



### PD

Linear Photodiode Sensors for PLC-Multipoint Controllers

#### DESCRIPTION

The **PLC-MULTIPOINT PD** is a Class 2, low voltage light sensor designed to provide input to **PLC-MULTIPOINT** controllers. The **PD** sensor may also serve as input into analog scaling boards used in energy management systems. **PD** sensor models are available in a wide variety of light sensing ranges and housing styles.

The **PD** allows the **PLC-MULTIPOINT** controllers to switch banks of lights on and off, or provide continuous signals to electronic dimming ballasts for fluorescent fixtures.

#### ADJUSTABILITY

The sensor sensitivity is adjustable. **PD** sensor adjustments are made remotely at the controller board, not at the sensor head. The sensor measures dark at 0 VDC and maximum light level at 9 VDC and provides an output selection range at 9 VDC of 750, 2,500, 4,000 or up to 10,000 FC.

#### CONSTRUCTION

The electronic circuit for all exterior domes and lens for PLC-Multipoint sensor models is encased in a Lexan housing, ultrasonically welded to ASA LI-912; Acrylate Styrene Acrylonitrile (ASA) and meets flame retardant requirements of UL Standard 94HB.

#### SENSORS FOR ALL APPLICATIONS

All indoor sensors have a flat Fresnel lens that looks downward in a 60 degree cone of reference to measure actual light on the work surface. The Fresnel lens is used to reduce the influence of stray light striking the sensor from nearby windows or incidental side lighting.

The Outdoor sensor is enclosed in a weatherproof housing with a visor for shading and lens protection. The Atrium and Skylight sensors both use diffusing dome lenses to provide a 180 degree angle of photodiode response.



#### FEATURES

- Adjustable maximum output voltage for high resolution in 10-7,500 FC range.
- Remote sensor calibration.
- Indoor sensor with 60 degree clear Fresnel Lens, Adhesive mounting to ceiling, facing down. Sensor range 0/5-750 FC.
- Outdoor sensor with flat clear lens. Two sensors ranges: 0/5-750FC and 0/500-2500FC. 1/2" IPT connection for horizontal mounting. Weather proof housing.
- Atrium sensor with opaque dome lens filters 33% of light level in upper atrium. Sensor range 2/200-4,000 FC. 1/2" IPT connection for horizontal mounting.
- Skylight sensor with dark dome lens filters 90% of light level in skylight. Sensor range: 10/1,000-10,000 FC in skylight. 1/2" IPT connection to for upward vertical mounting.
- Interface with LC3X PLC-MULTIPOINT controller.
- New high temperature suturing process combines LEAD FREE parts & premium circuit boards offers same level of performance.
- Fully patented technology.
- 2 year warranty.

DATA SHEET



# PLC-MULTIPOINT, INC.

## PHOTO LIGHTING CONTROL & SYSTEMS

DATA SHEET

### PD TECHNICAL DATA

<b>Accuracy:</b>	+/-1% at 70 F (21 C) Derated to +/-5% at 120 F or at 0 F (-18 C to 49 C)
<b>Operating Temp:</b>	13 F to +140 F. (-11 C to 60 C)
<b>Sensor Type:</b>	Blue-enhanced Photo Diode
<b>Sensor Ranges:</b>	<u>Minimum</u> <u>Maximum</u>
<b>PD1 - Indoor</b>	0 Fc                      2-750 Fc
<b>PD5 - Outdoor</b>	0 Fc                      2-750 Fc
<b>PD5D - Outdoor</b>	5 Fc                      500-2,500 Fc
<b>PD9 - Atrium</b>	2 Fc                      200- 4,000 Fc
<b>PD9D - Skylight</b>	10 Fc                      1,000-10,000 Fc
<b>PD9DT - Tunnel</b>	10 Fc                      1,000-10,000 Fc
<b>Input Voltage:</b>	12VDC from controller
<b>Output Voltage:</b>	0 at darkness to 9 VDC at full output
<b>PC Input Controls:</b>	<b>LC3X-3X/PD, LC6, LC7B4, LC7B6, PD-SIM</b>
<b>Wiring:</b>	4 conductor 22 ga. stranded Cable. Red: Signal Black: +12VDC Yellow: Remote gain adjust Green: DC common
<b>ROHS:</b>	Directive 2002/95/EC on the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equip- ment (RoHs)

### SPECIFICATION

#### PHOTODIODE SENSOR

The photoelectric device shall be a Class 2, low voltage, ambient light sensor designed to interface directly with the analog input of the controller. The sensor shall supply an analog signal to the controller system proportional to the light measured. The sensor shall be capable of a fully adjustable response in the range between 0 and 10,000 footcandles with a +/-1% accuracy at 70 degrees F (21 deg. C).

The sensitivity adjustment shall be remote at the controller. The sensor housing shall be constructed from GE Cyclocac (R) ABS, shall be flame retardant and meet UL 94 HB standards.

#### INDOOR

Indoor sensors shall have a Fresnel lens, with a 60 degree cone of response. Indoor sensors shall only require a penetration hole in the ceiling of 3/8" dia. and the sensor shall mount to the ceiling using adhesive tape. The indoor sensor range shall be between 0 and 750 FC. The indoor sensor shall be **PLC-MULTIPOINT PD1**.

#### OUTDOOR

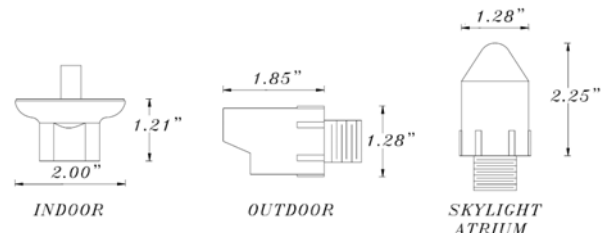
Outdoor models shall have a hood over the aperture to shield the sensor from direct sunlight. The outdoor sensor circuitry shall be completely encased in an optically clear epoxy resin. Outdoor sensors shall mount to a standard threaded 1/2" conduit or fit a 1/2" knockout. The Outdoor sensor shall have two ranges: between 0 and 750 FC or 5 and 2500 FC. The outdoor sensor shall be **PLC-MULTIPOINT PD5 or PD5D**.

#### ATRIUM or SKYLIGHT

The Atrium or Skylight sensors shall have a translucent dome with a 180 degree field of view. Atrium or Skylight sensors shall mount to standard threaded 1/2" conduit or fit a 1/2" knockout. Atrium sensor range shall be from 2 to 4,000 FC. Skylight sensor range shall be between 10 and 10,000 FC. The Atrium or Skylight sensors shall be **PLC-MULTIPOINT PD9 or PD9D**.

### PD SENSOR SELECTOR

<u>SENSOR</u>	<u>LENS</u>	<u>FILTER</u>	<u>MOUNTING</u>	<u>ORIENT</u>	<u>Height</u>	<u>Dia.</u>
PD1	Fresnel	Clear	Ceiling	Down	2.00"	1.23"
PD5	Flat	Clear	1/2" IPT	Horiz.	1.85"	1.28"
PD5D	Flat	Dark	1/2" IPT	Horiz.	1.85"	1.28"
PD9	Dome	Opaque	1/2" IPT	Horiz	2.25"	1.28"
PD9D	Dome	Dark	1/2" IPT	Up	2.25"	1.28"
PD9DT	Dome	Dark	1/2" IPT	Horiz	2.25"	1.28"





### PHOTO DIODE SENSOR APPLICATION NOTE

#### SENSOR CALIBRATION & SETPOINT DETERMINATION

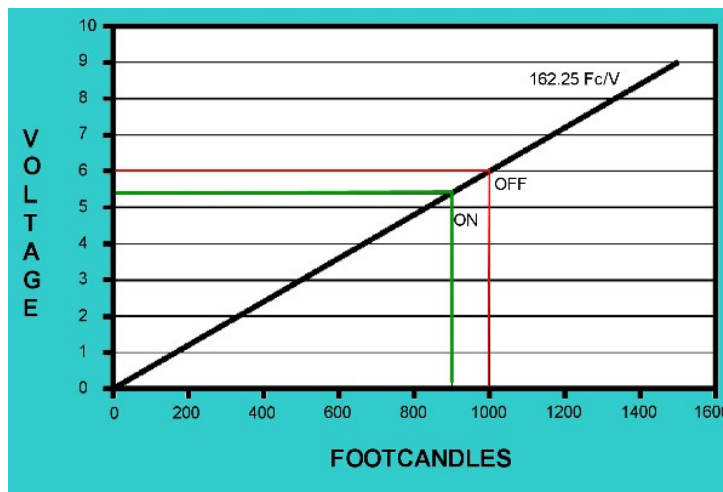
Photodiode (PD) sensors are sensitive to the amount of light sensed in blue bandwidth. PD sensors are different from Photoconductive sensors in two ways. PD sensors provide a linear response over the range of the sensor and have an adjustable footcandle sensitivity. Thus the same sensor can be calibrated for a wide variety of response ranges. The following figure shows a range response for a Photodiode sensor.

Calibration of the PD sensor is accomplished by a potentiometer in PLC-MULTIPOINT LC series controller boards such as the LC3X with 3X/PD adaptor board, LC6, LC7B4 and LC7B6. The adjustment of this potentiometer changes the sensitivity or **Footcandles per Volt (FC/V)** that the sensor uses in its output signal. PD sensors have a 0 to 8VDC output signal range. The sensitivity adjustment is used to optimized the light level range of the sensor. An optimized sensor range is important for control because it provides the best resolution of the sensor to precisely allow the controller to switch at the desired lighting levels. The PD sensor ranges are characterized as follows:

<u>MODEL</u>	<u>APPLICATION</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>
PD1	Indoor	0 FC	2-750 FC
PD5	Outdoor	0 FC	2-750 FC
PD5D	Outdoor	5 FC	5-2500 FC
PD9	Atrium	2 FC	200-4,000 FC
PD9D	Skylight	10 FC	1,000-10,000 FC
PD9DT	Tunnel	10 FC	1,000-10,000 FC

APPLICATION NOTES

For the **PD9** Atrium sensor highlighted above the minimum footcandle detection level is fixed at 2FC. The maximum footcandle detection level can be calibrated from 200 to 4,000 FC. A good guideline to use in range selection is that the maximum sensor range should be approximately **30% higher** than the highest setpoint. For example, if the highest switching setpoint is 1,000 Footcandles, then maximum calibration range of the sensor should be 1300 FC.



Photodiode sensors require that the FC/V ratio be calculated:

**Footcandle per Volt= (Maximum-Minimum Footcandle)/(8-0)VDC.**

In the example above for a PD9 sensor, the sensitivity is calculated as follows:

**(1300-2)FC/(8-0)V=162.25 FC/V.**

This ratio is used to select setpoint voltages.

To switch lights OFF at 1000 FC, the corresponding voltage is:

**(1000FC / 162.25FC/V)=6.16V.**

To switch lights ON at 900 FC, the corresponding voltage is

**( 900FC / 162.25FC/V)=5.55V.**

By setting a **PLC-MULTIPOINT PD-SIM** to these voltages, and providing it as an input into a controller, the controller's setpoint potentiometers are adjusted to switch at that lighting level.