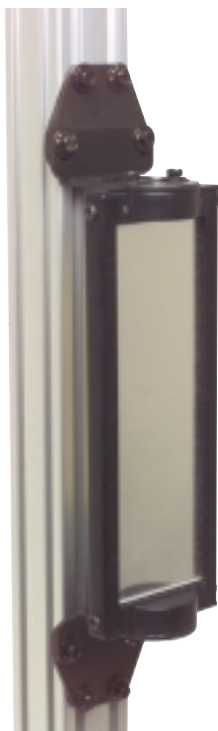


MSM Corner Mirrors

For use with Banner Safety Light Screen Systems



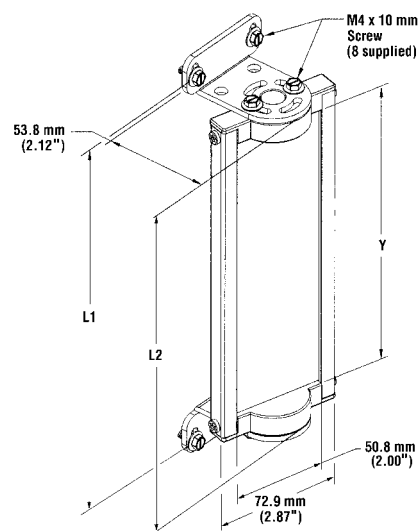
MSM Series Description

Banner MSM Series corner mirrors are designed for use with MICRO-SCREEN[®] and MINI-SCREEN[®] System sensors, but may also be used with other light screen systems. They enable guarding along more than one side of an area using only one emitter/receiver pair.

MSM Series mirrors are small and lightweight. Brackets are included for quick and easy mounting. Once mounted, a unique mirror end cap design allows rotation of the mirror to any angle.

The rear-surface glass mirrors are rated at 85 percent efficiency. See pages 3 and 4 for specific information on sensing range and excess gain.

MSM Series mirrors are available in 12 lengths which correspond to MINI-SCREEN sensor lengths. Mirror length is two inches greater than the corresponding sensor's defined area.



Note: The mounting brackets may be inverted from the positions shown at right (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 56.9 mm (2.24"), and rotation decreases to $\pm 45^\circ$.

MSM Series Features

- Designed for use with Banner MICRO-SCREEN, MINI-SCREEN and MACHINE-GUARD Safety Light Screen systems
- Allows guarding of multi-sided applications with one emitter and receiver pair
- Small and lightweight
- Mounting bracket design allows 360° rotation of mirror for easy installation and alignment
- Available in 12 lengths

MSM Series Dimensions

Mirror Model	Part Number	Reflective Area Length (Y)	Mounting Length (L1)	Mirror Height Overall (L2)
MSM4A	43162	165 mm (6.5")	221 mm (8.7")	191 mm (7.5")
MSM8A	43163	267 mm (10.5")	323 mm (12.7")	292 mm (11.5")
MSM12A	43164	356 mm (14")	411 mm (16.2")	381 mm (15")
MSM16A	43165	457 mm (18")	513 mm (20.2")	483 mm (19")
MSM20A	43166	559 mm (22")	615 mm (24.2")	584 mm (23")
MSM24A	43167	660 mm (26")	716 mm (28.2")	686 mm (27")
MSM28A	43168	762 mm (30")	818 mm (32.2")	787 mm (31")
MSM32A	43169	864 mm (34")	919 mm (36.2")	889 mm (35")
MSM36A	43170	965 mm (38")	1021 mm (40.2")	991 mm (39")
MSM40A	43171	1067 mm (42")	1123 mm (44.2")	1092 mm (43")
MSM44A	43172	1168 mm (46")	1224 mm (48.2")	1194 mm (47")
MSM48A	43173	1270 mm (50")	1326 mm (52.2")	1295 mm (51")

MSM Series Corner Mirrors

MSM Series mirrors may also be used with light screen sensors up to 48" long. The table at right, recommends which mirror to use with the applicable sensors.

Each mirror is supplied with two mounting brackets and associated hardware (see dimension drawing).

Mirrors should be securely mounted to a solid surface that is free from vibration. Mirrors must be mounted parallel to their sensors, with the midpoint of the mirror(s) directly in line with the midpoint of the sensor's defined area.

MSA Series stands may be used to mount MSM Series mirrors. These stands offer an extruded channel design for convenient mirror (or sensor) height adjustment. See data sheet P/N 43687 for complete information. Several stand heights are available:

Stand Model	Part Number	Stand Height	Mirror Length	
			Brackets Outward	Brackets Inward
MSA-S24-1	43174	24"	4" to 8"	4" to 12"
MSA-S42-1	43175	42"	4" to 24"	4" to 28"
MSA-S66-1	43176	66"	4" to 48"	4" to 48"

Light Screen Defined Area Length Up To	Recommended Mirror Model	Reflective Area Length
8.5"	MSM8A	10.5"
12"	MSM12A	14"
18"	MSM20A	22"
24"	MSM24A	26"
30"	MSM32A	34"
36"	MSM36A	38"
42"	MSM44A	46"
48"	MSM48A	50"

MSM Series Construction

Mirror	Safety glass; rear-surface mirror
Mirror Frame	Molded ABS end caps; rigid PVC sides
Bracket	Cold-rolled steel; black zinc chromate finish
Routine Maintenance	Mirrors should be cleaned with a mild glass cleaning solution and a soft cloth

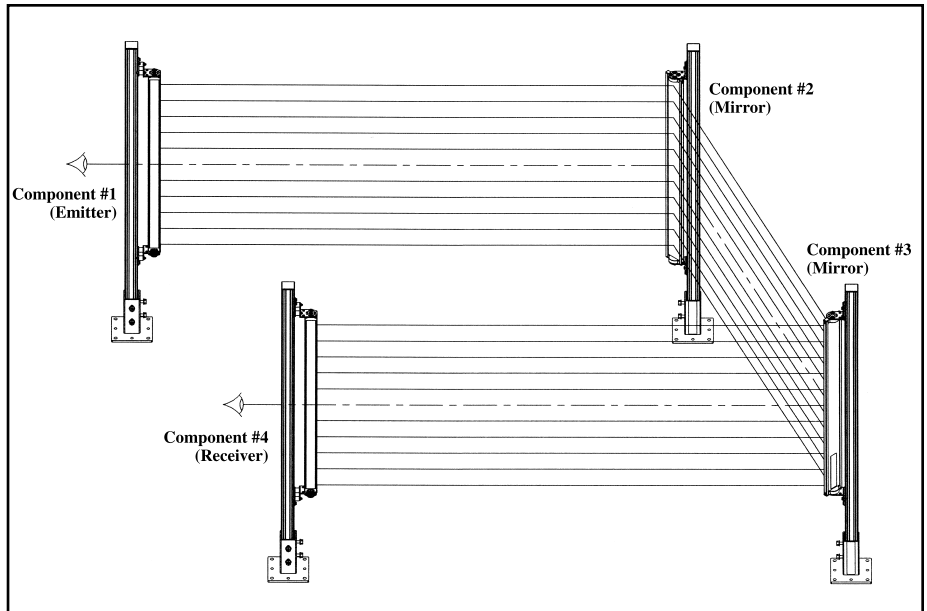
Alignment of Sensors and Corner Mirrors

Mount the mirror(s) and the sensors so that they are all parallel. Use a level, if possible. Adjust the position of the sensors and the mirror(s) so that the midpoint of the mirror(s) and the sensors' defined areas are even. (A line connecting the midpoint of all components is illustrated by the dashed line in the drawing.) The midpoint of the defined area of a MICRO-SCREEN sensor is the midpoint of the window. The upper and lower limits of the defined area of MINI-SCREEN sensors is marked by arrows along the edge of each sensor window, and is dimensioned in the appropriate instruction manual. The midpoint of the defined area of MACHINE-GUARD/PERIMETER-GUARD sensors corresponds to the midpoint of the sensor length.

Adjust the corner mirror(s) so that the angle of incidence to the mirrors equals the angle of reflection from the mirror. Sight from behind one of the sensors directly towards the mirror (or the first mirror in line). When alignment is correct, you will see the straight and centered reflection of the lens of the other sensor in the mirror.

Use the alignment indicator(s) of the safety light screen system (and the appropriate instruction manual) for final alignment.

MSM Series Corner Mirrors



Corner Mirror Alignment

Range Reduction Using MSM Series Corner Mirrors

Use of corner mirrors reduces light screen range (the maximum separation between the emitter and receiver). The following table lists the resultant range when using from one to four MSM Series corner mirrors in the sensing path.

Light Screen Maximum Range					
Light Screen Sensors	0 Mirrors	1 Mirror	2 Mirrors	3 Mirrors	4 Mirrors
MICRO-SCREEN V-Series	6 m (20')	5.6 m (18.4')	5.2 m (17.0')	4.8 m (15.7')	4.4 m (14.5')
MICRO-SCREEN Standard Series	9 m (30')	8.5 m (28')	7.8 m (25.5')	7.2 m (23.5')	6.7 m (22')
MINI-SCREEN Standard Series	9 m (30')	8.5 m (28')	7.8 m (25.5')	7.2 m (23.5')	6.7 m (22')
MINI-SCREEN XL-Series	18 m (60')	16.8 m (55')	15.5 m (51')	14.3 m (47')	13.1 m (43')
MACHINE-GUARD/ PERIMETER-GUARD	14 m (45')	12.6 m (41.5')	11.6 m (38')	10.7 m (35')	9.9 m (32.5')

Maximized excess gain is always important when installing a safety light screen. Use hard guarding whenever possible to reduce the overall sensing range and the number of mirrors required. Also, keep sensor lenses and mirrors clean and properly aligned.

MSM Series Corner Mirrors

Excess Gain

Given the range from the above chart, excess gain can be calculated for any distance by using the inverse square law. For example, the excess gain for a 30' range MINI-SCREEN system at a 10' separation, using two corner mirrors, is calculated as follows:

$$\frac{\text{E.G.}}{1x} = \frac{(25.5')^2}{(10')^2} = 6.5 \quad \text{E.G.} = (1x) (6.5) = 6.5x$$

For the same situation at a 10' separation, using MACHINE-GUARD sensors:

$$\frac{\text{E.G.}}{3x^*} = \frac{(38')^2}{(10')^2} = 14.4 \quad \text{E.G.} = (3x) (14.4) = 43x$$

*Note: MACHINE-GUARD sensor range is the separation between emitter and receiver where 3x excess gain remains.

Guidelines for Excess Gain Values

Maximum Excess Gain Required	Operating Environment
1.5x	Clean air: no dirt buildup on lenses or mirrors
5x	Slightly dirty: slight buildup of dust, dirt, oil, moisture, etc. on lenses or mirrors. Lenses and mirrors cleaned on a regular schedule.
10x	Moderately dirty: obvious contamination on lenses or mirrors (but not obscured). Lenses and mirrors cleaned occasionally or when necessary.
50x	Very dirty: heavy contamination on lenses and mirrors. Heavy fog, mist, dust, smoke, or oil film. Minimal cleaning of lenses and mirrors.



the machine safety specialist

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