SM512 Series Diffuse Mode Sensors

DC sensors with metal housings: SM512DB, DBX, LBD, and LBDX

the photoelectric specialist

Banner SM512 Series dc diffuse mode sensors are designed for reliable performance in especially hostile industrial environments. These sensors have totally-encapsulated circuitry within die-cast metal housings for superior resistance to moisture and physical abuse. Models include: SM512DB, SM512DBX, SM512LBD, and SM512LBDX.

Model SM512DB has a sensing range of 8 inches and a response time of 1 millisecond (ms). Model SM512DBX has greater range (15 inches) and 10 ms response time. Models SM512LBD and LBDX are divergent diffuse sensors with a wide field of view, which makes them ideal for sensing of transparent objects. See the individual product descriptions (page 2) for more information.

SM512 Series sensors have *complementary* NPN transistor outputs (one normally open and the other normally closed), which connect directly to Banner MICRO-AMP and MAXI-AMP logic modules, as well as to most logic gates, small relays, and other similar dc loads.

SPECIFICATIONS, SM512 Series Diffuse Sensors

RANGE: See excess gain curves in individual product descriptions.

SUPPLY VOLTAGE: 10-30V dc. Maximum allowable ripple 10%; supply current is typically less than 40mA (exclusive of load).

OUTPUT CONFIGURATION: Complementary open-collector NPN transistors (one normally open and one normally closed), with continuous short-circuit protection. All models have reverse polarity protection.

OUTPUT RATING: Each output transistor is capable of sinking up to 250mA continuously. On-state saturation voltage less than 2 volts at full load and less than 1 volt at signal levels. Off-state leakage current less than 100 microamps. Outputs are reverse-polarity protected.

RESPONSE TIME: See individual sensor specifications. Response time is independent of signal strength.

REPEATABILITY: See individual sensor specifications. Repeatability is independent of signal strength.

OPERATING TEMPERATURE: -40 to +70 °C (-40 to +158 °F).

CONSTRUCTION: Die-cast metal housing with stainless steel legend plate. Totally encapsulated. NEMA 1, 2, 3, 3S, 4, 4X, 12, and 13. Cables are .15-inch diameter, PVC covered, and shielded (4 conductor, 6 feet long).

INDICATOR LED: Red LED indicator at rear of sensor (above cable exit) lights when the sensor is receiving a "light" signal.

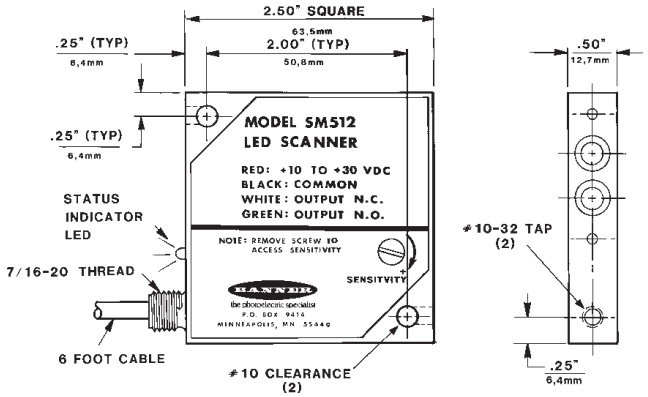
SENSITIVITY ADJUSTMENT: Single-turn adjustment, accessible by removing the nylon screw on the side of the sensor.

APPLICATION WARNINGS:

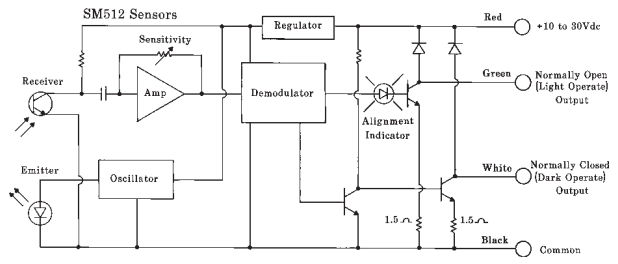
Outputs will not directly interface TTL logic, due to the reverse-polarity protection diode. Contact the factory for TTL interfacing instructions.

The short-circuit protection may de-energize the outputs with certain incandescent light bulb or capacitive loads. Contact the factory if these loads are anticipated.

Dimension Drawing



Functional Schematic



WARNING These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

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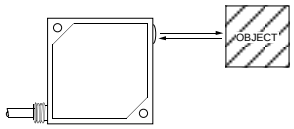
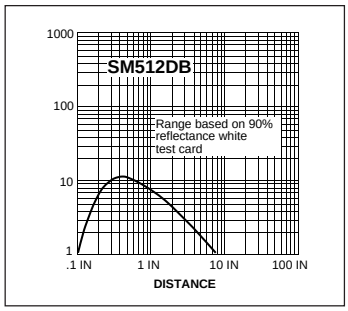
SM512 Series Diffuse Mode Sensors

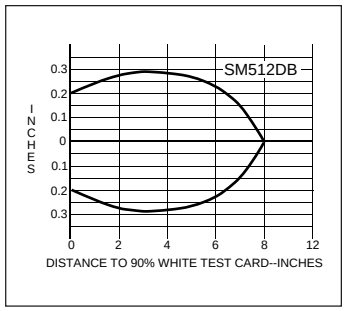
SM512DB

Diffuse mode



VOLTAGE: 10-30V dc
RANGE: 8 inches (20 centimeters)
RESPONSE TIME: 1 millisecond
REPEATABILITY: 0.3 millisecond
SENSING BEAM: infrared, 940nm



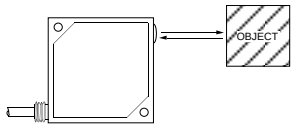


Model **SM512DB** is a **short-range proximity mode sensor** for applications requiring fast response time, such as leading-edge detection in carton-flap gluing installations or presence sensing for triggering high-speed ink-jet type imprinters.

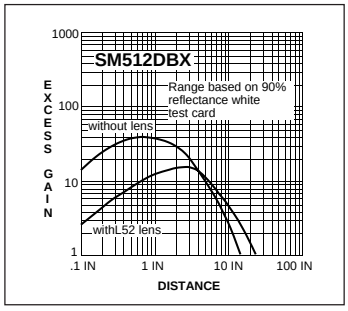
It is **totally encapsulated** and its **lenses are hermetically sealed** to the case, making it **completely leakproof. It should be used to sense any matte-finish material** such as paper, corrugated cardboard, wood, dull plastics, or painted metal surfaces. It should not be used to sense transparent objects or those with very shiny surfaces, (unless the position of the shiny surface can be reliably maintained at an angle of 90 degrees to the beam). **It will sense very small parts**, but at greatly reduced ranges: a toothpick, for example, would be reliably sensed at a distance of up to about 1 inch.

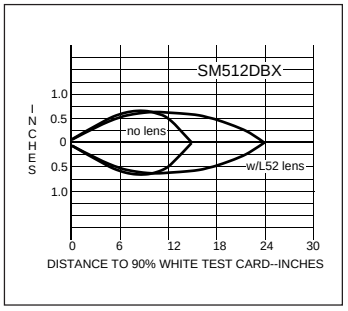
SM512DBX

Diffuse mode



VOLTAGE: 10-30V dc
RANGE: 15 inches (38 centimeters)
RESPONSE TIME: 10 milliseconds
REPEATABILITY: 0.3 millisecond
SENSING BEAM: infrared, 880nm

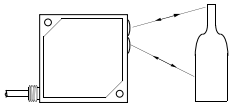




Model **SM512DBX** is a **relatively high power, long range proximity mode sensor.** It has several times the excess gain of the SM512DB, but at the cost of slower response time. It should be used in all proximity mode applications where it is certain that the 10-millisecond response time is not so slow as to cause the sensor to "miss" the object (the sensor must also see the *absence* of the object for at least 10 milliseconds in order to turn off). An important advantage of the SM512DBX is that the repeatability of the response time is extremely good (0.3 milliseconds), so it is sometimes possible to use this slower sensor in precise positioning controls. The range of the SM512DBX may be extended to 24 inches by using the optional model L52 lens block.

SM512LBD
SM512LBDX

Divergent diffuse mode



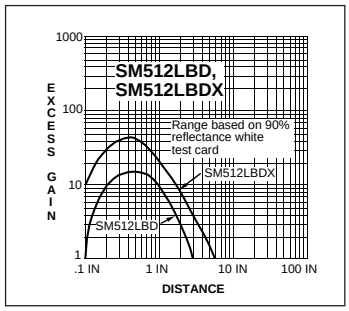
VOLTAGE: 10-30V dc

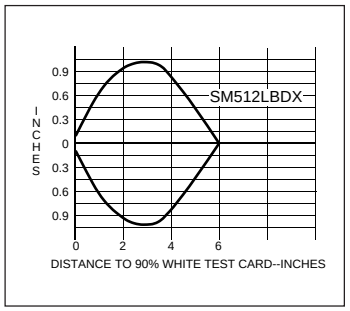
RANGE:
LBD 3 inches (7,6 centimeters)
LBDX 6 inches (15 centimeters)

RESPONSE TIME:
LBD 1 millisecond
LBDX 10 milliseconds

REPEATABILITY:
LBD 0.1 millisecond
LBDX 0.3 millisecond

SENSING BEAM: infrared,





Models **SM512LBD** and **SM512LBDX** are **short-range divergent diffuse mode sensors** with an **extremely wide field of view.** Because of their wide angle of view, they will **reliably sense transparent objects** such as glass or plastic bottles and clear cellophane or poly bags at distances of up to 2 or 3 inches (respectively), even when the object is at an angle to the sensing beam. Most other proximity mode sensors will sense these objects (at even greater ranges) if the object is *perpendicular* to the sensing beam, but at relative angles of even a few degrees the returned light is reflected off in a different direction and never returns to the sensor.

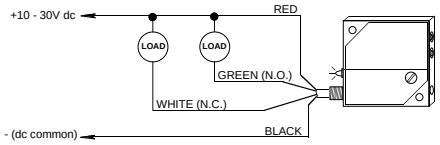
Both models are well-suited to applications where the object will appear within a few inches of the sensor, but where a background object (perhaps more reflective than the object being sensed) makes differentiating between the two difficult. In this respect, the wide angle optics of these sensors serves the same purpose as a convergent sensor. Note that the SM512LBD is "blind" to objects passing very close to the lens. The SM512LBD has somewhat lower excess gain but a faster (1 ms) response time. See excess gain curves.

SM512 Series Diffuse Mode Sensors

Hookup Diagrams

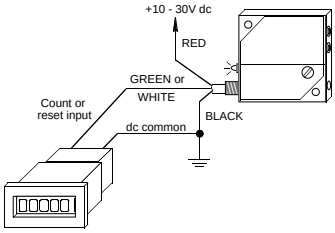
Hookup of SM512 Series Sensor to Relay or Solenoid

SM512 Series sensors offer two open collector NPN outputs in a complementary configuration (one normally open and one normally closed). The green output wire switches the load when the receiver "sees" its modulated light source (LIGHT operate). The white output wire switches in the dark condition (DARK operate). Both output circuits can switch up to 1/4 amp.



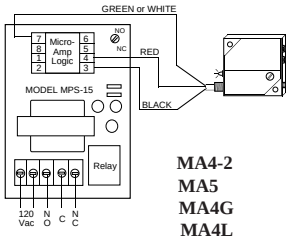
Hookup of SM512 Series Sensor to Counter

Most counters, totalizers, rate meters, etc. accept either output of the SM512s. Hookup to a battery-powered LCD type is shown here. For other types, follow the counter's hookup instructions for an NPN or current sinking input device.



Hookup to MICRO-AMP Logic (MPS-15 Chassis)

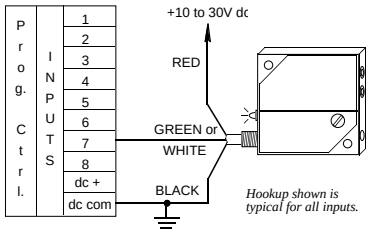
The output (green or white wire) of SM512 Series sensors connects directly to any input of Banner MICRO-AMP logic-only modules. These MICRO-AMP logic modules may be used:



MA4-2	One-shot
MA5	Delay
MA4G	4-input "AND"
MA4L	Latch

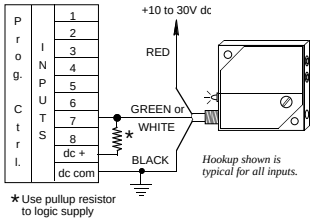
Hookup of SM512 Series Sensor to Programmable Controller requiring current sink

Either sensor output is wired directly to any input of the PLC. Also, connect the negative of the sensor power supply to the negative of the PLC (input card) power supply (if they are separate supplies).



Hookup of SM512 Series Sensor to Programmable Controller requiring current source

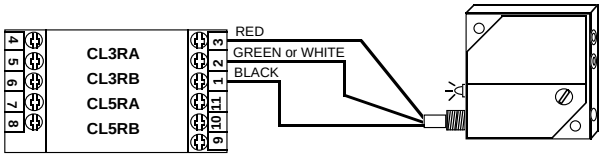
Either sensor output is wired to any input of the PLC. An external "pullup" resistor is connected between the input and +V of the PLC (input card) power supply. The value of the resistor is not critical: values from 1KΩ to 10KΩ, 1/4 watt or larger, will satisfy most inputs. Also, connect the negative of the sensor power supply to the negative of the PLC (input card) power supply (if they are separate supplies).



The wiring scheme inverts the LIGHT and DARK output configuration (as seen by the PLC input). The white output becomes LIGHT operate, while the green output is used for DARK operate.

Hookup to MAXI-AMP Logic (CL Series modules)

The output of an SM512 series sensor may be used as an input to Banner MAXI-AMP CL Series logic modules. The MAXI-AMP, when powered by AC voltage, offers a DC supply with enough capacity to power one SM512 Series sensor. An SM512 Series sensor may also be used as an input to the auxiliary input of a CL5 module.



Modification Information for SM512 series Sensors

These modifications are available for SM512 Series sensors. They are not stocked, but are available on a "quote" basis:

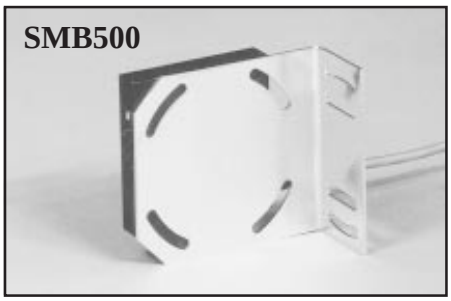
HIGH SPEED Modification (model Suffix "MHS")
SM512 Series sensors with normal response speed of 1 millisecond may be modified for faster response. Modification "MHS" offers 300 microsecond (0.3 millisecond) on and off response time. **Repeatability** of "MHS" models is 0.1 millisecond.

CABLE LENGTH Modification (30-foot cable)
Any of the SM512 Series sensors may be built with a cable longer than the standard 6-foot length. The most readily available length is 30 feet. Lengths longer than 30 feet may also be quoted.

SM512 Series Diffuse Mode Sensors

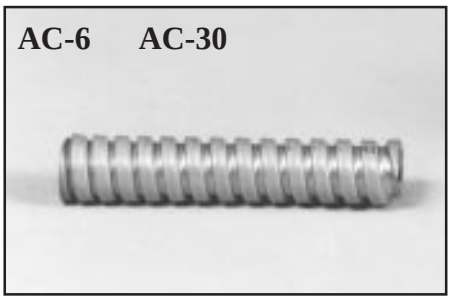
Accessories and Modifications for SM512 Series Sensors

SMB500



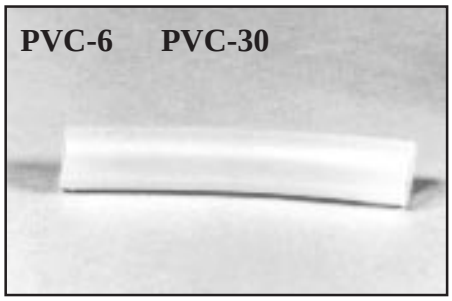
Universal steel mounting bracket for 512 Series sensors permits adjustment in both axes. Also available in stainless steel (order model SMB500SS).

AC-6 AC-30



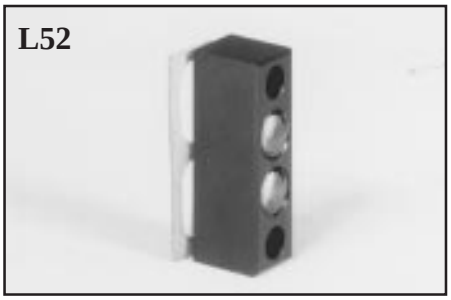
These are 6 and 30-foot lengths of flexible steel conduit and may be used with any of the 512 Series sensors and the CF7-16 fitting to provide protection to the sensor cable.
Size: I.D. = 5/16"; O.D. = 7/16".

PVC-6 PVC-30



These are 6 and 30-foot lengths of plastic (PVC) flexible tubing for use with the 512 Series sensors and the CF7-16 in food applications where flexible steel conduit is not allowed.
Size: I.D. = 1/4"; O.D. = 3/8".

L52



Extends range of SM512DB and SM512DBX by about 50% and reduces beam diameter.

FOF500

Fiberoptic interface block. Creates a fiberoptic sensor from SM512DB or SM512DBX. Contact factory for ranges.

CF7-16

Aluminum compression fitting for the cable entrance at the rear of the 512 Series sensors. May be used with either plastic or flexible steel conduit (PVC-6 or AC-6).

Banner Engineering Corp. 9714 Tenth Ave. No. Minneapolis, MN 55441 Telephone: (612) 544-3164 FAX (applications): (612) 544-3573