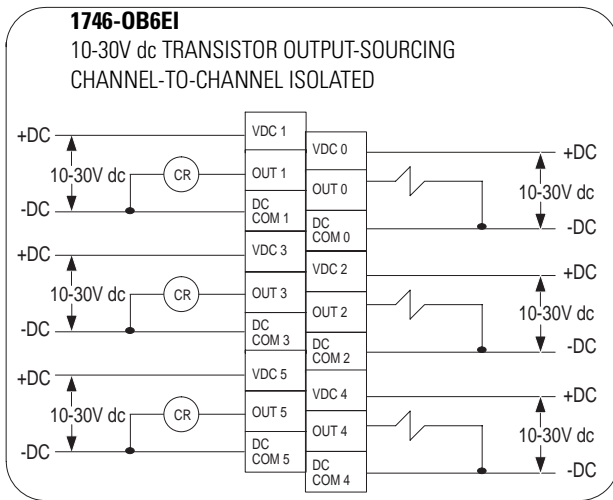
**1746-OB16E**

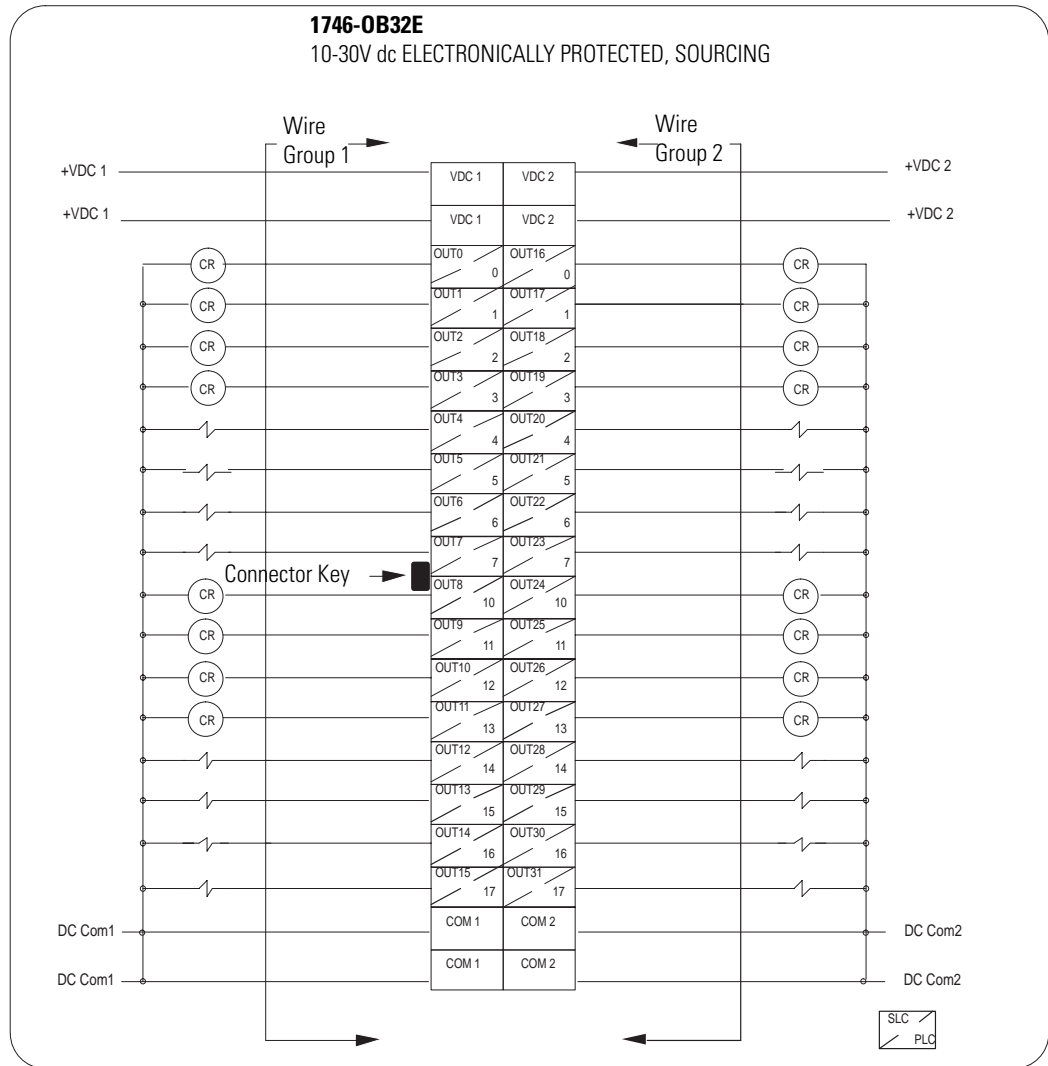


**1746-OB32E**



*Wiring Diagrams*





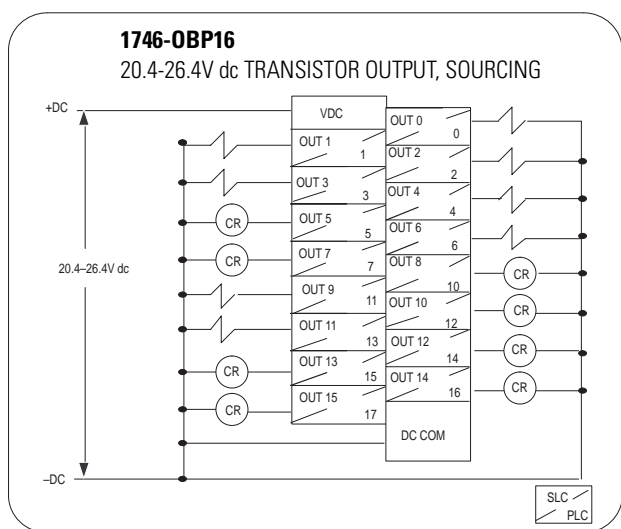
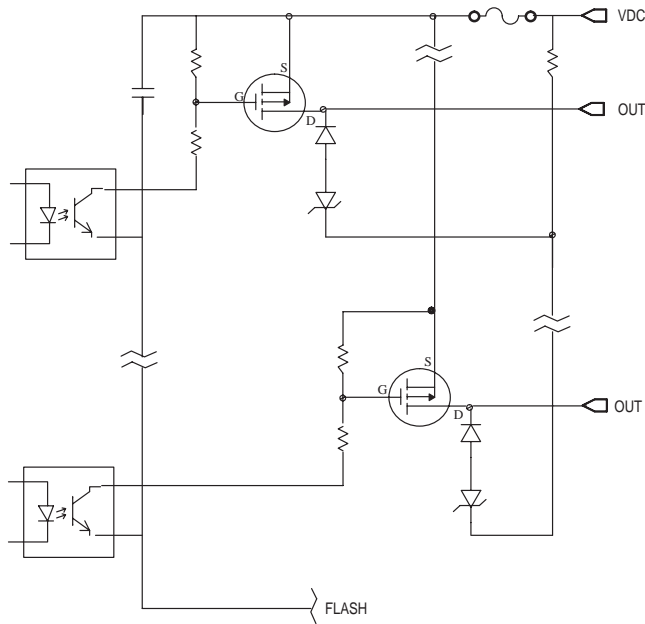
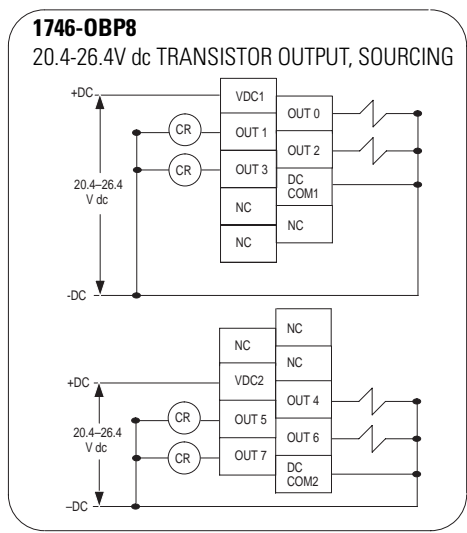
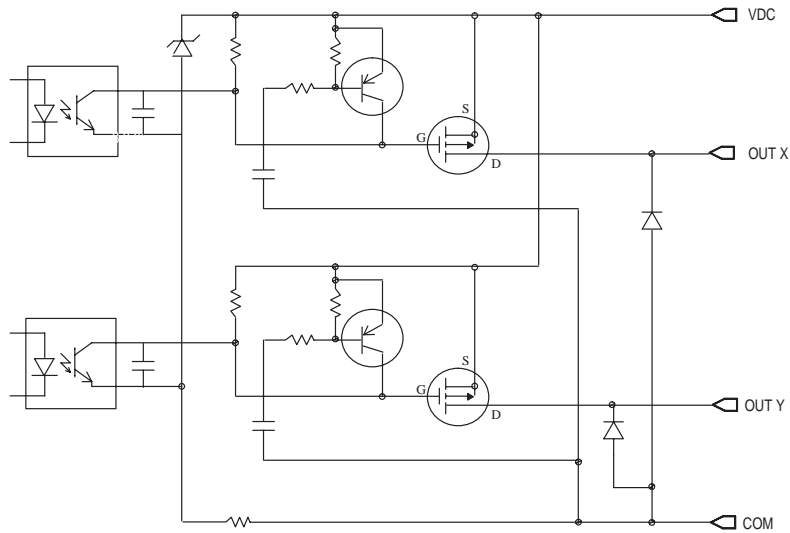
**Important:** The V dc and dc Com pins on the 1746-OB32E output module are isolated between the two groups and the two dc Com pins in each group are connected internally. Both V dc pins on the 1746-OB32E must be connected to the dc power source if current for a common group is expected to exceed 2 Amps. Use a 1492 terminal block to maintain group isolation provided by 32-point I/O modules. Consult 1492 documentation or your Allen-Bradley Sales Office for additional information.

The 1746 32-point modules include a keyed 40-pin female connector and crimp-type pins for connection to I/O wiring. In addition, 1492 prewired cables and interface modules can be used for connecting external I/O. (See pages 7 and 50.)

The maximum user cable length is dependent on how much voltage drop [current x (ohms/ft.) x (feet)] the user's system can tolerate. The user's system should take into account the minimum turn-on voltage required by external loads connected to the 32-point output modules and all of the voltage drops associated with wiring to and from the load, terminal blocks, power sources, and the module itself.



Circuit and Wiring Diagrams



## Sinking DC Output Modules (1746-OV8, -OV16, -OV32)

Specification		Catalog Number		
		1746-OV8	1746-OV16 (RTB)	1746-OV32 Series D <sup>(1)</sup>
Voltage Category		24V dc		
Operating Voltage		10 to 50V dc sink		5 to 50V dc sink
Number of Outputs		8	16	32
Points per Common		8	16	16
Backplane Current Draw	5V dc	0.135A	0.270A	0.190A
	24V dc	0.0A	0.0A	0.0A
Signal Delay (max.) (Resistive Load)		on = 0.1 ms / off = 1.0 ms		
Off-State Leakage <sup>(2)</sup> (max.)		1 mA		
Load Current (min.)		1 mA		
Continuous Current <sup>(3)</sup> (max.)	Per Point <sup>(4)</sup>	1A at 30°C 0.5A at 60°C	0.5A at 30°C 0.25A at 60°C	0.5A at 30°C 0.25A at 60°C
	Per Module	8A at 30°C 4A at 60°C	8A at 30°C 4A at 60°C	8.0A at 0°C to 60°C 4A at 0 to 60°C per common <sup>(5)</sup> 2A at 0 to 60°C per common pin
On-State Voltage Drop (max.)		1.2V at 1A	1.2V at 0.5A	1.2V at 0.5A
Surge Current Per Point <sup>(6)</sup> (max.)		3A for 10 ms	3A for 10 ms	1A for 10 ms

(1) Series A, B, and C 32-point output modules are fused to protect external wiring, one fuse per common. These fuses are non-replaceable and are rated at 2.5A. Series D modules are not fused and have a higher current rating than Series A, B, and C.

(2) To limit the effects of leakage current, a loading resistor can be connected in parallel with your load. For 24V dc operation use a 5.6k ohm, ½W resistor.

(3) To attain the maximum Continuous Current per common of 4A for an OV32 Series D module, both dc com connections in a wire group must be connected to your DC source.

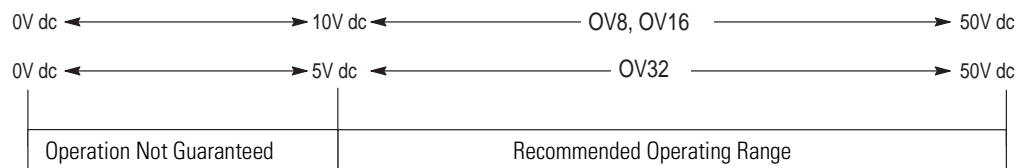
(4) Recommended surge suppression for switching 24V dc inductive loads is a 1N4004 diode that is reverse wired across the load. See page 6 for more information on surge suppression.

(5) To attain the maximum Continuous Current per common rating of 4A for an OV32 Series D module, both V dc connections in a wire group must be connected to your DC source.

(6) Repeatability is once every 1 second at 30°C. Repeatability is once every 2 seconds at 60°C.

RTB = Removable Terminal Block.

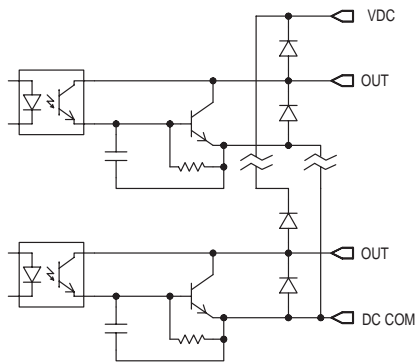
### Operating Voltage Range



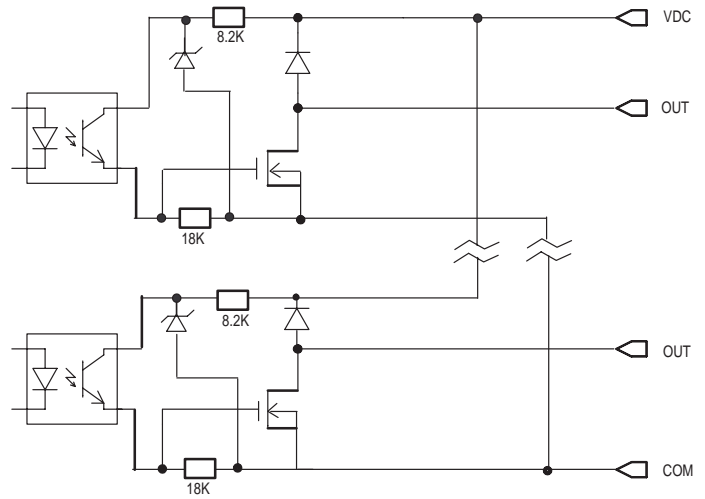
(Voltage is applied between +VDC and DC common.)

*Circuit Diagrams*

**1746-0V8, 0V16**



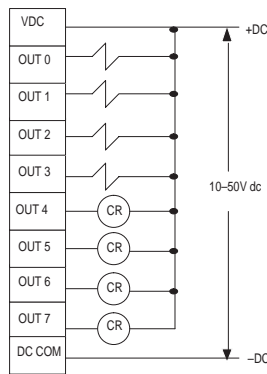
**1746-0V32**



*Wiring Diagrams*

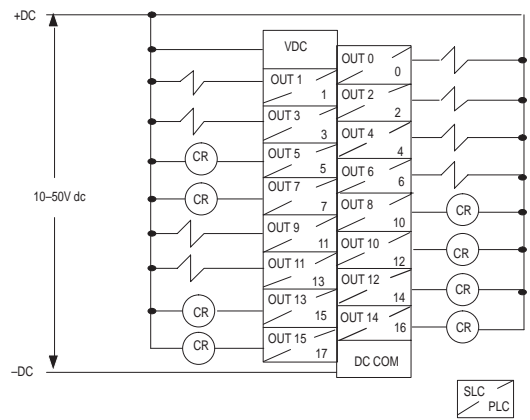
**1746-0V8**

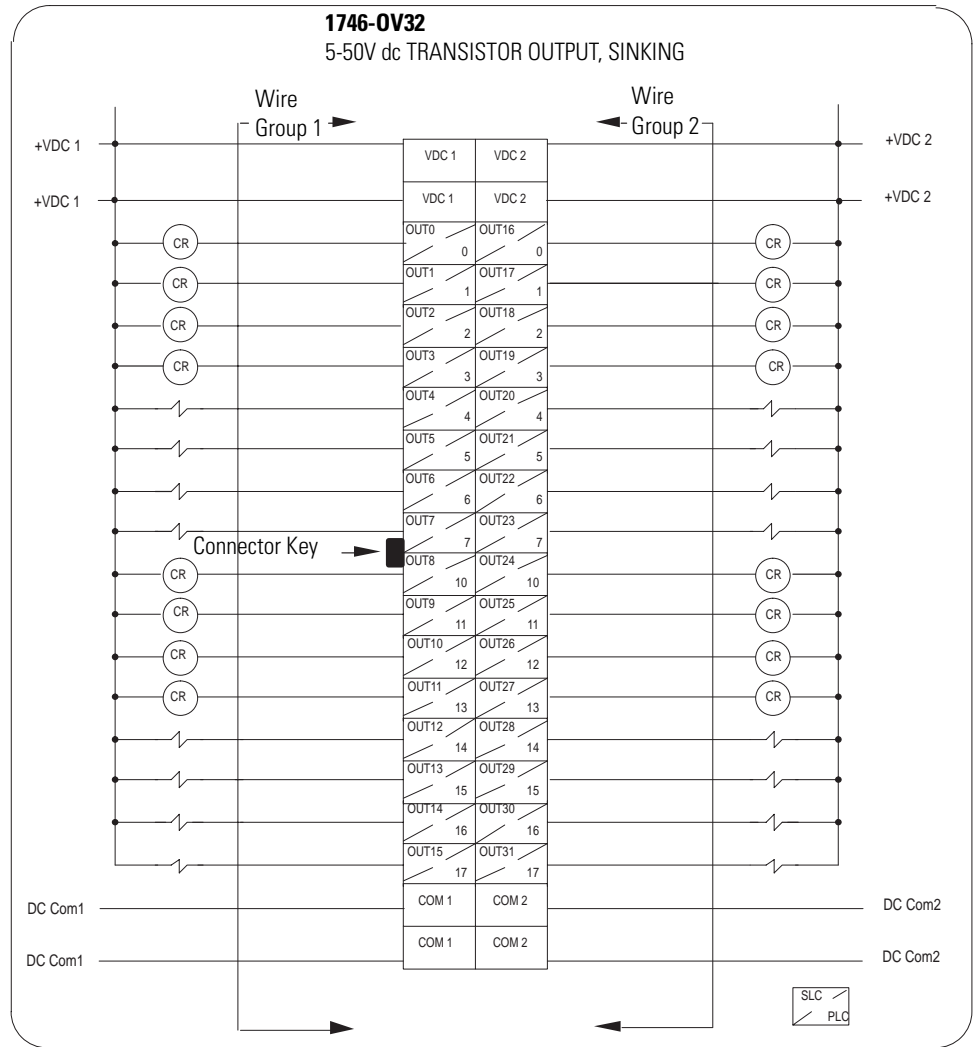
10-50V dc TRANSISTOR OUTPUT  
SINKING



**1746-0V16**

10-50V dc TRANSISTOR OUTPUT, SINKING





**Important:** The V dc and dc Com pins on the 1746-OV32 output module are isolated between the two groups and the two V dc and two dc Com pins in each group are connected internally. Both dc com pins on the 1746-OV32 must be connected to the dc power source if current for a common group is expected to exceed 2 Amps. Use a 1492 terminal block to maintain group isolation provided by 32-point I/O modules. Consult 1492 documentation or your Allen-Bradley Sales Office for additional information.

The 1746 32-point modules include a keyed 40-pin female connector and crimp-type pins for connection to I/O wiring. In addition, 1492 prewired cables and interface modules can be used for connecting external I/O. (See pages 7 and 50.)

The maximum user cable length is dependent on how much voltage drop [current x (ohms/ft.) x (feet)] the user's system can tolerate. The user's system should take into account the minimum turn-on voltage required by external loads connected to the 32-point output modules and all of the voltage drops associated with wiring to and from the load, terminal blocks, power sources, and the module itself.

### High Current Sinking DC Output Module (1746-OVP16)

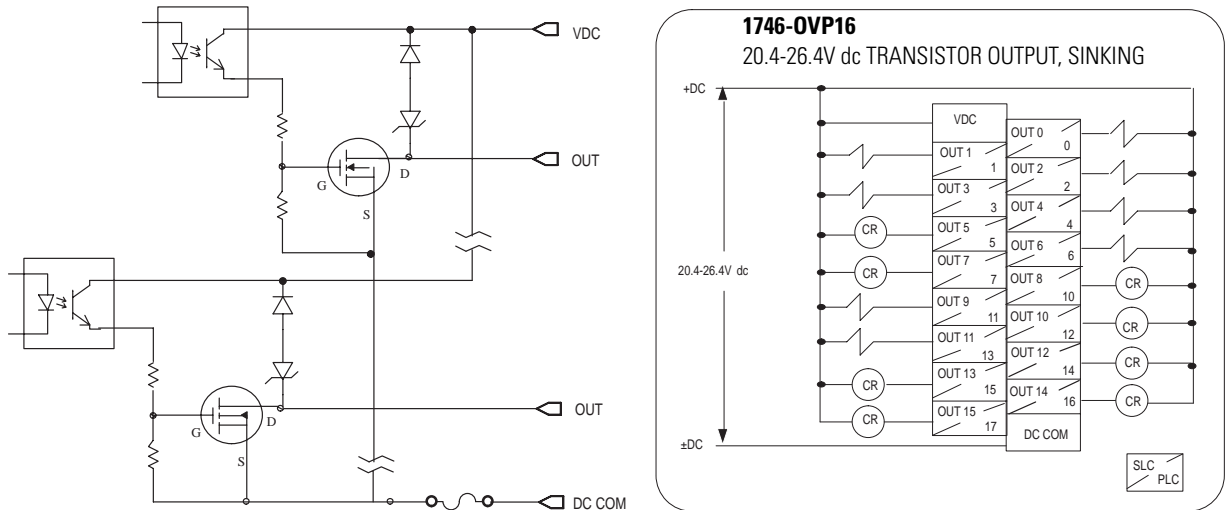
Specification		Catalog Number
		<b>1746-OVP16</b> <sup>(1)</sup> <sup>(2)</sup> (RTB)
<b>Voltage Category</b>		24V dc
<b>Operating Voltage</b>		20.4 to 26.4V dc sink
<b>Number of Outputs</b>		16
<b>Points per Common</b>		16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.25A
	<b>24V dc</b>	0.0A
<b>Signal Delay (max.) (Resistive Load)</b>		on = 0.1 ms / off = 1 ms
<b>Off-State Leakage<sup>(3)</sup> (max.)</b>		1 mA
<b>Load Current (min.)</b>		1 mA
<b>Continuous Current (max.)</b>	<b>Per Point</b>	1.5A at 30°C / 1A at 60°C
	<b>Per Module</b>	6.4A at 0°C to 60°C
<b>On-State Voltage Drop (max.)</b>		1V at 1A
<b>Surge Current<sup>(4)</sup> (max.)</b>	<b>Per Point</b>	4A for 10 ms
	<b>Per Module</b>	32A for 10 ms

- (1) A fused common and blown fuse LED are provided on this module.
  - (2) Fast turn-off modules (1746-OB6EI, -OBP8 Series B and later, -OB16E Series B and later, -OBP16, and -OVP16) provide fast OFF delay for inductive loads. Fast turn-off delay for inductive loads is accomplished with surge suppressors on this module. 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. Comparative OFF delay times for 1746-OB8/-OV8 and fast turn-off modules, when switching Bulletin 100-B110 (24W sealed) contactor, are: 1746-OB8/-OV8 OFF delay = 152 ms; fast turn-off modules OFF delay = 47 ms.
  - (3) To limit the effects of leakage current, a loading resistor can be connected in parallel with your load. For 24V dc operation use a 5.6k ohm, ½W resistor.
  - (4) Repeatability is once every 1 second at 30°C. Repeatability is once every 2 seconds at 60°C.
- RTB = Removable Terminal Block.

#### Operating Voltage Range



#### Circuit and Wiring Diagrams



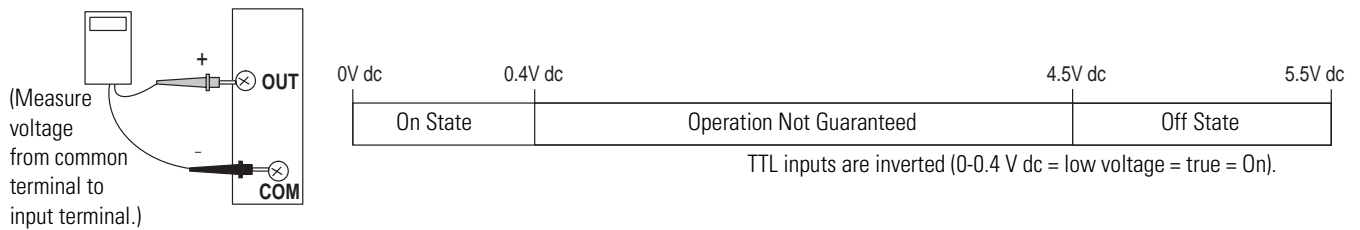
### Sinking TTL Output Module (1746-0G16)

Specification		Catalog Number
		<b>1746-0G16 (RTB)</b>
<b>Voltage Category</b>		5V dc TTL <sup>(1)</sup>
<b>Operating Voltage Range</b>		4.5 to 5.5V dc 50 mV peak-to-peak ripple maximum 495 mA maximum at 5V dc
<b>Number of Outputs</b>		16
<b>Points per Common</b>		16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.180A
	<b>24V dc</b>	0.0A
<b>Signal Delay (max.) (Resistive Load)</b>		on = 0.25 ms / off = 0.5 ms
<b>Off-State Leakage (max.)</b>		0.1 mA
<b>Load Current (min.)</b>		0.15 mA
<b>Continuous Current (max.)</b>		24 mA

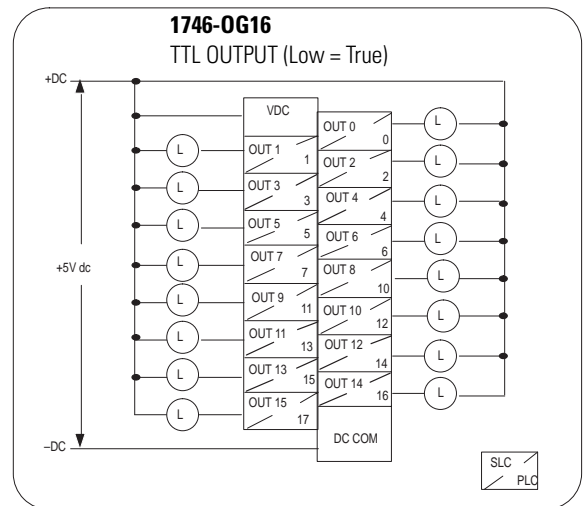
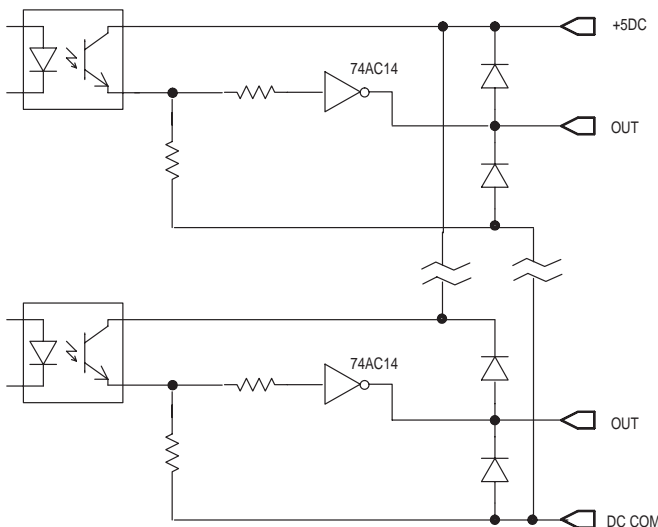
(1) TTL outputs are inverted (0-0.4V dc = low voltage = True = On). Use a NOT instruction in your ladder program to convert to traditional True = High logic.

RTB = Removable Terminal Block.

#### On/Off-State Voltage Range



#### Circuit and Wiring Diagrams



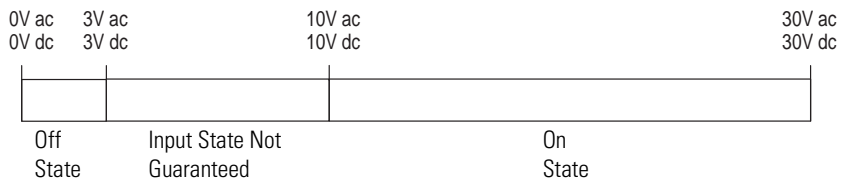
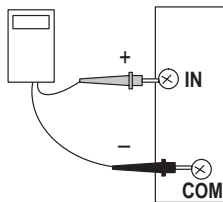
### AC/DC Input Module (1746-IN16)

Specification		Catalog Number
		<b>1746-IN16 (RTB)</b>
<b>Voltage Category</b>		24V ac/dc
<b>Operating Voltage</b>		10 to 30V dc sink 10 to 30V ac at 47 to 63 Hz
<b>Number of Inputs</b>		16
<b>Points per Common</b>		16
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.085A
	<b>24V dc</b>	0.0A
<b>Signal Delay (max.)</b>		dc: on = 15 ms / off = 15 ms ac: on = 25 ms / off = 25 ms
<b>Off-State Voltage (max.)</b>		3V dc 3V ac
<b>Off-State Current (max.)</b>		1 mA dc 1 mA ac
<b>Nominal Input Current</b>		8 mA at 24V dc 8 mA at 24V ac
<b>Inrush Current (max.)</b>		0.02A (ac only)

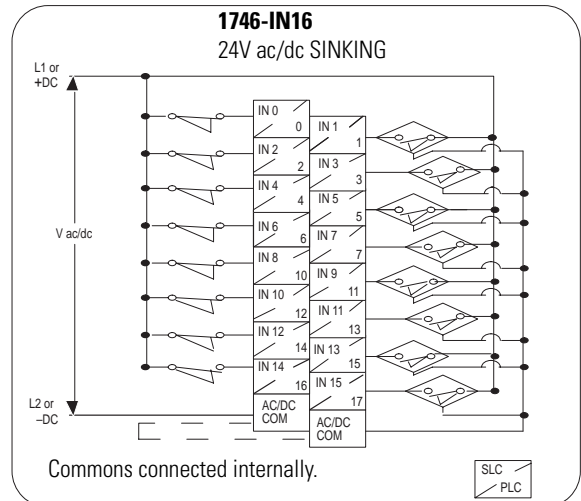
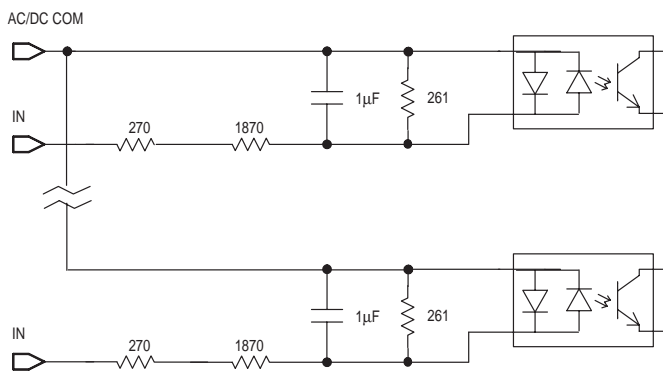
RTB = Removable Terminal Block.

#### On/Off-State Voltage Range

(Measure voltage from common terminal to input terminal.)



#### Circuit and Wiring Diagrams



### AC/DC Relay Output Modules (1746-OW4, -OW8, -OW16, -OX8)

Specification		Catalog Number			
		1746-OW4	1746-OW8	1746-OW16 (RTB)	1746-OX8 (RTB)
Voltage Category		ac/dc Relay			
Operating Voltage		5 to 265V ac at 47 to 63 Hz / 5 to 125V dc			
Number of Outputs		4	8	16	8
Points per Common		4	4	8	Individually Isolated
Backplane Current Draw	5V dc	0.045A	0.085A	0.170A	0.085A
	24V dc	0.045A	0.090A	0.180A	0.090A
Signal Delay (max.) (Resistive Load)		on = 10 ms / off = 10 ms			
Off-State Leakage (max.)		0 mA			
Load Current (min.)		10 mA at 5V dc			
Continuous Current per Point <sup>(1)</sup> (max.)		See the <i>Relay Contact Ratings</i> tables shown below.			
Continuous Current per Module (max.)		8.0A ac	16.0A ac	16.0A ac	(2)
Current per Common (max.)		8.0A	8.0A	8.0A	

#### Relay Contact Ratings for 1746-OW4, OW8, and OW16

Maximum Volts		Amperes <sup>(1)</sup>		Amperes Continuous <sup>(2)</sup>	Volt-Amperes	
		Make	Break		Make	Break
ac	240V ac	7.5A	0.75A	2.5A	1800 VA	180 VA
	120V ac	15A	1.5A			
dc	125V dc	0.22A <sup>(3)</sup>		1.0A	28 VA	
	24V dc	1.2A <sup>(3)</sup>		2.0A		

#### Relay Contact Ratings for 1746-OX8

Maximum Volts		Amperes <sup>(1)</sup>		Amperes Continuous <sup>(2)</sup>	Volt-Amperes	
		Make	Break		Make	Break
ac	240V ac	15A	1.5A	5.0A	3600 VA	360 VA
	120V ac	30A	3.0A			
dc	125V dc	0.22A <sup>(3)</sup>		1.0A	28 VA	
	24V dc	1.2A <sup>(3)</sup>		2.0A		

(1) Connecting surge suppressors across your external load extends the life of SLC 500 relay contacts. For recommended surge suppressors when switching ac inductive loads, consult the *SLC 500 Modular Hardware Style Installation and Operation User Manual* (Publication 1746-6.2) or the *SLC 500 Fixed Hardware Style Installation and Operation User Manual* (Publication 1747-6.21). Recommended surge suppression for switching 24V dc inductive loads is 1N4004 diode reverse wired across the load.

(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 the 28 VA by the applied dc voltage. For example, 28 VA/48V dc = 0.58A. For dc voltage applications less than 14V, the make/break ratings for relay contacts cannot exceed 2A.

RTB = Removable Terminal Block.

### Operating Voltage Range

(For ac operation: voltage is applied between L1 and L2.)

(For dc operation: voltage applied is between +VDC and DC common.)

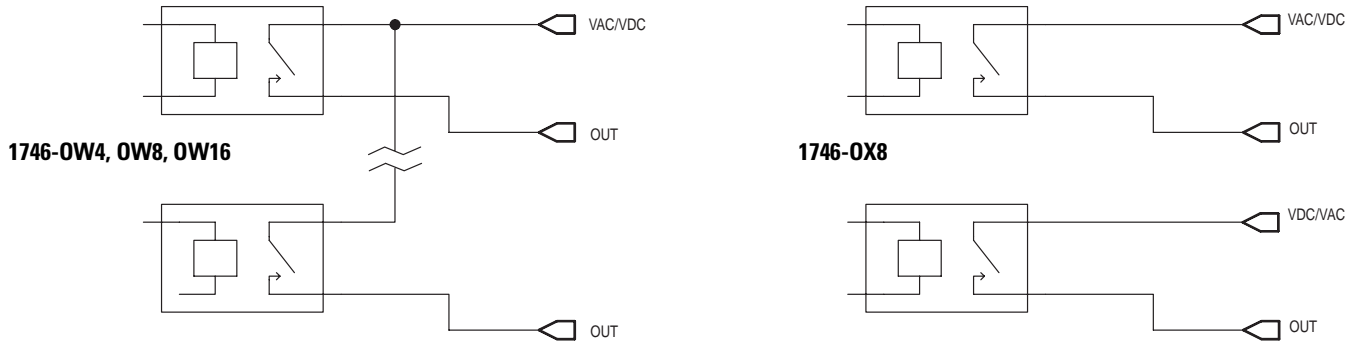
0 V 5V ac  
0 V 5V dc

265V ac  
125V dc

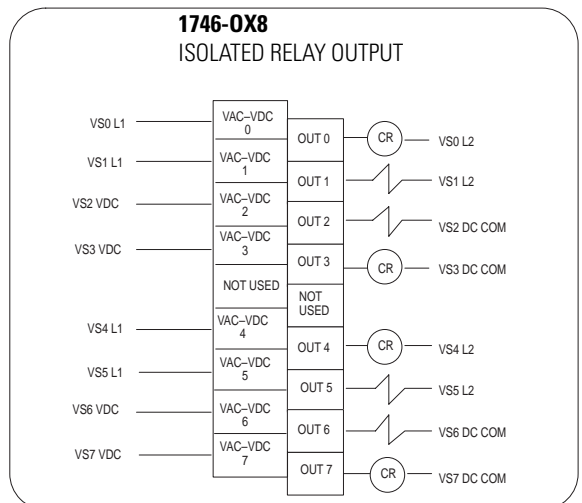
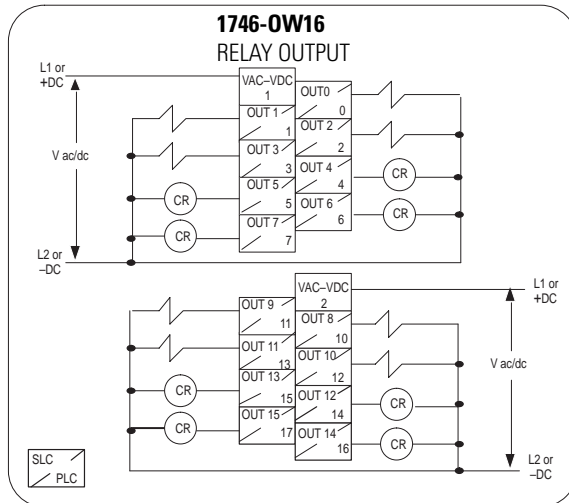
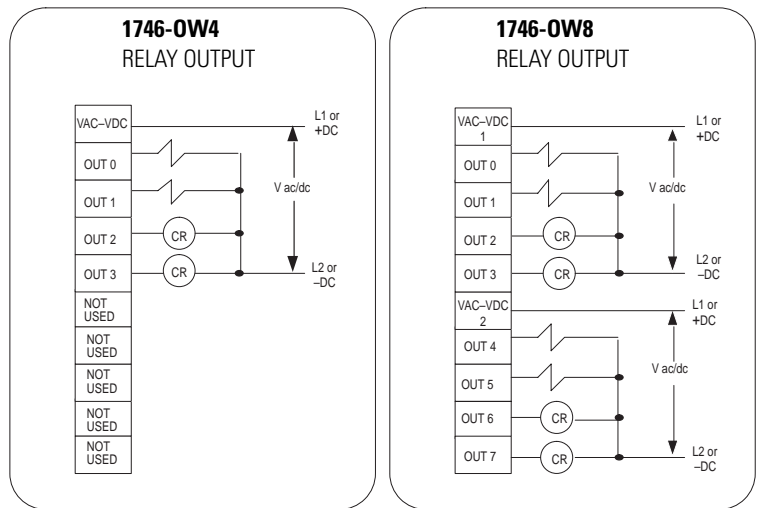


Operation Not Guaranteed

### Circuit Diagram



### Wiring Diagrams

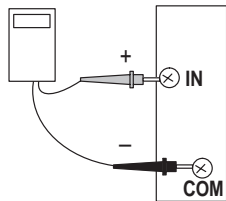


### Combination Modules (1746-IO4, -IO8, -IO12, -IO12DC)

Specification	Catalog Number			
	1746-IO4	1746-IO8	1746-IO12 (RTB)	1746-IO12DC (RTB)
<b>Voltage Category</b>	inputs: 120V ac outputs: ac/dc Relay			inputs: 24V dc outputs: ac/dc Relay
<b>Operating Voltage</b>	inputs: 85 to 132V ac at 47 to 63 Hz outputs: 5 to 265V ac at 47 to 63 Hz / 5 to 125V dc			inputs: 10 to 30V dc sinking
<b>Points per Common</b>	2	4	6	6
<b>Points per Module</b>	2 inputs / 2 outputs	4 inputs / 4 outputs	6 inputs / 6 outputs	6 inputs / 6 outputs
<b>Backplane Current Draw</b>	<b>5V dc</b>	0.030A	0.060A	0.090A
	<b>24V dc</b>	0.025A	0.045A	0.070A
<b>Continuous Current per Module</b>	4.0A	8.0A	8.0A	8.0A
<b>Specification Reference</b>	input same as 1746-IA4 output same as 1746-OW4		input same as 1746-IA16 output same as 1746-OW16	

RTB = Removable Terminal Block.

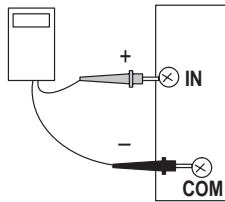
#### On/Off-State Voltage Range (AC Inputs)



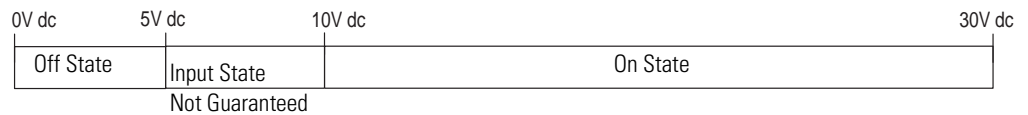
(Measure voltage from common terminal to input terminal.)



#### On/Off-State Voltage Range (DC Inputs)

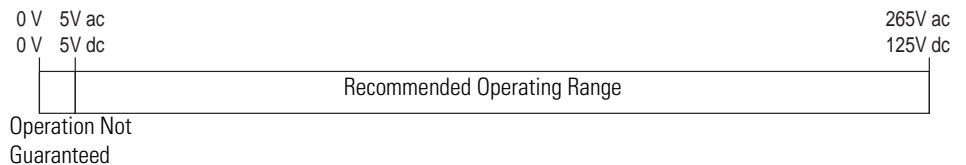


(Measure voltage from common terminal to input terminal.)

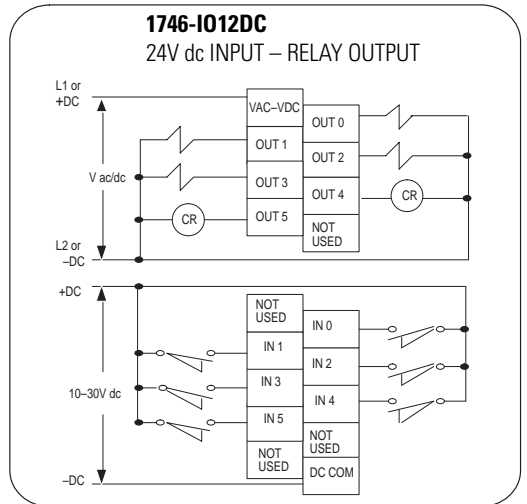
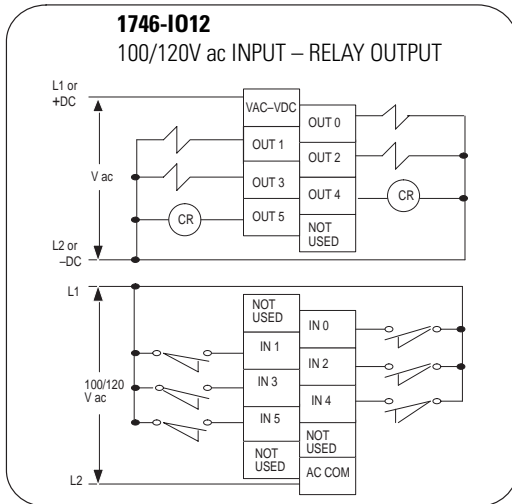
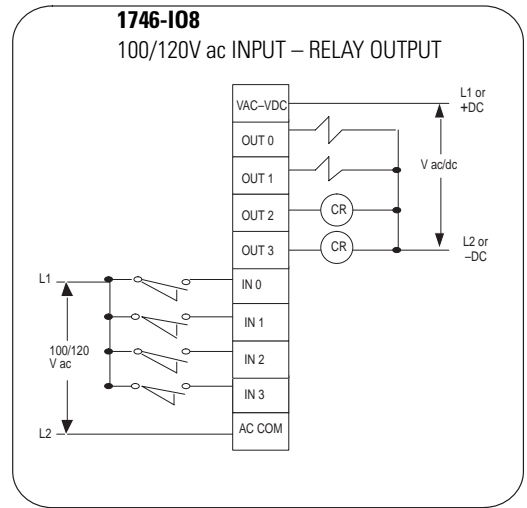
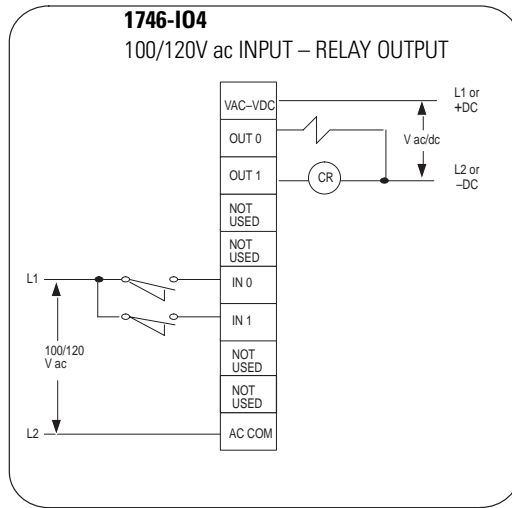
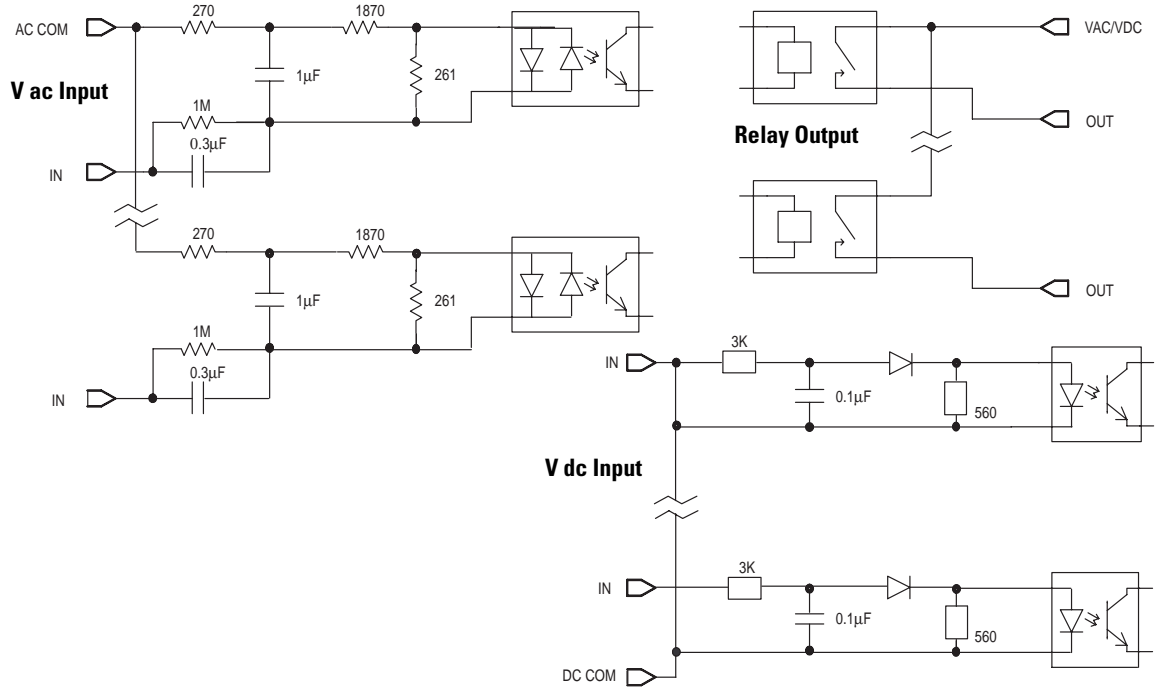


#### Operating Voltage Range (AC/DC Relay Outputs)

(For ac operation: voltage is applied between L1 and L2.)  
(For dc operation: voltage is applied between +VDC and DC common.)



*Circuit and Wiring Diagrams*



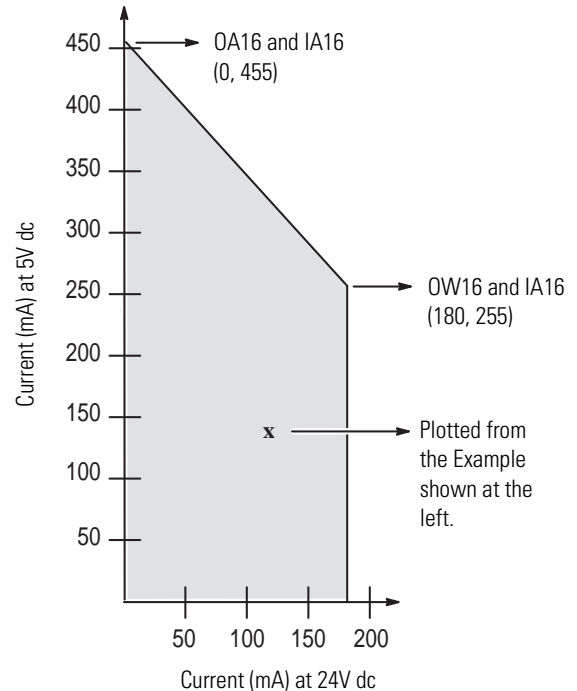
## Fixed I/O Chassis and Module Compatibility

The following chart depicts the range of current combinations supported by the fixed I/O expansion chassis. To use it, you must first determine the backplane current draw and operating voltage for both of the modules you plan to use in the chassis. You can get these specifications from the *Power Supply Loading* table on page 48.

Next, plot each of the currents on the chart below. If the point of intersection falls within the operating region, your combination is valid. If not, your combination cannot be used in a 2-slot, fixed I/O chassis.

**Example:** Plot IN16 and NIO4V  
 IN16 = 0.085A at 5V dc and 0A at 24V dc.  
 NIO4V = 0.055A at 5V dc and 0.115A at 24V dc

1. Add current draws of both modules at 5V dc to get 0.14A (140 mA).
2. Plot this point on the chart at the right. (140 mA at 5V dc).
3. Add current draws of both modules at 24V dc to get 0.115A (115 mA).
4. Plot current draw at 24V dc (115 mA at 24V dc).
5. Note the point of intersection on the chart (marked x). This combination falls within the valid operating region for your fixed I/O chassis.




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**Important:** The 1746-NO4I and 1746-NO4V analog output modules may require an external power supply. Refer to your analog module user's manual.

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**Important:** There are certain conditions that affect the compatibility characteristics of the BASIC module (1746-BAS) and the DH-485/RS-232C module (1746-KE).

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When you use the BAS module or the KE module to supply power to a 1747-AIC Link Coupler, the Link Coupler draws its power through the module. The higher current drawn by the AIC at 24V dc is calculated and recorded in the tables for the modules identified as BASn (BAS networked) or KEn (KE networked). Make sure to check the current draw values for these modules if your application uses the BAS or KE module in this way.

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## Power Supply Loading

Hardware Components	Catalog Number	Maximum Current at 5V dc (Amps)	Maximum Current at 24V dc (Amps)	Hardware Component	Catalog Number	Maximum Current at 5V dc (Amps)	Maximum Current at 24V dc (Amps)
Discrete Input Modules	1746-IA4	0.035	0	Discrete Output Modules	1746-OA8	0.185	0
	1746-IA8	0.050	0		1746-OA16	0.370	0
	1746-IA16	0.085	0		1746-OAP12	0.370	0
	1746-IB8	0.050	0		1746-OB6EI	0.046	0
	1746-IB16	0.085	0		1746-OB8	0.135	0
	1746-IB32	0.050	0		1746-OB16	0.280	0
	1746-IC16	0.085	0		1746-OB16E	0.135	0
	1746-IG16	0.140	0		1746-OB32	0.190	0
	1746-IH16	0.085	0		1746-OB32E	0.190	0
	1746-IM4	0.035	0		1746-OBP8	0.135	0
	1746-IM8	0.050	0		1746-OBP16	0.250	0
	1746-IM16	0.085	0		1746-OG16	0.180	0
	1746-IN16	0.085	0		1746-OV8	0.135	0
	1746-ITB16	0.085	0		1746-OV16	0.270	0
	1746-ITV16	0.085	0		1746-OV32	0.190	0
	1746-IV8	0.050	0		1746-OVP16	0.250	0
	1746-IV16	0.085	0		1746-OW4	0.045	0.045
1746-IV32	0.050	0	1746-OW8	0.085	0.090		
Discrete Input and Output Modules	1746-IO4	0.030	0.025	1746-OW16	0.170	0.180	
	1746-IO8	0.060	0.045	1746-OX8	0.085	0.090	
	1746-IO12	0.090	0.070				
	1746-IO12DC	0.080	0.060				

## Discrete I/O Power Dissipation

The table below lists the power dissipation for the discrete I/O modules operating at nominal voltage. The following terms are used in the Power Dissipation table:

Watts per Point	Minimum Watts	Total Watts
The heat dissipation that can occur in each field wiring point when energized at nominal voltage.	The amount of heat dissipation that can occur when there is no field power present.	The watts per point plus the minimum watts (with all points energized).

For examples on calculating system heat dissipation, refer to the *SLC 500 Modular Hardware Style Installation and Operation User Manual* (Publication 1747-6.2) or the *SLC 500 Fixed Hardware Style Installation and Operation User Manual* (Publication 1747-6.21).

### Power Dissipation

Catalog Number	Watts per Point	Minimum Watts	Total Watts	Catalog Numbers	Watts per Point	Minimum Watts	Total Watts
<b>1746-IA4</b>	0.27	0.175	1.30	<b>1746-OB6EI</b>	0.440	0.230	2.90
<b>1746-IA8</b>	0.27	0.250	2.40	<b>1746-OB8</b>	0.775	0.675	6.90
<b>1746-IA16</b>	0.27	0.425	4.80	<b>1746-OB16</b>	0.338	1.40	7.60
<b>1746-IB8</b>	0.20	0.250	1.90	<b>1746-OB16E</b>	0.150	0.675	3.07
<b>1746-IB16</b>	0.20	0.425	3.60	<b>1746-OB32</b>	0.172	0.950	6.45
<b>1746-IB32</b>	0.20	0.250	6.65	<b>1746-OB32E</b>	0.250	0.95	8.95
<b>1746-IC16</b>	0.22	0.425	3.95	<b>1746-OBP8</b>	0.300	0.675	3.08
<b>1746-IG16</b>	0.02	0.700	1.00	<b>1746-OBP16</b>	0.310	1.250	6.26
<b>1746-IH16</b>	0.32	0.217	5.17	<b>1746-OG16</b>	0.033	0.900	1.50
<b>1746-IM4</b>	0.35	0.175	1.60	<b>1746-OV8</b>	0.775	0.675	6.90
<b>1746-IM8</b>	0.35	0.250	3.10	<b>1746-OV16</b>	0.388	1.400	7.60
<b>1746-IM16</b>	0.35	0.425	6.00	<b>1746-OV32</b>	0.172	0.950	6.45
<b>1746-IN16</b>	0.35	0.425	6.00	<b>1746-OVP16</b>	0.310	1.250	6.26
<b>1746-ITB16</b>	0.20	0.425	3.60	<b>1746-OW4</b>	0.133	1.310	1.90
<b>1746-ITV16</b>	0.20	0.425	3.60	<b>1746-OW8</b>	0.138	2.590	3.70
<b>1746-IV8</b>	0.20	0.250	1.90	<b>1746-OW16</b>	0.033	5.170	5.70
<b>1746-IV16</b>	0.20	0.425	3.60	<b>1746-OX8</b>	0.825	2.590	8.60
<b>1746-IV32</b>	0.20	0.250	6.65	<b>1746-IO4</b>	0.27 per input point 0.133 per output point	0.75	1.60
<b>1746-OA8</b>	1.000	0.925	9.00	<b>1746-IO8</b>	0.27 per input point 0.133 per output point	1.38	3.00
<b>1746-OA16</b>	0.462	1.850	9.30	<b>1746-IO12</b>	0.27 per input point 0.133 per output point	2.13	4.60
<b>1746-OAP12</b>	1.000	1.850	10.85	<b>1746-IO12DC</b>	0.20 per input point 0.133 per output point	1.84	3.90

## Environmental Specifications

Operating Temperature	0°C to 60°C (32°F to 140°F) <sup>(1)</sup>
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Operating Humidity	5% to 95% (non-condensing)
Noise Immunity	NEMA standard ICS 2-230
Vibration (Operating)	Displacement 0.015 inch peak at 5 to 57 Hz. Acceleration 2.5Gs at 57 to 2000 Hz
Shock (Operating)	30Gs (all modules except relay contact) 10Gs (relay contact modules, 1746-OW, -OX, I/O Combo)
Isolation <sup>(2)</sup>	1500 Volts
Certification <sup>(3)(4)</sup>	UL listed. CSA or C-UL approved as indicated by product markings. CE compliant for all applicable directives when product or packaging is marked.
Hazardous Environment Class <sup>(4)</sup>	Class I, Division 2, Groups A, B, C, D Hazardous Environment

(1) Exceptions are indicated with certain modules.

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

(3) Some modules are not CE marked. See page 2.

(4) All modules meet Class 1, Division 2 requirements for hazardous location. Some modules are rated Class 1, Division 2 by CSA only. See page 2.

## Accessories

The following accessories are available for use with discrete I/O modules:

Catalog Number	Item	Description
1746-N2	Modular chassis slot filler	Helps prevent debris from entering the SLC enclosure that can cause shorts or improper operation.
1492-IFMxx	Feed-through interface modules	Connects electronic wiring (discrete I/O modules, particularly 16- and 32-point) to electric wiring (factory devices). Available with either 20 or 40 terminals.
1492-CABLExxxx • xxxx = 010H • xxxx = 025H • xxxx = 050H	Cables: • 1 m (3.3 ft.) • 2.5 m (8.2 ft.) • 5 m (16.4 ft.)	Connects directly to the 1492-IFMxx interface module and is available with a removable terminal block or a ready-to-wire free end.
1746-N3	Connector kit	This kit allows you to create your own cable. It contains one female connector and 45 crimp contacts. <b>Note:</b> 32-point modules are shipped with one connector kit.

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