



# Compact 16-point 24V dc Sink/Source High-speed Input Module

Catalog Number 1769-IQ16F

Use this document as a guide when installing a Compact™ 16-point 24V dc sink/source high-speed input module.

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**Important User Information**



Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

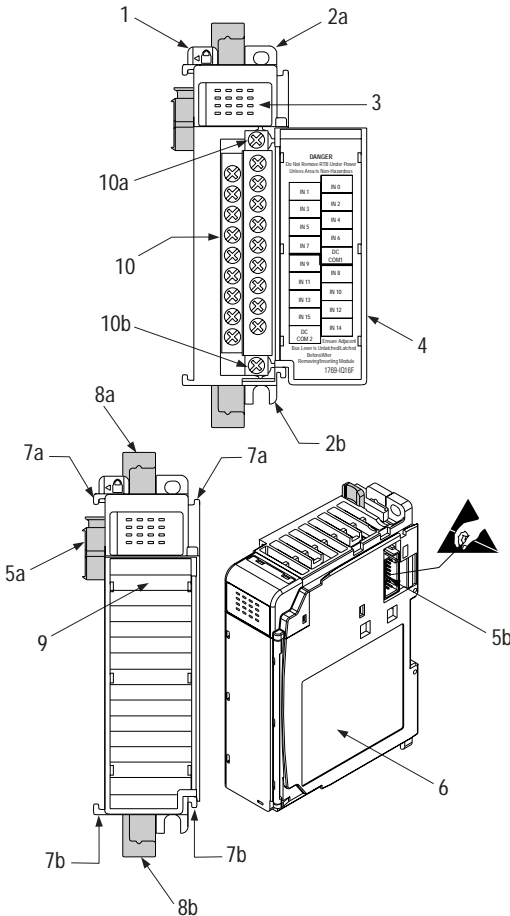
Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

|   |  |
|---|--|
| <b>WARNING</b>  | Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss. |
|    | Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.  |
| <b>ATTENTION</b>  | Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.  |
|  | Identifies information that is critical for successful application and understanding of the product.   |
| <b>IMPORTANT</b>  | Identifies information that is critical for successful application and understanding of the product.   |

## Module Description



| Item | Description  |
|------|--|
| 1    | bus lever<br>(with locking function)                     |
| 2a   | upper panel mounting tab                                 |
| 2b   | lower panel mounting tab                                 |
| 3    | I/O diagnostic LEDs                                      |
| 4    | module door with terminal<br>identification label        |
| 5a   | movable bus connector<br>with female pins                |
| 5b   | stationary bus connector<br>with male pins               |
| 6    | nameplate label  |
| 7a   | upper<br>tongue-and-groove slots                         |
| 7b   | lower<br>tongue-and-groove slots                         |
| 8a   | upper DIN rail latch                                     |
| 8b   | lower DIN rail latch                                     |
| 9    | write-on label (user ID tag)                             |
| 10   | removable terminal block (RTB)<br>with finger-safe cover |
| 10a  | RTB upper retaining screw                                |
| 10b  | RTB lower retaining screw                                |

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## Module Installation

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2<sup>(1)</sup>) and to circuits not exceeding Over Voltage Category II<sup>(2)</sup> (IEC 60664-1).<sup>(3)</sup>

## Prevent Electrostatic Discharge

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### ATTENTION



Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
  - Wear an approved wrist-strap grounding device.
  - Do not touch the bus connector or connector pins.
  - Do not touch circuit components inside the module.
  - If available, use a static-safe work station.
  - When not in use, keep the module in its static-shield box.
- 

## Remove Power

### ATTENTION



Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

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<sup>(1)</sup> Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.

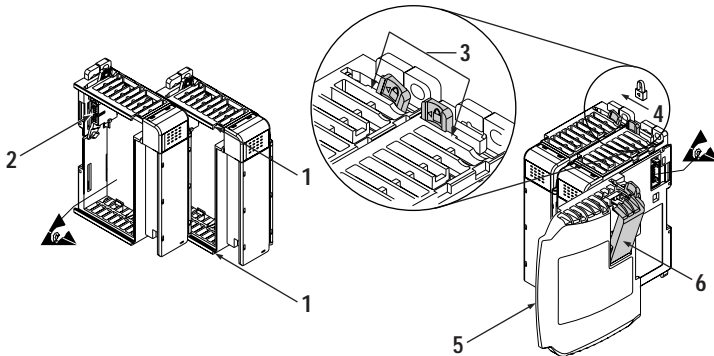
<sup>(2)</sup> Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

<sup>(3)</sup> Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

## System Assembly

The module can be attached to the controller or an adjacent I/O module *before* or *after* mounting. For mounting instructions, see Panel Mounting on page 6, or DIN Rail Mounting on page 8. To work with a system that is already mounted, see Replacing a Single Module within a System on page 8.

The following procedure shows you how to assemble the Compact I/O system.



1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.

### ATTENTION



When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

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7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
  8. Lock the end cap bus terminator (6).
- 

**IMPORTANT**

A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the serial communication bus.

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## Mounting Expansion I/O

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**ATTENTION**

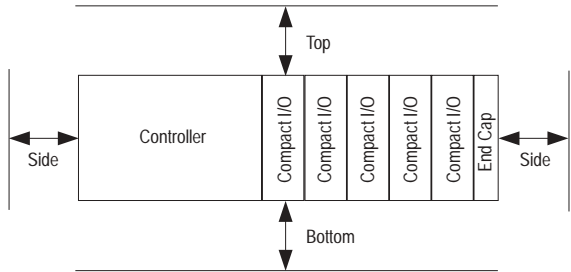


During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage on power up.

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## Minimum Spacing

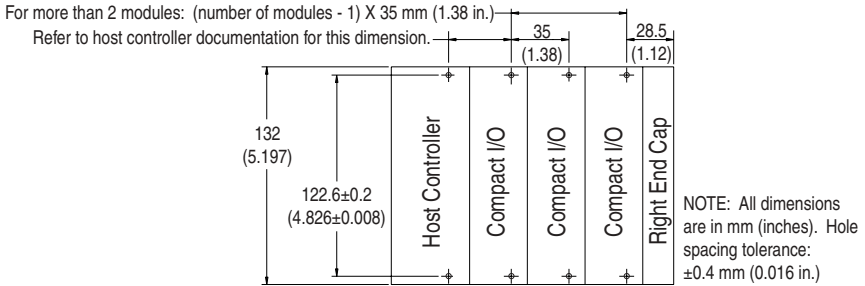
Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown:



## Panel Mounting

Mount the module to a panel using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

### Panel Mounting Using the Dimensional Template



### Panel Mounting Procedure Using Modules as a Template

The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. If you have sophisticated panel mounting equipment, you can use the dimensional template provided on page 7. Due to module mounting hole tolerance, it is important to follow these procedures:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw.
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.

#### TIP

If mounting more modules, mount only the last one of this group and put the others aside. This reduces remounting time during drilling and tapping of the next group.

7. Repeat steps 1 to 6 for any remaining modules.

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## DIN Rail Mounting

The module can be mounted using the following DIN rails: 35 x 7.5 mm (EN 50 022 - 35 x 7.5) or 35 x 15 mm (EN 50 022 - 35 x 15).

Before mounting the module on a DIN rail, close the DIN rail latches. Press the DIN rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

## Replacing a Single Module within a System

The module can be replaced while the system is mounted to a panel (or DIN rail).

1. Remove power. See important note on page 4.
2. On the module to be removed, remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or phillips style screw driver).
3. Move the bus lever to the right to disconnect (unlock) the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.
5. Gently slide the disconnected module forward. If you feel excessive resistance, check that the module has been disconnected from the bus, and that both mounting screws have been removed (or DIN latches opened).

### TIP

It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement module, be sure that the bus lever on the module to be installed, and on the right-side adjacent module are in the unlocked (fully right) position.
7. Slide the replacement module into the open slot.
8. Connect the modules together by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws (or snap the module onto the DIN rail).



## Field Wiring Connections

### Grounding the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used), are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

### Input Wiring

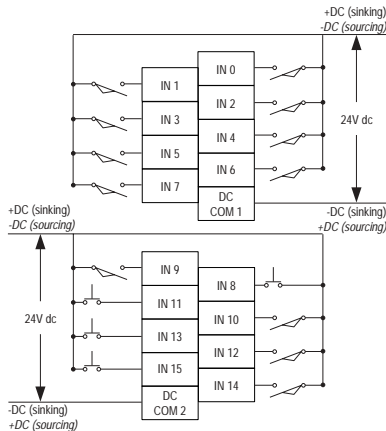
Basic wiring of input devices<sup>(1)</sup> to the 1769-IQ16F is shown below.

#### ATTENTION



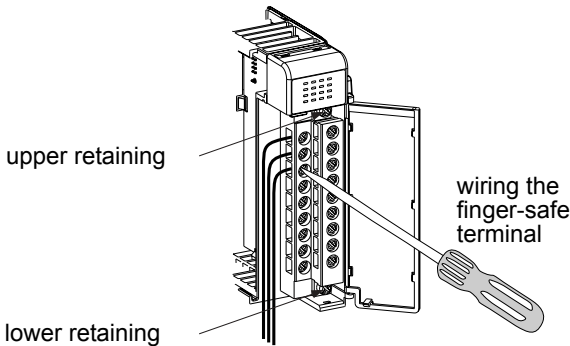
Miswiring of the module to an AC power source will damage the module.

Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up. Once wiring is complete, ensure the module is free of all metal fragments.



<sup>(1)</sup>**Sinking/Sourcing Inputs** - Sourcing/sinking describes the current flow between the I/O module and the field device. Sourcing I/O circuits supply (source) current to sinking field devices. Sinking I/O circuits are driven by a current sourcing field device. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe*: DC sinking input and sourcing output module circuits are the commonly used options.

A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.



## Removing the Finger-Safe Terminal Block

To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).

## Wiring the Finger-Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate. You can use the bare wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.

### TIP

The terminal screws are non-captive. Therefore, it is possible to use a ring lug [max. 1/4" o.d. with a 0.139" minimum i.d. (M3.5)] with the module.

- Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lbs).

**TIP**

If you need to remove the finger-safe cover, insert a screw driver into one of the square, wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

## Wire Size and Terminal Screw Torque

Each terminal accepts up to two wires with the following restrictions:

| Wire Type |                 | Wire Size      | Terminal Screw Torque | Retaining Screw Torque |
|-----------|-----------------|----------------|-----------------------|------------------------|
| Solid     | Cu-90°C (194°F) | #14 to #22 AWG | 0.68 Nm (6 in-lbs)    | 0.46 Nm (4.1 in-lbs)   |
| Stranded  | Cu-90°C (194°F) | #16 to #22 AWG | 0.68 Nm (6 in-lbs)    | 0.46 Nm (4.1 in-lbs)   |

## I/O Memory Mapping

### *Input Data File*

For each input module, slot x, word 0 in the input data file contains the current state of the field input points.

| Word | Bit Position |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |
|------|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
|      | 15           | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |   |
| 0    | r            | r  | r  | r  | r  | r  | r | r | r | r | r | r | r | r | r | r | r |

r= read

1769-IQ16F Configuration File

The read/writable configuration data file allows the setup of the digital filter settings for each of the two input groups. Group 0 is inputs 0 - 7, Group 1 is inputs 8 - 15.

The manipulation of the bits from this file is normally done with programming software (e.g., RSLogix 500, RSNetworkx for DeviceNet, etc.) during initial configuration of the system. In that case, graphical screens are provided via the programmer to simplify configuration. However, some systems (e.g., 1769-ADN DeviceNet Adapter) also allow the bits to be altered as part of the control program using communication rungs. In that case, it is necessary to understand the bit arrangement.

| Word | Bit Position                     |    |    |    |                                  |    |   |   |                                  |   |   |   |                                  |   |   |   |
|------|----------------------------------|----|----|----|----------------------------------|----|---|---|----------------------------------|---|---|---|----------------------------------|---|---|---|
|      | 15                               | 14 | 13 | 12 | 11                               | 10 | 9 | 8 | 7                                | 6 | 5 | 4 | 3                                | 2 | 1 | 0 |
| 0    | Filter Time On to Off<br>Group 1 |    |    |    | Filter Time Off to On<br>Group 1 |    |   |   | Filter Time On to Off<br>Group 0 |   |   |   | Filter Time Off to On<br>Group 0 |   |   |   |
| 1    | 0000000000000000                 |    |    |    |                                  |    |   |   |                                  |   |   |   |                                  |   |   |   |
| 2    | 0000000000000000                 |    |    |    |                                  |    |   |   |                                  |   |   |   |                                  |   |   |   |
| 3    | 0000000000000000                 |    |    |    |                                  |    |   |   |                                  |   |   |   |                                  |   |   |   |

| Filter Time <sup>(1)</sup> | Bit Setting |
|----------------------------|-------------|
| 2.0 msec                   | 0010        |
| 1.0 msec                   | 0011        |
| 0.5 msec                   | 0100        |
| 0.1 msec                   | 0101        |
| 0.0 msec                   | 0110        |

<sup>(1)</sup> Filter Time: Word 0, the Filter Time configures the ON to OFF and OFF to ON hardware delay times for each input group.

Spare/Replacement Module Parts

- Terminal Block: 1769-RTBN18 (1 per kit)
- Door Label: 1769-RL1 (2 per kit)
- Door: 1769-RD (2 per kit)

## Specifications

### General Specifications

| Specification                             | Value  |
|---|--|
| Dimensions                                | 118 mm (height) x 87 mm (depth) x 35 mm (width)<br>height including mounting tabs is 138 mm<br>4.65 in. (height) x 3.43 in (depth) x 1.38 in (width)<br>height including mounting tabs is 5.43 in. |
| Approximate Shipping Weight (with carton) | 270g (0.6 lbs.)  |
| Storage Temperature                       | -40°C to +85°C (-40°F to +185°F)   |
| Operating Temperature                     | 0°C to +60°C (32°F to +140°F)  |
| Operating Humidity                        | 5% to 95% non-condensing   |
| Operating Altitude                        | 2000 meters (6561 feet)  |
| Vibration                                 | Operating: 10 to 500 Hz, 5G, 0.030 inches maximum peak-to-peak<br>Relay Operation: 2G  |
| Shock                                     | Operating: 30G panel mounted (20G DIN rail mounted)<br>Relay Operation: 7.5G panel mounted (5G DIN rail mounted)<br>Non-Operating: 40G panel mounted (30G DIN rail mounted)                        |
| Agency Certification                      | C-UL certified (under CSA C22.2 No. 142)<br>UL 508 listed<br>CE compliant for all applicable directives  |
| Hazardous Environment Class               | Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)   |
| Radiated and Conducted Emissions          | EN50081-2 Class A  |
| <i>Electrical /EMC:</i>                   | <i>The module has passed testing at the following levels:</i>  |
| ESD Immunity (IEC1000-4-2)                | 4kV contact, 8 kV air, 4 kV indirect   |
| Radiated Immunity (IEC1000-4-3)           | 10 V/m, 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier   |
| Fast Transient Burst (IEC1000-4-4)        | 2 kV, 5 kHz  |
| Surge Immunity (IEC1000-4-5)              | 2 kV common mode, 1 kV differential mode   |
| Conducted Immunity (IEC1000-4-6)          | 10V, 0.15 to 80 MHz <sup>(1)</sup>   |

<sup>(1)</sup> Conducted Immunity frequency range may be 150 kHz to 30 MHz if the Radiated Immunity frequency range is 30 MHz to 1000 MHz.

## Input Specifications

| Specification                              | 1769-IQ16F  |
|--|---|
| Voltage Category                           | 24V dc (sink/source <sup>(1)</sup> )  |
| Operating Voltage Range                    | 10 to 30V dc at 30°C (86°F)<br>10 to 26.4V dc at 60°C (140°F)   |
| Number of Inputs                           | 16  |
| Bus Current Draw (max.)                    | 110 mA at 5V dc (0.55W)   |
| Heat Dissipation                           | 3.55 Total Watts <i>(The Watts per point, plus the minimum Watts, with all points energized.)</i>   |
| Digital Filter                             | OFF to ON 0s, 100µs, 500µs, 1ms, 2ms<br>ON to OFF 0s, 100µs, 500µs, 1ms, 2ms  |
| Hardware Delay                             | OFF to ON 100µs (typical)<br>300µs (maximum)<br>ON to OFF 250µs (typical)<br>1ms (maximum)  |
| Off-State Voltage (max.)                   | 5V dc   |
| Off-State Current (max.)                   | 1.5 mA  |
| On-State Voltage (min.)                    | 10V dc  |
| On-State Current (min.)                    | 2.0 mA  |
| Inrush Current (max.)                      | 250 mA  |
| Nominal Impedance                          | 3K Ω  |
| IEC Input Compatibility                    | Type 1+   |
| Power Supply Distance Rating               | 8 (The module may not be more than 8 modules away from the power supply or controller.)   |
| Input Point to Bus (Compact Bus) Isolation | Verified by one of the following dielectric tests: 1200V ac for 1 sec. or 1697V dc for 1 sec.<br>75V dc working voltage (IEC Class 2 reinforced insulation) |
| Isolated Groups                            | Group 1: inputs 0 to 7<br>Group 2: inputs 8 to 15<br>Isolated groups operate in either sink or source configurations.                                       |
| Input Group to Input Group Isolation       | Verified by one of the following dielectric tests: 1200V ac for 1 sec. or 1697V dc for 1 sec.<br>75V dc working voltage (IEC Class 2 reinforced insulation) |
| Vendor I.D. Code                           | 1   |
| Product Type Code                          | 7   |
| Product Code                               | 69  |

<sup>(1)</sup> **Sinking/Sourcing Inputs** - Sourcing/sinking describes the current flow between the I/O module and the field device. Sourcing I/O circuits supply (source) current to sinking field devices. Sinking I/O circuits are driven by a current sourcing field device. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe:* DC sinking input and sourcing output module circuits are the commonly used options.

## Hazardous Location Considerations

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

**ATTENTION****EXPLOSION HAZARD**

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Do not connect or disconnect components unless power has been switched off or the area is known to be non-hazardous.
- This product must be installed in an enclosure.
- All wiring must comply with N.E.C. article 501-4(b).

## Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

**ATTENTION****DANGER D'EXPLOSION**

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
- Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée et que l'environnement est classé non dangereux.
- Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée ou que l'environnement est classé non dangereux.
- Ce produit doit être installé dans une armoire.

# For More Information

| For  | Refer to this Document   | Pub. No.         |
|--|--|------------------|
| a more detailed description of how to install and use your Compact I/O with MicroLogix 1200 & 1500 programmable controller | MicroLogix 1200 and MicroLogix 1500 Programmable Controllers User Manual | 1764-RM001B-US-P |
| a more detailed description of how to install and use your Compact I/O with the 1769-ADN DeviceNet Adapter                 | 1769-ADN DeviceNet Adapter User Manual                                   | 1769-UM001A-US-P |
| a more detailed description of how to install and use your Compact I/O with CompactLogix programmable controllers          | CompactLogix System User Manual  | 1769-UM007C-EN-P |
| more information on proper wiring and grounding techniques   | Industrial Automation Wiring and Grounding Guidelines                    | 1770-4.1         |

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