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**ISC-1781**

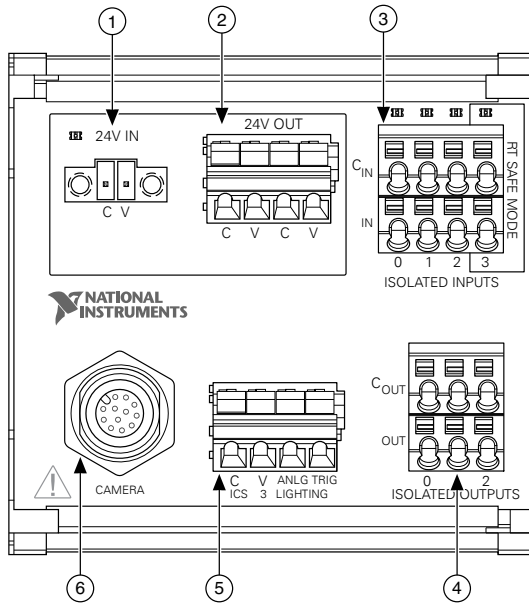
# Power and I/O Accessory

For ISC-178x Smart Cameras

The Power and I/O Accessory for ISC-178x Smart Cameras (Power and I/O Accessory) is a terminal block that simplifies power and I/O signal configuration for the ISC-178x Smart Camera.

This document describes how to install and operate the Power and I/O Accessory.

**Figure 1.** Power and I/O Accessory for ISC-178x Smart Cameras



- |                                     |   |
|-------------------------------------|---|
| 1. 24V IN connector                 | 4. Isolated outputs spring terminals    |
| 2. 24V OUT spring terminals         | 5. Lighting controller spring terminals |
| 3. Isolated inputs spring terminals | 6. Camera connector                     |

The Power and I/O Accessory has the following features:

- 12-pin A-coded M12 connector
- Spring terminals for each ISC-178x Smart Camera I/O signal
- Spring terminals for 24 V output

- User-replaceable fuses for accessory power, isolated outputs, and the lighting controller
- Built-in DIN rail clips for easy mounting

## What You Need to Get Started

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- Power and I/O Accessory for ISC-178x Smart Camera
- ISC-178x Smart Camera
- A-Code M12 to A-Code M12 Power and I/O Cable, NI part number 145232-03
- Power Supply, 100 V AC to 240 V AC, 24 V, 1.25 A, NI part number 723347-01
- 12-28 AWG wire
- Wire cutter
- Wire insulation stripper

For more information about using the Power and I/O Accessory with the ISC-178x Smart Camera, refer to the following documents on [ni.com/manuals](http://ni.com/manuals).

- *ISC-178x User Manual*
- *ISC-178x Getting Started Guide*

## Installing the Power and I/O Accessory

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Complete the following steps to install the Power and I/O Accessory:

1. Connect the included cable to the Camera connector on the Power and I/O Accessory and the Digital I/O and Power connector on the ISC-178x Smart Camera.



**Caution** Never touch the exposed pins of connectors.

2. Connect signal wires to the spring terminals on the Power and I/O Accessory:
  - a) Strip 1/4 in. of insulation from the signal wire.
  - b) Depress the lever of the spring terminal.
  - c) Insert the wire into the terminal.

Refer to the spring terminal labels and the Signal Descriptions section for a description of each signal.



**Caution** Do not connect input voltages greater than 24 VDC to the Power and I/O Accessory. Input voltages greater than 24 VDC can damage the accessory, all devices connected to it, and the smart camera. National Instruments is not liable for damage or injury resulting from such misuse.

3. Connect the power supply to the 24 V IN connector on the Power and I/O Accessory.
4. Connect the power supply to a power source.

# Wiring the Power and I/O Accessory

## ISC-178x Isolation and Polarity

The Power and I/O Accessory has three different grounds for the spring terminals labeled C, C<sub>IN</sub>, and C<sub>OUT</sub>. The spring terminals with the same label are connected internally, but C, C<sub>IN</sub>, and C<sub>OUT</sub> are not connected to each other. Users can wire different grounds together in order to share a power supply between the smart camera and the inputs or outputs.



**Note** To achieve functional isolation, users must maintain isolation when wiring the accessory.

Some wiring configurations may cause the polarity to appear inverted at the receiver. Users can invert the signal in the smart camera software to provide the intended polarity.

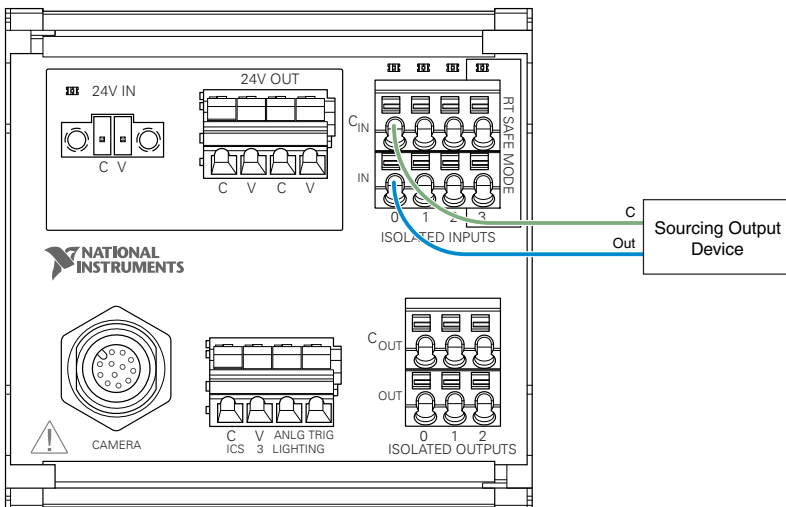
## Wiring Isolated Inputs

The following images show how to wire the isolated input spring terminals of the Power and I/O Accessory.



**Note** Isolated inputs have a built-in current limit on the smart camera. It is not usually necessary to use a current-limiting resistor on input connections. Refer to the documentation of the connected device to ensure that the maximum input current limit of the smart camera does not exceed the current capability of the connected output.

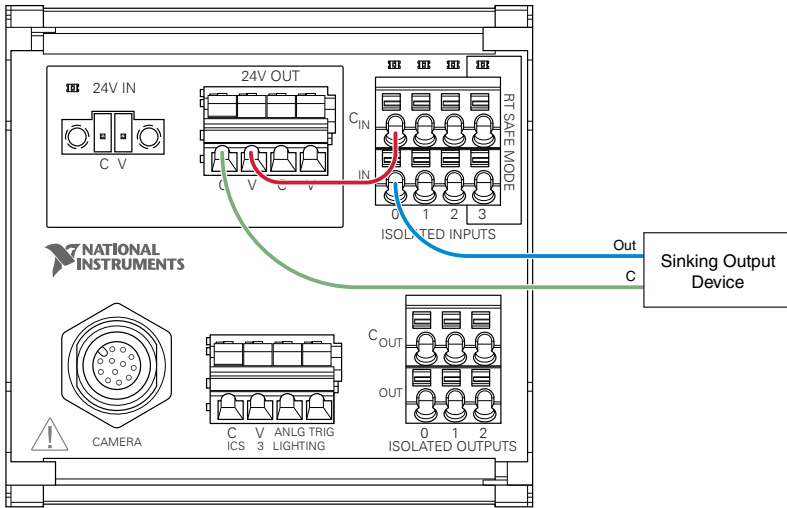
**Figure 2.** Wiring Isolated Input (Sinking Configuration) to Sourcing Output





**Caution** Connecting  $C_{IN}$  to a ground signal in a sinking output configuration will result in a short circuit.

**Figure 3.** Wiring Isolated Input (Sinking Configuration) to Sinking Output



## Wiring Isolated Outputs

Some configurations require a pull-up or current-limiting resistor on each output. When using resistors, refer to the following guidelines.



**Caution** Failure to follow these guidelines may result in damage to the smart camera, connected devices, or resistors.

- Do not exceed current sink capability of the isolated outputs of the smart camera.
- Do not exceed the current source or sink capability of the connected devices.
- Do not exceed the power specification of the resistors.



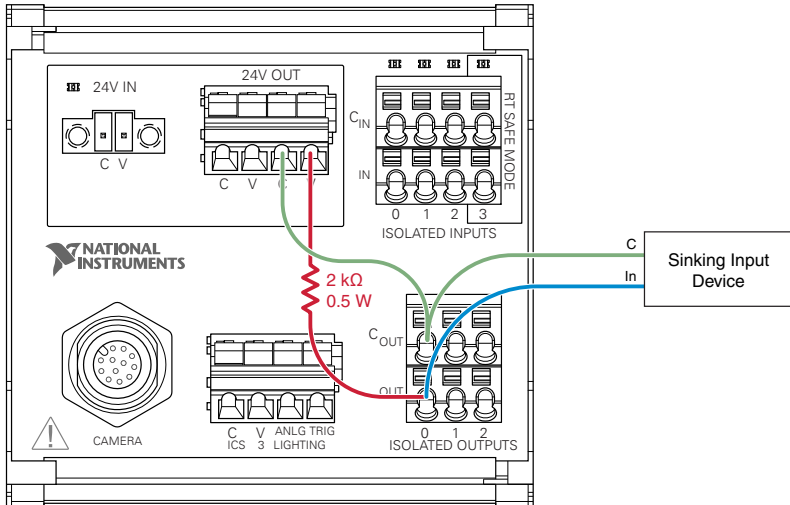
**Note** For most applications, NI recommends a 2 k $\Omega$  0.5 W pull-up resistor. Refer to the documentation of the connected input device to ensure this resistor value is suitable for that device.



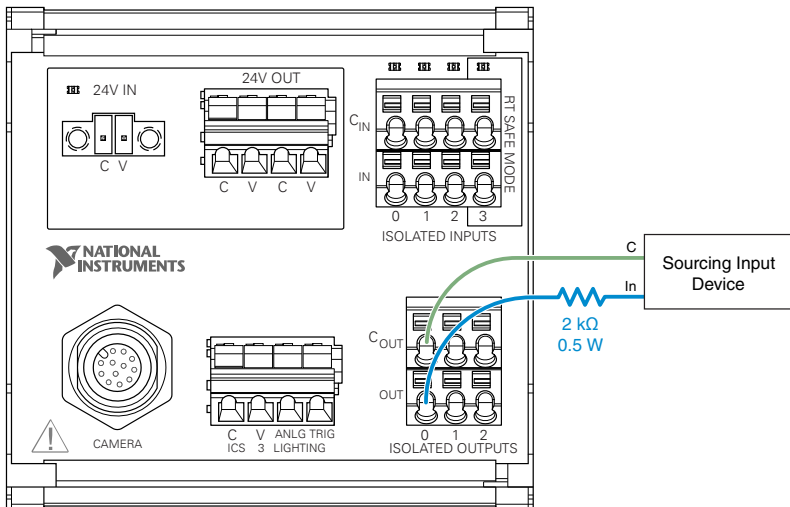
**Note** Resistors with a rating less than 2 k $\Omega$  can be used for faster rise times. Users must take care not to exceed the current sink limit of the smart camera or the connected device.

The following images show how to wire the isolated output spring terminals of the Power and I/O Accessory.

**Figure 4. Wiring Isolated Output to Sinking Input**



**Figure 5. Wiring Isolated Output to Sourcing Input**



**Note** A resistor may not be necessary for every sourcing input device. Refer to the documentation for the connected sourcing input device to verify resistor requirements.

## Wiring the Lighting Controller

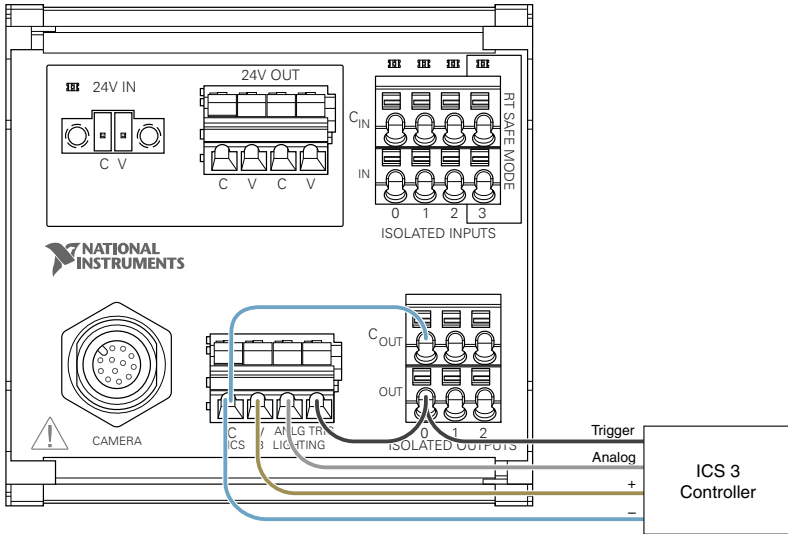
The following images show how to wire a lighting controller to the Power and I/O Accessory.

The TRIG terminal connects only to the V terminal through a built-in 2 kΩ pull-up resistor. To use the TRIG terminal, users must wire the terminal to the output signal generating the trigger. Any isolated output may be used as the trigger signal.

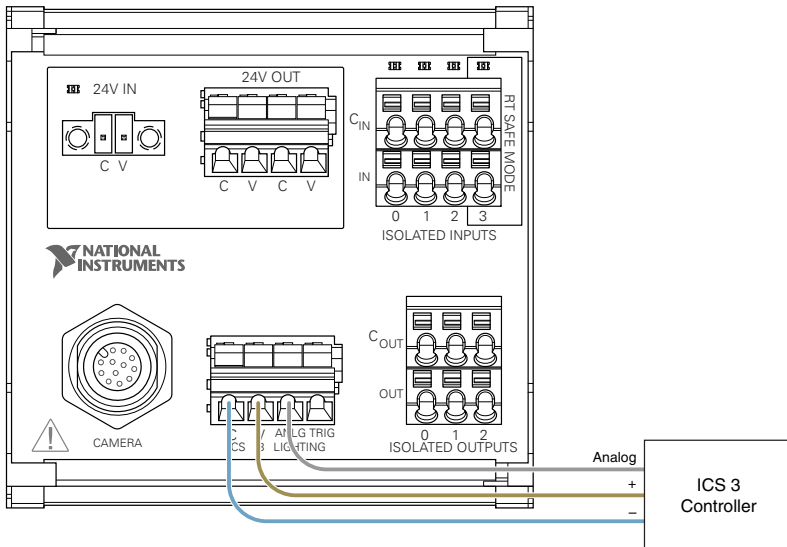


**Note** Review the power requirements for the lighting controller to ensure that the power supply is sufficient to power both the smart camera and the lighting controller.

**Figure 6.** Wiring the Lighting Controller using Isolated Output as Trigger



**Figure 7. Wiring the Lighting Controller without Trigger**



## Forcing the Real-Time ISC-178x into Safe Mode

Users can wire the Power and I/O Accessory to force the ISC-178x to boot into safe mode. Safe mode launches only the services necessary for updating the smart camera configuration and installing software.

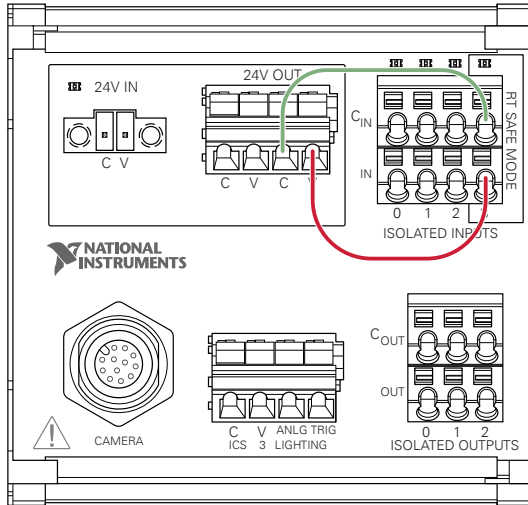


**Note** Users can only force Real-Time smart cameras to boot into safe mode. Windows smart cameras do not support safe mode.

1. Power down the Power and I/O Accessory.
2. Wire the accessory as shown in the following figure.



**Figure 8. Wiring to Force Safe Mode**



3. Power on the accessory to boot the ISC-178x into safe mode.

## Exiting Safe Mode

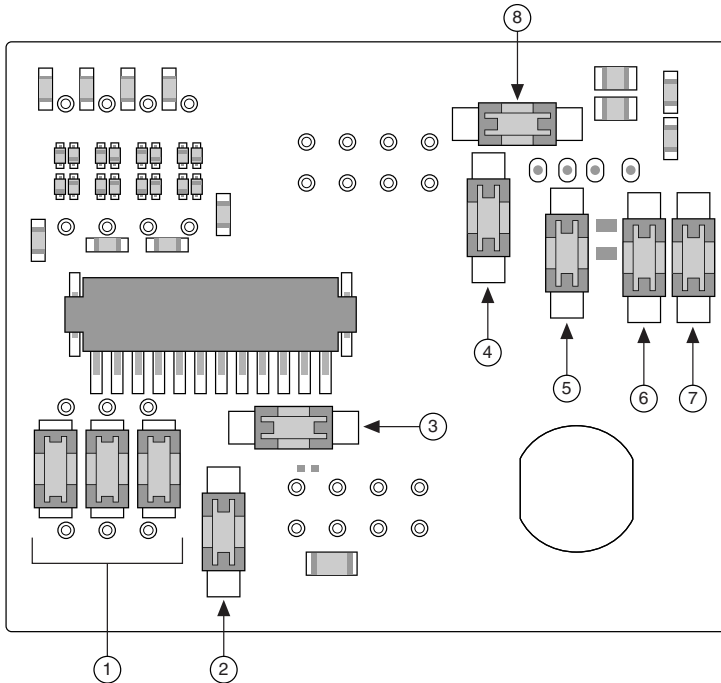
Follow these steps to restart the ISC-178x in normal operating mode.

1. Power down the Power and I/O Accessory.
2. Disconnect the wire to the IN3 spring terminal
3. Power on the accessory to restart the ISC-178x.

# Testing and Replacing Fuses

The Power and I/O Accessory has replaceable fuses and includes one additional fuse of each type.

**Figure 9. Fuse Locations**



- |                                 |                                 |
|---------------------------------|---------------------------------|
| 1. Isolated output fuses, 0.5 A | 5. ICS 3, V terminal fuse, 10 A |
| 2. Spare 0.5 A fuse             | 6. Spare 10 A fuse              |
| 3. ANLG terminal fuse, 0.1 A    | 7. Spare 0.1 A fuse             |
| 4. Spare 2 A fuse               | 8. Camera V terminal, 2 A       |

**Table 1. Power and I/O Accessory Fuses**

Protected Signal	Replacement Fuse Quantity	Littelfuse Part Number	Fuse Description
ICS 3, V terminal	1	0448010.MR	10 A, 125 V NANO <sup>2</sup> ® Fuse, 448 series, 6.10 × 2.69 mm
Camera V terminal	1	0448002.MR	2 A, 125 V NANO <sup>2</sup> ® Fuse, 448 series, 6.10 × 2.69 mm

**Table 1.** Power and I/O Accessory Fuses (Continued)

Protected Signal	Replacement Fuse Quantity	Littelfuse Part Number	Fuse Description
Isolated outputs	1	0448.500MR	0.5 A, 125 V NANO <sup>2</sup> ® Fuse, 448 series, 6.10 × 2.69 mm
ANLG terminal	1	0448.100MR	0.1 A, 125 V NANO <sup>2</sup> ® Fuse, 448 series, 6.10 × 2.69 mm



**Note** You can use a handheld DMM to verify the continuity of a fuse.

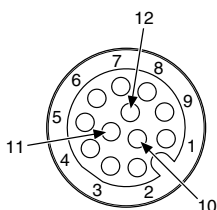
Complete the following steps to replace a blown fuse:

1. Unplug the power supply.
2. Remove all signal wires and cables from the Power and I/O Accessory.
3. Remove a side panel. Use a Phillips head screwdriver to remove the 2 retaining screws.
4. Slide the circuit board out.
5. Replace any blown fuses with an equivalent replacement fuse. Replacement fuses are labelled as SPARE on the circuit board.

## Signal Descriptions

Refer to the *ISC-178x Smart Camera User Manual* for detailed signal descriptions.

## ISC-178x Power and I/O Connector Pinout



**Table 2.** ISC-178x Power and I/O Connector Signal Descriptions

Pin	Signal	Description
1	C <sub>OUT</sub>	Common reference (negative) for isolated outputs
2	Analog Out	Analog reference output for lighting controller

**Table 2.** ISC-178x Power and I/O Connector Signal Descriptions (Continued)

Pin	Signal	Description
3	Iso Out 2+	General-purpose isolated output (positive)
4	V	System power voltage (24 VDC $\pm$ 10%)
5	Iso In 0	General-purpose isolated input
6	C <sub>IN</sub>	Common reference (positive or negative) for isolated inputs
7	Iso In 2	General-purpose isolated input
8	Iso In 3	<b>(NI Linux Real-Time)</b> Reserved for safe mode <b>(Windows)</b> General-purpose isolated input
9	Iso In 1	General-purpose isolated input
10	Iso Out 0+	General-purpose isolated output (positive)
11	C	System power and analog reference common
12	Iso Out 1+	General-purpose isolated output (positive)

The following NI power and I/O cables are available for the ISC-178x.

**Table 3.** Power and I/O Cables

Cables	Length	Part Number
A-Code M12 to A-Code M12 Power and I/O Cable	3 m	145232-03
A-Code M12 to Pigtail Power and I/O Cable	3 m	145233-03

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