

# INSTALLATION and SERVICE INSTRUCTIONS FE-MLS3B SERIES PHOTOELECTRIC SCANNERS

## GENERAL INFORMATION

The FE-MLS3B is a light operated retroreflective scanner that replaces FE-MLS3A (form, fit and function). It energizes a load when its invisible infrared beam is reflected from a retroreflective target. The load turns off when the beam is blocked.

The FE-MLS3B operates on DC voltage; to drive a relay, provide input to a MICRO SWITCH logic function card in a separate control base, or provide direct input to other logic level circuitry (e.g., a programmable controller). The FE-MLS3B can be used in bright ambient light, even sunlight.

## SCANNING

The recommended **maximum** scanning distance of the FE-MLS3B with the 3-inch retroreflector supplied with it

is 25 feet in clean air. Fog, steam, dust, smoke, etc., will shorten the scanning distance. Smaller reflectors reflect less of the beam, and, therefore, also shorten the scanning distance as shown here:

Reflector	Reflector Description	Max. Distance
FE-RR1	3-inch acrylic disc	25 ft. (7.6 m)
FE-RR2	1 x 2-inch tape	2½ ft. (0.76 m)
FE-RR3	1-inch acrylic disc	8 ft. (2.4 m)
FE-RR4	5/8-inch acrylic disc	4 ft. (1.2 m)

Up to the recommended maximum distance, the beam diameter increases. Figure 1 shows the approximate beam pattern within which the reflector should be centered for best operation.

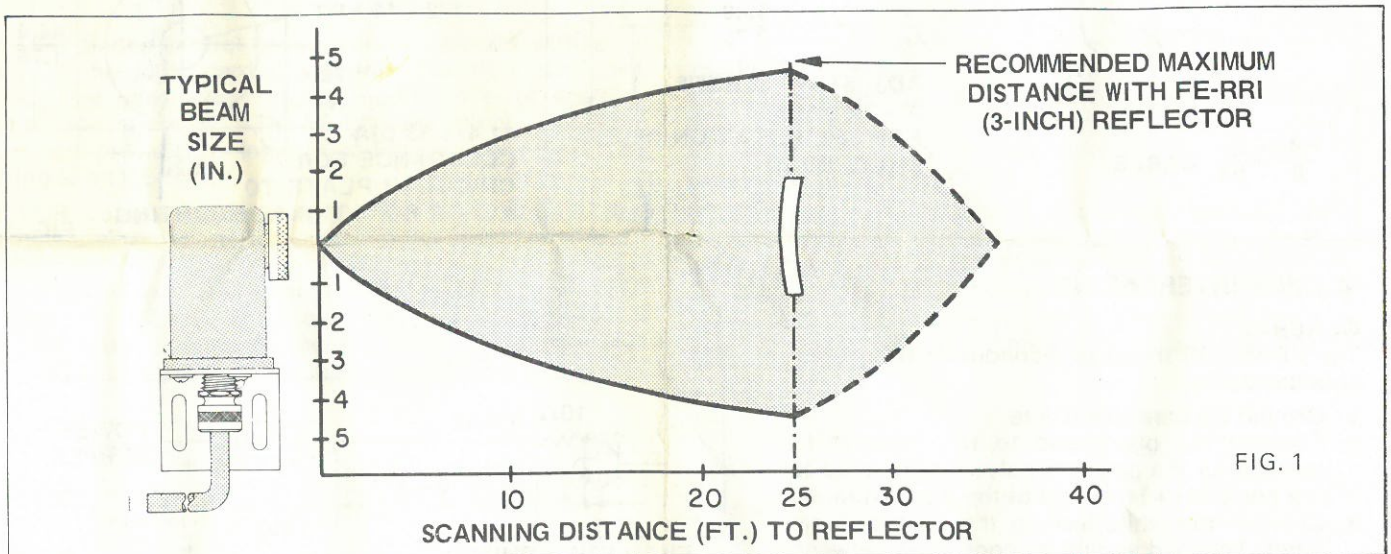


FIG. 1

When detecting translucent objects, it can be helpful to use a smaller retroreflector (or to mask the 3-inch reflector). With less reflection, the translucent object can more effectively interrupt the beam. An alternative is to decrease scanner sensitivity. (See Figure 2.) Use a small screwdriver to turn the sensitivity adjustment (on the top horizontal PC board) counterclockwise to decrease sensitivity. Maximum rotation is 3/4 of a turn. (NOTE: FE-MLS3B-4 is sealed to meet oiltight, dusttight, and watertight NEMA standards. No sensitivity adjustment can be made, because removing the scanner cover breaks the seal. FE-MLS3B-T10000 meets these NEMA standards and has a sealed sensitivity control externally located).

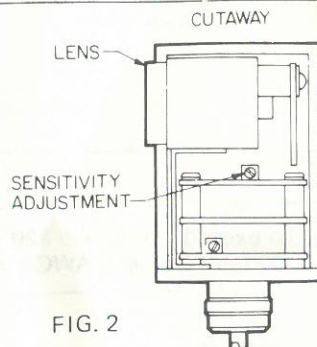


FIG. 2

Typically, an object 1 inch in diameter (the scanner lens diameter) can be detected if it interrupts the beam closer

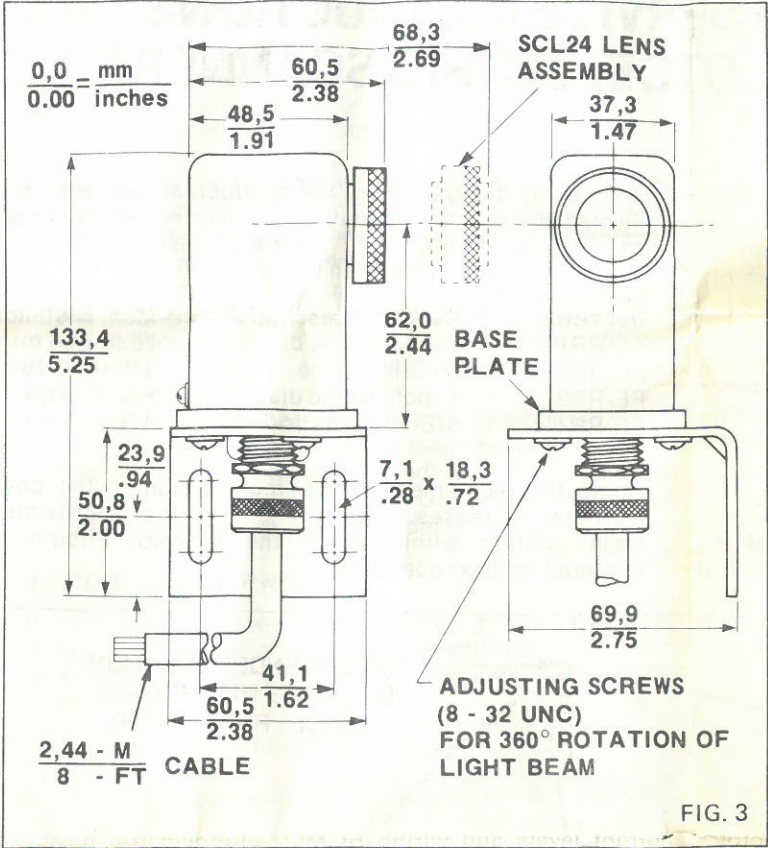
to the scanner than to the reflector. If closer to the reflector, the diameter of the object should be at least 90% of the reflector diameter.

Although the scanner can be as far as 15° off-axis from the reflector, the scanner lens should be directly opposite and parallel to the reflector face for best operation.

**FE-MLS3B-01000 (MLS3B with FE-LH-27-127-1 Lensholder)** This scanner has a special lens assembly (SCL27) that produces a short-focus converging beam. It gives a sharp 1/16-inch diameter image at 8 inches. Because of the narrowing beam, smaller objects (how small depending on where they interrupt the beam) can be detected. (Not used with retroreflector)

**FE-MLS3B-02000 (MLS3B with FE-LH27-108 Lensholder)** Another short-focus scanner (lens assembly SCL24) gives a 1/32-inch diameter image at 3 inches. No retroreflector is needed with this scanner, since ordinary reflection from nearly any surface — shiny or dull — is sufficient to operate the scanner at 3 inches. The FE-MLS3B-02000 should be positioned perpendicular to the objects it detects (reflects off). (Not used with retroreflector)

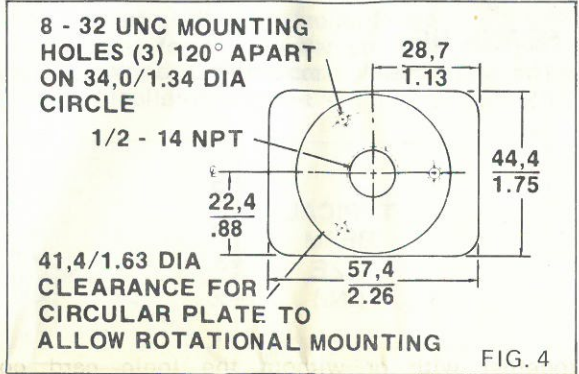
**MOUNTING**



The FE-MLS3B includes a reinforced steel mounting bracket that allows vertical and 360° horizontal adjustment. Use 1/4-20 bolts and lock washers to fix the unit against a flat, rigid surface.

The mounting bracket (FE-MB3 when ordered separately) can easily be removed to allow direct base mounting. (See Fig. 4.) For rotational mounting, a 1.63-inch diameter hole is needed to accommodate the rotational spacer beneath the base plate. Otherwise, only a 5/8-inch diameter hole is needed for the 1/2-inch NPT cable connection.

If possible, mount the FE-MLS3B so you can see the alignment indicator at the back of the scanner. Do not fully tighten mounting bolts until you have checked scanner-reflector alignment.

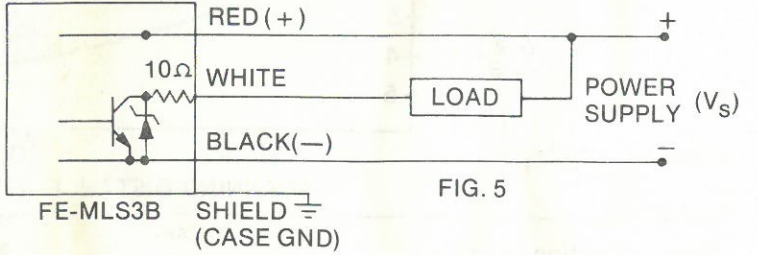


**WIRING/INTERFACING**

**GENERAL**

The FE-MLS3B includes 3-conductor (#22 AWG) shielded cable.

1. Ground the bare shield wire.
2. Connect the black lead to the negative (-) terminal of the power supply; the red lead to the positive (+) terminal of the power supply.
3. Connect the white lead to the load or logic input. The load should be connected between the red lead and the white (output) lead. When the beam is reflected to the scanner, the output is grounded, turning the load on.



**CAUTIONS:**

1. Do not connect AC voltage to the FE-MLS3B. Supply voltage should not exceed the maximum rated voltage.
2. Do not exceed 120 mA load current or 30 VDC.
3. To extend leads, use #20 AWG shielded wire for up to 100 feet. Use #18 AWG shielded wire for 100 to 500 ft.

**WIRING TO MICRO SWITCH CONTROL BASES**

MICRO SWITCH control bases (Figures 6-8) are ideal to power FE-MLS3B Series scanners. A control base also has both a logic card connector to provide various (latched, pulsed, etc.) types of output, and an output socket (sometimes with relay). Only 12-18 VDC MLS3B Models are wired to MICRO SWITCH control bases.

**Logic Cards**

1. When using logic cards, the 10-kilohm, 1/4-watt pull-up resistor supplied with the FE-MLS3B must be wired between terminals PC1 and PC2 (except with the FE-LOGJ jumper card).
2. The selector switch (light or dark operation) on the logic card must be set exactly the **opposite** from the desired mode of operation.

**PRECAUTION:**

SENSITIVITY POTS ON LOG AND LOGIC SERIES CARDS MUST BE TURNED FULLY CLOCKWISE WHEN USED WITH MLSB DEVICES. CONTROL SENSITIVITY IS ADJUSTED BY USING THE POT ON THE MAIN PRINTED CIRCUIT BOARD.

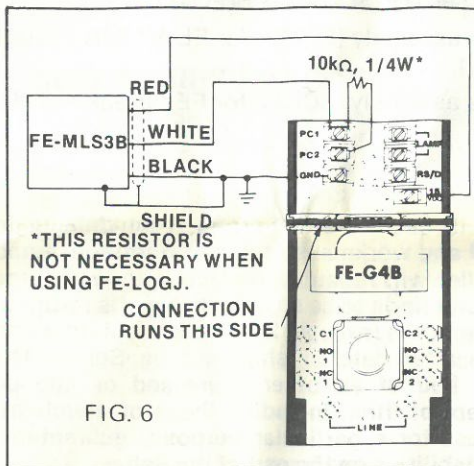


FIG. 6

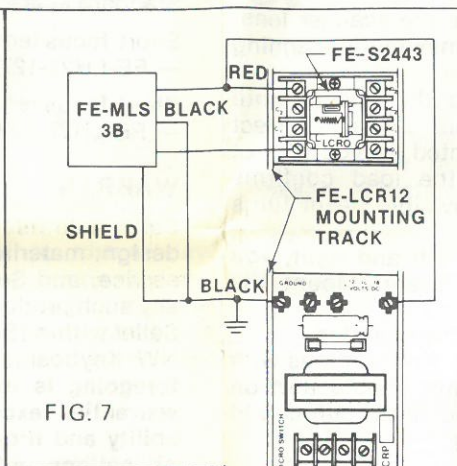


FIG. 7

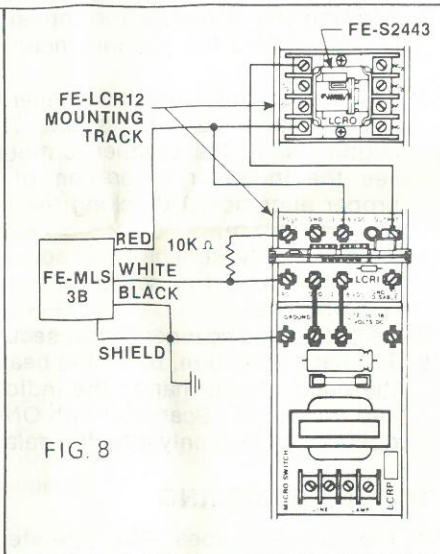


FIG. 8

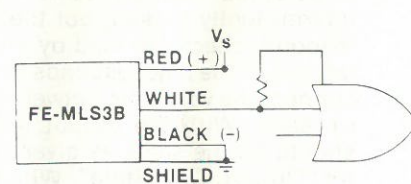
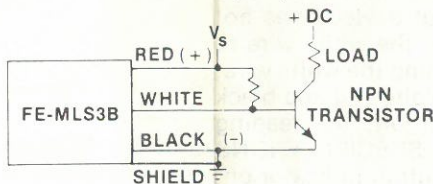
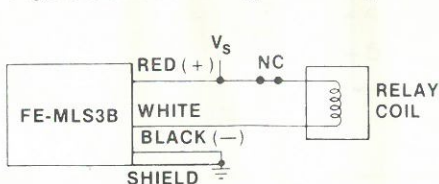
FE-G4B Series control bases will not operate without a card in the logic card connector. The FE-LOGJ card should be used where signal modification of scanner output is not needed. (The FE-LOGJ is simply a jumper card, and provides no logic.) See Figure 6 for FE-MLS3B wiring to an FE-G4B.

FE-LCR control bases are modular, and can be put together with or without the logic card connector component. The FE-LCRP ground terminal should always be connected to an electrical ground. Figure 7 shows how to wire the FE-MLS3B to an FE-LCR control base to directly drive a relay (without logic card connector). Figure 8 shows wiring with a logic card connector.

**Interfacing With Other Circuitry**

FE-MLS3B current sinking output will interface directly with logic level circuitry. See the typical schematics here. A pull-up resistor is normally required. (A resistor is supplied with each scanner.)

A Logic Interface Handbook provides input voltages, current levels and wiring of MLS photoelectric devices (and other MICRO SWITCH products) to specific manufacturers programmable controllers and hardwired logic systems. For a copy contact your local MICRO SWITCH Branch Office or Freeport, Illinois 61032. Phone (815) 235-6600.



DTL, RTL or TTL GATE

**SPECIFICATIONS**

Following the standard specifications below are specifications that differ for special scanner models.

**INPUT—**  
Voltage (Vs): 12-18 VDC; 20% max. power supply ripple  
Current: 100 mA (exclusive of load)  
Power Dissipation: 2 watts max. (exclusive of load)  
**OUTPUT—**  
**(Momentary Protection against short circuit load) — (1 sec.)**  
Circuit: Current sinking (SPNO); light operated  
OFF State: Load supply voltage (30 VDC max.)  
ON State: 0.4 VDC max., sinking 20 mA

ON State: 1.5 VDC max., sinking 120 mA max.  
Rise and Fall Times: Typically 2 micro-seconds (measured at 10%-90% of full voltage)  
**RESPONSE TIMES (ON and OFF)—** Typically 5 milliseconds\*  
**MAX. RATE OF OPERATION—** 100 times per second max. At the minimum, object being detected must move at least 1-1/4 feet per minute.

**TEMPERATURE RANGE—** -40° to 158°F (-40° to 70°C)  
**SEALING —** NEMA 1, 12. (FE-MLS3B-40000, FE-MLS3B-10000; NEMA 1, 4, 12, 13.)

\*It may be necessary to decrease scanner sensitivity to respond to a 5-millisecond signal. Turning the sensitivity adjustment counterclockwise decreases sensitivity. (See Figure 2.)

The specifications above apply, except in the instance noted below.

**FE-MLS3B-00300**  
**INPUT—**  
Voltage (Vs): 22-30 VDC; 10% max. power supply ripple  
Current: 100 mA (exclusive of load)  
Power Dissipation: 3 watts max. (exclusive of load)

For all other specifications see standard MLS3B 12-18 VDC model.

## ALIGNMENT/ADJUSTMENT

1. Apply power. The red LED indicator at the back of the scanner will be off.
2. Position the retroreflector opposite the scanner lens. Do not exceed the recommended maximum scanning distance.
3. Adjust the position of the scanner or the reflector until the indicator LED turns on. This signals correct alignment. (If the scanner is mounted so you cannot see the indicator, operation of the load confirms proper alignment.) Blocking the invisible beam turns the indicator off.
4. By moving the reflector up, down, left and right, you can determine the center of the beam. Mount the reflector there.
5. Be certain the scanner is now securely mounted.
6. To check operation, block the beam several times with the palm of your hand; the indicator should turn on and off. NOTE: Scanners with ON-delayed output will operate the load only after the delay.

## TROUBLESHOOTING

If the scanner does not operate, follow the steps below. A voltmeter or vacuum tube voltmeter is the only test equipment needed. Maximum voltage to be measured is 30 VDC.

1. Make certain the scanner lens and reflector are clean and dry.
2. Recheck scanner-reflector alignment as described above.
3. Check the power supply voltage. Connect the voltmeter across the red (+) and black (-) leads. DC voltage should be within the range given under SPECIFICATIONS. An improper reading could mean a faulty or underrated power supply.
4. If the output indicator turns off and on as the beam is intermittently broken, but the output device does not respond, check the load by shorting the white wire to ground. If the load responds to shorting the white wire, connect the voltmeter between the white (+) and black (-) leads. With the output indicator off, the reading should be the same as given under SPECIFICATIONS for "Output, OFF State". With the output indicator on, the reading should be the same as given under SPECIFICATIONS, for "Output, ON State".  
If you do not get the proper readings, the scanner should be returned to the factory.

**NOTE:** With a 100-120 milliamp relay load, you cannot drive a logic circuit at the same time.

5. If an output relay chatters (gives more than one output pulse per input signal), it could be because the object blocking the beam is moving too slowly. A minimum speed of 1/4 inch per second (1-1/4 feet per minute) is necessary for reliable output performance.

## REPLACEMENT PARTS

Steel right angle mounting bracket — FE-MB3

Standard lens assembly (SCL23) — FE-LH27-127

Short-focus lens assembly (SCL27) for FE-MLS3B - 01000 — FE-LH27-127-1

Short-focus lens assembly (SCL24) for FE-MLS3B - 02000 — FE-LH27-108

## WARRANTY

Seller warrants its products to be free from defects in design, material and workmanship under normal use and service, and Seller will repair or replace without charge any such product it finds to be so defective on its return to Seller within 18 months (except 12 months for Motors and NW Keyboards) after date of shipment by Seller. **The foregoing is in lieu of all other expressed or implied warranties (except of title), including those of merchantability and fitness for a particular purpose, guarantees, obligations, or liabilities on the part of the Seller.**

# MICRO SWITCH

FREERPORT, ILLINOIS 61032

A DIVISION OF HONEYWELL

Manufactured in Marlborough, Mass. 01752

**IN CANADA:** 740 Ellesmere Road, Scarborough, Ontario.  
**IN EUROPE:** Honeywell S.A., Ave. Henri Matisse 16, Brussels, Belgium.

Sales and service offices in all principle cities of the world.