Installation Instructions

Original Instructions

SensaGuard 18 mm Barrels

(These instructions are only for the Series B Version.)

Catalog Numbers—Low-level Coding: 440N-Z21S16A, 440N-Z21S16B, 440N-Z21S16H, 440N-Z21S16J, 440N-Z21S17A, 440N-Z21S17B, 440N-Z21S17H, 440N-Z21S26A, 440N-Z21S26B, 440N-Z21S26H, 440N-Z21S26J, 440N-Z21S17J, 440N-Z21X16H, 440N-Z21S16E, 440N-Z21S17B-PUR, High-level Coding: 440N-Z21U16A, 440N-Z21U16B, 440N-Z21U16H, 440N-Z21U16J, 440N-Z21U17A, 440N-Z21U17B, 440N-Z21U17H, 440N-Z21U26A, 440N-Z21U26B, 440N-Z21U26H, 440N-Z21U26J, 440N-Z21U17J

IMPORTANT SAVE THESE INSTRUCTIONS FOR FUTURE USE.

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Installation must be in accordance with the following instructions and specifications and implemented by suitable competent personnel. Adherence to the recommended maintenance instructions forms part of the warranty.

This unit is not to be used as a mechanical stop. Guard stops and guides must be fitted.

This device is intended to be part of the safety-related control system of a machine. Before installation, a risk assessment is performed to determine whether the specifications of this device are suitable for all foreseeable operational and environmental characteristics.

WARNING: Do not defeat, tamper, remove, or bypass this unit. Severe injury to personnel could result.

ATTENTION: This device must be provided with a 24V DC PELV or SELV power supply that conforms to the requirements of 414-3 of IEC 60364-4-41 where provisions have been taken. To confirm that, even if an internal fault, the voltage at the outgoing terminals cannot exceed 60V DC.

Improper selection or installation of the devices affects the integrity of the safety systems.

Personal injury or death, property damage, or economic loss can result.

Comply with ISO 14119 including section, accessibility to the installation, arrangement, and mounting, possible substitute actuation, access to the escape release, motivation to defeat, and actuation mode.

Management controls, working procedures, training, and additional protective measures can be used to minimize the motivation to defeat and to manage the use and availability of spare actuators.

Comply with ISO 13857 and ISO 13855 for guard openings and minimum (safe) distances.

Comply with IEC 62061 or ISO 13849-1 and ISO 13849-2 for functional safety.

This product is intended for industrial/business application only. It is not intended to be used in residential applications as it may cause radio interference on other residential devices.

ATTENTION: Read this document and the documents that are listed in the Additional Resources section about installation, configuration, and operation of this equipment before you install. Users are required to familiarize themselves with installation and connection instructions and requirements of all applicable codes, laws, and standards.

In accordance with applicable codes of practice, suitably trained personnel are required to implement installation, adjustments, service initiation, use, assembly, disassembly, and maintenance

If this equipment is used in a manner that the manufacturer does not specify, the protection that is provided by the equipment can be impaired.

Additional Resources

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, http://www.rockwellautomation.com/products/certification	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications (including translations) at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

ATTENTION: Do not attempt to install this device unless the installation instructions have been studied and understood. This document acts as a guide for a typical installation and is available in additional languages at http://www.rockwellautomation.com/literature/.

Table 1 - Technical Specifications

Attribute	18 mm Plastic Actuator	30 mm Plastic Actuator	18 mm Stainless Steel Actuator
Safety Ratings			
Standards Safety Classification	IEC 60947-5-3, Cat. 4 PLe Per ISO 13849-1, Type 4 Interlocking Device according to ISO 14119 with either low (standard) or high (unique) coding, SIL CL3 per IEC 62061 and IEC 61508		
Functional safety data	PFH_D = 1.32E-9 (Probability of dangerous failure per hour) T1 = 20 (Proof test interval)		
Certifications	CE marked for all applicable directives, c-UL-us (UL 508), and TÜV http://www.rockwellautomation.com/certification/overview.page		
Operating Characteristics			
Sensing distance, assured ON	15 mm (0.59 in.)	25 mm (0.98 in.)	10 mm (0.39 in.)
Sensing distance, assured OFF	25 mm (0.98 in.)	35 mm (1.78 in.)	20 mm (0.79 in.)
Operating voltage	24V DC 10%/-15% Class 2 SELV or PELV power supply		
Response time (Off)	45 ms		
Utilization category according to Ue Ie	DC-12 and DC-13 24V 200 mA		
Frequency of Operating Cycle	0.25 Hz		
No-load supply current	< 50 mA		
Outputs (OSSD)			
Safe state	De-energized (2 x PNP, 0V), AUX energized (1 x PNP, 24V)		
Run state	Energized (2 x PNP, 24V), AUX de-energized (1 x PNP, 0V)		
Load current	200 mA maximum		
Voltage drop	< 1.5V		
Switches connected in series	Unlimited. See Timing Diagram on page 6.		
Mechanical			
Sensor case material	Polycarbonate		Stainless Steel 304
Actuator case material	Polycarbonate		Stainless Steel 304
Environmental			
Operating temperature	-25…+70°C (-13…+158°F)		
Operating humidity	5…95% relative		
Washdown rating	IP66, IP67, IP69K		
Shock and vibration	IEC 60068-2-27 — 30 g (1.05 oz), 11 ms IEC 60068-2-6 — 10…55 Hz		

Attribute	18 mm Plastic Actuator	30 mm Plastic Actuator	18 mm Stainless Steel Actuator
Safety Ratings			
Standards Safety Classification	IEC 60947-5-3, Cat. 4 PLe Per ISO 13849-1, Type 4 Interlocking Device according to ISO 14119 with either low (standard) or high (unique) coding, SIL CL3 per IEC 62061 and IEC 61508		
Pollution degree	IEC 60947-1 — 3		
Electro-magnetic Compatibility (EMC)			
Electrostatic discharge ESD	IEC 61000-4-2: air discharge Per IEC 61326-1 (functional): 8 kV Per IEC 61000-6-7 (fail-safe): 8 kV		
	IEC 61000-4-2: contact discharge Per IEC 61326-1 (functional): 4 kV Per IEC 61000-6-7 (fail-safe): 6 kV		
Radiated EMF immunity	IEC 61000-4-3 Per IEC 61326-1 (functional): 10 V/m Per IEC 61000-6-7 (fail-safe): 20 V/m		
Electrical fast transient/burst immunity	IEC 61000-4-4 Per IEC 61326-1 (functional): 2 kV/5 kHz Per IEC 61000-6-7 (fail-safe): 2 kV/5 kHz		
Conducted immunity	IEC 61000-4-6 Per IEC 61326-1 (functional): 10V Per IEC 61000-6-7 (fail-safe): 20V		
Rated impulse withstand voltage	IEC 60947-1: 1 kV		
Protection	Short circuit, overload, reverse polarity, overvoltage, loss of ground		

Figure 1 - 18 mm Plastic Barrel Dimensions [mm (in.)]

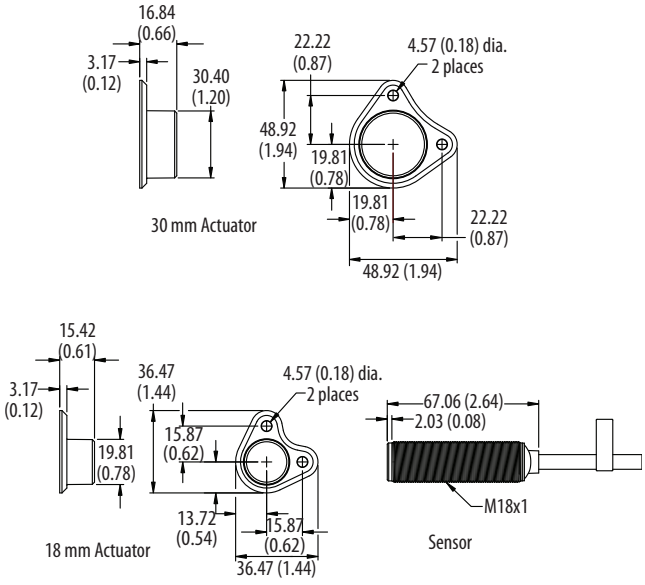


Figure 2 - 18 mm Stainless Steel Barrel Dimensions [mm (in.)]

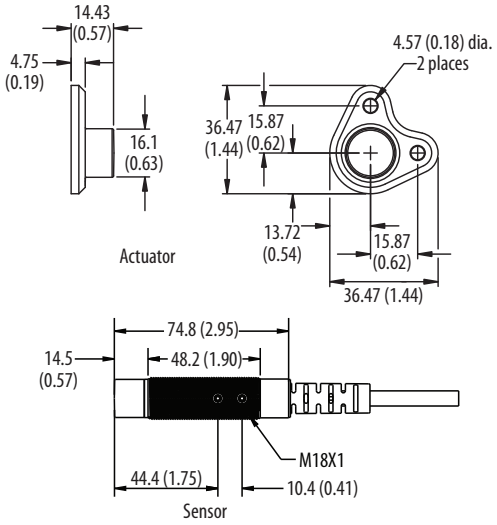


Figure 3 - Mode of Operation — Status Indicators

- Actuator is supplied with sensor
- Indicator green: Door/guard closed, safety outputs active.
- Indicator red: Door/guard open, safety outputs off.
- Indicator flashes red: Unit failure. See Diagnostic — Unit Indicators on page 3.
- Indicator flashes green: Safety inputs off.

Mounting Information

Use non-removable screws, bolts, or nuts to mount the switch and actuator. Do not over torque the mounting hardware. Position the switch and actuator so they are aligned with each other.

Nut Torque Specification

Switch/Actuator: 2.20 N•m (19.5 in•lbs)

Figure 4 - Minimum Distance between Sensors [mm (in.)]

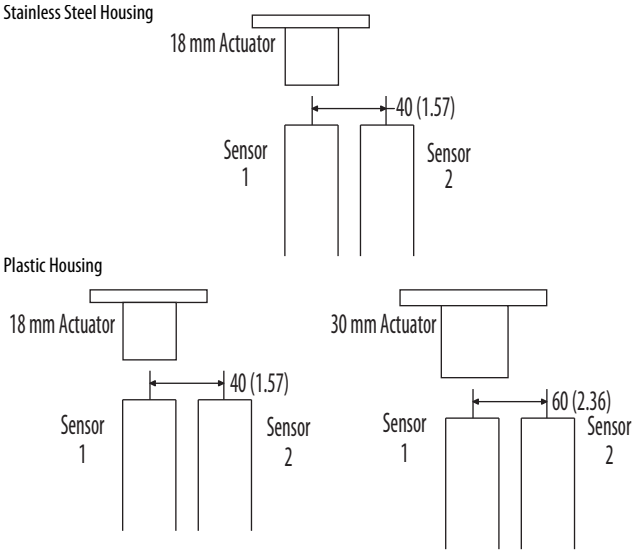


Figure 5 - Misalignment Curve

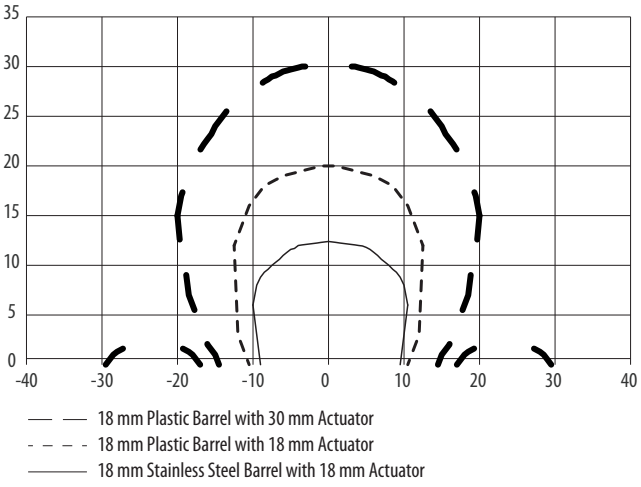


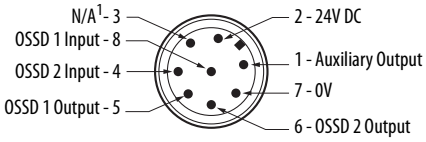
Table 2 - Diagnostic — Unit Indicators

	State	Status	Troubleshooting
Status/Diagnostic Indicator	Off	Not powered	—
	Red	OSSD not active	—
	Green	OSSD active	—
	Green flash	Power up test or OSSD inputs not valid	Check 24V DC or OSSD inputs (yellow or red wire)
	Red flash	0.5 Hz flash OSSD fault	OSSD fault—check OSSD outputs are not shorted to GND, 24V DC or each other.
		2 Hz flash internal fault	Cycle power.

See Unique Coded Diagnostic on page 5 for learning sequence errors.

Typical Wiring Diagram

Table 3 - 8-pin Unit

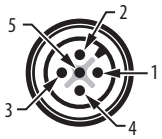


Pin Number	Wire Color	Signal
1	White	Auxiliary Output
2	Brown	24V DC
3	Green	— [1]
4	Yellow	OSSD 2 Input
5	Gray	OSSD 1 Output
6	Pink	OSSD 2 Output
7	Blue	0V
8	Red	OSSD 1 Input

Recommended mating cable, 2 m (6.5 ft)—889D-F8AB-2. Replace the 2 with 5 (5 m [16.4 ft]) or 10 (10 m [32.8 ft]) for standard cable lengths.

[1] Shield wire for Stainless Steel version.

Table 4 - 5-pin Unit



Pin Number	Color	Signal
1	Brown	+24V
2	White	Safety OSSD 1 Output
3	Blue	0V
4	Black	Safety OSSD 2 Output
5	Gray	Auxiliary Output

The recommended cordset is 2 m (6.5 ft) - 889D-F5AC-2. For additional lengths, replace the 2 with 5 (5 m [16 ft]) or 10 (10 m [32.8 ft]) for standard cable lengths.

IMPORTANT If you do not require the auxiliary signal, a 4-pin cordset (889D-F4AC-2) can be used.

The recommended patchcord for use with ArmorBlock® Guard Safety I/O is 2 m (6.5 ft) - 889D-F4ACDM-2. Replace the 2 with 0M3 (0.3 m [0.98 ft]), 1 (1 m [3.28 ft]), 5 (5 m [16.4 ft]), or 10 (10 m [32.8 ft]) for standard cable lengths.

IMPORTANT Do not use a 5-pin patchcord with the ArmorBlock I/O.

Commissioning (Unique Coded Units) — Power the Sensor

Connect the sensor to 24V DC (see Typical Wiring Diagram on page 4 for help).

IMPORTANT The unique coded sensor is shipped from the factory unprogrammed and must be taught a unique coded actuator, see Teaching the Actuator (Ability to Learn an Additional Actuator).

A unique coded sensor can only learn a unique coded actuator and cannot learn a standard coded actuator.

A standard coded sensor does not work with a unique coded actuator.

The unique coded sensor, "Status/Diag" indicator, begins to blink green eight times then repeats, which indicates that the sensor has not yet learned an actuator.

The unique coded sensor can be locked so it cannot learn another actuator, see Teaching the Unique Actuator (One Time Learn Only; Unit Locked) on page 5.

Teaching the Actuator (Ability to Learn an Additional Actuator)

Quick Start

1. Power up the sensor and bring an actuator into the sensing range.
2. Leave the actuator in the sensing field for two minutes or longer.
3. Learn is complete.

IMPORTANT The sensor can learn a new actuator up to eight times. The Status/Diag" indicator blinks the number of actuators left that a sensor can learn.

The sensor automatically starts the learning process as soon as an actuator is brought into the sensing range.

Learning Sequence

1. Target present	"Status/Diag" indicator blinking green 2 Hz rate (15 s)
2. Verifying actuator	"Status/Diag" indicator blinking green/ red 1 Hz rate (15 s)
3. Program sensor	"Status/Diag" indicator blinking green/ red 2 Hz rate (15 s)
4. Program complete	"Status/Diag" indicator blinking green 2 Hz rate (# of learns remaining) (15 s)
5. Ready state	"Status/Diag" indicator solid green
6. Learn is completed	

Teaching the Unique Actuator (One Time Learn Only; Unit Locked)

Initially Teaching in the Actuator

The sensor automatically starts the learning process as soon as an actuator is brought into the sensing range.

Learning Sequence

1. Target present	“Status/Diag” indicator blinking green 2 Hz rate (15 s)
2. Verifying actuator	“Status/Diag” indicator blinking green/red 1 Hz rate (15 s)
3. Program sensor	“Status/Diag” indicator blinking green/red 2 Hz rate (15 s)
4. Program Locking	“Status/Diag” indicator blinking green 2 Hz rate (# of learns remaining) (15 s)
5. Remove the actuator from the sensing field	"Status/Diag" indicator changes to solid red
6. Replace the actuator back into the sensing field	"Status/Diag" indicator continues blinking green 2 Hz rate (number of learns remaining), this action triggers the lock function.
7. Ready state	“Status/Diag” indicator solid green
8. Learn is completed	Sensor is locked and cannot learn another actuator.

Learning a New Actuator (Unique Coded Actuator Only)

To learn a replacement actuator, bring the actuator to be taught into the sensing range of the safety switch.

The learn sequence is the same as the sequence for teaching the actuator (ability to learn an additional actuator).

A sensor cannot relearn a previously learned actuator or a standard SensaGuard™ actuator.

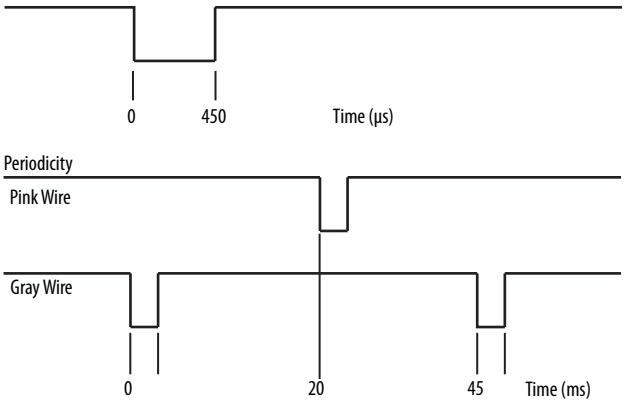
The sensor only recognizes the most recently learned actuator.

Unique Coded Diagnostic

Error codes for learning process. Power cycle to clear fault.

Status/Diag Indicator—Flashes (2 Hz)	Error Code
Green	OSSD inputs not valid
Red-Red-Red-Green	Cannot learn a standard SensaGuard™ actuator
Red-Red-Red-Green-Green	Actuator already learned
Red-Red-Red-Green-Green-Green	Bad RFID; Target that is moved out of range
Red-Red-Red-Green-Green-Green-Green	Exceeded learning eight actuators
Red-Red-Red-Green-Green-Green-Green-Green	Unit locked: Cannot learn another actuator

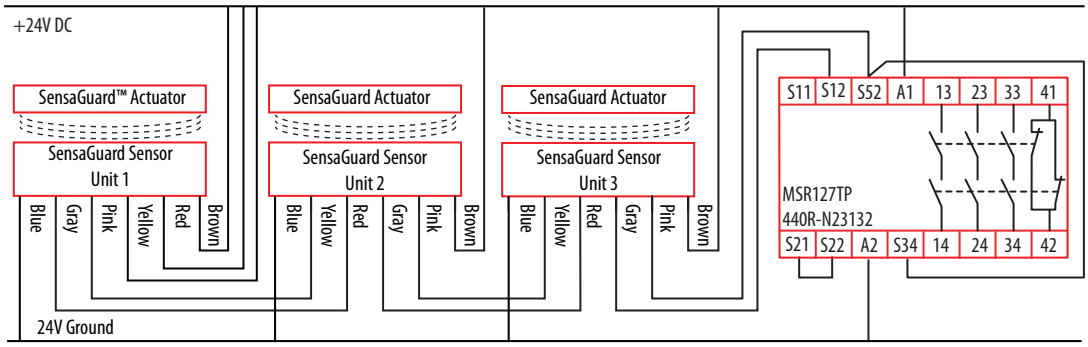
OSSD Test Pulses



Individual Pulses

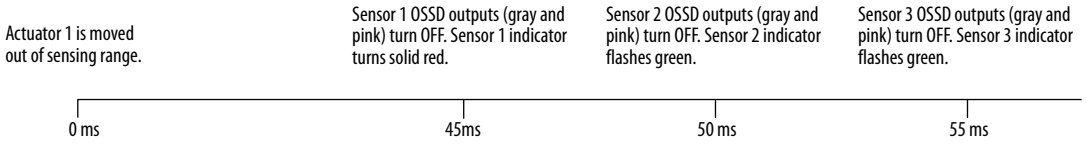
Test pulses appear on each OSSD output. These pulses are approximately every 45 ms. The times that are shown are approximate and depend on the processing of the safety-related status.

Timing Diagram



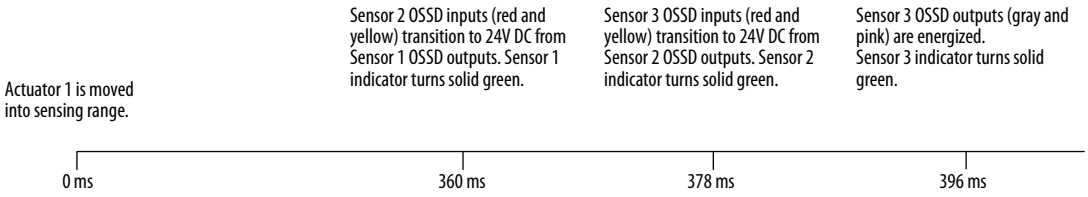
Response Time: Safety Outputs Turn OFF

Initial Conditions: All actuators are in sensing distance.

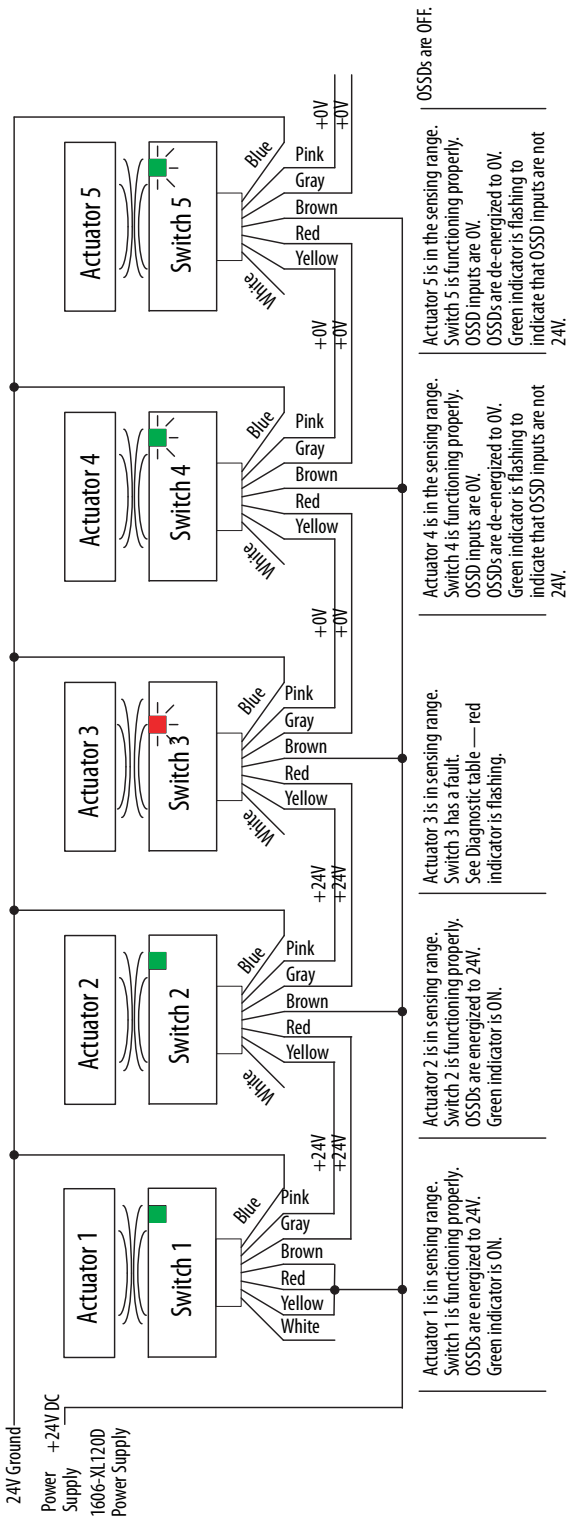


Response Time: Safety Outputs Turn ON

Initial Conditions: Actuator1 is out of sensing range. Sensor 1 indicator is solid red. Actuators 2 and 3 are in sensing range. Sensor 2 and 3 indicators flash green.

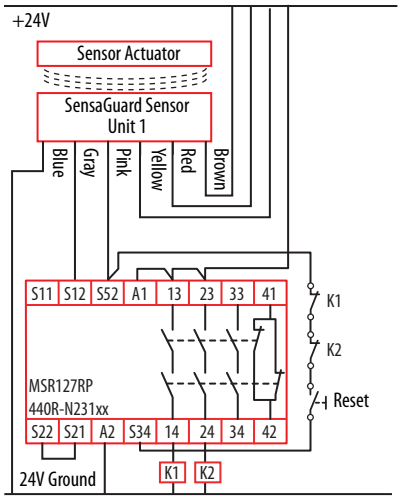


Troubleshooting — Series Circuit

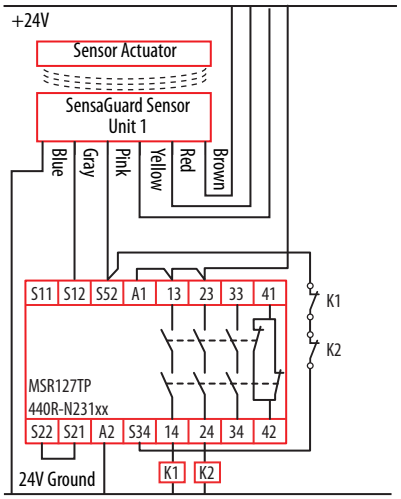


Application Wiring Examples

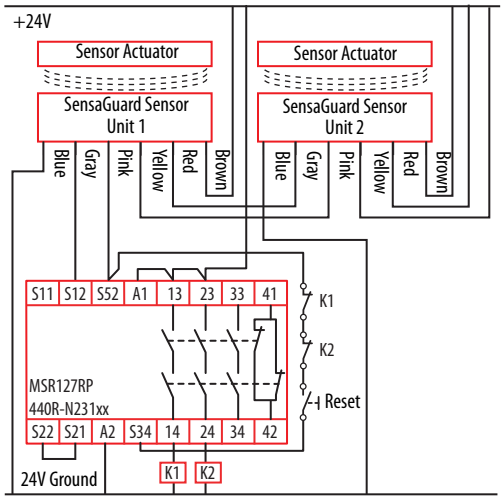
Wiring to MSR127 Safety Relay



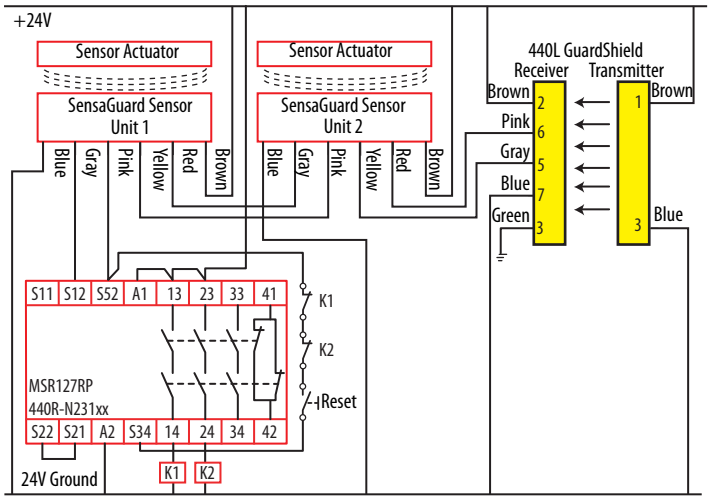
MSR127RP with one sensor, monitored manual reset, drives 100S or 700S safety relays.



MSR127RP with one sensor, automatic reset, drives 100S or 700S safety relays.



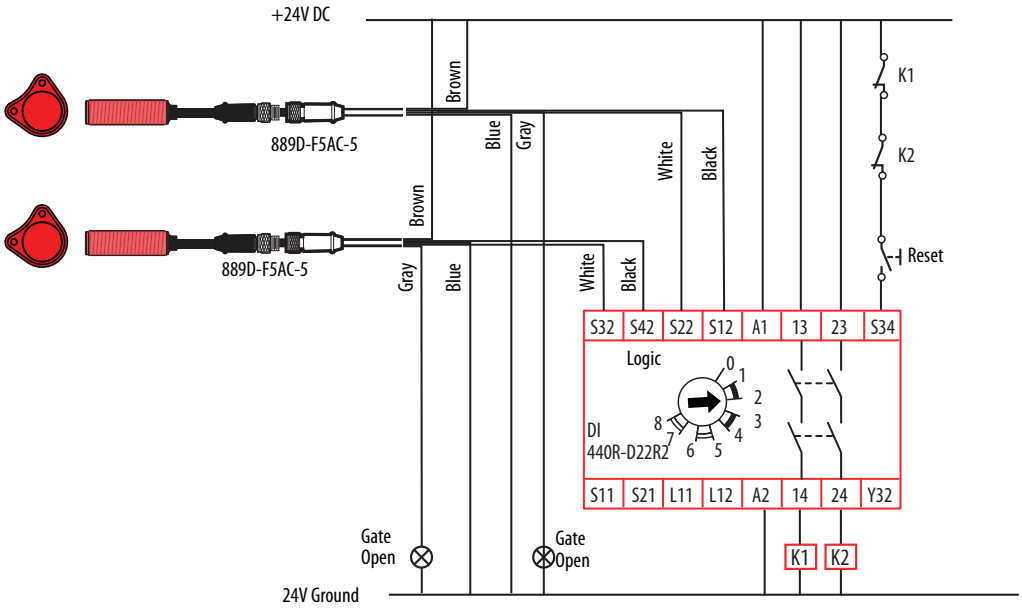
MSR127RP with one sensor, monitored manual reset, driving 100S or 700S safety relays.

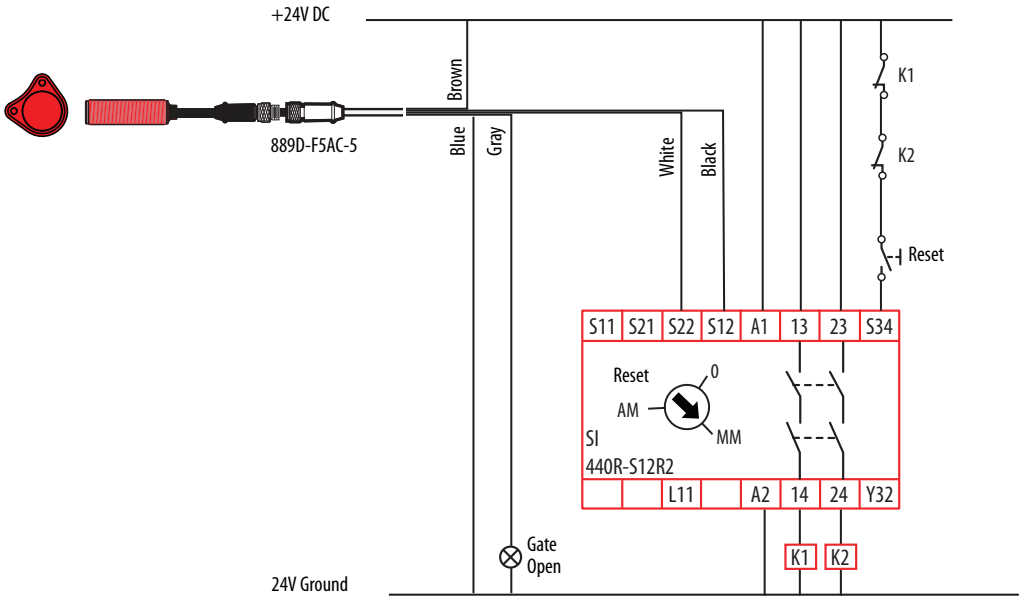


MSR127RP with two sensors and 1 440L light curtain in series, monitored manual reset, driving 100S or 700S safety relays.

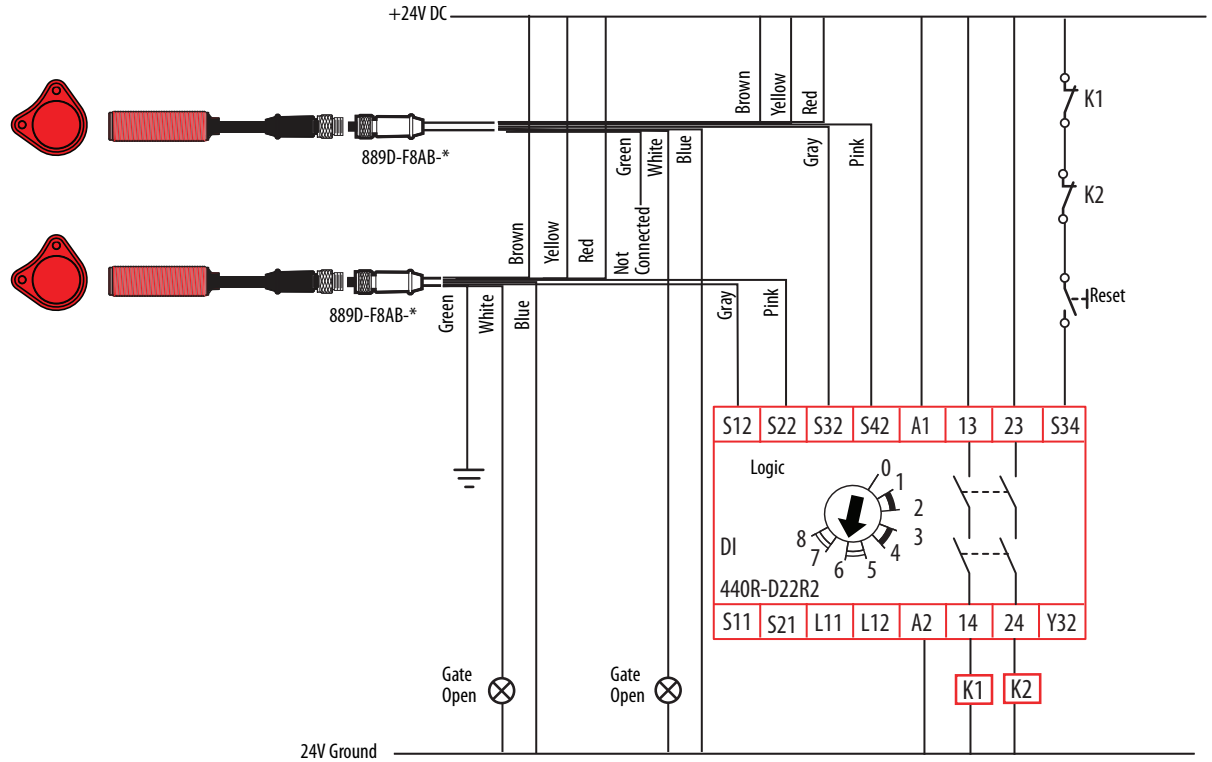
IMPORTANT The light curtain must be last (the furthest from MSR127).

Guardmaster® SI or DI Safety Relay Wiring

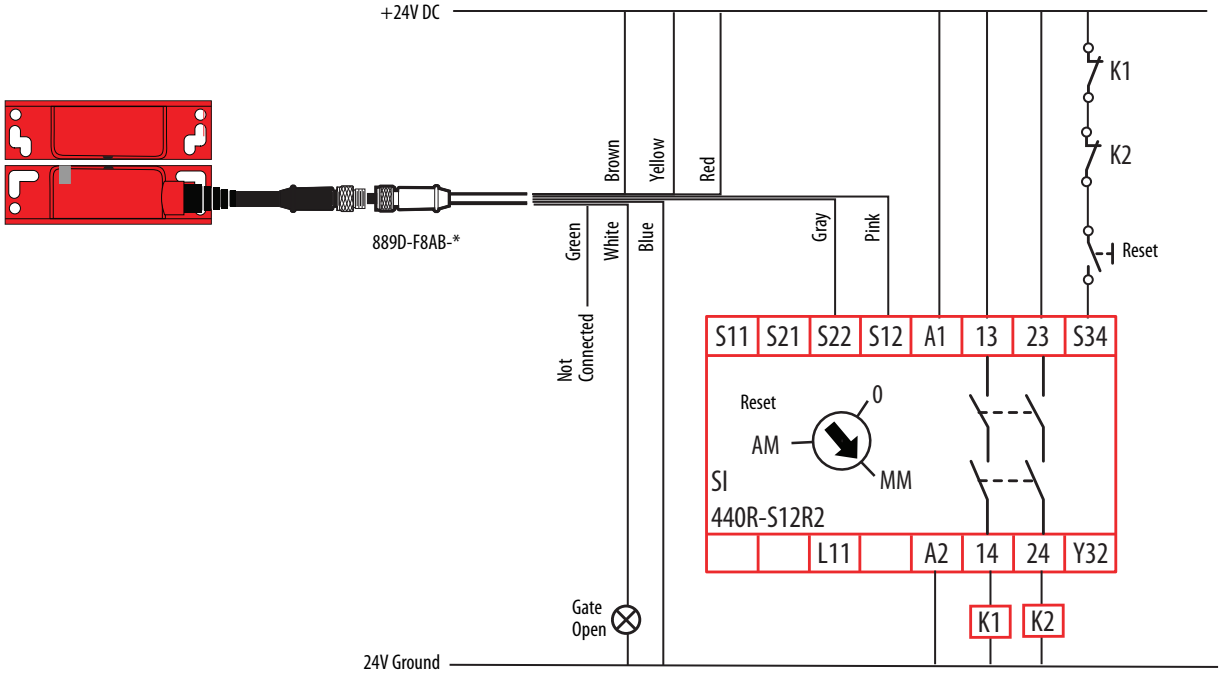




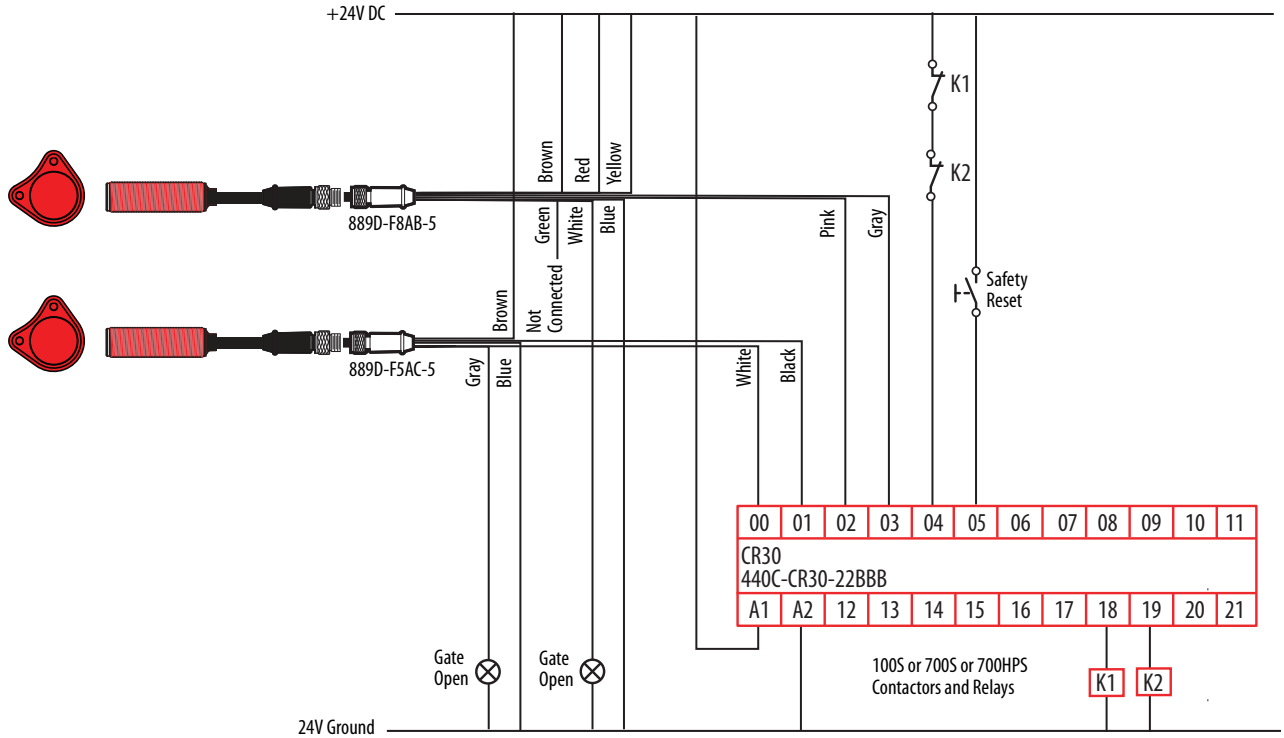
Guardmaster® SI or DI Safety Relay Wiring

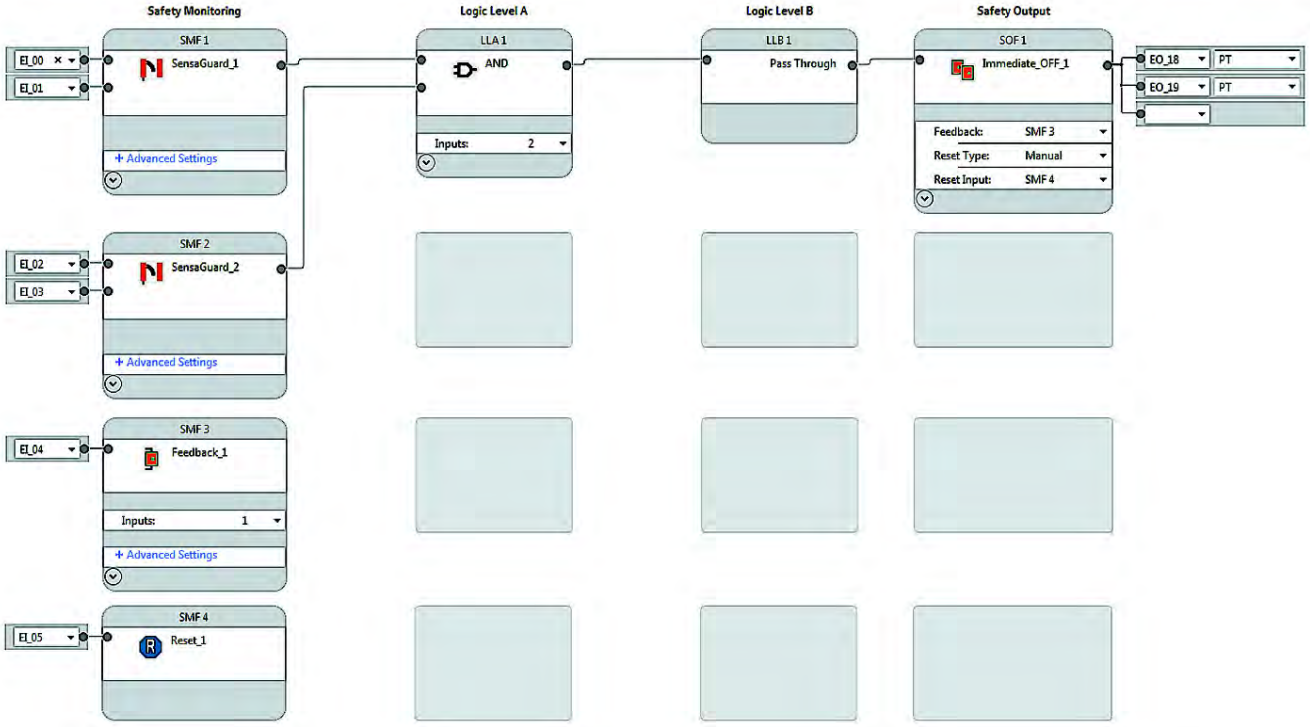


IMPORTANT The green wire is connected to the housing of the stainless steel SensaGuard only; it has no connection for plastic SensaGuard.

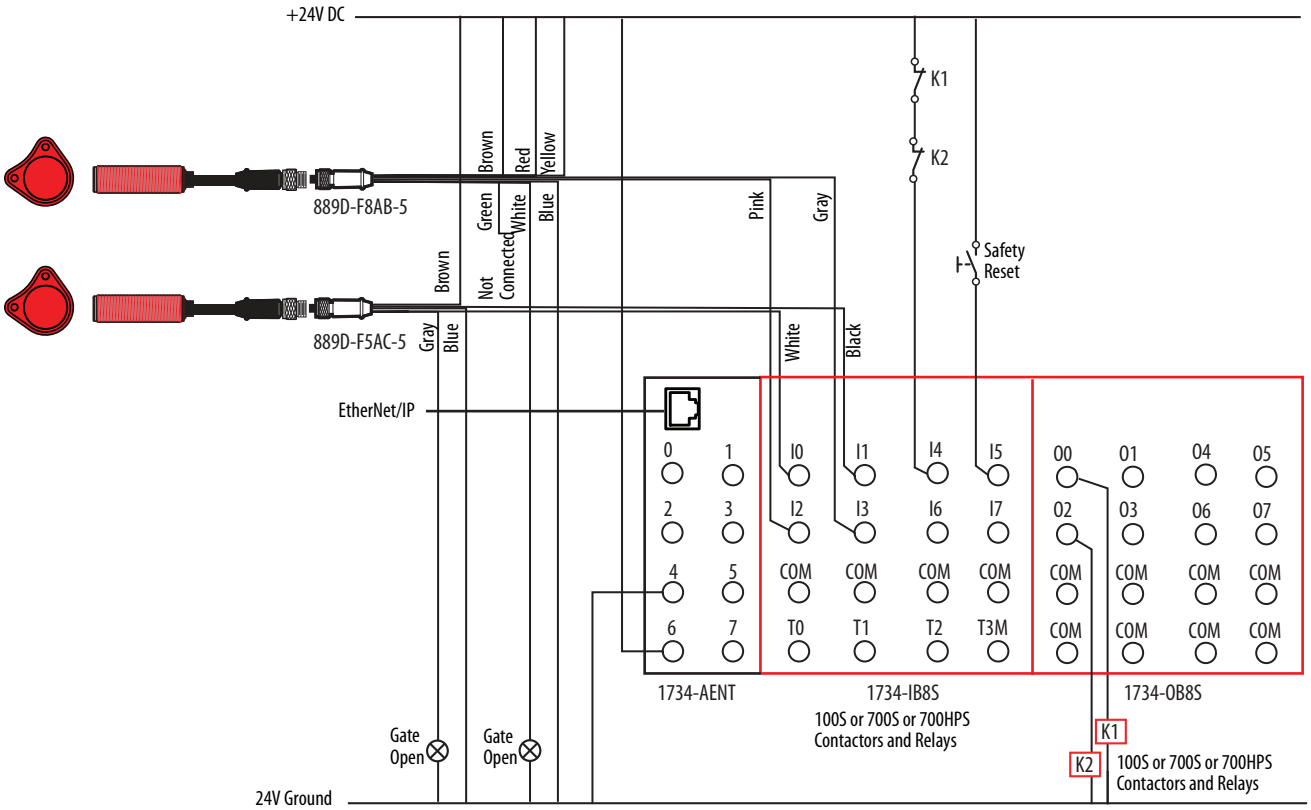


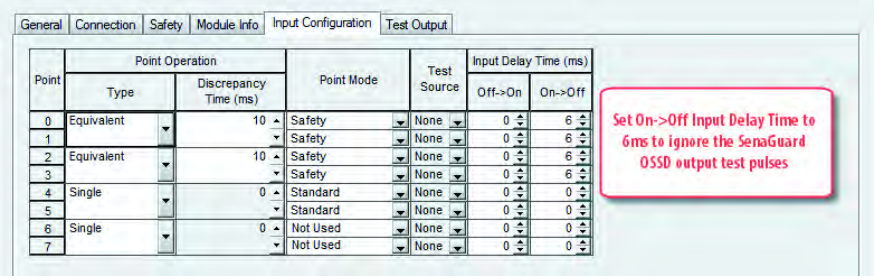
CR30 Software Configurable Relay Wiring



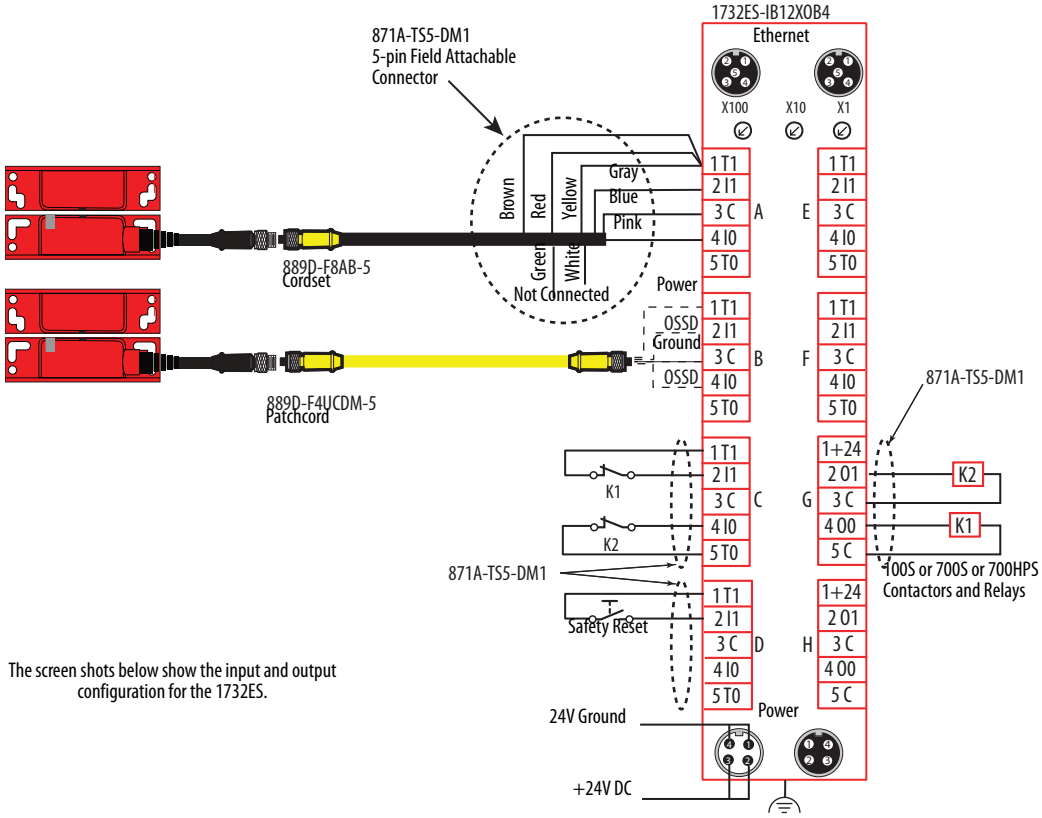


1734 POINT Guard I/O™ Wiring

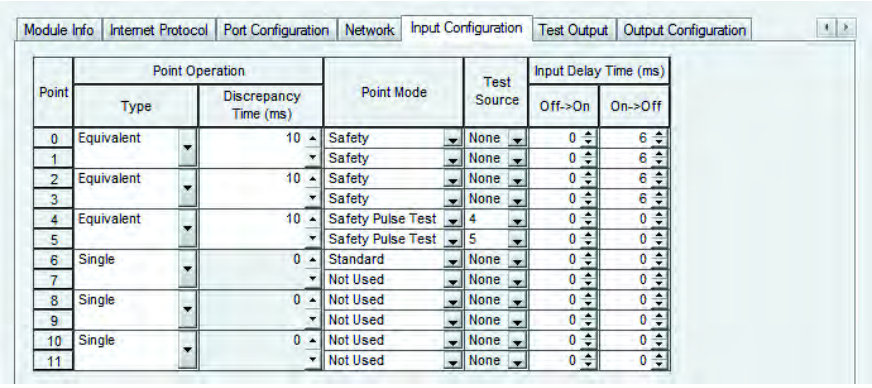


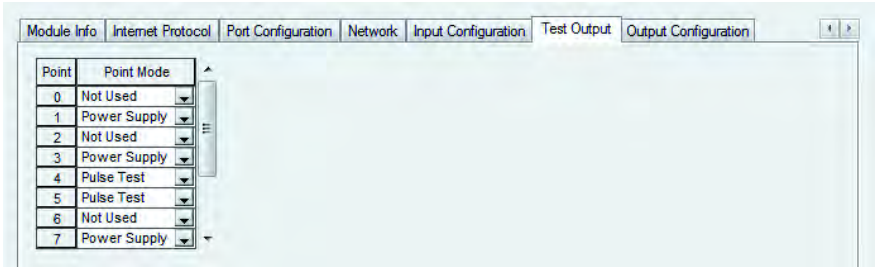


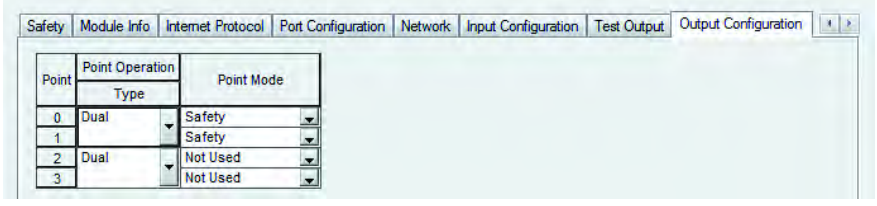
1732DS/ES ArmorBlock® Guard Safety I/O Wiring



The screen shots below show the input and output configuration for the 1732ES.







Notes:

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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