

Isolated-Circuit Discrete Input and Output Modules

(Cat. No. 1746sc Series)

Installation Instructions

Input Module Catalog Numbers:

- 1746sc-IA8I Isolated-Circuit 100/120 V ac/dc Inputs (8)
- 1746sc-IB8I Isolated-Circuit 24 Vdc Inputs (8)
- 1746sc-IC8I Isolated-Circuit 48 Vdc Inputs (8)
- 1746sc-IM8I Isolated-Circuit 200/240 V ac/dc Inputs (8)

Output Module Catalog Numbers:

- 1746sc-OAP8I Isolated-Circuit 120/240 Vac Outputs (8)

Preface

In addition to providing module specifications, this document tells you how to:

- install your module into the SLC 500™ chassis
- wire field devices to your module
- interpret your module's LED indicators
- check for blown fuses (1746sc-OAP8I only)
- get technical assistance

Please read all the information in this publication before installing these products. This publication assumes a full working knowledge of the relevant programmable controller.

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Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

General Information And Specifications

This module is designed exclusively to mount Allen-Bradley 1746 I/O racks for use with Allen-Bradley SLC500 fixed and modular systems. The **1746sc-IA8I**, **IB8I**, **-IC8I**, and **-IM8I** feature 8 isolated-circuit inputs, each with its own common. These modules also feature broad operating ranges for increased versatility. They are designed for use with a wide variety of input devices, such as limit switches, float switches, selector switches, push-buttons, and proximity switches (photo-sensors). They can even monitor relay or motor starter outputs directly.

The **1746sc-OAP8I** provides 8, triac-controlled, isolated-circuit outputs, each with its own common. The module also provides a broad operating range for increased versatility. It is designed for use with high inductive loads, such as solenoids, relays, and motor starters. Unlike relay outputs, triac outputs do not require back-EMF surge suppression for many inductive loads. A triac output module is also a good replacement for a relay output module when solid-state speed and reliability are desired.

General Specifications-- 1746sc Series

Isolation Voltage	1500 Vac point-to-point 1500 Vac field wiring-to-backplane
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity	0° to 60°C (32° to 140°F) -40° to +85°C (-40° to 185°F) 5 to 95% (non-condensing)
Certifications	UL/C-UL (Class I, Div 2, Groups ABCD) CE per Council Directives 89/336/EEC for EMC and 73/23/EEC for Low Voltage
Conductors Wire Size Category	14 gage stranded maximum 3/64 inch insulation maximum 1 ^①
Field Wiring Terminal Block	Red, removable (A-B part 1746-RT25R)

^① Use this conductor-category information for planning conductor routing as described in Allen-Bradley's system-level *Installation and Operation Manual*.

As noted in the previous table, these **1746sc-Series** modules provide 1500 V point-to-point isolation. This point-to-point isolation means:

- shorts, overloads, or noise on one circuit won't affect devices on other circuits.
- different power sources can be connected to the same module without damaging components due to excessive voltage differences between points.
- interposing relays aren't needed to achieve these benefits, saving space and simplifying installation.

The **1746sc-OAP8I** provides some additional benefits:

- each output circuit is individually fuse protected.
- blown fuses are indicated to the user through an LED and to the logic controller through the logic controller's input image table. This allows for fuse monitoring and smart power-down sequencing of equipment after a circuit failure.

For more information on the benefits of isolated circuits and other features of the 1746sc-Series modules, call your local distributor or Spectrum Controls (425-746-9481).

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

1746sc-IA8I Specifications

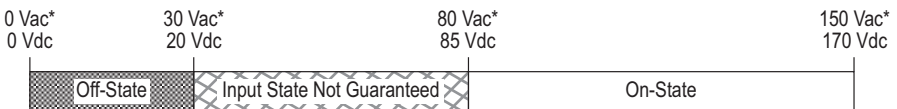
Number of Inputs	8
Points per Common	1 (individually isolated)
Voltage Category	100/120 Vac @ 50/60 Hz 100/120 Vdc, sink or source
Operating Voltage	80 to 150 Vac @ 47 to 63 Hz 85 to 170 Vdc
Nominal Input Current	16 mA @ 120 Vac, 60 Hz 2.5 mA @ 120 Vdc
Input Inrush Current (maximum)	0.7 A @ 120 Vac
Input Signal Delay (maximum) Off to On On to Off	17 ms @ 120 Vac 7 ms @ 120 Vdc 45 ms @ 120 Vac 40 ms @ 120 Vdc
Off-State Current (maximum)	4 mA @ 20 Vac ^① 0.5 mA @ 20 Vdc
Power Dissipation (maximum) Watts per point ^② Total watts ^③	0.5 W @ 120 Vac/dc; 0.75 W @ 150 Vac/dc 4 W @ 120 Vac/dc; 6 W @ 150 Vac/dc
Backplane Current Draw (max.) 5 V 24 V	0.110 A 0.0 A

^① Maximum allowable leakage current from an input device in an off state.

^② Maximum with 1 input turned on.

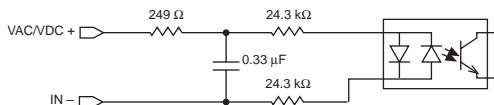
^③ Maximum with all 8 inputs turned on (100% duty cycle).

1746sc-IA8I On/Off-State Voltage Range



* Frequency = 47 to 63 Hz

1746sc-IA8I Circuit Diagram (one circuit shown)



Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

1746sc-IB8I Specifications

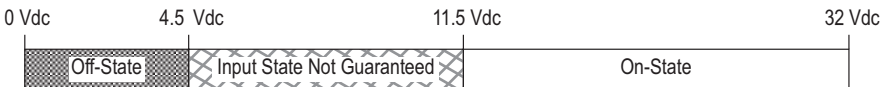
Number of Inputs	8, sink or source
Points per Common	1 (individually isolated)
Voltage Category	24 Vdc
Operating Voltage	± 11.5 to 32 Vdc
Nominal Input Current	12 mA @ 24 Vdc
Input Signal Delay (maximum) Off to On On to Off	0.5 ms @ 24 Vac 1 ms @ 24 Vac
Off-State Current (maximum)	1.8 mA @ 4.5 Vac ^①
Power Dissipation (maximum) Watts per point ^② Total Watts ^③	6.6 W @ 240 Vac/dc 0.4 W @ 24 Vdc; 0.6 W @ 32 Vdc 3 W @ 24 Vdc; 4.8 W @ 32 Vdc
Backplane Current Draw (max.) 5 V 24 V	0.110 A 0.0 A

^① Maximum allowable leakage current from an input device in an off state.

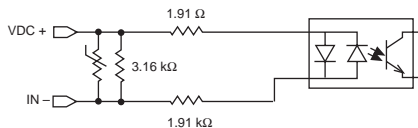
^② Maximum with 1 input turned on.

^③ Maximum with all 8 inputs turned on (100% duty cycle).

1746sc-IB8I On-Off-State Voltage Range



1746sc-IB8I Circuit Diagram (one circuit shown)



Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

1746sc-IC8I Specifications

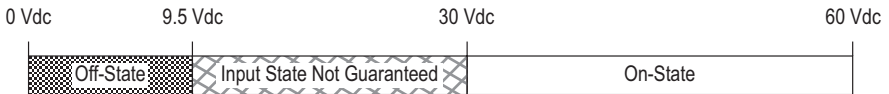
Number of Inputs	8, sink or source
Points per Common	1 (individually isolated)
Voltage Category	48 Vdc
Operating Voltage	± 30 to 60 Vdc
Nominal Input Current	10 mA @ 48 Vdc
Input Signal Delay (maximum) Off to On On to Off	0.5 ms @ 48 Vdc 1 ms @ 48 Vdc
Off-State Current (maximum)	1.8 mA @ 9.5 Vac ^①
Power Dissipation (maximum) Watts per point ^② Total watts ^③	4 W @ 120 Vac/dc 0.6 W @ 48 Vdc; 0.85 W @ 60 Vdc 4.5 W @ 48 Vdc; 6.7 W @ 60 Vdc
Backplane Current Draw (max.) 5 V 24 V	0.110 A 0.0 A

^① Maximum allowable leakage current from an input device in an off state.

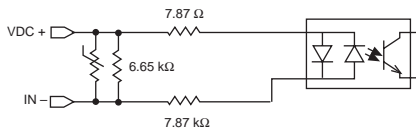
^② Maximum with 1 input turned on.

^③ Maximum with all 8 inputs turned on (100% duty cycle).

1746sc-IC8I On/Off-State Voltage Range



1746sc-IC8I Circuit Diagram (one circuit shown)



Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

1746sc-IM8I Specifications

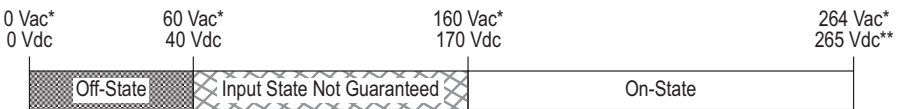
Number of Inputs	8, sink or source
Points per Common	1 (individually isolated)
Voltage Category	200/240 Vac @ 50/60 Hz 200/240 Vdc
Operating Voltage	160 to 264 Vac @ 47 to 63 Hz 170 to 265 Vdc
Nominal Input Current	13.5 mA @ 240 Vac, 60 Hz 2.5 mA @ 250 Vdc
Input Inrush Current (maximum)	0.7 A @ 240 Vac
Input Signal Delay (maximum) Off to On On to Off	15 ms @ 240 Vac 7 ms @ 250 Vdc 40 ms @ 240 Vac 36 ms @ 250 Vdc
Off-State Current (maximum)	2.5 mA @ 40 Vac ^① 0.85 mA @ 40 Vdc
Power Dissipation (maximum) Watts per point ^② Total watts ^③	0.85 W @ 240 c/dc; 1 W @ 264 Vac/dc 6.6 W @ 240 Vac/dc; 8 @ 264 Vac/dc
Backplane Current Draw (max.) 5 V 24 V	0.110 A 0.0 A

^① Maximum allowable leakage current from an input device in an off state.

^② Maximum with 1 input turned on.

^③ Maximum with all 8 inputs turned on (100% duty cycle).

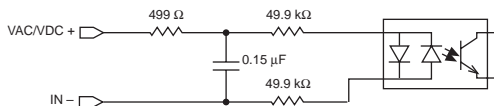
1746sc-IM8I On-Off-State Voltage Range



* Frequency = 47 to 63 Hz

** 276 Vdc short-term overload (1 hour)

1746sc-IM8I Circuit Diagram (one circuit shown)



Important Pre-Installation Considerations

This module is shipped in a static-shielded container to guard against electrostatic discharge damage. Observe the following precautions when handling the module:



CAUTION

ELECTROSTATICALLY SENSITIVE COMPONENTS

Observe the following precautions to guard against electrostatic damage:

- **Wear an approved wrist strap grounding device, or touch a grounded object to discharge yourself before handling the module.**
- **Do not touch the gold backplane connector or connector pins.**
- **If available, use a static-free work station.**
- **When not in use, keep the module in a static-shielded bag.**

Failure to observe these precautions can damage your module.

When using Allen-Bradley Programming Software (APS) to configure a chassis slot for your module, simply select your module from the list of modules on the system I/O configuration display. (Note: Some versions of APS list the modules without the “sc” designation, as in 1746-IA8I.) If your module is not listed, select OTHER at the bottom of the list and enter your module’s ID code at the prompt:

Module ID Code			
1746sc-IA8I	303	1746sc-IM8I	304
1746sc-IB8I/-IC8I	324	1746sc-OAP8I	1905

Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

Installing Your Module Into The SLC 500 Chassis



WARNING

EXPLOSION HAZARD

When in hazardous locations, turn off power before replacing or wiring modules.

Failure to observe this precaution can cause equipment damage, severe personal injury, or death.



WARNING

POSSIBLE EQUIPMENT OPERATION AND DAMAGE

Always remove power from the I/O chassis backplane and terminal block before removing or installing an I/O module.

- Failure to remove power from the backplane or terminal block can cause module damage, degraded performance, or injury.
 - Failure to remove power from the backplane can also cause injury or equipment damage due to possible equipment operation.
-

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D, or non-hazardous locations only.

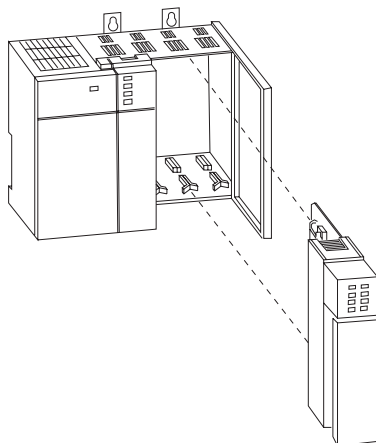
Before installing your module into the SLC500 chassis, make sure that nothing will block the ventilation above and below your module. Also, at high ambient temperatures, you may need to install forced air cooling to prevent excessive heat buildup.

To install your module into the chassis, follow these steps:

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

1. Turn off power to the I/O chassis.
2. Align the circuit board of your module with the card guides at the top and bottom of the chassis
3. Slide your module into the chassis until both top and bottom retaining clips are secure. Apply firm even pressure on your module to attach it to its backplane connector. Never force your module into the slot.



Cover all unused slots with the Card Slot Filler, Allen-Bradley part 1746-N2.

To remove your module, follow these steps:

1. Turn off power to the I/O chassis.
2. Remove the terminal block or field device wiring if necessary.
3. Press the retaining clips at the top and bottom of your module.

Note that the components on the circuit board may get very hot:

- | | |
|-----------------------|----------------------------------|
| • 1746sc-IB8I & -IC8I | 120° C (UL temperature code T4A) |
| • 1746sc-IM8I | 135° C (UL temperature code T4) |
| • 1746sc-OAP8I | 100° C (UL temperature code T5) |

CAUTION



HOT COMPONENTS

When removing the 1746sc-IM8I or -OAP8I after use, avoid touching any of the components on its printed circuit board.

Failure to observe this precaution can cause personal injury.

Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

Wiring Field Devices To Your Module

For UL and C-UL compliance, power, input, and output (field device) wiring must be in accordance with Class I, Division 2, wiring methods [Article 501-4 (b) of the National Electrical Code, NFPA 70] and in accordance with the authority having jurisdiction. In addition, peripheral equipment must be suitable for the location in which it is used.



WARNING

THIS DEVICE IS INTENDED TO ONLY BE USED WITH THE ALLEN-BRADLEY SLC500 SYSTEMS.



WARNING

EXPLOSION HAZARD

When in hazardous locations, turn off power before replacing or wiring modules.

Also, do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Failure to observe this precaution can cause equipment damage, severe personal injury, or death.



WARNING

HIGH LEAKAGE CURRENT

Before wiring field devices to the 1746sc-IA8I, -IM8I, or -OAP8I, ensure that the SLC 500 processor has been properly grounded.

Failure to observe this precaution can cause equipment damage or personal injury.

To wire field devices to your module, follow these steps:

1. Turn off power to the I/O chassis.
2. **Optional:** Remove the supplied 18-position red terminal block from the module. To remove the terminal block, unscrew the two retaining screws at the top and bottom of the terminal block, and pull the terminal block loose.
3. Wire field devices to your module as shown in the following wiring diagrams, using a maximum wire size of 14 AWG and a maximum of two wires per terminal. The recommended terminal screw torque is 7 to 9 in.-lb.
4. Install a wire tie in the slot below the terminal block and secure the wires.

CE Compliance Requirements

For installations requiring CE compliance, you must do the following:

- Observe the grounding guidelines provided in Allen-Bradley's *SLC 500 Installation and Operation Manual* (Allen-Bradley publication 1747-NI002).
- Connect an E-GND terminal on the module directly to a rack mounting bolt.
- Hard wire or permanently connect the PLC to the AC mains, or provide a pin and sleeve (IEC 309) connector for connection to the AC mains.

This equipment is intended for use in over-voltage category II installations (see IEC 364-4-443), where the rated mains supply voltage does not exceed 1000 Vac (50/60 Hz) or 1500 Vdc. If the input power is rated above these levels, ensure that your system is isolated from the power main by an isolation transformer (or equivalent over-voltage protection device) that has CE approval or approval from a European test agency.

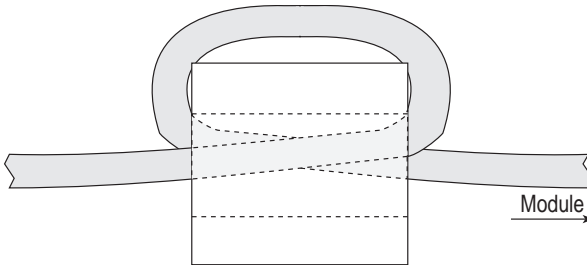
For the 1746c-IA8I, -IM8I, and -OAP8I, you must also protect against electrical shock by installing the I/O chassis in an enclosure with an IP20 to IP29 rating per IEC 529. The enclosure should have warning labels (hazard symbol 417-IEC-5036) and/or a mechanical disconnect to minimize the risk of accidental shock during maintenance. Use an enclosure that can only be opened with a key or tool.

Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

In addition, for the 1746sc-IA8I, -IB8I, -IC8I, and -IM8I only, you must install a ferrite on the SLC 500 power line. You may use either a clam-shell type (Steward part 28B2029-0A0 or equivalent) or a ring type (Steward part 28B2400-000 oivalent). If you use the ring type, loop the cable through at least once.



You may obtain these ferrites directly from Steward:

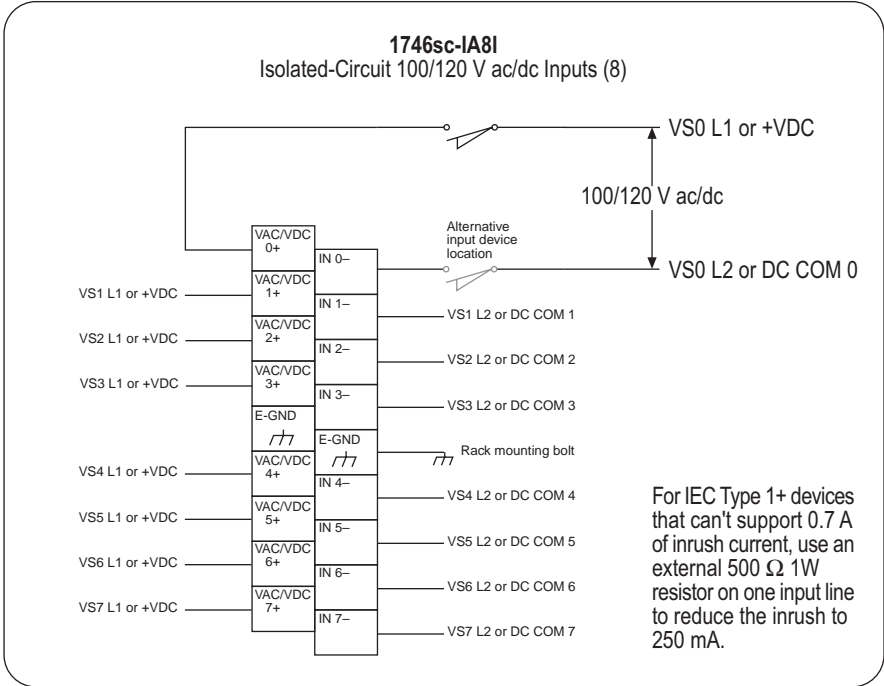
Post Office Box 510

Chattanooga, TN 37401

Fax: (426) 867-4102 • Tel: (426) 867-4100

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules



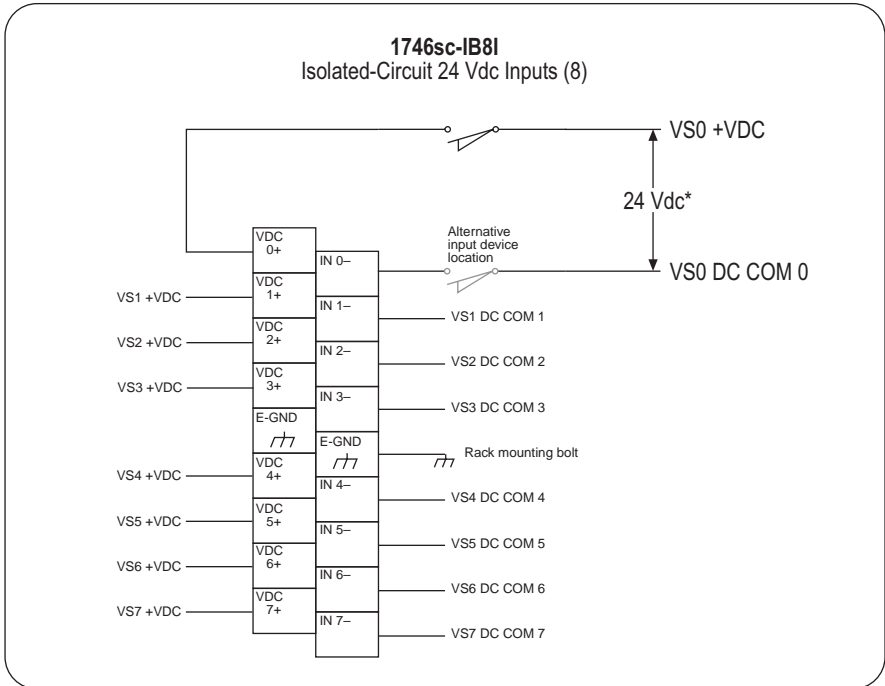
Note -- The input circuits are electrically isolated from each other (the commons are NOT connected internally). Therefore, up to eight different voltage sources (VS0-VS7) may be used.

Module ID Code = 303

Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules



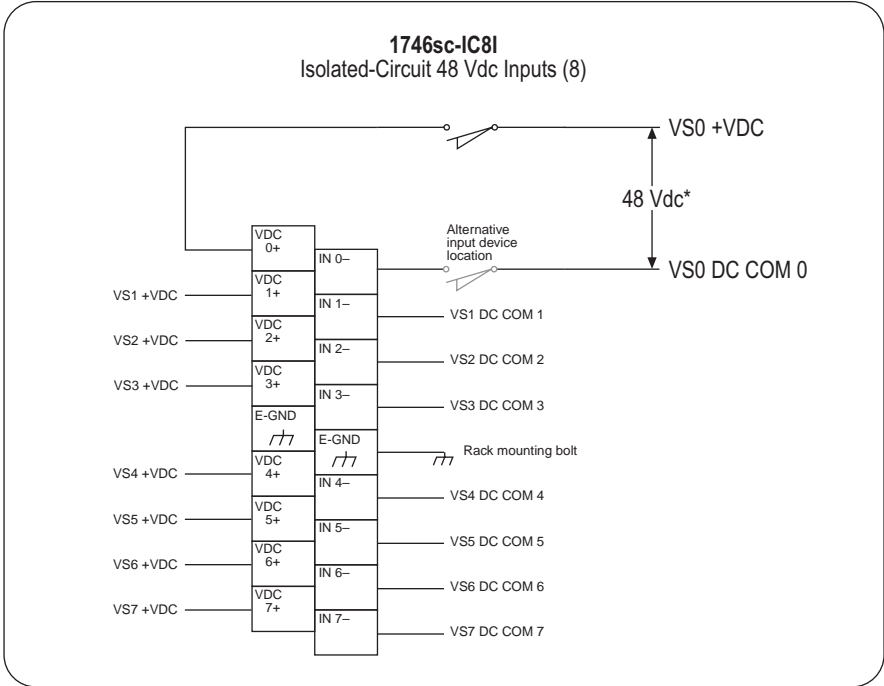
Note — The input circuits are electrically isolated from each other (the commons are NOT connected internally). Therefore, up to eight different voltage sources (VS0–VS7) may be used.

* Inputs are bipolar and may be connected without regard to polarity.

Module ID Code = 324

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules



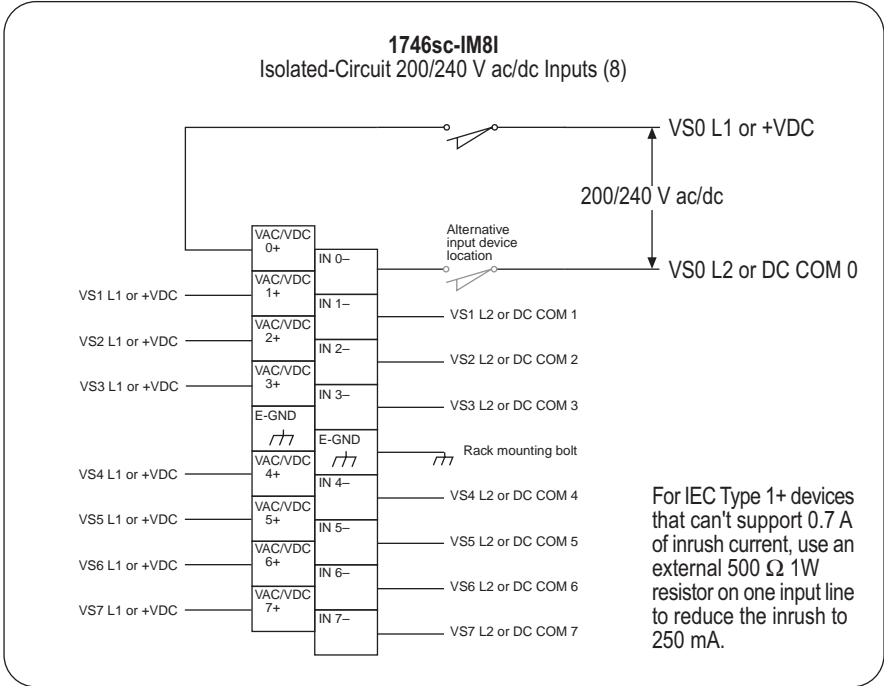
Note — The input circuits are electrically isolated from each other (the commons are NOT connected internally). Therefore, up to eight different voltage sources (VS0–VS7) may be used.

* Inputs are bipolar and may be connected without regard to polarity.

Module ID Code = 324

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

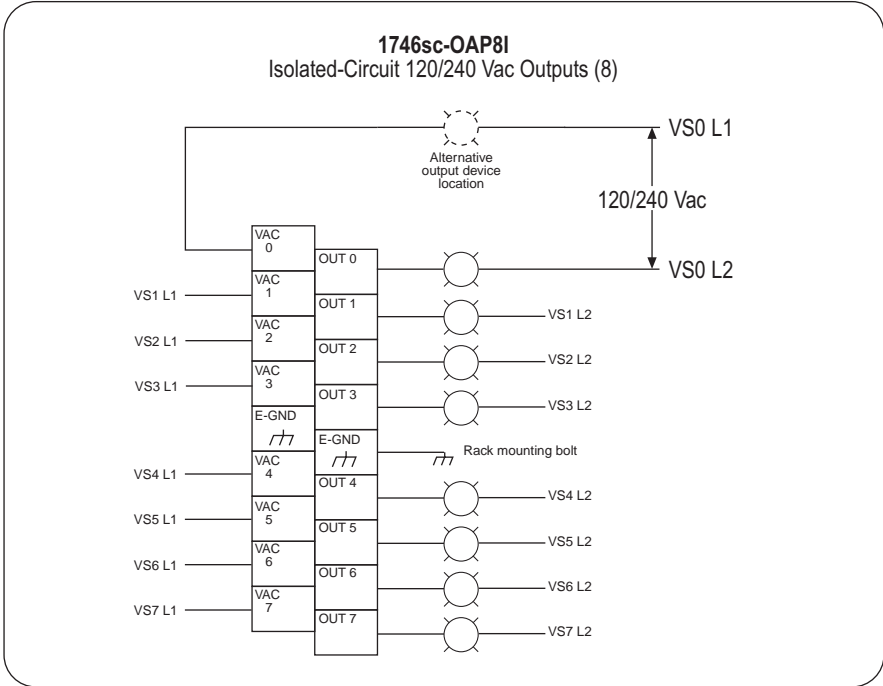


Note — The input circuits are electrically isolated from each other (the commons are NOT connected internally). Therefore, up to eight different voltage sources (VS0–VS7) may be used.

Module ID Code = 304

Installation Instructions

Isolated-Circuit Discrete Input and Output Modules

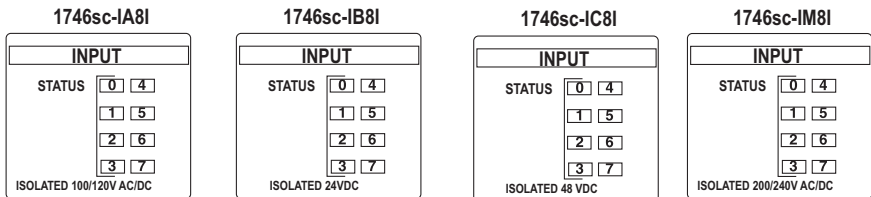


Note — The output circuits are electrically isolated from each other (the commons are NOT connected internally). Therefore, up to eight different voltage sources (VS0–VS7) may be used.

Module ID Code = 1905

Interpreting Your Module's LED Indicators

On the 1746sc-IA8I, -IB8I, -IC8I, and -IM8I, each status indicator (0–7) illuminates when the proper signal is received at the corresponding input terminal.



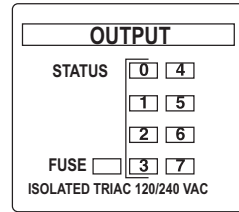
Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

On the 1746sc-OAP8I, each status indicator (0–7) illuminates when the processor commands the module to turn on the corresponding output. The indicators do not necessarily indicate the presence or absence of AC power at an output. The Blown-Fuse indicator illuminates when any 1 of the 8 output fuses blows.

1746sc-OAP8I

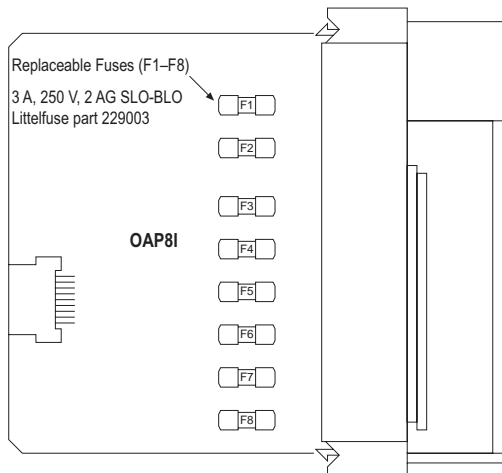


Checking For Blown Fuses (1746sc-OAP8I only)

If a fuse blows on the 1746sc-OAP8I, the following occurs:

1. The blown-fuse LED indicator illuminates (provided your module is receiving power from the chassis).
2. The module indicates to the logic controller's input image table which fuse has blown. This allows for fuse monitoring and smart power-down sequencing of equipment after a circuit failure.

You can verify that a fuse has opened by visually checking the fuses, shown below. Turn all power off, and replace blown fuses with the specified replacement part only. Substitutes are not acceptable.



Getting Technical Assistance

If you need technical assistance, please review the troubleshooting information in Allen-Bradley's system-level *Installation and Operation Manual* before calling your local distributor or Spectrum Controls. Except for the 8 replaceable fuses (1 for each output) on the 1746sc-OAP8I, these modules contain no user-serviceable parts, and if necessary, should be returned to Spectrum Controls for repair.



WARNING

EXPLOSION HAZARD

Substituting components may impair suitability for Class I, Division 2.

Note that your module contains electronic components which are susceptible to damage from electrostatic discharge (ESD). An electrostatic charge can accumulate on the surface of ordinary plastic wrapping or cushioning material. **In the unlikely event that the module should need to be returned to Spectrum Controls, please ensure that the unit is enclosed in approved ESD packaging (such as static-shielding / metallized bag or black conductive container).** Spectrum Controls reserves the right to void the warranty on any unit that is improperly packaged for shipment.

For further information or assistance, please contact your local distributor, or call the Spectrum Controls Customer Satisfaction department at (425) 746-9481 from 8:00 A.M. to 5:00 P.M., Pacific Time.

Installation Instructions

Isolated-Circuit

Discrete Input and Output Modules

Notice

The products and services described in this publication are useful in a wide variety of applications. Therefore, the user and others responsible for applying the products and services described herein are responsible for determining their acceptability for each application. While efforts have been made to provide accurate information within this publication, Spectrum Controls assumes no responsibility for the accuracy, completeness, or usefulness of the information contained herein. Under no circumstances will Spectrum Controls be responsible or liable for any damages or losses, including indirect or consequential damages or losses, arising out of either the use of any information contained within this publication or the use of any product or service referenced herein. No patent liability is assumed by Spectrum Controls with respect to the use of any of the information, products, circuits, programming, or services referenced herein. The information contained in this publication is subject to change without notice.

Limited Warranty

Spectrum Controls warrants that its products are free from defects in material and workmanship under normal use and service, as described in Spectrum Controls literature covering this product, for a period of 1 year. Spectrum Controls obligations under this warranty are limited to replacing or repairing, at its option, at its factory or facility, any product which shall, in the applicable period after shipment, be returned to the Spectrum Controls facility, transportation charges prepaid, and which after examination is determined, to the satisfaction of Spectrum Controls, to be thus defective. This warranty shall not apply to any such equipment which shall have been repaired or altered except by Spectrum Controls or which shall have been subject to misuse, neglect, or accident. In no case shall Spectrum Controls liability exceed the purchase price. The aforementioned provisions do not extend the original warranty period of any product which has either been repaired or replaced by Spectrum Controls.

Declaration Of Conformity

Available upon request.



Ask your distributor about these other Allen-Bradley compatible products from Spectrum Controls:

Catalog No.	Description
1746sc-INI4vi	Isolated-Channel Analog Inputs (4) Each Current or Voltage Selectable
1746sc-INI4i	Isolated-Channel Analog Inputs (4) Current only
1746sc-INO4vi	Isolated-Channel Analog Outputs (4) Each Current or Voltage Selectable
1746sc-INO4i	Isolated-Channel Analog Outputs (4) Current only
1746sc-IA8I	Isolated-Circuit 100/120 V ac/dc Inputs (8)
1746sc-IB8I	Isolated-Circuit 24 Vdc Inputs (8)
1746sc-IC8I	Isolated-Circuit 48 Vdc Inputs (8)
1746sc-IM8I	Isolated-Circuit 200/240 V ac/dc Inputs (8)
1746sc-OAP8I	Isolated-Circuit 120/240 Vac Outputs (8)
1771sc-IMI16	Isolated-Circuit 200/240 V ac/dc Inputs (16)
1771sc-OMI16	Isolated-Circuit 120/240 Vac Triac Outputs (16) Each Fuse Protected

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