Installation Instructions

Compact™ I/O High Speed Counter Module

(Cat. No. 1769-HSC)

Inside...

Publication 1769-IN030A-EN-P - December 2001

European Communities (EC) Directive Compliance

This product carries the CE mark and is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC — Generic Emission Standard, Part 2 — Industrial Environment
- EN 50082-2 EMC — Generic Immunity Standard, Part 2 — Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests. For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the Allen-Bradley publication *Industrial Automation Wiring and Grounding Guidelines For Noise Immunity*, publication 1770-4.1. and the Automation Systems Catalog, B111.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

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 WARNING statement applies to use in hazardous locations.

WARNING

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 cables connected to the product must remain in the enclosure or be protected by conduit or other means.
- 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.

AVERTISSEMENT

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.

Module Description

Overview

Product Description

The 1769-HSC is 1 MHz counter/encoder input module with four on-board 5 to 30V dc sourcing outputs designed for high speed control applications such as flow control, measuring length, position, speed, frequency or duration. The module can simultaneously interface with a maximum of two quadrature incremental encoders or four single-input count inputs from devices such as proximity sensors, photo-eyes, single pulse output encoders (with or without direction), or similar products used to monitor counting, flow or frequency.

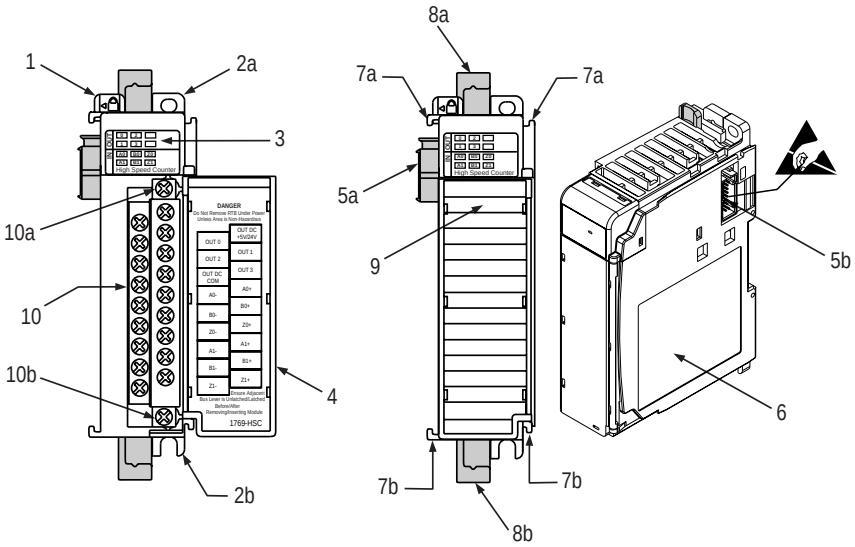
The input voltage range is 2.6 to 30V dc. The module is compatible with CompactLogix and MicroLogix 1500 programmable controllers, as well as the Series B 1769-ADN DeviceNet Adapter.

Features

The 1769-HSC module includes all of the standard 1769 I/O module features: rackless, removable terminal block, integrated high speed bus/backplane, panel or DIN rail mounting. In addition, it possesses the following:

- 2 quadrature (ABZ) differential inputs alternately configurable for:
  - Pulse internal direction input (4 counters in this configuration)
  - Pulse external direction input
  - Up and down pulse input
  - X1, X2 or X4 quadrature encoder input
- 32-bit count values (±2 billion counts)
- 21-bit rate values (±1 MHz)
- User-definable minimum and maximum count values
- 16 user-defined ranges with each range individually assignable to one of the four counter channels
- User-definable preset
- Linear or ring counter operation
- Selectable input filters
- 5 to 30V dc counter/encoder inputs and control outputs
- 4 real (physical) outputs and 12 virtual (control bit) outputs
- Real outputs have electronic overcurrent protection and rated current of 0.5A per channel
- Safe State control options (options depend on which controller is used) to allow the module to operate during fault or program conditions

Hardware Features



Item	Description
1	bus lever
2a	upper panel mounting tab
2b	lower panel mounting tab
3	module input and output status LEDs
4	module door with terminal identification label
5a	movable bus connector (bus interface) with female pins
5b	stationary bus connector (bus interface) with male pins
6	nameplate label
7a	upper tongue-and-groove slots
7b	lower tongue-and-groove slots
8a	upper DIN rail latch
8b	lower DIN rail latch
9	write-on label for user identification tags
10	removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

Module Installation

The 1769-HSC module 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[1]) and with circuits not exceeding Over Voltage Category II[2] (IEC 60664-1).[3]

Prevent Electrostatic Discharge

ATTENTION

Electrostatic discharge can damage integrated circuits or semiconductors if you touch the bus connector pins, terminal block, or devices on the circuit board. 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.

(1) 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.

(2) 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.

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

System Planning

Consider the following when planning your system:

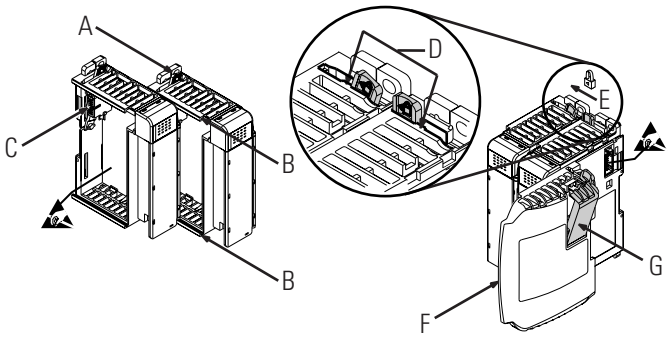
- A 1769-ECR (right end cap) or 1769-ECL (left end cap) is required to terminate the end of the Compact I/O bus.
- Each bank of Compact I/O must have its own power supply (a MicroLogix 1500 acts as the power supply for modules directly connected to it).
- A Compact I/O power supply, or MicroLogix 1500 Base Unit, has limits in the amount of +5V dc and +24V dc current it can supply to modules in its I/O bank. These limits depend on the catalog number (e.g. 1769-PA2) of the supply. A bank of modules must not exceed the current limits of the I/O bank power supply (e.g. 1769-PA2) or MicroLogix 1500 Base Unit.

  Refer to the *Compact 1769 Expansion I/O Power Supplies Installation Instructions*, publication 1769-5.14 or the *MicroLogix 1500 User Manual*, publication 1764-UM001A-EN-P.
- The module has a distance rating of four, therefore the module must be within four modules of the I/O bank's power supply.

System Assembly

The module can be attached to an adjacent controller, power supply, or I/O module. For mounting instructions, see "Panel Mounting" on page 9, or "DIN Rail Mounting" on page 11. To work with a system that is already mounted, see "Replacing a Single Module within a System" on page 12.

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 (A) is in the unlocked (fully right) position.

3. Use the upper and lower tongue-and-groove slots (B) to secure the modules together.
4. Move the module back along the tongue-and-groove slots until the bus connectors (C) line up with each other.
5. Use your fingers or a small screw driver to push the bus lever back slightly to clear the positioning tab (D).
6. Move the module's bus lever fully to the left (E) 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.

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

IMPORTANT A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the Compact I/O bus.

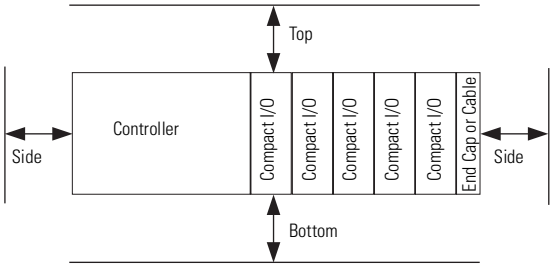
System Mounting

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.

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:



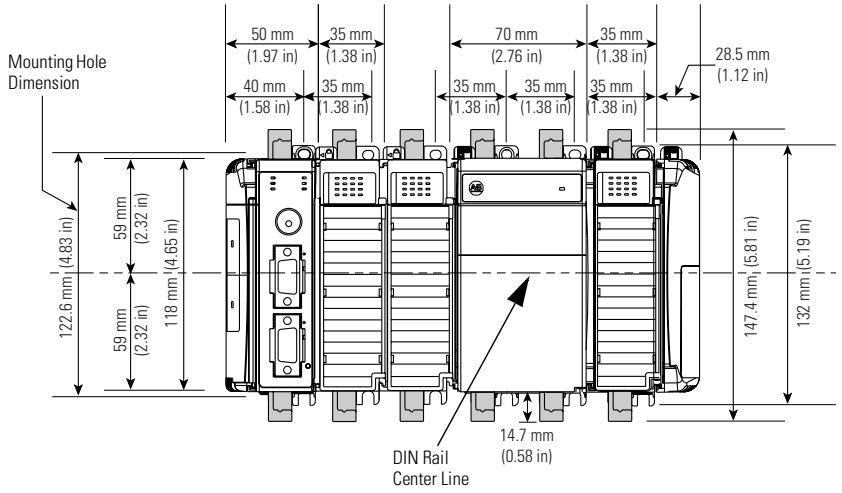
Panel Mounting

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

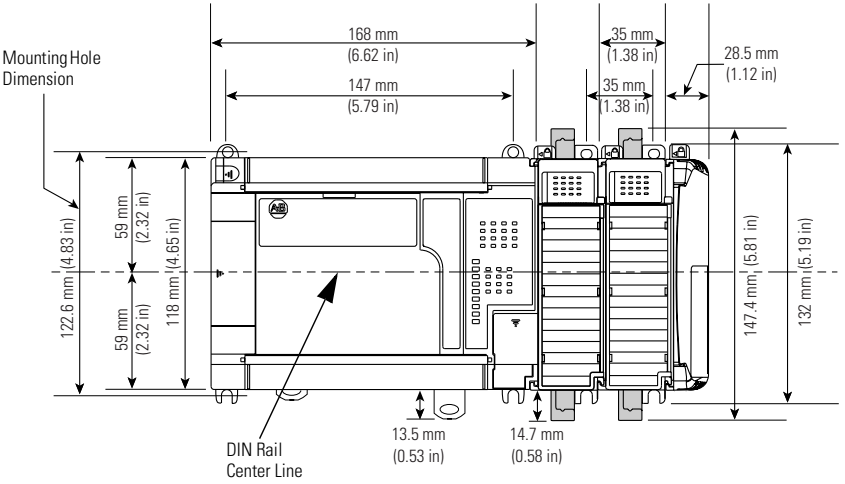
Panel Mounting Using the Dimensional Drawing

NOTE: All dimensions are in mm (inches). Hole spacing tolerance: ±0.04 mm (0.016 in.).

Compact I/O with CompactLogix Controller and Power Supply



Compact I/O with MicroLogix 1500 Base Unit and Processor



Panel Mounting Procedure Using Modules as a Template

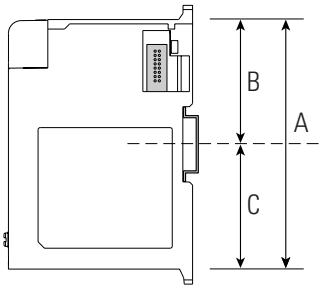
The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. Due to module mounting hole tolerance, it is important to follow these procedures:

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

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. DIN rail mounting dimensions are shown below.



Dimension	Height
A	118 mm (4.65 in.)
B	59 mm (2.325 in.)
C	59 mm (2.325 in.)

Replacing the 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 6.
2. Remove terminal block or disconnect input/output wiring from the module.
3. Remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade screwdriver).
4. On the module to be replaced and the right-side adjacent module (or end cap if the module is the last module in the bank), move the bus levers to the right (unlock) to disconnect the module from the adjacent modules.
5. Gently slide the disconnected module forward.

   If you feel excessive resistance, make sure that you disconnected the module from the bus and that you removed both mounting screws (or opened the DIN latches).

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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 right-side adjacent module is 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 or end cap.
9. Replace the mounting screws (or snap the module onto the DIN rail).
10. Replace the terminal block or connect input/output wiring to the module.

Field Wiring Connections

System Wiring Guidelines

Consider the following when wiring your system:

General

- Disconnect power to the module before wiring. This includes sensor power and 1769 bus power.
- Input and output channels are isolated from the 1769 Compact bus. Input channels are isolated from one another; output channels are not.
- Shielded cable is required for high-speed input signals A, B, and Z. Use individually shielded, twisted-pair cable (or the type recommended by the encoder manufacturer) for lengths up to 300 meters (1000 feet).
- Group this module and other low voltage DC modules away from AC I/O or high voltage DC modules.
- Route field wiring away from any other wiring and as far as possible from sources of electrical noise, such as motors, transformers, contactors, and ac devices.
- Routing field wiring in a grounded conduit can reduce electrical noise.
- If field wiring must cross ac or power cables, ensure that they cross at right angles.
- Make sure the system is properly grounded.

Grounding

- 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 only required when the mounting surface is non-conductive and cannot be grounded.
- Keep shield connection to ground as short as possible.
- Ground the shield drain wire at the 1769-HSC input end only.

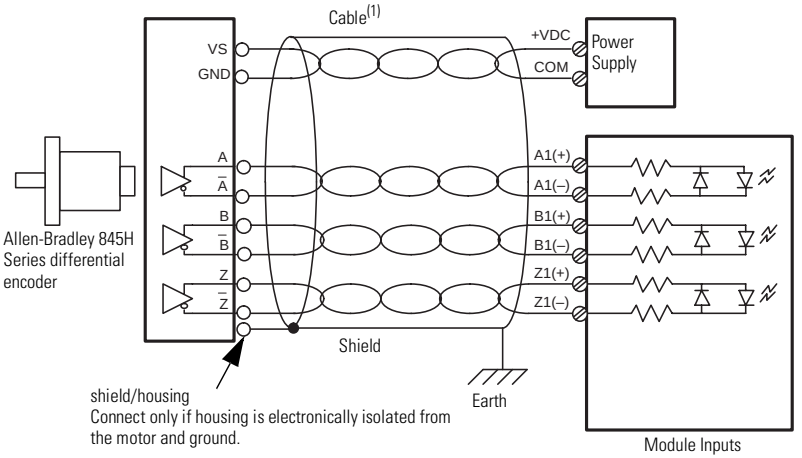
  Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

Terminal Block

- To ensures optimum accuracy, limit overall cable impedance by keeping cable as short as possible. Locate the module as close to input devices as the application permits.
- Tighten terminal screws with care. Excessive tightening can strip a screw.

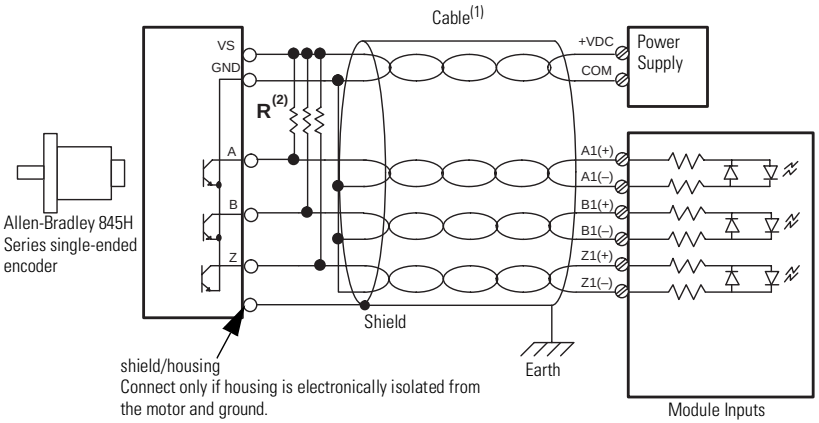
Wiring Diagrams

Figure 1 Differential Encoder Wiring



(1) Refer to your encoder manual for proper cable type. The type of cable used should be twisted pair, individually shielded cable with a maximum length of 300m (1000 ft.).

Figure 2 Single-Ended Encoder Wiring



(1) Refer to your encoder manual for proper cable type. The type of cable used should be twisted-pair, individually shielded cable with a maximum length of 300m (1000 ft.).

(2) External resistors are required if they are not internal to the encoder. The pull-up resistor (R) value depends on the power supply value. The table below shows the maximum resistor values for typical supply voltages. To calculate the maximum resistor value, the following formula:

$$R = \frac{(Vdc - Vmin)}{Imin}$$

where:

R = maximum pull-up resistor value

Vdc = power supply voltage

Vmin = 2.6V dc

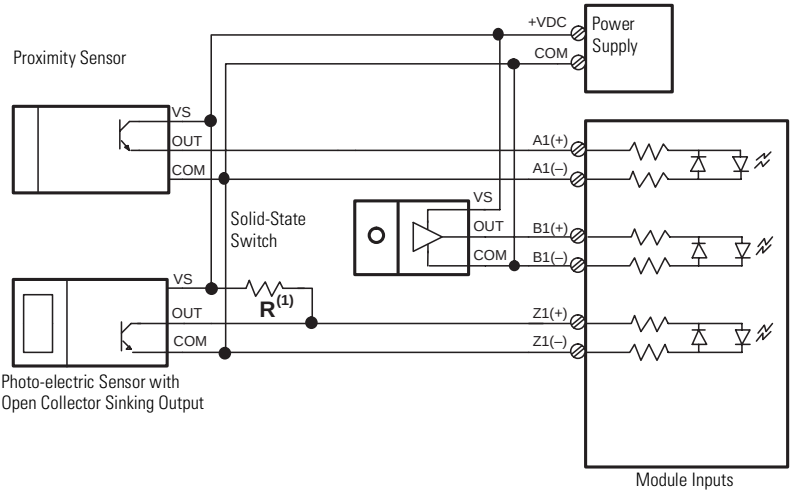
Imin = 6.8 mA

Power Supply Voltage (Vdc)	Maximum Pull-up Resistor Value (R)(1)
5V dc	352 Ω
12V dc	1382 Ω
24V dc	3147 Ω

(1) Resistance values may change, depending upon your application.

The minimum resistor (R) value depends on the current sinking capability of the encoder. Refer to your encoder's documentation.

Figure 3 Discrete Device Wiring



(1) External resistors are required if they are not internal to the sensor. The pull-up resistor (R) value depends on the power supply value. The table below shows the maximum resistor values for typical supply voltages. To calculate the maximum resistor value, the following formula:

$$R = \frac{(Vdc - Vmin)}{Imin}$$

where:

R = maximum pull-up resistor value

Vdc = power supply voltage

Vmin = 2.6V dc

Imin = 6.8 mA

Power Supply Voltage (Vdc)	Maximum Pull-up Resistor Value (R)(1)
5V dc	352 Ω
12V dc	1382 Ω
24V dc	3147 Ω

(1) Resistance values may change, depending upon your application.

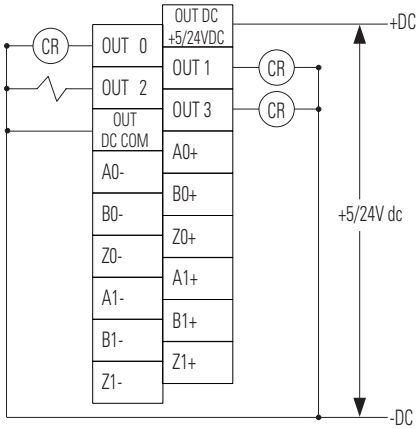
The minimum resistor (R) value depends on the current sinking capability of the sensor. Refer to your sensor's documentation.

Figure 4 Output Wiring

Basic wiring(1) of output devices(2) to the module is shown below.

ATTENTION

- Miswiring of the module to an AC power source or applying reverse polarity 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.



Removing the Finger-Safe Terminal Block

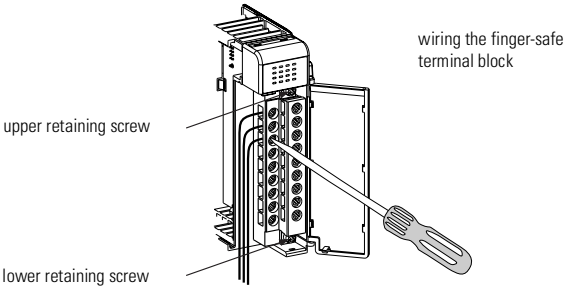
When wiring field devices to the module, it is not necessary to remove the terminal block. If you remove the terminal block, use the write-on label on the side of the terminal block to identify the module slot location and type.

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).

(1) Recommended Surge Suppression - The module has built-in suppression which is sufficient for most applications, however, for high-noise applications, use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V dc inductive loads. For additional details, refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1.

(2) Sourcing Output - Source describes the current flow between the I/O module and the field device. Sourcing output circuits supply (source) current to sinking field devices. 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.

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 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 [maximum 1/4 inch o.d. with a 0.139 inch minimum i.d. (M3.5)] with the module.

3. 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 screwdriver 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:

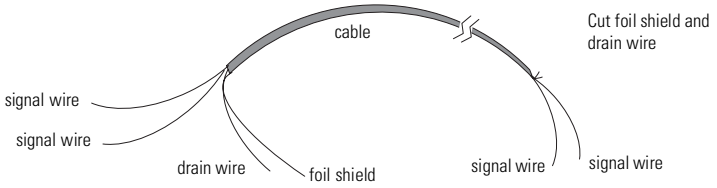
Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)
Stranded	Cu-90°C (194°F)	#16 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)

Wiring the Modules

ATTENTION

To prevent shock hazard, care should be taken when wiring the module to signal sources. Before wiring any module, disconnect power from the system power supply and from any other source to the module.

After the module is properly installed, follow the wiring procedure below. To ensure proper operation and high immunity to electrical noise, always use shielded wire.



To wire your module follow these steps.

1. At each end of the cable, strip some casing to expose the individual wires.
2. Trim the signal wires to 2-in. (5 cm) lengths. Strip about 3/16 in. (5 mm) of insulation away to expose the end of the wire.

ATTENTION

Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up.

3. At the 1769-HSC input end of the cable, twist the drain wire and foil shield together, bend them away from the cable, and apply shrink wrap. Ground the shield at this end using as short a lead-length as possible.
4. At the other end of the cable, cut the drain wire and foil shield back to the cable and apply shrink wrap.
5. Connect the signal wires to the terminal block. Connect the other end of the cable to the input device.
6. Repeat steps 1 through 5 for each channel on the module.

Output Operation

The four output terminals must be powered by a user-supplied external source. User Power range is from +5 to +30V dc. See Output Specifications on page 24 for voltage and current levels. There is no isolation between the outputs, but the outputs are isolated from the inputs and the 1769 Compact bus.

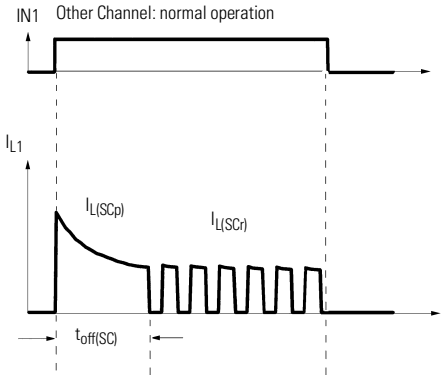
Electronic Protection

The electronic protection of the 1769-HSC has been designed to provide protection from current overload and short circuit conditions. The protection is based on a thermal cut-out principle. In the event of a short circuit or current overload condition on an output channel, that channel will turn off within milliseconds after the thermal cut-out temperature has been reached.

When this occurs, the module Fuse LED will turn on. You have the option to allow the protection device to automatically reset, or to be reset under program control. The automatic reset function occurs after the thermal protection device cools. If the current overload or short circuit condition still exists, the automatic reset cycle repeats until it is removed.

Short-circuits and overload conditions should be corrected as soon as possible. Damage may occur if short-circuits or overload conditions are allowed for extended periods.

Figure 5 Timing Diagram for Over-Current or Short-Circuit Shut-Down and Re-Start



IN1 – Commanded state of output channel

I_{L1} – Output current due to short-circuit overload

$I_{L(SCp)}$ – Peak short-circuit or overload current

$t_{off(SC)}$ – Time before shut-off occurs. This may take up to 11 milliseconds depending on external conditions.

$I_{L(SCr)}$ – Recurring short-circuit or overload current

Under-Voltage Condition

If the field supply voltage falls below a value of approximately 4V dc, all the 1769-HSC outputs shut down and remain off until the field supply voltage returns to a value within the module's normal operating range.

Transistor Output Transient Pulses

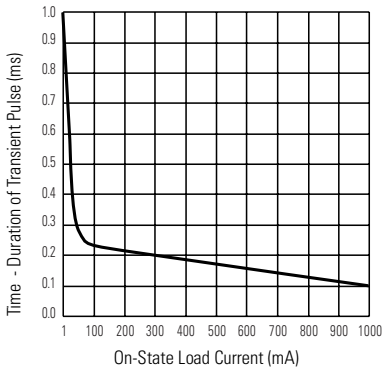
The maximum duration of the transient pulse occurs when minimum load is connected to the output. However, for most applications, the energy of the transient pulse is not sufficient to energize the load.

ATTENTION

A transient pulse occurs in transistor outputs when the external DC supply voltage is applied to the output common terminals (e.g. via the master control relay). The sudden application of voltage creates this transient pulse. This condition is inherent in transistor outputs and is common to solid state devices. A transient pulse can occur regardless of the controller having power or not. Refer to your controller's user manual to reduce the chance of inadvertent operation.

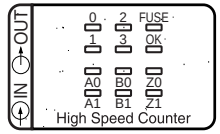
The following graph illustrates that the duration of the transient is proportional to the load current. Therefore, as the on-state load current increases, the transient pulse decreases. Power-up transients do not exceed the time duration shown below, for the amount of loading indicated, at 60°C (140°F).

Figure 6 Transient Pulse Duration as a Function of Load Current



Module Power-Up

At module power-up, a series of internal diagnostic tests are performed. These diagnostic tests must be successfully completed or the module OK LED remains off or red, and a module error is reported to the controller.



Diagnostic Indicators

LED	Color	Indicates	LED	Color	Indicates
0 OUT	Amber	ON/OFF logic status of output 0	**A0**	Amber	ON/OFF status of input A1
1 OUT	Amber	ON/OFF logic status of output 1	**A1**	Amber	ON/OFF status of input A2
2 OUT	Amber	ON/OFF logic status of output 2	**B0**	Amber	ON/OFF status of input B1
3 OUT	Amber	ON/OFF logic status of output 3	**B1**	Amber	ON/OFF status of input B2
FUSE	Red	Overcurrent	**Z0**	Amber	ON/OFF status of input Z1
OK	Off	No power is applied.	**Z1**	Amber	ON/OFF status of input Z2
	Red (briefly)	Performing self-test.			
	Solid Green	Normal operating condition.			
	Flashing Green	OK, in Program or Fault mode.			
	Solid Red or Amber	Hardware error. Cycle power to the module. If problem persists, replace the module.			
	Flashing Red	Recoverable fault. Reconfigure, reset, or perform error recovery. Refer to the *Compact I/O High Speed Counter User Manual*, publication 1769-UM006A-EN-P.			
ALL ON	Possible causes for all LEDs to be on: • Bus Error has occurred: Controller hard fault. Cycle power. • During Flash Upgrade of Controller: Normal. Do not cycle power during the Flash Upgrade.				

Default Configuration

When the module is powered up for the first time, it uses the following default configuration values. All counters are disabled and all outputs are off. The module' s Default Safe State configuration is all zero's, resulting in the following:

- Program State = UDSS (User Defined Safe State)
- Program Value = OFF
- ProgramStateRun = No
- Fault State = UDSS (User Defined Safe State)
- Fault Value = OFF
- FaultStateRun = No
- PFE (Program to Fault Enable) = leave program value applied.

Refer to the *Compact I/O High Speed Counter User Manual*, publication 1769-UM006A-EN-P, and use your programming software to change the configuration.

Specifications

General Specifications

Specification	Value
Dimensions	118 mm (height) x 87 mm (depth) x 35 mm (width), height including mounting tabs is 138 mm 4.65 in. (height) x 3.43 in (depth) x 1.38 in (width), height including mounting tabs is 5.43 in.
Approximate Shipping Weight (with carton)	309g (0.681 lbs.)
Bus Current Draw (max.)	425 mA at 5V dc 0 mA at 24V dc
Heat Dissipation	6.21 Total Watts (The Watts per point, plus the minimum Watts, with all points energized.)
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 in. peak-to-peak Relay Operation: 2G (1)
Shock	Operating: 30G, 11 ms panel mounted (20G, 11 ms DIN rail mounted) Non-Operating: 40G panel mounted (30G DIN rail mounted)
System Power Supply Distance Rating	4 (The module may not be more than 4 modules away from a system power supply.)
Recommended Cable	Individually shielded, twisted-pair cable (or the type recommended by the encoder or sensor manufacturer)
Agency Certification	C-UL certified (under CSA C22.2 No. 142) UL 508 listed 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
Vendor I.D. Code	1
Product Type Code	109
Product Code	19
Electrical /EMC:	*The module has passed testing at the following levels:*
ESD Immunity (IEC61000-4-2)	4 kV contact, 8 kV air, 4 kV indirect
Radiated Immunity (IEC61000-4-3)	10 V/m, 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
Fast Transient Burst (IEC61000-4-4)	2 kV, 5kHz
Surge Immunity (IEC61000-4-5)	1kV galvanic gun
Conducted Immunity (IEC61000-4-6)	10V, 0.15 to 80MHz(2)

(1) This rating applies for your system if a relay module such as the 1769-OW8 is used.

(2) 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	Value
Input Voltage Range	-30 to +30V dc(1)
On-State Voltage (max.)	30V dc(1)
On-State Voltage (min.)	2.6V dc
On-State Current (min.)	6.8 mA
Off-State Voltage (max.)	1.0V dc
Off-State Current (max.)	1.5 mA
Off-State Leakage Current (max.)	1.5 mA
Input Current (max.)	15 mA
Input Current (min.)	6.8 mA
Input Impedance (nominal)	1950 Ω
Pulse Width (min.)	250 nsec
Phase Separation (min.)	131 nsec
Input Frequency (max.)	1 MHz
Isolation (Input to Bus and Input to Input) Verified by one of the following dielectric tests:	• 1200V ac or 1697V dc for 1 second • 75V dc working voltage (IEC Class 2 reinforced insulation)

(1) See Maximum Input Voltage - 24V dc Operation temperature derating on page 25.

Output Specifications

Specification	Value
Output Voltage Range	5 to 30V dc(1)
On-State Voltage (max.)	User Power - 0.1V dc
On-State Output Current (max.)	1A per point(2)
	4A per module(3)
On-State Output Current (min.)	1 mA
On-State Voltage Drop (max.)	0.5V dc
Off-State Leakage Current (max.)	5 µA
Turn On Time (max.)	400 µs(4)
Turn Off Time (max.)	200 µs
Reverse Polarity Protection	30V dc
Isolation (Outputs to Bus) Verified by one of the following dielectric tests:	• 1200V ac or 1697V dc for 1 second • 75V dc working voltage (IEC Class 2 reinforced insulation)

(1) See Maximum Output Voltage - 24V dc Operation temperature derating on page 25.

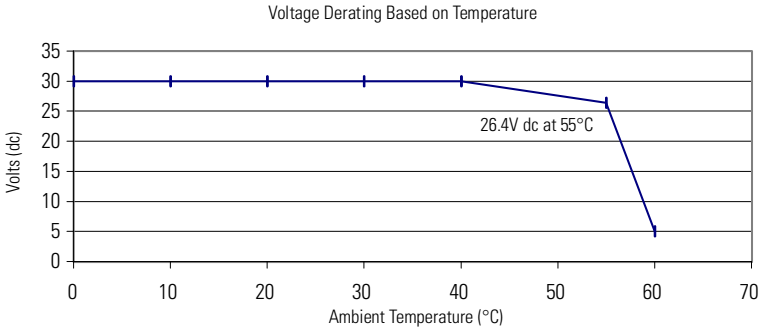
(2) See Maximum Output Current per Point - 5V dc Operation temperature derating on page 26 and Maximum Output Current per Point - 24V dc Operation temperature derating on page 27.

(3) See Maximum Output Current per Module - 5V dc Operation temperature derating on page 26 and Maximum Output Current per Module - 24V dc Operation temperature derating on page 27.

(4) Maximum turn-on time applies to output voltage range of 5 to 7V dc. For output voltages greater than 7V dc, the maximum turn-on time is 200 µs.

Temperature Derating

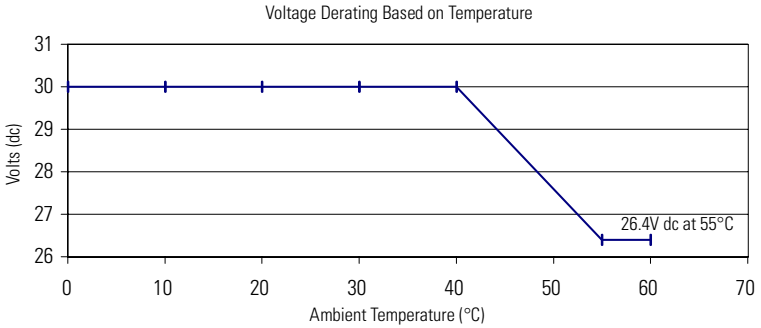
Maximum Input Voltage - 24V dc Operation



Temperature	Derated Voltage(1)
0°C to 40°C (-32°F to 104°F)	30V dc
55°C (131°F)	26.4V dc
60°C (140°F)	5V dc

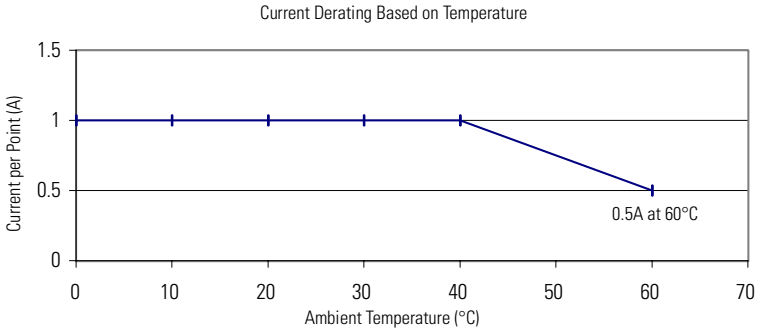
(1) Input voltage derating between 55°C and 60°C is achieved by using a dropping resistor.
For 24V dc input voltage, use a 2.4 kΩ, ½ Watt resistor.
For input voltages other than 24V dc, use a ½ Watt resistor with value: 125 x (V_{in} - 5V).

Maximum Output Voltage - 24V dc Operation



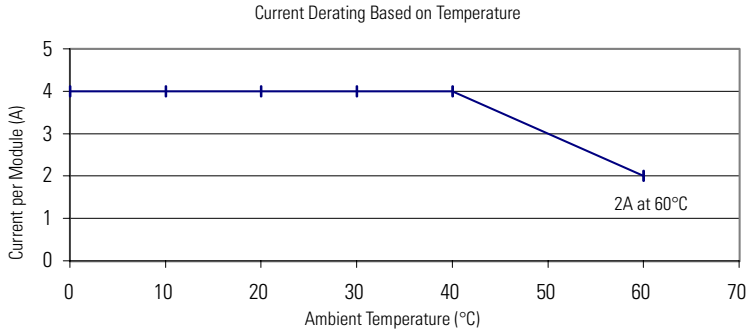
Temperature	Derated Voltage
0°C to 40°C (-32°F to 104°F)	30V dc
55°C to 60°C (131°F to 140°F)	26.4V dc

Maximum Output Current per Point - 5V dc Operation



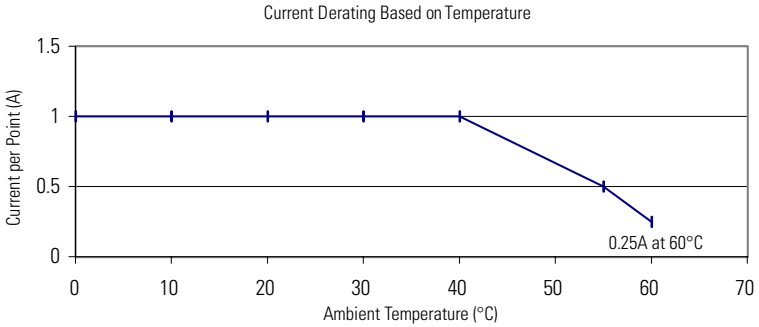
Temperature	Derated Current
0°C to 40°C (-32°F to 104°F)	1A
60°C (140°F)	0.5A

Maximum Output Current per Module - 5V dc Operation



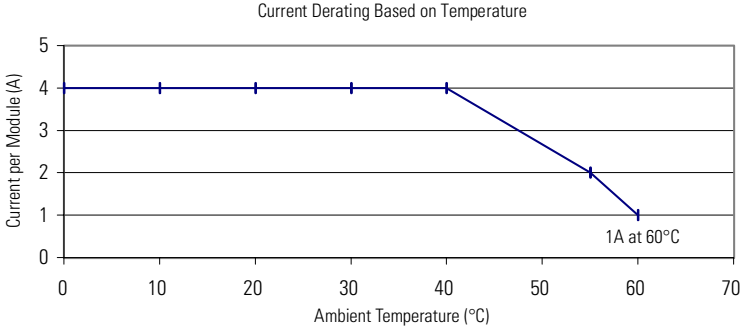
Temperature	Derated Current
0°C to 40°C (-32°F to 104°F)	4A
60°C (140°F)	2.0A

Maximum Output Current per Point - 24V dc Operation



Temperature	Derated Current
0°C to 40°C (-32°F to 104°F)	1A
55°C (131°F)	0.5A
60°C (140°F)	0.25A

Maximum Output Current per Module - 24V dc Operation



Temperature	Derated Current
0°C to 40°C (-32°F to 104°F)	4A
55°C (131°F)	2A
60°C (140°F)	1A

For More Information

For	Refer to this Document	Pub. No.
A more detailed description of how to use your High Speed Counter Module	Compact™ I/O High Speed Counter Module User Manual	1769-UM006A-EN-P
Detailed information on planning, mounting, wiring, and troubleshooting your CompactLogix System.	CompactLogix System User Manual	1769-UM007C-EN-P
Detailed information on planning, mounting, wiring, and troubleshooting your MicroLogix 1500 System.	MicroLogix 1500 Programmable Controllers User Manual	1764-UM001A-US-P
More information on proper wiring and grounding techniques.	Industrial Automation Wiring and Grounding Guidelines	1770-4.1

If you would like a manual, you can:

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