

# PSP-900 Series Retrofit Switch Pack Installation Notes

## CAUTION

- Read and understand these instructions prior to starting installation.
- TURN THE POWER OFF before installation. Live installation is hazardous to you and can damage the motion sensor.
- Capacitor charge storage in a de-powered light fixture can be lethal. Only qualified personnel familiar with high voltage should install this motion sensor.
- This product must be installed in accordance with applicable electrical codes and regulations pertinent to the city of installation.
- Do not use this product with fixtures rated more than 400 watts or whose capacitor current exceeds 4A rms at full power.



**PSP Switch Packs Compatible with PIP Motion Sensors.** PSP-900 series switch packs are compatible with PIP-900 series motion sensors. Switch packs have no motion sensing capability. They obtain their switching commands from nearby PIP motion sensors via plastic optical fiber.

### Compatibility with PIP-200 Series Sensors.

Although the PSP-900 switch pack is designed primarily to be used with PIP-900 motion sensors, the fiber optic signal format is fully compatible with Viewpoint's PIP-200 series sensors.

**Fixture Compatibility.** PSP-900 targets HID fixtures shipped from their manufacturer without a dual-section dimming capacitor pre-installed. The PSP-900 contains an internal oil-filled capacitor that works in conjunction with the single-section capacitor of a standard, non-dimming fixture.

**Why use switch packs and optical fiber?** Switch packs are less expensive than motion sensors. More important, switch packs don't require downward aiming. They can be mounted on the ballast housing where they cause less fixture tilting.

Viewpoint ships the PSP-900 with its internal capacitor pre-installed and sized according to the type of ballast specified by the purchaser at time of purchase. The microfarad and voltage rating of the switch pack's cap is stamped on the outside of the enclosure.

**Specifying the Internal Capacitor.** Viewpoint Electronics has posted on its website (<http://www.viewpointelectronics.com>) tables of capacitor values for many popular ballast styles. The tables are drawn from ballast manufacturers' catalogs. The data in the tables is based on fixture laboratory measurements and EIA guidelines for HID dimming.

**Theory of Operation.** PSP-900 is a two-wire device that wires in series with the existing capacitor in the fixture. The switch pack's microprocessor draws its power from the capacitor current. When the warehouse aisle is unoccupied, the series connection of the fixture's internal capacitor and the switch pack's capacitor lowers the lamp wattage by 50%.

The sensor is an electrical short in a busy aisle and drives the fixture to its full rated wattage.

**What are indications that the switch pack's internal cap is the wrong value for my fixture?** If the lamp extinguishes when the switch pack drops to its low-power step, the internal cap may be undersized microfarads-wise. Lamp "drop-out" due to insufficient capacitance may occur after a new lamp has accumulated a few hours of run time.

If the switch pack's capacitor is too large microfarads-wise, the fixture will "shallow dim" and not yield expected energy savings.

**Can I specify deeper dimming?** No. 50% of rated lamp wattage is the maximum permissible dimming depth for most lamps. Greater dimming depth shortens lamp life and violates EIA guidelines for HID dimming.

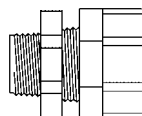
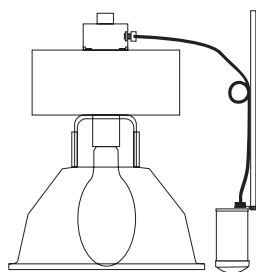
*The PSP-900 sensor does not affect the full-power operating mode of the attached HID fixture. This mode is entirely governed by the ballast.*

**Parallel or Series Switching?** Series switching is inherent in PSP-900's design. It cannot support parallel switching. It is not suitable for fixtures already provisioned for parallel operation.

Other control products (e.g. Viewpoint's PIP-200 series sensors and PSP-100 switch packs) support the parallel configuration.

**I've discovered that my jobsite has multiple fixture types. Can I change the switch pack's internal capacitor in the field?** No, the sensor's UL listing does not permit user servicing. It must be returned to Viewpoint for cap swapping. Replacement-style wet film caps available in the lighting industry are not suitable for use inside the PSP-900 and void its warranty.

**Switch Pack Mounting.** The PSP-900 switch pack can be ordered with either short pigtail leads or a 4 foot long STOW whip similar to the companion PIP-900 sensor. In demanding applications with hook-and-swivel mounted fixtures, tilting caused by the switch pack may be objectionable. Alternatively, the switch pack can be mounted to the fixture pedestal or to roof structural members.



**ATTACHING HARNESS TO BALLAST HOUSING:**  
**UL Requirement for Strain Relief.** The Underwriters Laboratories listing for this sensor requires that the wire harness be strain relieved where it enters the ballast housing. The following cord grips are approved for this application:

**www.remke.com** (877)438-8833  
Part No. RSR5-107 (metallic)  
Part No. RSP-107 (non-metallic)

**www.sealconusa.com** (303)699-1135  
Part No. CD16NR-BK (non-metallic)

**DayBrite and Widelite Fixtures:** Die-cast aluminum ballast housings from Genlyte's DayBrite and Wide-Lite divisions feature an internal wiring compartment covered by a detachable access door. The sensor's wire harness should pass through this door using an approved cord grip. Viewpoint can supply the PIP-900 with a Genlyte-style access door and strain relief pre-installed. DayBrite's EHO Series fixtures with sheet metal ballast housings are wired through the concentric knock-outs of the top-mounted wiring box using a cord grip.

**Hubbell Fixtures:** Hubbell's die-cast ballast housings are offered with a Slick-ON pendant mounting box suffixed -SO. Located above the ballast clamshell, the SO box has removable end plates containing knock-outs. Use cord grips with these stock end plates or order PIP-900 with a Hubbell-compatible access plate and strain relief pre-installed on the STOW cord.

**Cooper Fixtures:** Cooper's die-cast ballast hous-

ings are offered with a -QD suffixed mounting box that will accept a cord grip and the sensor's wire harness. Cooper's "Steeler" fixtures with sheet metal ballast housings are wired through knock-outs in the top-mounted wiring box.

**Lithonia Fixtures:** Lithonia's die-cast ballast housings are offered with a -TOB Thru-Wire Outlet Box that accepts a cord grip and sensor's wire harness.

**TEST SWITCH HERE dot.** The motion sensor contains a manual override switch that is activated by placing a strong permanent magnet near the red TEST SWITCH HERE dot on the enclosure. A pocket magnet is usually sufficiently strong but a flexible refrigerator magnet is not. The override magnet causes the relay to change state with an audible "click". Using the override magnet zeroes-out whatever time remains in the lamp warm up and TIME timer intervals.

**Blinking Red Diagnostic Lamp.** The switch pack contains a red LED behind the Fresnel lens that "blinks" three diagnostic patterns. The triple-blink pattern indicates observed motion.

1 <sup>st</sup> Blink	2 <sup>nd</sup> Blink	Fiber State	Fixture State
Short	Short	Dark	Low Brightness
Short	Long	Dark	High Brightness
Long	Long	Lighted	High Brightness

**Lamp Warm-up Interval.** When power is first applied to the fixture the switch pack's relay is closed for 15 minutes, placing the fixture in the full power mode. This occurs even in an unoccupied aisle. This warm-up period is unaffected by the setting of the TIME adjustment and can be terminated only with the TEST SWITCH HERE magnet.

The lamp warm-up interval forces the high brightness mode for 15 minutes in accordance with the lamp manufacturer's recommendations for achieving rated life.

## FIBER OPTIC NETWORKING NOTES

**Why is plastic optical fiber better than low-voltage copper wiring used in control systems offered by other manufacturers?**

Fiber can be used in retrofit jobsites without conduit. The optical fiber can be secured to the outside of conduit using ordinary wire ties. Optical fiber is non-conductive and provides a safe method for interconnecting high voltage fixtures wired to different AC phases

**Why are PSP's fiber connectors color coded?**

The black connector receives signals from upstream devices. The blue connector transmits signals to downstream devices. Simply stated, blue connectors "talk" to black connectors.

Two blue connectors or two black connectors should never be fibered to each other.

**What is the white dummy plug inserted in the black fiber connector?** As shipped from the factory, the black connector is plugged with a removable white plastic pin to facilitate

# PSP-910 Installation Notes Continued

testing. Without a fiber or pin inserted in the black connector, the PSP device may give erratic behavior due to stray light.

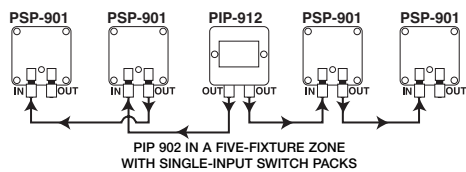
## Is there a limitation on the maximum number of PSP fiber devices in each aisle?

No. Each fiber optic zone must have at least one motion sensor. A zone may include any number of switch packs—even zero. The signal emitted by a blue connector is regenerated at full intensity and clarity compared to the attenuated signal arriving on the black connector, hence there is no maximum aisle length.

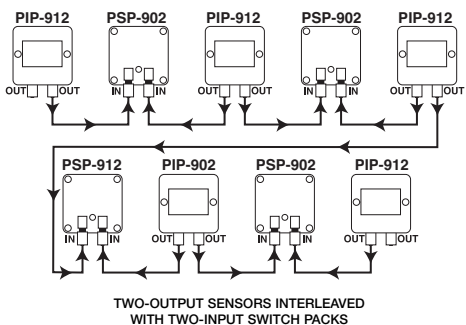
However, the spacing between devices is limited to 200 feet—possibly less if you are a sloppy fiber terminator. (See comments below about clean fiber termination.)

## Why does the PSP-902 switch pack have two black connectors but no blue one?

The PSP-901 is intended for creating motion sensor-centric aisle zones that look like this:

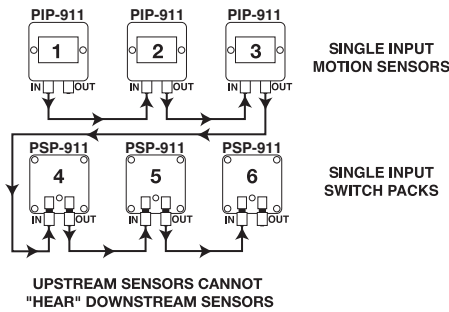


Or PSP-902 dual-input switch packs can be interleaved with motion sensors:



**What happens if I create a fiber loop connecting the last device in the aisle to the first one?** First-generation PIP-911/912 motion sensors and PSP-901/902 switch packs cannot be fibered in this way. They lock up and remain on the high brightness step. Second generation digital devices introduced in late 2003 encourage the use of fiber loops.

**Can I "fiber" the sensors and switch packs in any order in the aisle?** No, at least not with the analog versions of the PIP devices introduced in early 2003. (Second-generation products to be introduced in late 2003 are digital and can be fibered in any order.) This limitation of the first-generation analog products results from the fiber connectors' uni-directional data transmission characteristics. Upstream PIP devices cannot "hear" signals from downstream devices:



In the example network shown above, upstream motion sensor #1 cannot go "high" as a result of motion under sensors #2 or #3. However, downstream devices #3 through #6 will go high if motion occurs under sensors #1 or #2.

## Do PIP devices have diagnostic features to assist debugging the fiber network?

Yes. Your eye and an ordinary flashlight make excellent fiber testers. The light emitted by the blue fiber connector is ordinary 638 nm red light. Even tens of meters away from the blue transmit connector, red light exiting a plastic fiber is visible to the naked eye.

## The "polarity" of the fiber signal is:

Red fiber light ON:  
downstream PIPs/PSPs go to high brightness

Red fiber light OFF:  
downstream PIPs/PSPs go to dimmed step

The black receiving connector of a PSP device has a broad spectral response. It treats the white light from a flashlight the same as red light from the blue transmit connector.

Shining a flashlight into an open fiber segment will cause downstream PSP devices to go to the high-brightness step. Covering the open fiber segment with your thumb (assuring that no stray light gets into the fiber) forces downstream PSP devices to the dimmed step.

## OBTAINING PLASTIC OPTICAL FIBER

**Where can I purchase plastic optical fiber? What are its characteristics?** The plastic optical fiber is manufactured by Mitsubishi Rayon under the trade names SUPER ESKA and PREMIER ESKA:

[www.pofeska.com/pofeskae/pofe/pofe.htm](http://www.pofeska.com/pofeskae/pofe/pofe.htm)

As of early 2003, the cheapest version of ESKA suitable for PIP applications is Mitsubishi part number SH4001 with an attenuation of 0.2 db per meter. It comes on 500 and 1000 meter reels.

## Mitsubishi's most visible distributor is:

Industrial Fiber Optics, Inc.  
627 South 48th Street Suite 100  
Tempe, AZ 85281  
(480) 804-1227

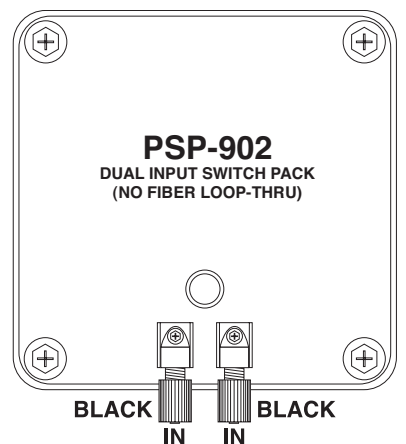
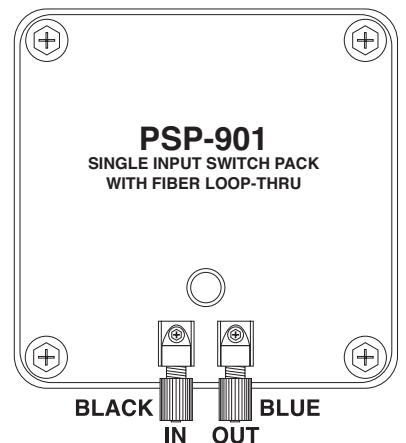
[www.i-fiberoptics.com](http://www.i-fiberoptics.com)

Industrial Fiber Optics sells low-cost hand tools that provide a clean cleave of plastic fiber without special training. IFO's polishing pucks are handheld, fine grit abrasive disks that allow you to clean up carelessly chopped fibers to give low attenuation.

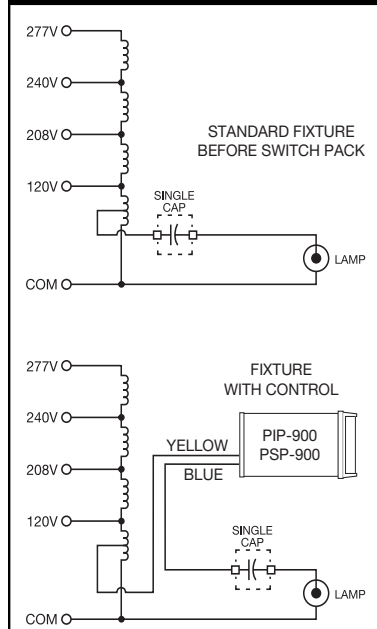
PSP devices employ the jacketed version of Mitsubishi fiber with a core diameter of 1.0mm (1000 um). Mitsubishi data sheets refer to jacketed fiber as optical cable in contrast to bare clear fiber which has no protective jacket. Do not purchase bare fiber: PSP devices require "simplex" single-strand jacketed fiber.

The lowest-cost optical cable has a black polyethylene jacket. The polyvinyl chloride jacketed GHV4001 is more expensive but feature Underwriters Labs VW-1 flame rating for plenum-rated installations.

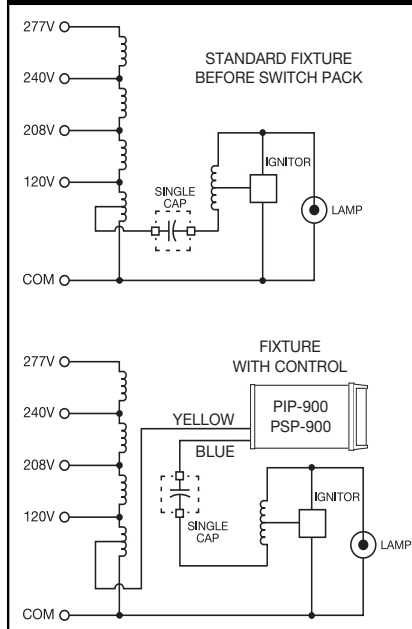
The essential differences between Super ESKA and Premier ESKA fiber relate to data rate and attenuation. The data rate for PIP devices is slow and typical signal levels are high. If your tools and skills permit you to make fiber cuts with clean cleaves, feel free to purchase the least expensive versions of optical fiber.



## Metal Halide Fixture Without Pulse Start



## High Pressure Sodium or Pulse Start Halide



## SPECIFICATIONS

Fixture Compatibility . . . HID with constant wattage autotransformer ballast  
Step Dimming Method . . . . . Relay-switched capacitor  
Switching Configurations . . . . . Series Switching/Capacitor-in-Sensor  
Power Rating (Full Brightness) . . . . . 4 amperes RMS or 400 Watts maximum  
Range of Internal Capacitor . . . . . 15uF@400VAC to 40uF@300VAC  
Fixture Line Voltage Compatibility . . . . . 120/208/240/277/347/480VAC  
Sensor Power Consumption . . . . . 3 watts maximum  
Usable PIR range . . . . . 50 feet on axis at 25°C floor temp  
Fresnel Lens Pattern Aisle . . . . . (PIP-900) and Area (PIP-910)  
Ambient Temperature Range . . . . . 0-50° C non-condensing  
Observed Motion ON time . . . . . 0-15 minutes (user adjustable)  
Lamp Warm-up Interval . . . . . 15 minutes (not adjustable)  
Installation/Debug Assists . . . . . Magnetic Test Switch and Blinking LED  
Mounting Options . . . . . 1/2" NPT nipple  
Mounting Bracket . . . . . 1/2" NPT-to-1/2" NPT steel transition plate  
Wire Harness . . . . . 2 Conductor 18AWG stranded copper STOW or pigtail  
Wire Harness Length . . . . . 48" (STOW) or 6" (pigtail leads)  
Harness Termination . . . . . Bare wire leads or fixture-specific connector  
Off-center Weight . . . . . 22 ounces without optional counterweight  
Shipping Weight . . . . . 2 lbs.  
Enclosure Dimensions (including mounting nipple) . . . . . 7" x 3.25" x 3.25"  
UL File Number/Category . . . . . FNFT File No. E234927