BANNER®

the machine safety specialist

PICO-GUARD™

Fiber Optic Safety Interlock System

PICO-GUARD™: A revolutionary safety system combining fiber optics with control reliability.

Non-contact. Eliminates interlock wiring.

The patent pending PICO-GUARD™ system is a unique combination of control-reliable, non-contacting photoelectric and fiber optic technologies that provide a low-cost alternative to cumbersome and costly methods for machine safeguarding. The fibers can be easily piped to points requiring safeguarding with no electrical wiring required. The controller has four independent optical channels, offering the ability to safeguard multiple points with one controller. The optical elements require no electrical connection and no electrical energy is used at the optical elements - all electronics are at the controller. Optical elements can be used either as emitters or receivers to simplify installation.

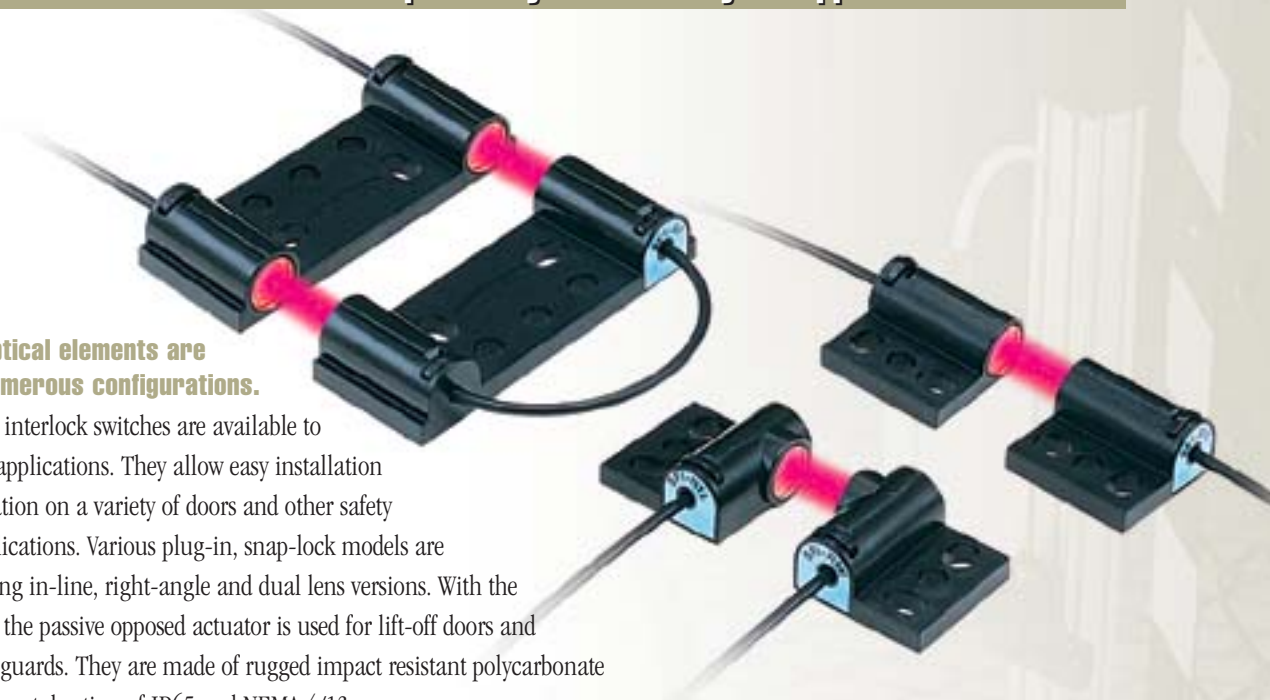
Directly replace mechanical safety interlock switches.

PICO-GUARD offers a simpler way to guard doors, openings and dangerous areas, compared with mechanical safety interlock switches. Because PICO-GUARD uses only optical elements, it eliminates electrical contacts and other failure-prone mechanical components, including actuators that have alignment issues. PICO-GUARD fiber optic safety interlock switches are also several times smaller and several times lighter than mechanical switches.

Incredibly easy to install.

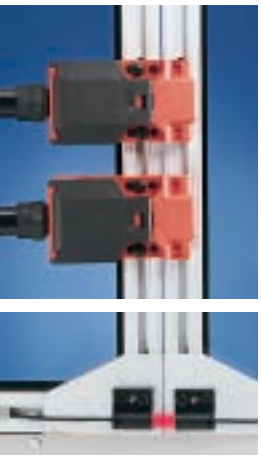
Installation is incredibly simple; switches install instantly with cut-to-length plastic fiber optic cable and snap-lock connectors. Multiple optical elements can be connected in series on a single optical channel, providing the ability to monitor several dangerous points with a single channel. Additional guarding points can easily be added at any time by inserting optical elements into an existing optical channel.

PICO-GUARD™: All the features & components you need for your applications.



PICO-GUARD optical elements are available in numerous configurations.

Fiber optic safety interlock switches are available to solve numerous applications. They allow easy installation and proper operation on a variety of doors and other safety interlocking applications. Various plug-in, snap-lock models are available including in-line, right-angle and dual lens versions. With the dual lens model, the passive opposed actuator is used for lift-off doors and other removable guards. They are made of rugged impact resistant polycarbonate with an environmental rating of IP65 and NEMA 4/13.



Achieve Category 4 with a single switch point.

PICO-GUARD is the industry's first system designed to meet Safety Category 4, per ISO 13849 (EN 954-1)* and IEC 61496-1 Type 4 requirements, using a single switch point for each door. This is possible due to its patent pending, diverse-redundant, self-checking controller specifically designed to be used with plastic fiber optic cable. In addition, the hardware and firmware of the controller has been extensively tested via Banner's rigorous Failure Modes and Effects Analysis (FMEA) techniques to assure that no single component failure will cause the system to fail into a dangerous condition.

Category 4 with a single switch point versus two mechanical switches.

Three optical fiber choices.

Banner offers three types of fiber optic cables, all with 1 mm solid core plastic fiber.

- Standard 2.2 mm polyethylene jacketed.
- 2.2 mm fluoropolymer sheath over polyethylene jacket to withstand harsh chemicals.
- 5 mm PVC sheath over polyethylene jacket to withstand some mechanical abrasion or harsh duty.

5.3 mm stainless steel sheathing or 6.2 mm black PVC sheathing is available for use over existing polyethylene jacketed fiber to withstand rigorous mechanical abrasion.

**Approvals pending*

Additional optics available soon.

Fiber optic safety grids and points will be available to guard entry/exit points, and perimeter guarding applications.

The points are housed in a heavy-duty 30 mm stainless steel housing. The grids come in rugged sealed aluminum enclosures with pre-set optical element separation to meet either IEC or ANSI/RIA and B11 standards, depending on the model. Contact Banner Applications for availability.

Advanced, solid-state controller with four optical channels.

Unique solid-state controller features flexible inputs & outputs.

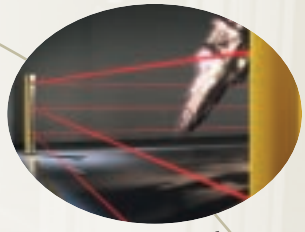
This sleek, esthetically-designed controller includes four separate optical sensing channels. Each of the four channels can monitor several fiber optic safety interlock switches, beams or grids in the same fiber loop. If desired, each channel can monitor a separate zone or section of a machine (such as doors, entry gates, sensors, etc.). Regardless of the optical elements or combination of elements used, when the system detects a loss in light signal or receives a safety stop request via its USSI input, it will provide a stop signal to the machine control circuit. This can be used both to protect personnel from hazardous equipment and to protect equipment, critical tooling, or other critical materials in process.

Universal Safety Stop Interface provides the ultimate in connectivity.

Rope-Pull E-Stops

E-Stop Buttons

Safety Light Screens



Perimeter Guards

Patent-pending Universal Safety Stop Interface (USSI) for connecting multiple PICO-GUARD™ controllers.

Banner's incredibly flexible Universal Safety Stop Interface (USSI) allows multiple PICO-GUARD™ controllers to be connected together into a single safety circuit, when required. This allows centralized control and monitoring of a large number of optical channels, each capable of guarding multiple interlock switches.

Integrate multiple safety device functions into one or more PICO-GUARD controllers.

The novel USSI inputs permit direct connection of other safety devices such as light screens, E-Stop buttons, rope pulls, safety modules and mechanical safety switches. This makes it very easy to integrate many safety functions into one convenient safety circuit. Each controller has two of these very useful input connections — one with latching output logic and the other with trip output logic.

Safety Modules

Access Guards

Safety Mat Modules

Mechanical Safety Switches

PICO-GUARD Model Selection, Accessories and Dimensions

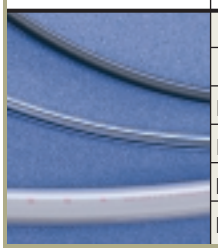
Controller

Model Number	Part Number	Description
SFCDT-4A1	70403	System Controller

Fiber Optic Safety Interlock Switches

	Model Number	Part Number	Orientation/ Type	Lens Size	Mounting Flange
	SFI-S1R	69770	Straight	8 mm	Right Side
	SFI-S1L	69771	Straight	8 mm	Left Side
	SFI-R1R	69772	Right-angle	8 mm	Right Side
	SFI-R1L	69773	Right-angle	8 mm	Left Side
	SFI-D1	69774	Dual-lens	8 mm	—
	SFI-A1	69775	Actuator	8 mm	—

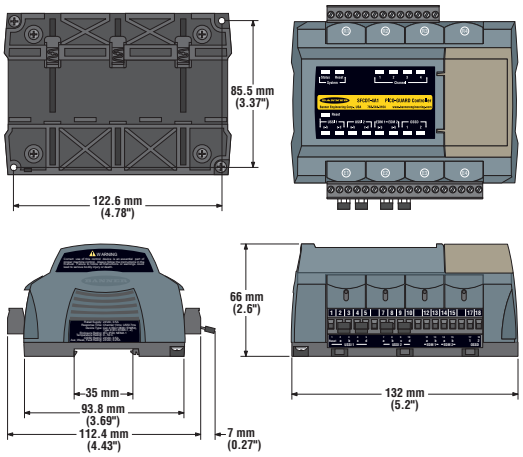
Plastic Optical Fiber (Bulk)

	Model Number	Part Number	Length	Jacket/Sheath
	PIU430U	26751	9 m (30')	Polyethylene jacket
	PIU460U	26230	18 m (60')	Polyethylene jacket
	PIU430UXT	68618	9 m (30')	Poly jacket, Fluoropolymer sheath
	PIU460UXT	68619	18 m (60')	Poly jacket, Fluoropolymer sheath
	PIU430UXP	70720	9 m (30')	Poly jacket, PVC sheath
	PIU460UXP	70721	18 m (60')	Poly jacket, PVC sheath

PICO-GUARD Accessories

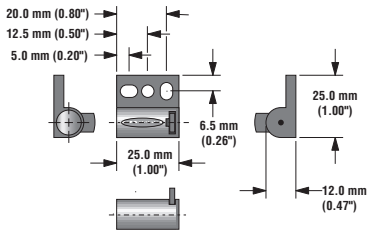
Model Number	Part Number	Description
SFA-FA	70382	In-line signal attenuator
SFA-FS	69777	Fiber splice
SFA-IAG	02618	Interlock alignment guide
SFA-IMB1	02641	Optional switch mounting brackets (retrofits SI-MAG1SM)
SFA-IMB2	02642	Optional switch mounting brackets (retrofits SI-MAG2SM)
SFA-RD	69013	Remote display
SFA-AT	02764	Alignment tool (available soon)
PFC-1-25	02613	Bag of 25 PFC-1 plastic optical fiber cutters
PFS53S6	42825	Stainless steel sheathing, 2 m (6')
FS64P100	70734	Black PVC sheathing, 30 m (100')
MGA-KS0-1	30140	SPST key reset switch, no wires (includes key)
IM-T-9A	61425	Interface module (3 N/O redundant-output contacts)
IM-T-11A	61424	Interface module (2 N/O redundant + 1 N/C aux contacts)
LAT-1	52150	Laser alignment tool
BRT-THG-2-100	26620	50 mm (2") wide reflective tape, 2.5 m (100") long

Dimensions, Controller

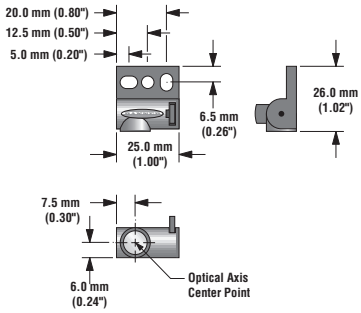


Dimensions, Interlock Switches

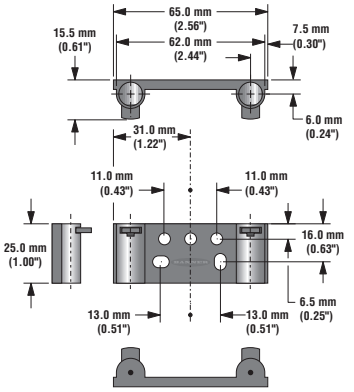
SFI-S1R (shown) & SFI-S1L



SFI-R1R (shown) & SFI-R1L



SFI-D1 (shown) & SFI-A1



PICO-GUARD™ Specifications

Controller

System Power Requirements	24V dc +15%, 10% maximum ripple; 500 mA max., exclusive of output load.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common.
Response Time	13 milliseconds max. (Time between the opening of an optical switch and the OSSD safety outputs turning off)
USSI Input Response Time	7 milliseconds max. (Time between actuation of the safety stop input device and the OSSD safety outputs turning off)
Safety Rating	Type 4 per IEC 61496-1, -2; Category 4 per ISO 13849-1 (EN 954-1).
EDM Input	Two normally closed contact inputs for external device monitoring (EDM). Each input monitors the status of a forced-guided monitor contact of an external safety device or MPCE. The EDM inputs must be high (10 to 30V dc) when the external device or MPCE is OFF, and must be low (less than 3V dc) when the external device or MPCE is ON. External devices or MPCEs must meet certain timing requirements, depending on the configuration setting.
System Reset Input	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a manual power-up, optical channel latch or system lockout condition.
USSI 1 Reset Input	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a USSI 1 latch condition.
USSI 1 Input	Dual-channel, redundant inputs for monitoring output contacts or handshake compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to latch OFF (Latch condition).
USSI 2 Input	Dual-channel, redundant inputs for monitoring output contacts or handshake compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to turn OFF (Trip condition).
OSSD Outputs	Two diverse-redundant solid state 24V dc, 0.5A max. sourcing OSSD (Output Signal Switching Device) safety outputs. **ON-state voltage:** > Vin-1.5V dc **OFF-state voltage:** 1.2V dc max. **Max. load resistance:** 1,000 ohms **Max. load capacitance:** 0.1 µF
Non-Safety Outputs (Aux., Weak Signal, Fault)	Solid state 24V dc (> Vin – 1.5V dc), 0.25A max. sourcing non-safety outputs.
Remote Status Interface	Isolated RS-232 non-safety output (4800 baud rate) for setup or monitoring the system status. Connections provided for a Remote Display unit.
Controls and Adjustments	Redundant switches for Auto/Manual power-up, Trip/Latch output operation and 1- or 2-channel EDM operation. Redundant switches for ON/OFF of each optical channel. (NOTE: At least one optical channel must be ON)
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence.
Strobe Light Immunity	Totally immune to one Federal Signal Corp. “Fireball” model FB2PST strobe.
Emitter Element	Visible red LED, 660 nm at peak emission.
Enclosure Rating	IEC IP20, NEMA 1.
Operating Conditions	**Temperature:** 0° to +50° C (+32° to 122° F). **Relative Humidity:** 95% maximum (non-condensing).
Status Indicators	System Status (bi-color Red/Green): overall status of the PICO-GUARD system. System Reset (bi-color Yellow/Red): status of the System Reset input; indicates system reset needed. Channel (4 bi-color Red/Green): each shows the status of one optical channel. USSI (2 bi-color Red/Green): status of the USSI input channels (a-b and c-d). USSI 1 Reset (bi-color Yellow/Red): status of USSI 1 reset input; indicates USSI 1 reset needed. EDM (bi-color Red/Green): status of the EDM input channels. OSSD (bi-color Red/Green): status of the OSSD outputs. Config (bi-color Red/Green): status of the system configuration.

Fiber Optic Safety Interlock Switches

Operating Distance	1-50 mm (0.04" - 2") max.
Mounting	Holes for M4 (#10) screws (not included).
Construction	Polycarbonate plastic housing and window; acrylic lens.
Operating Conditions	**Temperature:** 0° to +70°C (+32° to 158°F). **Relative Humidity:** 95% (non-condensing).
Environmental Rating	IEC IP65, NEMA 4/13

Banner: Industry's number one supplier of sensors & machine safety products.

When you buy your sensors and machine safety products from Banner, you gain the confidence of dealing with the largest, most knowledgeable and experienced sensor company. We have the broadest line of products and the most advanced manufacturing capabilities in the industry. We can handle any size order, large or small. We can deliver any of more than 15,000 products in just three days—most can ship within hours!

With our global sales support network, we're close by wherever you're located, and we're ready to help you with your applications, plus give you excellent service support. When you add it up, you'll find the best value in Banner products.

Visit Banner Online at bannerengineering.com

- Complete product information for:
  - Photoelectric sensors
  - Measurement and inspection sensors
  - Machine safety products
- Up-to-date "What's New" page.
- Complete descriptions for each product, with links to product data sheets and dimension drawings.
- Product catalogs, specifier's guides, and product brochures available for immediate download or email request.
- Documents available in multiple languages.

For more information or applications assistance:

Call 1.888.3.SENSOR (1.888.373.6767)

The Banner Photoelectric Sensors Catalog

The industry's most complete catalog; more than 800 pages of detailed product and technical information on more than 12,000 photoelectric sensors.

The Banner Measurement & Inspection Products Catalog

An advanced line of measurement and inspection products, including laser displacement sensors, ultrasonic gauging sensors, camera-based sensors, measuring light screens, and more.

The Banner Machine Safety Products Catalog

A complete selection of machine safety products, including Banner's extensive line of safety light screens, safety interlock switches, and safety modules.

All Three Catalogs on One CD-ROM

Get all three Banner catalogs on one easy-to-use CD-ROM, covering more than 15,000 Banner photoelectric, measurement and inspection, and machine safety products. Includes selection charts, technical information and glossaries. Call, write or email for your copy today!

Worldwide Representation.

- Australia
- Argentina
- Austria
- Belgium
- Brazil
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Czech Republic
- Denmark
- Egypt
- Estonia
- Finland
- France
- Germany
- Greece
- Hong Kong
- Hungary
- Iceland
- India
- Indonesia
- Ireland
- Israel
- Italy
- Japan
- Korea
- Latvia
- Lithuania
- Luxembourg
- Malaysia
- Mexico
- Netherlands
- New Zealand
- Norway
- Pakistan
- Peru
- Philippines
- Poland
- Portugal
- South Africa
- Russia/CIS
- Singapore
- Slovakia
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- Turkey
- United Kingdom
- Uruguay
- Venezuela

BANNER®

more sensors, more solutions

Banner Engineering Corp., 9714 10th Avenue North, Minneapolis, MN 55441 U.S.A.
Phone 763.544.3164 Fax 763.544.3213 bannerengineering.com email: sensors@bannerengineering.com

PRINTED IN U.S.A. Copyright, 2002 Banner Engineering Corp. P/N 110464