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## COMPACT DC POWERED PHOTO-ELECTRIC SENSORS

- **RETROREFLECTIVE, PROXIMITY (DIFFUSE) & OPPOSED BEAM PAIRS**
- **MODULATED LED LIGHT BEAMS FOR IMMUNITY TO AMBIENT LIGHT**
- **+10 to +30 VDC OPERATION WITH REVERSE POLARITY PROTECTION**
- **NPN & PNP (CURRENT SINKING AND SOURCING) OUTPUTS**
- **RUGGED VALOX HOUSING MEETS NEMA 1, 2, 3, 3S, 4, 4X, 12, & 13 STANDARDS**
- **LED SIGNAL STRENGTH INDICATOR MAKES ALIGNMENT EASY & PROVIDES INDICATION OF LIGHT SIGNAL DETERIORATION**



### DESCRIPTION

These compact self-contained and powerful Retroreflective, Proximity (Diffuse) and Opposed Beam Pair Photo-electric Sensors provide application flexibility in counting, positioning and object detection. All units are interchangeable with conventional 18 mm threaded barrel-type photo-electrics and inductive proximity sensors. Their small 2-1/8" x 1-1/4" x 1/2" size, in addition to various mounting options, greatly increases alignment ease and application possibilities.

All units can be powered from +10 to +30 VDC and are reverse polarity protected. Current sinking NPN and current sourcing PNP Open Collector Transistors are protected from continuous overload and inductive load transients and are rated to 150 mA, with low saturation voltage and less than 1 µA offstate leakage current. In addition, no false outputs are generated at power-up. A 6 foot long 4 conductor PVC jacketed cable with strain relief provides supply input and transistor outputs.

A gasketed removable back cover provides access to the LIGHT/DARK Operate Mode Selector. When in the "Light Operate" (LO) position, outputs turn on when light **is** received by the detector. When in the "Dark Operate" (DO) position, the outputs are turned on when sensor light is **not** detected. Also accessible is a 15-turn screwdriver adjustable GAIN potentiometer that enables precise adjustment of system sensitivity. A rear mounted LED Signal Strength Indicator "lights" whenever the sensor sees a light condition and "blinks" at a rate proportional to the received signals strength (the stronger the signal, the faster the rate). This LED allows for easy alignment and monitoring of signal strength deterioration due to dirty optics or changes in alignment.

### SPECIFICATIONS

- POWER REQUIREMENTS:** +10 to +30 VDC, 10% Ripple Max., Reverse Polarity Protected, 25 mA max. (Model EMDC = 20 mA max.)
- OUTPUTS:** Current Sinking NPN and Current Sourcing PNP Open Collector Transistors; Short Circuit Protected to +30 VDC, Internal Zener Diode Protected;  
 $I_{SNK} = 150 \text{ mA}$  each;  $V_{OH} = 30 \text{ VDC}$  max.  
 $V_{SAT} = 0.2 \text{ V}$  @ 10 mA load; 1 V max. @ 150 mA max. load  
 $V_{SAT} = \text{Less than } 1 \text{ V}$  @ 10 mA load; less than 2 V @ 150 mA max. load  
**Offstate Leakage Current** = Less than 1 µA
- RESPONSE TIME:** Responds to a "light" or "dark" signal duration of 1 msec. or greater.
- OPERATING TEMPERATURE:** -4° to +158°F (-20° to +70°C)
- WEIGHT:** 3.5 oz (99.2 g)

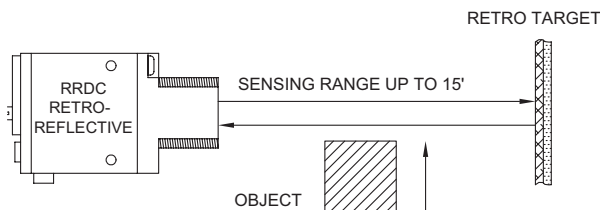
### MOUNTING

Various mounting methods have been designed to simplify alignment and provide versatility in any industrial environment. The integral 18 mm threaded lens can be interchanged with existing threaded entries common to 18 mm barrel sensors and inductive proximity switches. The threaded lens can also be installed into panel thicknesses of 5/16" through a 0.71" diameter hole and tightened into place with the supplied mounting nut. Two #4 screw clearance through-holes on 0.95" centers are available for side mounting or side nesting of multiple units on 1/2" centers for scanning large areas or for code reading applications. Units may also be mounted using the stainless steel Bottom-Mount or Side-Mount Bracket Kits (Models MB2 or MB3). These brackets allow 2 axes of movement & greatly simplify alignment.

### MODEL RRDC - RETROREFLECTIVE SENSOR

The Model RRDC is a compact, DC powered, retroreflective photo-electric sensor with maximum detection range of 15 feet (with 3" dia. reflector Model RT2). The "visible" LED light beam allows for easy alignment and is modulated, providing immunity to ambient light. The small beam size of 1/2" at 1 foot from the lens, makes it a good choice for detecting relatively small objects.

In operation, the visible LED light beam is directed at a prismatic photo transistor, amplified and demodulated. An object which then breaks this beam will trigger the outputs.



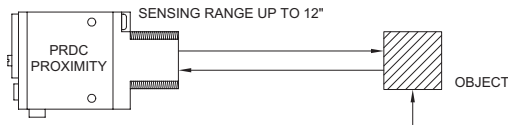
### ALIGNMENT

Apply DC power to the RRDC and direct its visible light beam at a reflective target (Models RT1 or RT2) while observing the Signal Strength LED on the back of the unit. Optimum alignment occurs when the sensor is receiving the maximum amount of reflected light and the GAIN (sensitivity) potentiometer is adjusted for the highest pulse rate on the Signal Strength LED. Note that glass, metallic objects, and other highly reflective surfaces may not be detected. In these applications, mount the sensor and reflector at any angle to the object to minimize direct reflections.

## MODEL PRDC - PROXIMITY SENSOR

The Model PRDC is a compact, DC powered, Proximity (Diffuse) photo-electric sensor with a 12" maximum detecting distance (as measured with a 90% reflective white test card). This sensor requires no special reflectors or reflective tapes and the limited 12" sensing range reduces detection of background reflections. It is ideally suited for detection of transparent or translucent objects, parts ejected from presses, and rotating targets such as pulley spokes. A modulated "infrared" LED light beam provides immunity to ambient light.

In operation, the modulated light beam is reflected by the object to be detected. Actual sensing range is determined by the surface area and the amount of reflectivity of the object. This reflected light is sensed by a photo-transistor, amplified, demodulated and then energizes the outputs.

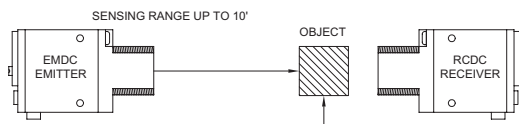


### ALIGNMENT

With the PRDC in its sensing position, apply DC Power and direct the infrared light beam at the object to be detected. While observing the Signal Strength LED, adjust the GAIN (sensitivity) potentiometer for the highest LED pulse rate. Now remove the sensed object. If the LED goes out, no further adjustment is necessary. If the LED remains lit, the sensor is "seeing" reflected light from the background. Reduce the GAIN by steps until the sensor "sees" the object but not the background. Then turn the pot counter clockwise 2 more full turns. If the background is still being sensed, it will be necessary to reduce its reflectivity by either moving it back or painting it flat black.

## MODELS EMDC & RCDC - OPPOSED BEAM EMITTER/ RECEIVER SENSOR PAIR

The Models EMDC (Emitter) and the RCDC (Receiver) are compact, DC powered, Opposed Beam photo-electric sensor pairs with a 10 foot sensing range. The Emitter contains a high power modulated "infrared" LED. The Receiver contains a sensitive photo-transistor, amplifier-demodulator and output transistors. In operation, these outputs will be triggered when the Receiver detects that an object begins to break the Emitter beam. Due to their high gain, they are ideally suited for detecting opaque objects in dirty and dusty areas or when condensation or oil film environments are present. The small 1/8" well defined beam size allows for sensing small parts accurately and provides repeatable edge sensing of opaque objects to better than 0.01" for accurate positioning applications. Greater accuracies can be achieved by aperturing the Emitter, Receiver or both. However, aperturing will result in reduced sensing distances. While the beam size is small, the Receiver has a wide field of view which allows easy "line-of-sight" alignment.

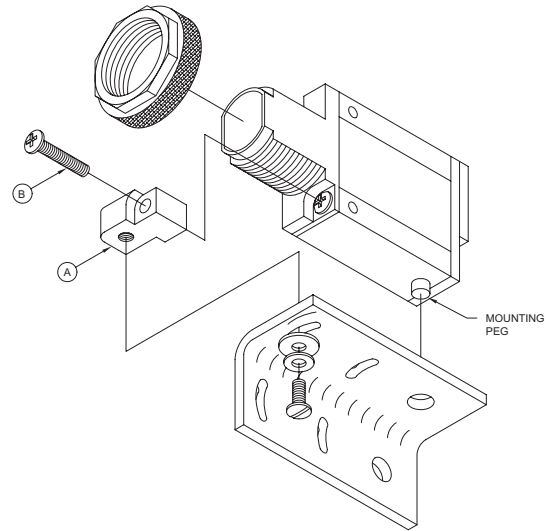


### ALIGNMENT

Temporarily mount the Emitter-Receiver Pair opposite, and in line-of-sight, to each other. Apply DC power to both and aim the Emitter at the Receiver. Move the Receiver up-down-left-right until the Signal Strength LED lights. Optimum alignment occurs when the Signal Strength LED flashes at the highest rate obtainable with the GAIN (Sensitivity) potentiometer adjusted to the lowest setting needed to light the LED. Mount the units in place. Opposed Beam Pairs should be used at their highest possible gain. Therefore, have the object to be detected in "sensing position" and adjust the GAIN potentiometer fully clockwise (maximum gain). If the Signal Strength LED comes on, "burn-through" is occurring, and will require that the GAIN pot be backed off (counter clockwise) until the LED goes out and then backed off 2 more full turns. Note that Opposed Beam Pairs must be aligned properly and mounted securely. Excessive movement or vibration can cause loss of alignment and intermittent or false operation.

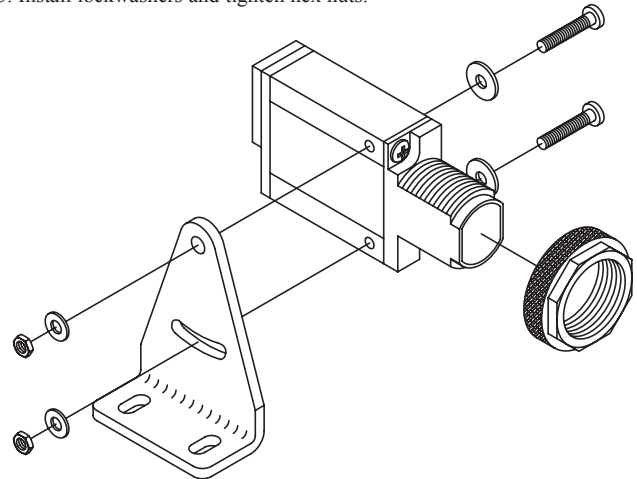
### MB2 BOTTOM MOUNT BRACKET KIT INSTALLATION

1. Remove lense mounting nut on sensor and bottom lense screw.
2. Align mounting foot (A) under lense as shown with threaded insert facing down and attach to lense with long kit supplied screw (B).
3. Place sensor mounting peg into bracket hole.
4. Install screw, with washers, into long slotted bracket hole and into mounting foot threaded insert.



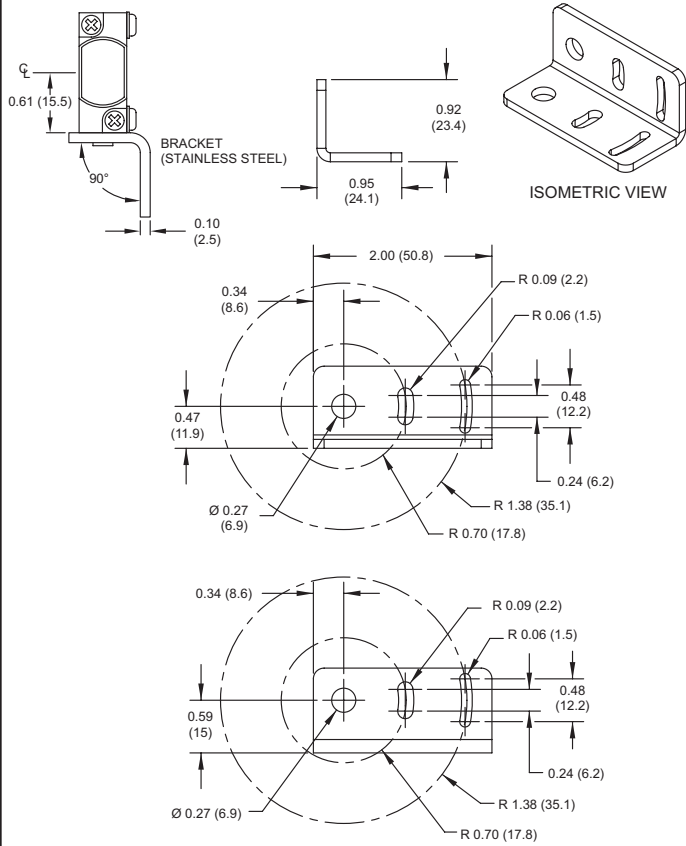
### MB3 SIDE MOUNT BRACKET KIT INSTALLATION

1. Remove lense mounting nut from sensor.
2. Install screws with flat washers, through side clearance holes in sensor and through top hole and slot of bracket.
3. Install lockwashers and tighten hex nuts.

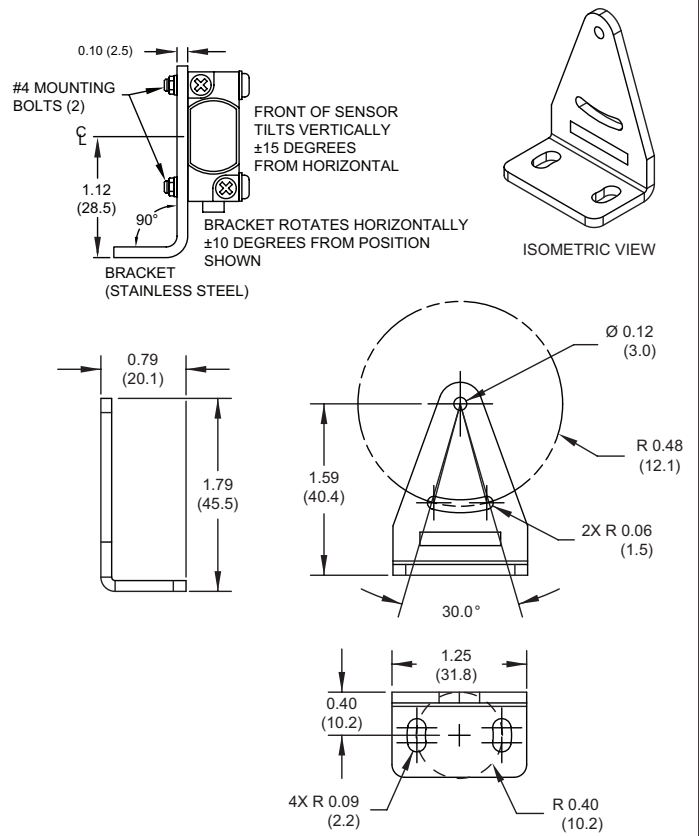


**MOUNTING OPTIONS**  
**DIMENSIONS In inches (mm)**

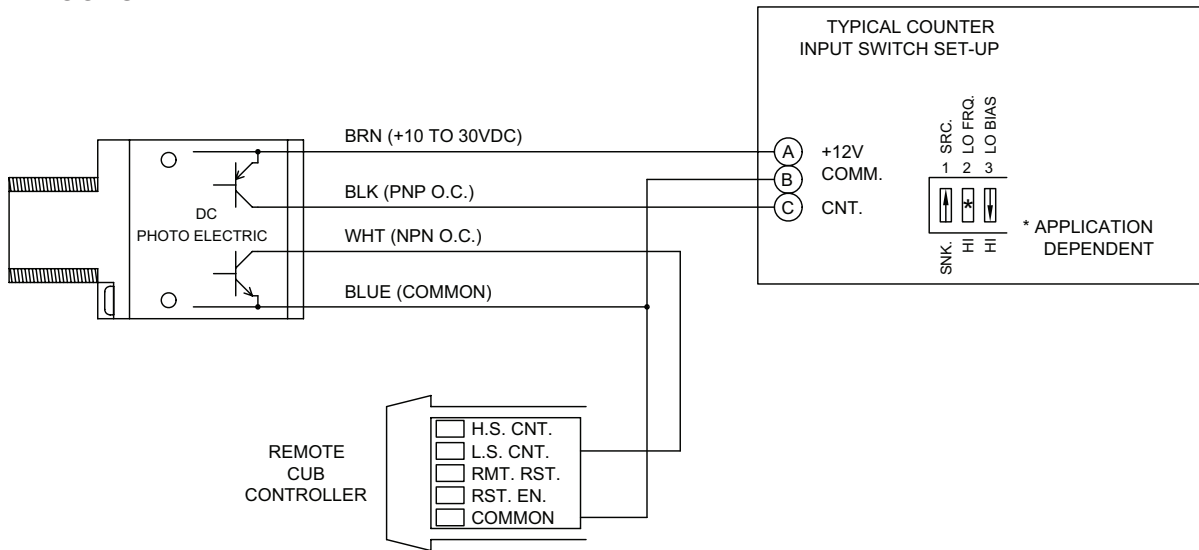
**MB2 BOTTOM MOUNTING BRACKET**



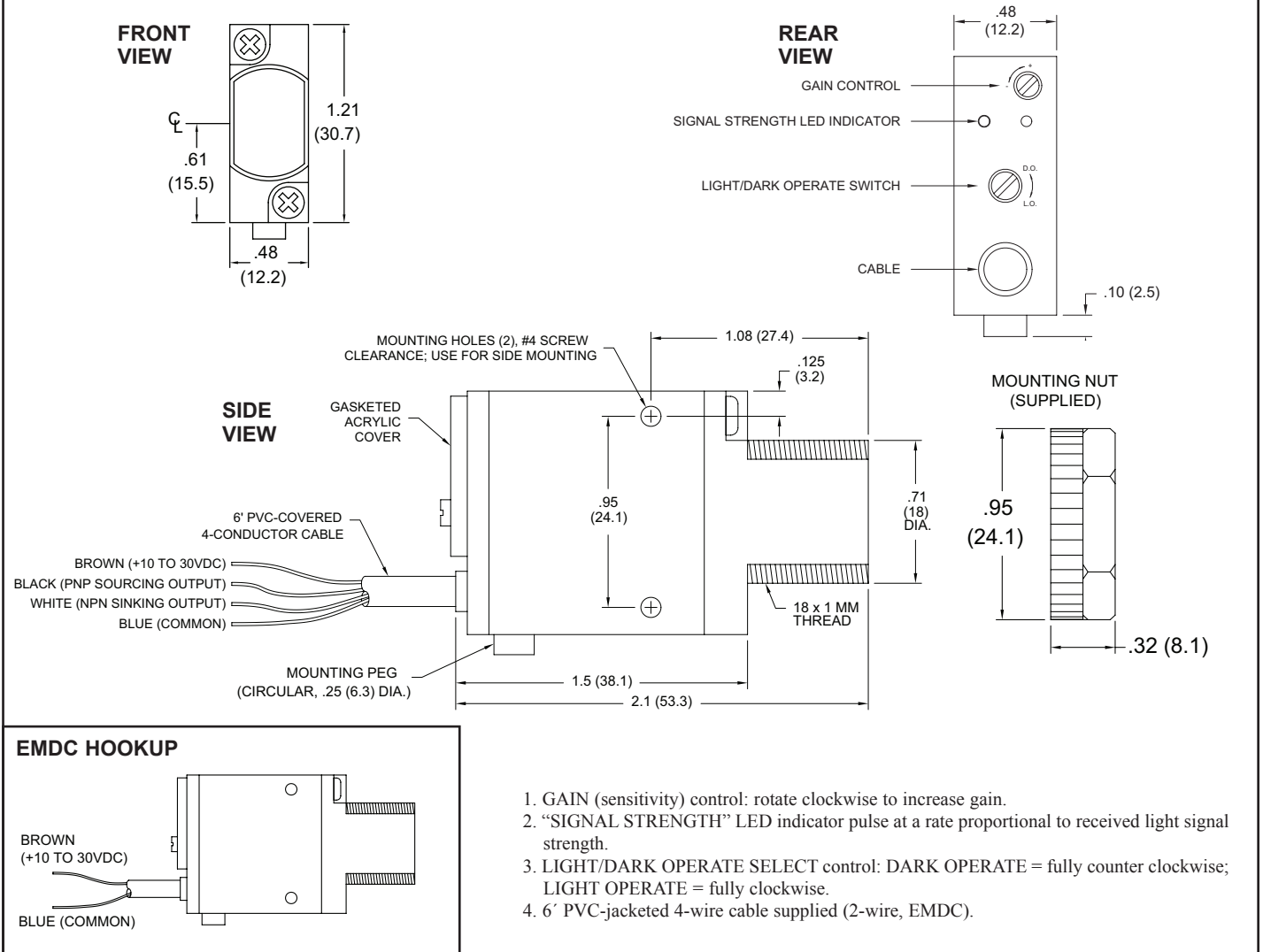
**MB3 SIDE MOUNTING BRACKET**



**TYPICAL HOOKUP**



## DIMENSIONS In inches (mm)



## ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBERS
RRDC	Retroreflective DC Photo-Electric Sensor	RRDC0000
PRDC	Proximity (Diffuse) DC Photo-Electric Sensor	PRDC0000
EMDC	DC Emitter (Opposed Beam Pair)	EMDC0000
RCDC	DC Receiver (Opposed Beam Pair)	RCDC0000
MB2	Bottom Mount Bracket Kit	MB200000
MB3	Side Mount Bracket Kit	MB300000
RT1	1-1/2" Dia. Prismatic Reflector (Model RRDC)	RT100000
RT2	3" Dia. Prismatic Reflector (Model RRDC)	RT200000



Do not dispose of unit in trash - Recycle

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