Background Reflectivity and Placement

Avoid mirror-like backgrounds that produce specular reflections. False sensor response will occur if a background surface reflects the sensor's light more strongly to the near detector, or "sensing" detector (R1) than to the far detector, or "cutoff" detector (R2). The result is a false ON condition (Figure 4). Use of a diffusely-reflective (matte) background will cure this problem. Other possible solutions are to angle the sensor or angle the background (in any plane) so the background does not reflect light back to the sensor (see Figure 5). Position the background as far beyond the cutoff distance as possible.

An object beyond the cutoff distance, either stationary (and when positioned as shown in Figure 6), or if it moves past the face of the sensor in a direction perpendicular to the sensing axis, can cause unwanted triggering of the sensor if it reflects more light to the near detector than to the far detector. The problem is easily remedied by rotating the sensor 90° (Figure 7). The object then reflects the R1 and R2 fields equally, resulting in no false triggering. A better solution, if possible, may be to reposition the object or the sensor.

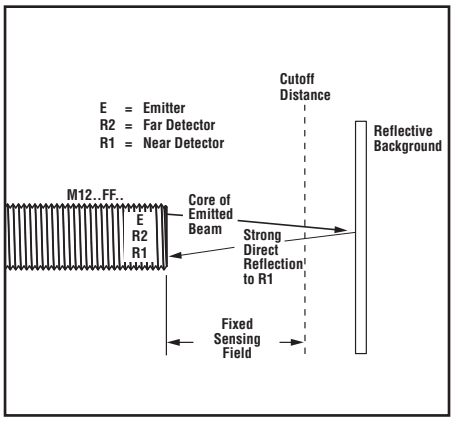

Figure 4. Reflective background – problem

Color Sensitivity

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. It is expected that at any given cutoff setting, the actual cutoff distance for lower reflectance targets will be slightly shorter than for higher reflectance targets. This behavior is known as color sensitivity.

The excess gain curves on page 5 were generated using a white test card of 90% reflectance. Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

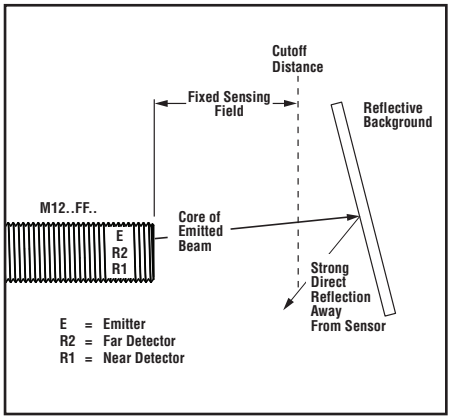

Figure 5. Reflective background – solution

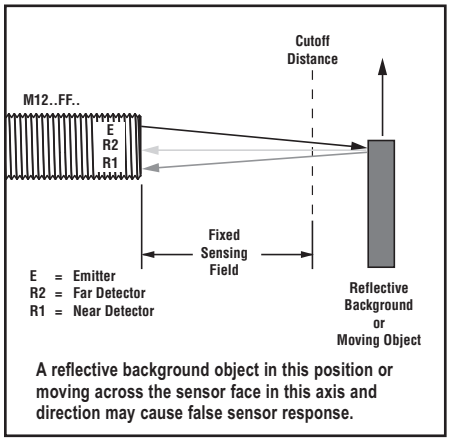

Figure 6. Object beyond cutoff – problem

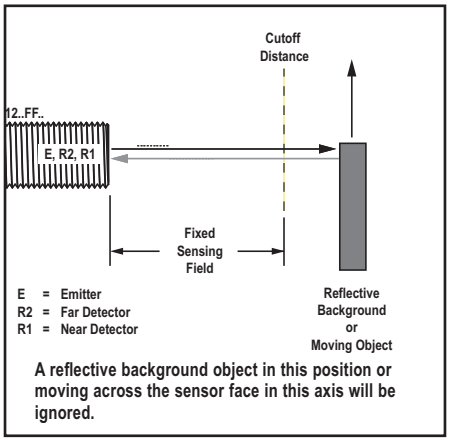

Figure 7. Object beyond cutoff – solution

Specifications

Sensing Beam	**Fixed-Field Models:** 680 nm visible red **All Other Models:** 660 nm visible red
Supply Voltage and Current	10 to 30V dc (10% max. ripple) @ 20 mA max current, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Complementary (1 normally open and 1 normally closed) solid-state, NPN or PNP, depending on model
Output Ratings	100 mA total across both outputs with overload and short circuit protection **OFF-state leakage current:** **NPN:** less than 200 µA @ 30V dc (see Application Note 1) **PNP:** less than 10 µA @ 30V dc **ON-state saturation voltage:** **NPN:** less than 1.6V @ 100 mA **PNP:** less than 3.0V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up, short-circuit protected
Output Response Time	**Opposed Mode:** 625 microseconds ON/375 microseconds OFF **All Other Modes:** 500 µs ON and OFF NOTE: 100 ms delay on power-up; outputs do not conduct during this time.
Repeatability	**Opposed Mode:** 85 microseconds **All Other Modes:** 95 microseconds
Indicators	Two Status (yellow) and one Power (green) LED (see Figure 1)
Adjustments	**Fixed-Field Models:** None **All Other Models:** Single-turn Gain (sensitivity) potentiometer
Construction	**Housing:** Nickel-plated brass **Lenses:** PMMA **Cable Endcap and Gain Potentiometer Adjuster:** PBT
Environmental Rating	IEC IP67; NEMA 6, IEC IP68 and 1200 PSI Washdown, NEMA ICS 5 Annex F-2002
Connections	2 m (6.5') or 9 m (30') 4-wire PVC-jacketed cable, 4-pin integral Euro-style QD fitting, or 4-pin 150 mm (6") Euro-style pigtail, depending on model
Operating Conditions	**Operating temperature:** −20° to +60° C (−4° to +140° F) **Relative humidity:** 90% max @ +50° C (+122° F) non-condensing
Application Notes	1. NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current
Certifications	CE