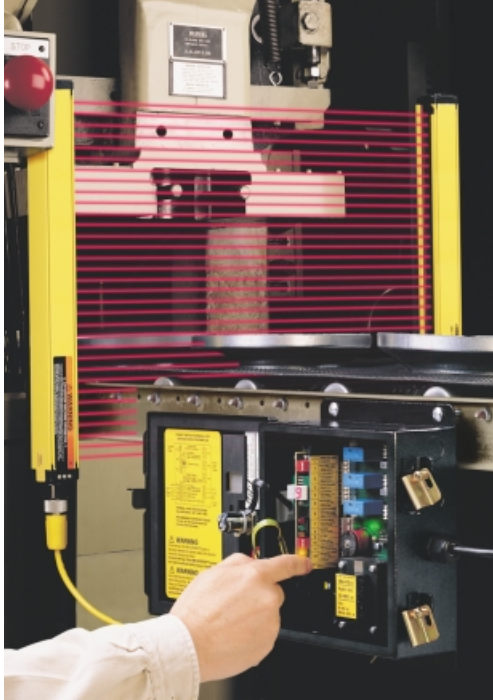




# MINI-SCREEN® Systems

System Overview . . . . .	88
Selection of Components . . . . .	89
Emitters & Receivers . . . . .	90
Controller Selection . . . . .	93
<b>Metal Box Controllers</b>	
MSCA-1, MSCA-1L2, MSCA-1T3, MSCB-1, MSCB-1L2, MSCB-1T3, and MSCT-1 Controllers . . . . .	94
<b>Metal Box Controllers with Fixed Blanking</b>	
MSCD-2, MSCD-2T3 and MSCT-2 Controllers . . . . .	98
<b>Metal Box Controllers with Muting Function</b>	
MSCC-2L2M and MSCC-2L3M Controllers . . . . .	100
<b>Metal Box Dual Light Screen Controller</b>	
MUSC-1 MULTI-SCREEN® . . . . .	104
<b>DIN Module Controllers</b>	
MSDINT-1/1L2 . . . . .	106
MSDINT-1T2/1L2 Dual Light Screens . . . . .	108
Cables . . . . .	110
ACCESS-GUARD™ Bracket System . . . . .	112
Modifications . . . . .	113
Accessories . . . . .	115
Replacement Parts . . . . .	119



## SYSTEM FEATURES

- Rugged and compact light screen suitable for heavy-duty machine guarding applications
- Each system includes emitter(s), receiver(s), controller, and interconnecting cables
- 12 light screen heights from 114 mm to 1.2 m (4.5" to 4')
- Emitter/receiver pairs are available with either:
  - 9 m (30') range with 19.1 mm (0.75") resolution\*
  - 18 m (60') range with 25.4 mm (1.00") resolution\*
- All controllers feature floating blanking and selectable auto power-up; other features (depending on model) include:
  - Trip or latch outputs
  - Fixed-beam blanking
  - Muting
  - One or two light screens per controller
- All components are FMEA tested to ensure control reliability
- System design meets applicable requirements of CE, UL, and CSA

\* Resolution assumes no blanking in use

## ADDITIONAL EMITTER/RECEIVER FEATURES

- Compact foot print: 38 x 38 mm (1.5" x 1.5")
- Rugged IP65 (NEMA 4) extruded aluminum housing
- Vibration-tolerant design
- Status indicators visible on three sides of housing:
  - Power on
  - Blanking on
  - Emitter/receiver alignment
  - Sensing area clear or blocked
  - System lockout
- Swivel brackets and vibration mounts included
- Highly immune to EMI, RFI, ambient light, weld flash, and strobe light

## EMITTER/RECEIVER OPTIONS AND ACCESSORIES

- Pigtail quick-disconnect (p. 113)
- Lens shields (p. 116)
- Corner mirrors and stands (p. 115)
- Custom mounting brackets (p. 117)



## ADDITIONAL CONTROLLER FEATURES

- Two controller styles:
  - IP64 (NEMA 13) lockable metal box
  - Polycarbonate DIN rail mount module
- Diverse-redundant microcontrollers and advanced system diagnostics
- Field-replaceable output safety relays
- Models for 115/230V ac and/or 24V dc operation
- System status and diagnostic indicators
- DIN style controllers have plug-in wiring terminal blocks



## CONTROLLER OPTIONS

- MULTI-SCREEN® (p. 104) and Dual MINI-SCREEN® (p. 108) controllers accept two emitter/receiver pairs for guarding two entry points on the same machine.
- Custom design and modification requests are welcome (see pp. 113-114 for examples)

# MINI-SCREEN® System Component Selection

## A MINI-SCREEN System is comprised of the following components:

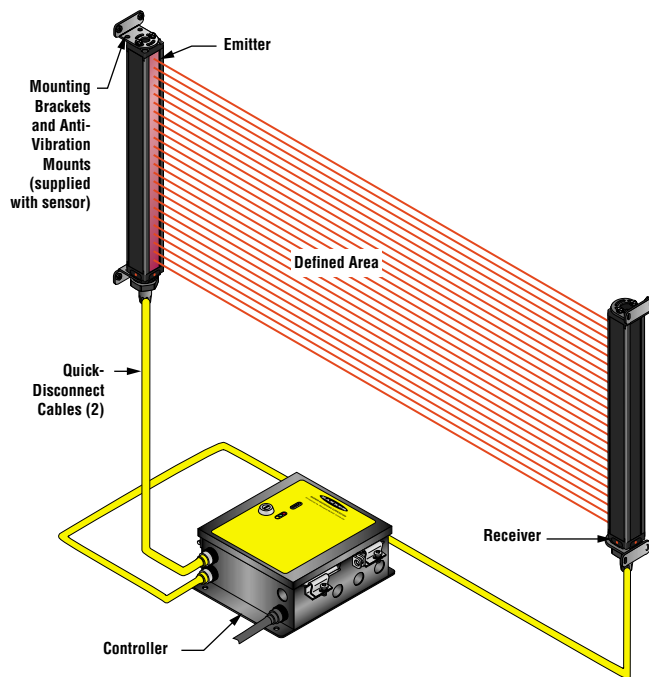
- An emitter/receiver pair (Dual MINI-SCREEN controllers require two pairs)
- A controller,
- Two cables for connecting the emitter and the receiver to the controller (four cables when using a Dual MINI-SCREEN controller).

## MINI-SCREEN Emitters and Receivers

Emitters and receivers are available:

- In 12 defined area heights from 114 mm (4.5") to 1219 mm (48")
- With black anodized finish or yellow polyester painted finish
- With minimum object detection size (assuming no blanking in use) of:
  - 19.1 mm (0.75") and maximum emitter/receiver separation of 9 m (30')
  - 25.4 mm (1.00") and maximum emitter/receiver separation of 18 m (60')

See pages 90 and 91 for model numbers



## MINI-SCREEN Controllers

Controllers are available housed in either a metal box or a DIN-style module. Other features to select include:

- Supply voltage: 115V ac, 230V ac, or 24V dc
- Output type: trip or latch
- Blanking: fixed or floating
- Muting function
- Single or dual light screen control
- Customized options available (see pages 113 and 114 for specials)

See page 93 for model numbers

## MINI-SCREEN Cables

Cables are available in five lengths:  
5 m (15'), 8 m (25'), 15 m (50'), 30 m (100'), and 45 m (150')

See page 110 for models.



## MINI-SCREEN System Accessories

MINI-SCREEN System accessories include:

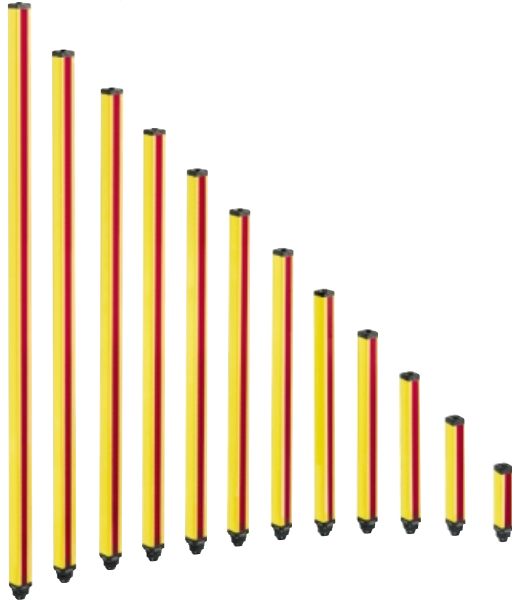
- Lens shields
- Corner mirrors and stands
- Special purpose brackets

## MINI-SCREEN System Kits

MINI-SCREEN controllers (except Dual controllers) are available for purchase kitted together with choice of emitter and receiver (of equal length and range) and cables. See individual controller descriptions for kit ordering information.

# MINI-SCREEN® Standard Range Emitters & Receivers

**Range to 9 m (30') • 19 mm (0.75") minimum object sensitivity**



- Light screens available in 12 heights: from 114 mm (4.5") to 1219 mm (48")
- Available with either black anodized or yellow polyester painted finish
- Compact design blends well with existing machinery
- Each sensor includes swivel brackets for ease of alignment, plus anti-vibration mounts
- All sensors use convenient quick-disconnect (QD) cables (pages 110 and 111); a 305 mm (12") quick-disconnect pigtail cable is an option (see note below and page 113)

Standard Range MINI-SCREEN Sensor Models*		
Black Anodized Finish	Yellow Painted Finish	Defined Area
MSE424 MSR424	MSE424Y MSR424Y	114 mm (4.5")
MSE824 MSR824	MSE824Y MSR824Y	215 mm (8.5")
MSE1224 MSR1224	MSE1224Y MSR1224Y	305 mm (12")
MSE1624 MSR1624	MSE1624Y MSR1624Y	406 mm (16")
MSE2024 MSR2024	MSE2024Y MSR2024Y	508 mm (20")
MSE2424 MSR2424	MSE2424Y MSR2424Y	610 mm (24")
MSE2824 MSR2824	MSE2824Y MSR2824Y	711 mm (28")
MSE3224 MSR3224	MSE3224Y MSR3224Y	813 mm (32")
MSE3624 MSR3624	MSE3624Y MSR3624Y	914 mm (36")
MSE4024 MSR4024	MSE4024Y MSR4024Y	1016 mm (40")
MSE4424 MSR4424	MSE4424Y MSR4424Y	1118 mm (44")
MSE4824 MSR4824	MSE4824Y MSR4824Y	1219 mm (48")

MINI-SCREEN Standard Range Sensor Specifications	
<b>Emitter/Receiver Separation</b>	150 mm (6") minimum to 9 m (30')
<b>Minimum Object Sensitivity</b>	19.1 mm (0.75") with no floating blanking in use 31.8 mm (1.25") with one-beam floating blanking ON 44.5 mm (1.75") with two-beam floating blanking ON
<b>Response Time</b>	See controller specifications.
<b>Ambient Light Immunity</b>	>10,000 lux at 5° angle of incidence
<b>Emitter Elements</b>	Infrared LEDs; 880 nm peak emission
<b>Status Indicators</b>	<b>Emitter:</b> Green LED for power ON <b>Receiver:</b> Red, yellow and green status indicators with same function as those on control box (see individual Controller Specifications). Yellow LED also indicates alignment.
<b>Emitter and Receiver Enclosure</b>	<b>Size:</b> See dimension information on next page. <b>Material:</b> Aluminum extrusion with black anodized or yellow polyester painted finish; acrylic lens cover. Mounting hardware supplied. <b>Rating:</b> IP65; NEMA 4, 13
<b>Optical Performance</b>	This system meets the ± 2.5° requirements of IEC 61496-2, section 5.2.9 (Type 4)
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (32° to 122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>Application Notes</b>	Use only Banner cables, which use a "twisted pair" for noise immunity on RS 485 data communication lines. Use of other cables can result in "nuisance" lockouts. See pages 110 and 111.

### Pigtail Quick Disconnect Option

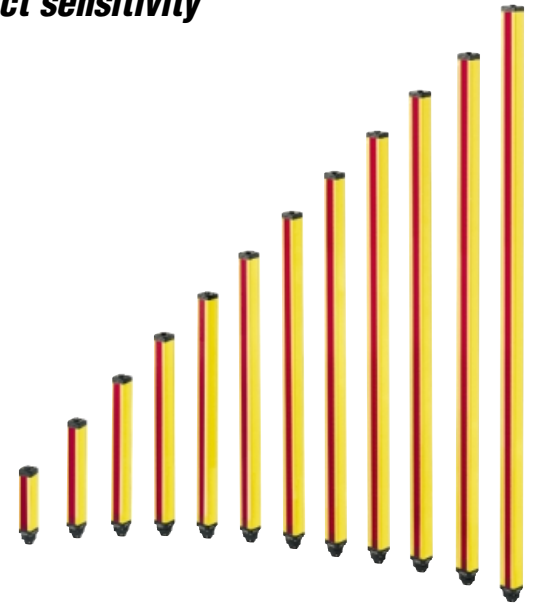
Any emitter or receiver may be ordered with a 305 mm (12") cable pigtail terminated in the 5-pin male mini-style quick-disconnect connector. The same mating quick-disconnect cables, as listed on pages 110 and 111, are used (ordered separately or included in kit). To specify the pigtail QD option, add suffix "P" to the model number of the emitter or receiver, for example: **MSE1624P**.

\*For example, MSE424, where "E" is emitter, MSR424, where "R" is receiver.

# MINI-SCREEN® Long-Range Emitters & Receivers

**Range to 18 m (60') • 25.4 mm (1.00") minimum object sensitivity**

- Light screens available in 12 heights: from 114 mm (4.5") to 1219 mm (48")
- Available with either black anodized or yellow polyester painted finish
- Compact design blends well with existing machinery
- Each sensor includes swivel brackets for ease of alignment, plus anti-vibration mounts
- All sensors use convenient quick-disconnect cables (pages 110 and 111); a 305 mm (12") quick-disconnect pigtail cable is an option (see note below and page 113)



Optical Safety Systems

## MINI-SCREEN Long-Range Sensor Models\*

Black Anodized Finish	Yellow Painted Finish	Defined Area
MSXLE424 MSXLR424	MSXLE424Y MSXLR424Y	114 mm (4.5")
MSXLE824 MSXLR824	MSXLE824Y MSXLR824Y	215 mm (8.5")
MSXLE1224 MSXLR1224	MSXLE1224Y MSXLR1224Y	305 mm (12")
MSXLE1624 MSXLR1624	MSXLE1624Y MSXLR1624Y	406 mm (16")
MSXLE2024 MSXLR2024	MSXLE2024Y MSXLR2024Y	508 mm (20")
MSXLE2424 MSXLR2424	MSXLE2424Y MSXLR2424Y	610 mm (24")
MSXLE2824 MSXLR2824	MSXLE2824Y MSXLR2824Y	711 mm (28")
MSXLE3224 MSXLR3224	MSXLE3224Y MSXLR3224Y	813 mm (32")
MSXLE3624 MSXLR3624	MSXLE3624Y MSXLR3624Y	914 mm (36")
MSXLE4024 MSXLR4024	MSXLE4024Y MSXLR4024Y	1016 mm (40")
MSXLE4424 MSXLR4424	MSXLE4424Y MSXLR4424Y	1118 mm (44")
MSXLE4824 MSXLR4824	MSXLE4824Y MSXLR4824Y	1219 mm (48")

## MINI-SCREEN Long-Range Sensor Specifications

<b>Emitter/Receiver Separation</b>	150 mm (6") minimum to 18 m (60')
<b>Minimum Object Sensitivity</b>	25.4 mm (1.00") with no floating blanking in use 38.1 mm (1.50") with one-beam floating blanking ON 50.8 mm (2.00") with two-beam floating blanking ON
<b>Response Time</b>	See controller specifications.
<b>Ambient Light Immunity</b>	>10,000 lux at 5° angle of incidence
<b>Emitter Elements</b>	Infrared LEDs; 880 nm peak emission
<b>Status Indicators</b>	<b>Emitter:</b> Green LED for power ON <b>Receiver:</b> Red, yellow and green status indicators with same function as those on control box (see individual Control Box Specifications). Yellow LED also indicates alignment.
<b>Emitter and Receiver Enclosure</b>	<b>Size:</b> See dimensions on next page. <b>Material:</b> Aluminum extrusion with black anodized or yellow polyester painted finish; acrylic lens cover. Mounting hardware supplied. <b>Rating:</b> IP65; NEMA 4, 13
<b>Optical Performance</b>	This system meets the ± 2.5° requirements of IEC 61496-2, section 5.2.9 (Type 4)
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (32° to 122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>Application Notes</b>	Use only Banner cables, which use a "twisted pair" for noise immunity on RS 485 data communication lines. Use of other cables can result in "nuisance" lockouts. See pages 110 and 111.

### Pigtail Quick Disconnect Option

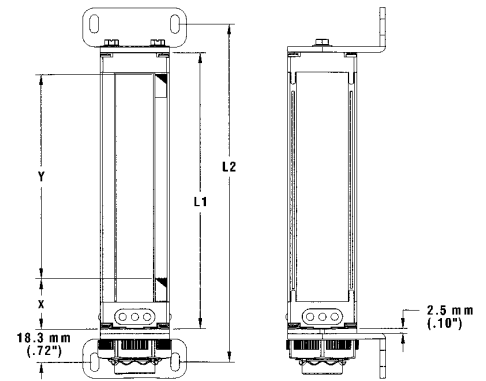
Any emitter or receiver may be ordered with a 305 mm (12") cable pigtail terminated in the 5-pin mini-style quick-disconnect connector. The same mating quick-disconnect cables, as listed on pages 110 and 111, are used (ordered separately or include in kit). To specify the pigtail QD option, add suffix "P" to the model number of the emitter or receiver, for example: **MSXLE1624P**.

\*For example, MSXLE424, where "E" is emitter, MSXLR424, where "R" is receiver.

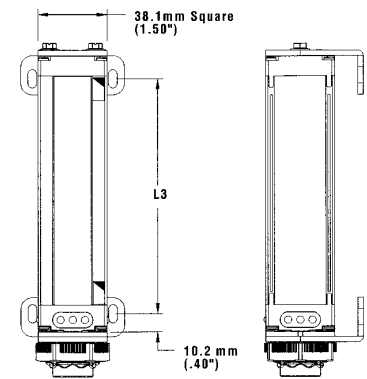
**MINI-SCREEN Emitter and Receiver Dimensions**

Models	Housing Length	Distance Between Bracket Holes			Defined Area	
	L1	L2	L3	X	Y	
MS(XL)E424 MS(XL)R424	153 mm (6.0")	188 mm (7.4")	130 mm (5.1")	28 mm (1.1")	114 mm (4.5")	
MS(XL)E824 MS(XL)R824	254 mm (10.0")	287 mm (11.3")	231 mm (9.1")	28 mm (1.1")	215 mm (8.5")	
MS(XL)E1224 MS(XL)R1224	356 mm (14.0")	389 mm (15.3")	333 mm (13.1")	30 mm (1.2")	305 mm (12")	
MS(XL)E1624 MS(XL)R1624	457 mm (18.0")	490 mm (19.3")	434 mm (17.1")	30 mm (1.2")	406 mm (16")	
MS(XL)E2024 MS(XL)R2024	558 mm (22.0")	592 mm (23.3")	536 mm (21.1")	30 mm (1.2")	508 mm (20")	
MS(XL)E2424 MS(XL)R2424	659 mm (26.0")	693 mm (27.3")	637 mm (25.1")	30 mm (1.2")	610 mm (24")	
MS(XL)E2824 MS(XL)R2824	761 mm (30.0")	795 mm (31.3")	739 mm (29.1")	33 mm (1.3")	711 mm (28")	
MS(XL)E3224 MS(XL)R3224	862 mm (33.9")	896 mm (35.3")	838 mm (33.0")	33 mm (1.3")	813 mm (32")	
MS(XL)E3624 MS(XL)R3624	963 mm (37.9")	998 mm (39.3")	940 mm (37.0")	33 mm (1.3")	914 mm (36")	
MS(XL)E4024 MS(XL)R4024	1064 mm (41.9")	1100 mm (43.3")	1041 mm (41.0")	33 mm (1.3")	1016 mm (40")	
MS(XL)E4424 MS(XL)R4424	1166 mm (45.9")	1201 mm (47.3")	1143 mm (45.0")	33 mm (1.3")	1118 mm (44")	
MS(XL)E4824 MS(XL)R4824	1267 mm (49.9")	1300 mm (51.2")	1245 mm (49.0")	33 mm (1.3")	1219 mm (48")	

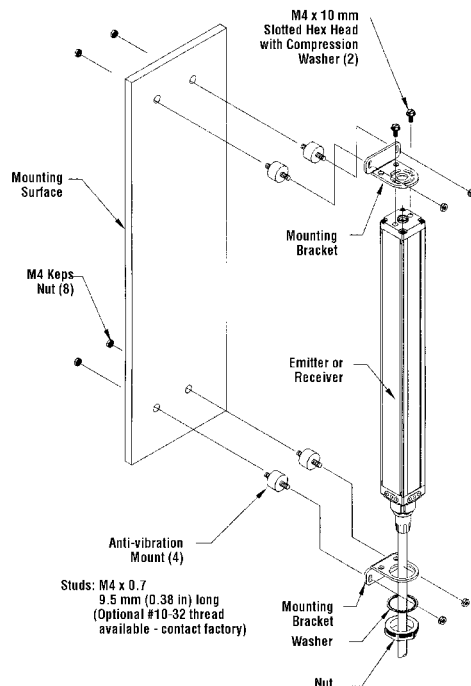
**With Mounting Brackets  
Flanges "Out"**



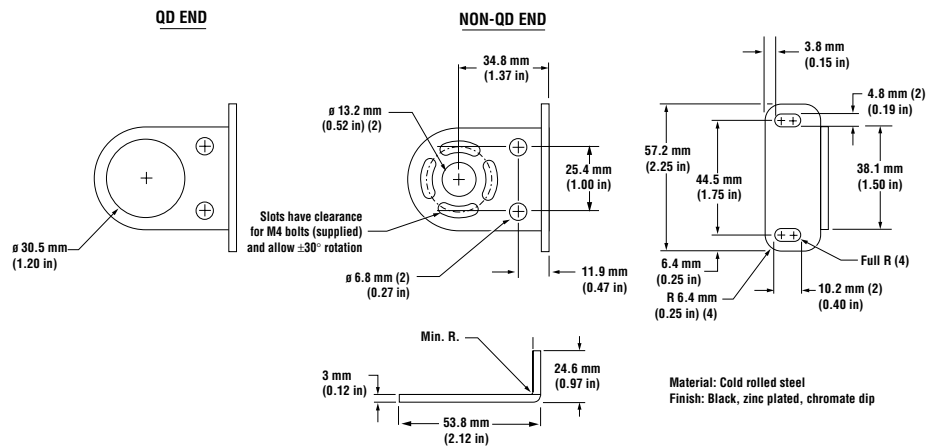
**With Mounting Brackets  
Flanges "In"**



**MINI-SCREEN Mounting Hardware  
(supplied with each emitter and receiver)**












**MINI-SCREEN Brackets  
(supplied with each emitter and receiver\*)**




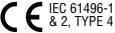






\* See pages 117 and 118 for additional optional brackets

# MINI-SCREEN® Controller Selection

**MINI-SCREEN Metal Box Controller Selection Chart**

	Models	Supply Voltage	Output Type	Output Contacts	Floating Blanking	Fixed Blanking	Muting Input	E-Stop Input	Light Screens per Controller	Certifications	Specifications
	<b>MSCA-1</b>	115V ac	Trip	2 N.O.						Certifications vary by model; see individual Specifications charts for more information.	p. 95
	<b>MSCA-1L2</b>	115V ac	Latch	2 N.O.							
	<b>MSCA-1T3</b>	115V ac	Trip	2 N.O./ 1 N.C. Aux							
	<b>MSCB-1</b>	230V ac	Trip	2 N.O.	2-beam	No	No	No	One		
	<b>MSCB-1L2</b>	230V ac	Latch	2 N.O.							
	<b>MSCB-1T3</b>	230V ac	Trip	2 N.O./ 1 N.C. Aux							
	<b>MSCT-1</b>	24V dc	Trip	2 N.O.							
	<b>MSCD-2</b>	115/230V ac	Trip	2 N.O.						  Pending: MSCD-2T3	p. 98
	<b>MSCD-2T3</b>	115/230V ac	Trip	2 N.O./ 1 N.C. Aux	1- or 2-beam	Yes	No	No	One		
	<b>MSCT-2</b>	24V dc	Trip	2 N.O.							
	<b>MSCC-2L2M</b>	115/230V ac or 24V dc	Latch	2 N.O.						Approvals in process	p. 100
	<b>MSCC-2L3M</b>	115/230V ac or 24V dc	Latch	2 N.O./ 1 N.C. Aux	1- or 2-beam	Yes	Yes	No	One		
	<b>MUSC-1</b>	115/230V ac or 24V dc	Trip	2 N.O.	1- or 2-beam	No	No	No	Two	  	p. 104

**MINI-SCREEN DIN Module Controller Selection Chart**

	Models	Supply Voltage	Output Type	Floating Blanking	Fixed Blanking	Muting Function	E-Stop Input	Light Screens per Controller	Certifications	Specifications
	<b>MSDINT-1</b>	24V dc	Trip						  	p. 106
	<b>MSDINT-1L2</b>	24V dc	Latch	2-beam	No	No	No	One		
	<b>MDSINT-1T2</b>	24V dc	Trip						 Pending: MDSINT-1L2  	p. 108
	<b>MDSINT-1L2</b>	24V dc	Latch	1- or 2-beam	No	No	Yes	Two		

Optical Safety Systems




# MINI-SCREEN® Metal Box Controllers



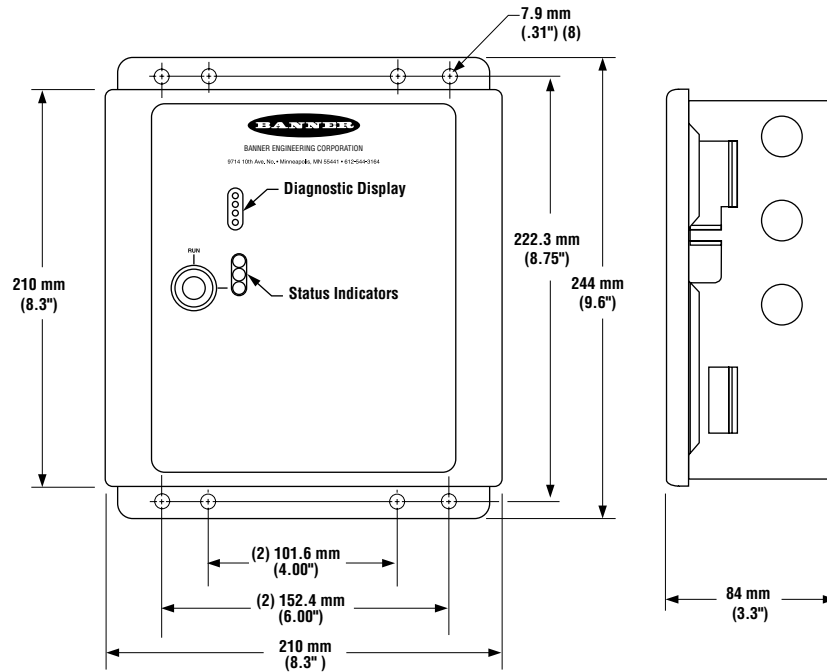
- Selectable two-beam floating blanking feature allows objects (usually workpiece material) up to 20 mm (0.8") in cross section to move through the defined area at any point without tripping the final switching devices
- Selectable auto power-up mode for applications where a key reset is difficult to perform
- Welded steel box enclosure with tough black polyester powder paint finish; rated NEMA 13, IEC IP64

MINI-SCREEN Metal Box Controllers				
Models	Supply Voltage	Output Type	Floating Blanking	No. of FSD Output Contacts
MSCA-1	115V ac	Trip	1- or 2-beam	2 N.O./4 amps
MSCA-1L2	115V ac	Latch		2 N.O./4 amps
MSCA-1T3	115V ac	Trip		2 N.O. & 1 N.C. Aux./6 amps
MSCB-1	230V ac	Trip		2 N.O./4 amps
MSCB-1L2	230V ac	Latch		2 N.O./4 amps
MSCB-1T3	230V ac	Trip		2 N.O. & 1 N.C. Aux./6 amps
MSCT-1	24V dc	Trip		2 N.O.

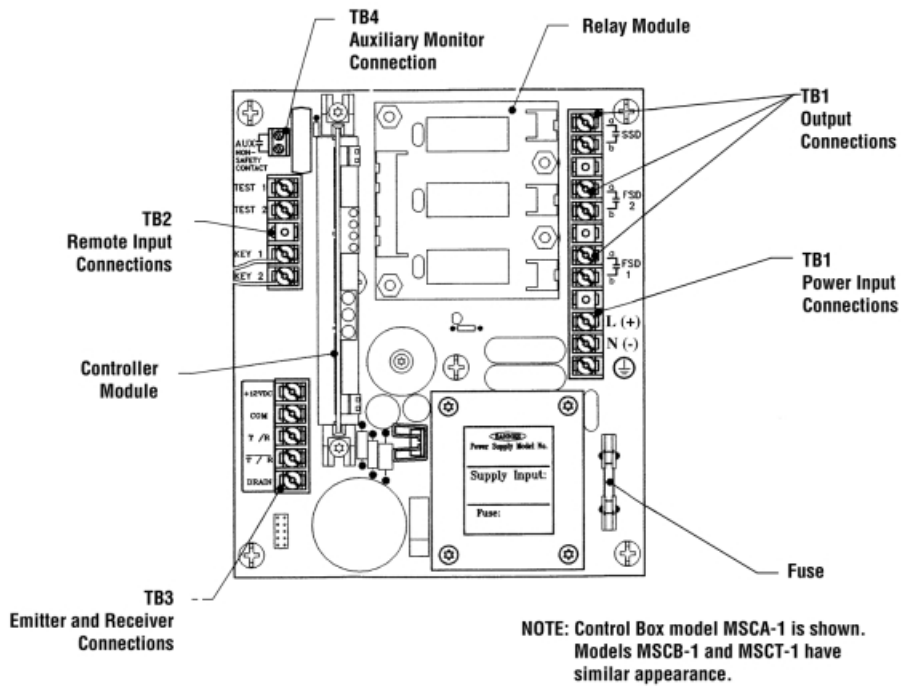


MINI-SCREEN Metal Box Controller Specifications	
<b>System Power Requirements</b>	See Controller Selection Chart on previous page
<b>Fuse Rating</b>	<b>MSCA-1, MSCA-1L2 &amp; MSCA-1T3:</b> ½ amp, 250V (3 AG or 5x20 mm slow blow) <b>MSCB-1, MSCB-1L2 &amp; MSCB-1T3:</b> ¼ amp, 250V (3 AG or 5x20 mm slow blow) <b>MSCT-1:</b> 2 amp, 250V (3 AG or 5x20 mm slow blow)
<b>Response Time</b>	Less than 48 ms using emitter/receiver with 114 mm (4.5") to 406 mm (16") defined area Less than 60 ms using emitter/receiver with 508 mm (20") to 813 mm (32") defined area Less than 72 ms using emitter/receiver with 914 mm (36") to 1219 mm (48") defined area
<b>Status Indicators (on control box and receiver)</b>	<b>Red</b> = BLOCKED <b>Flashing red</b> = LOCKOUT <b>Green</b> = CLEAR <b>Flashing green</b> = BLANKING ON <b>Yellow</b> = RESET <b>Double-flashing yellow</b> = Waiting for Power-up Key Reset <b>Single-flashing yellow</b> = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area is clear.
<b>Diagnostic Indicators</b>	Four LEDs indicate cause of lockout condition Diagnostic LEDs are visible through a window in the control box cover
<b>Controls and Adjustments</b>	Keyed Reset of system lockout conditions Blanking selection switches Auto Power Up on-off switches
<b>Auxiliary Monitor Relay</b>	Reed relay; 125V ac or dc max., 500 mA max. (10VA max., resistive load)
<b>Output Configuration (FSD1, FSD2, and SSD)</b>	Forced-guided contact relay (resistive load). <b>MSC...-..2:</b> FSD1 & 2, SSD = 250V ac max., 4 amp max. <b>MSC...-..3:</b> FSD1 & 2, CNC = 250V ac max., 6 amp max.; SSD = 250V ac max., 4 amp max <b>Mechanical life:</b> 10,000,000 operations (minimum). <b>Electrical life:</b> 100,000 operations (typical @ 1.0kVA switching power). <i>Arc suppression is recommended when switching inductive loads.</i>
<b>Enclosure</b>	<b>Size:</b> see dimensions on next page. <b>Material:</b> welded steel box with black polyester powder paint finish. <b>Rating:</b> NEMA 13, IEC IP64
<b>Connections</b>	See page 272 for general hookup information.
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (32° to +122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>FMEA Tested</b>	Per requirements IEC 61496-1 (type 4)
<b>Application Notes</b>	Use of fixed blanking requires sensors with 16 or more light beams. Up to 12 beams or 30% of the total number of beams in the array may be blanked, whichever is less. Call factory for applications assistance if a greater number of blanked beams is required.
<b>Certifications</b>	 IEC 61496-1 & 2, TYPE 4   UL 1998 Safety Software Certified      Except: MSCA-1T3 & MSCB-1T3

**MINI-SCREEN Metal Box Controller Dimensions**



**MINI-SCREEN Metal Box Controller Internal Features**



Note: TB3 Emitter/Receiver Color Codes

- Brown = +12V dc
- Blue = COM
- White = T/R
- Black =  $\bar{T}/\bar{R}$
- Uninsulated = Drain

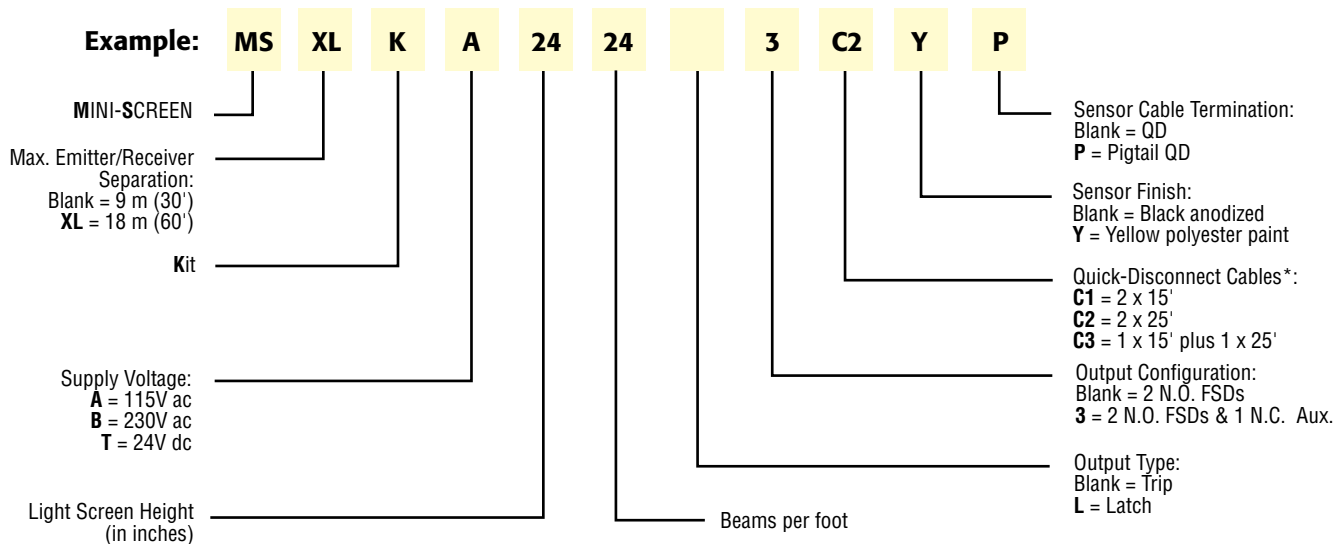
**MINI-SCREEN Metal Box Controller Kits Model Numbering Scheme**



MINI-SCREEN systems may be purchased as a kit which contains a controller, an emitter and receiver of equal length, standard mounting brackets, and a pair of interconnecting cables. See page 262 for a complete listing of possible kit models.

The resultant model number in this example is: **MSXLKA24243C2Y P**, which includes the following components:

- Metal box controller model **MSCA-1T3**: 115V ac, trip output, 2 N.O. FSDs & 1 N.C. Aux.
- Emitter and receiver models **MSXLE2424YP** and **MSXLR2424YP**: 18 m (60') range, 610 mm (24") high defined area, 25.4 mm (1.00") minimum object detection, yellow housing, and pigtail QD connector
- Two cables model **QDC-525C**: 8 m (25') long





\*NOTE: Other cable length combinations are possible. Contact factory.

# MINI-SCREEN® Metal Box Controllers with Fixed Blanking

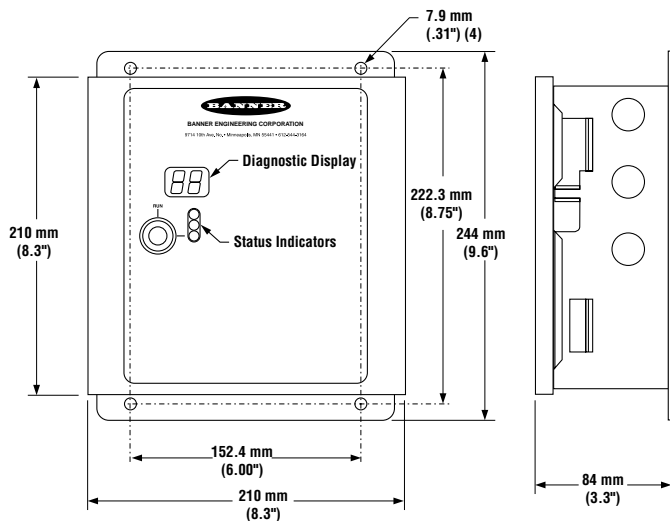


- Choose from three models:
  - **MSCD-2** with trip output for 115/230V ac operation, 2 N.O. FSDs
  - **MSCD-2T3** with trip output for 115/230V ac operation, 2 N.O. & 1 N.C. Aux.
  - **MSCT-2** with trip output for 24V dc operation, 2 N.O. FSDs
- Fixed-beam blanking allows continued presence of an object in the defined area: easy push-button teach-mode programming of blanked beams
- Selectable one- and two-beam floating blanking allows objects (usually workpiece material) to move through the defined area at any point without tripping the final switching devices
- Selectable auto power-up mode for applications where a key reset is difficult to perform
- Welded steel box enclosure with tough black polyester powder paint finish; rated NEMA 13, IEC IP64

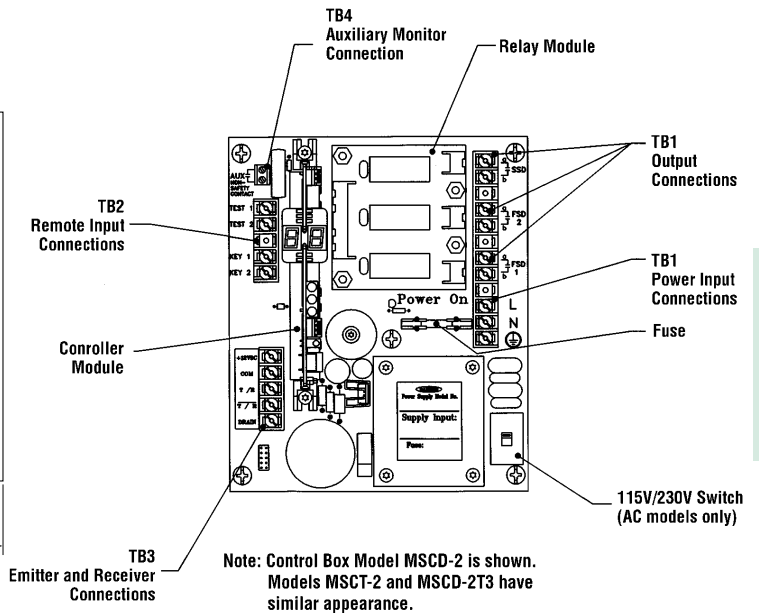
## MINI-SCREEN Metal Box Controller with Fixed Blanking Specifications

<b>System Power Requirements</b>	<b>MSCD-2 &amp; MSCD-2T3:</b> 115/230V ac $\pm 15\%$ (50/60 Hz), 55 VA <b>MSCT-2:</b> 24V dc $\pm 15\%$ , 10% maximum ripple, 1.5 amps max.
<b>Fuse Rating</b>	<b>Control Box MSCD-2 &amp; MSCD-2T3:</b> 115V ac: 1 amp, 250V; 230V ac: 1/2 amp, 250V <b>Control Box MSCT-2:</b> 2 amp, 250V (all fuses 3 AG or 5x20 mm slow blow)
<b>Response Time</b>	Less than 48 ms using emitter/receiver with 114 mm (4.5") to 406 mm (16") defined area Less than 60 ms using emitter/receiver with 508 mm (20") to 813 mm (32") defined area Less than 72 ms using emitter/receiver with 914 mm (36") to 1219 mm (48") defined area
<b>Status Indicators (on control box and receiver)</b>	<b>Red</b> = BLOCKED <b>Flashing red</b> = LOCKOUT <b>Green</b> = CLEAR <b>Flashing green</b> = BLANKING ON <b>Yellow</b> = RESET <b>Double-flashing yellow</b> = Waiting for Power-up Key Reset <b>Single-flashing yellow</b> = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area is clear.
<b>Diagnostic Indicators</b>	Two-digit numeric display indicates cause of lockout condition Display is visible through a window in the control box cover
<b>Controls and Adjustments</b>	Keyed Reset of system lockout conditions Floating Blanking selection switches and Fixed Blanking programming switches Auto Power Up on-off switches
<b>Auxiliary Monitor Relay</b>	Reed relay; 125V ac or dc max., 500 mA max. (10VA maximum, resistive load)
<b>Output Configuration: (FSD1, FSD2, and SSD)</b>	Forced-guided contact relay (resistive load). <b>MSCD-..2:</b> FSD1 & 2, SSD = 250V ac max., 4 amp max. <b>MSCD-..3:</b> FSD1 & 2, CNC = 250V ac max., 6 amp max.; SSD = 250V ac max., 4 amp max. <b>Mechanical life:</b> 10,000,000 operations (minimum). <b>Electrical life:</b> 100,000 operations (typical @ 1.0kVA switching power). <i>Arc suppression is recommended when switching inductive loads. See Warning on page 271.</i>
<b>Enclosure</b>	<b>Size:</b> see dimensions on next page. <b>Material:</b> welded steel box with black polyester powder paint finish. <b>Environmental rating:</b> NEMA 13, IEC IP64
<b>Connections</b>	See page 272 for general hookup information.
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (+32° to +122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>FMEA Tested</b>	Per requirements IEC 61496-1 (type 4)
<b>Application Notes</b>	Use of fixed blanking requires sensors with 16 or more light beams. Up to 12 beams or 30% of the total number of beams in the array may be blanked, whichever is less. See page 114 or call factory for applications assistance if a greater number of blanked beams is required.
<b>Certifications</b>	 Pending: MSCD-2T3  Other approvals in process. Contact factory.

**MINI-SCREEN Metal Box Controller with Fixed Blanking Dimensions**



**MINI-SCREEN Metal Box Controller with Fixed Blanking Internal Features**



Optical Safety Systems

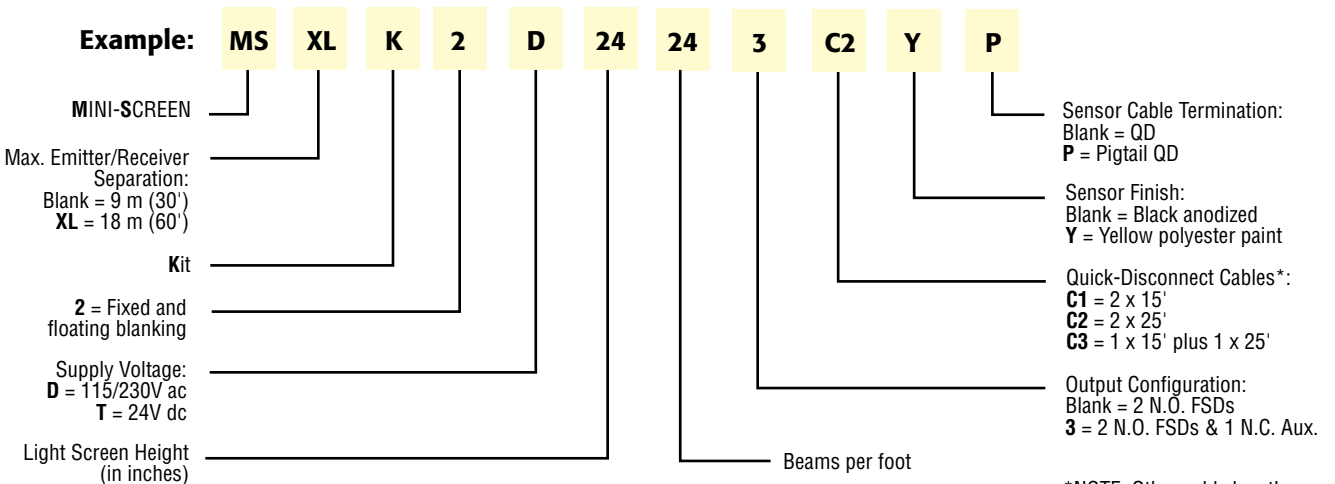
**MINI-SCREEN Metal Box Controller with Fixed Blanking Kits Model Numbering Scheme**



MINI-SCREEN systems may be purchased as a kit which contains a controller, an emitter and receiver of equal length and range, standard mounting brackets, and a pair of interconnecting cables. See page 267 for a complete listing of possible kit models.

The resultant model number in this example is: **MSXLK2D24243C2Y P**, which includes the following components:

- Metal box controller model **MSCD-2T3**: 115/230V ac, trip output, 2 N.O. FSDs & 1 N.C. Aux.
- Emitter and receiver models **MSXLE2424YP** and **MSXLR2424YP**: 18 m (60') range, 610 mm (24") high defined area, 25.4 mm (1.00") minimum object detection, yellow housing, and pigtail QD connector
- Two cables model **QDC-525C**: 8 m (25') long



\*NOTE: Other cable length combinations are possible. Contact factory.

# MINI-SCREEN® Metal Box Controller with Muting Function



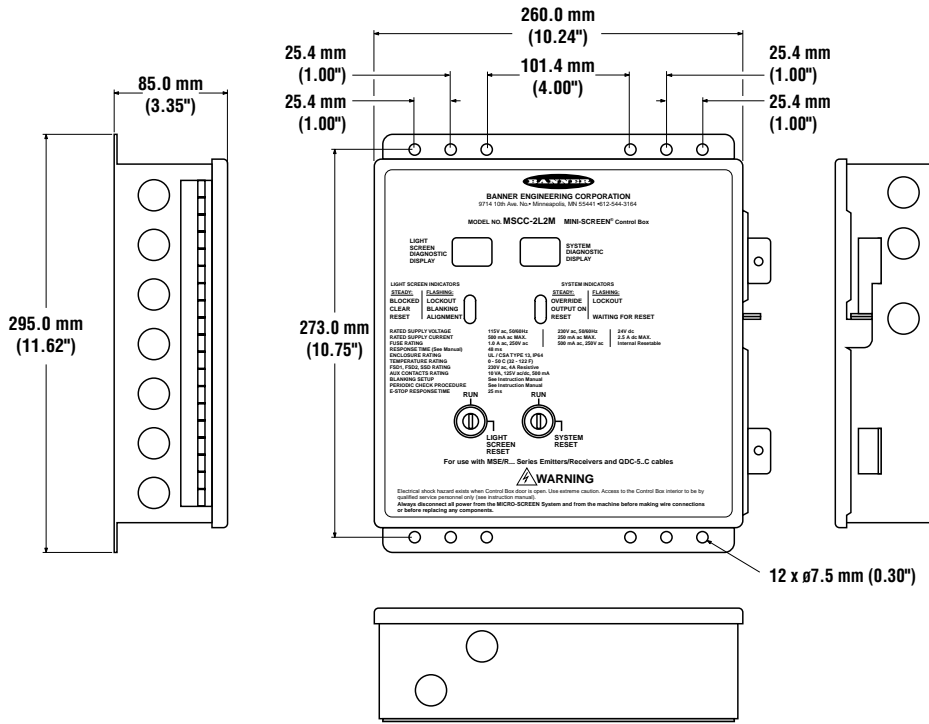
- Powered by 115/230V ac or 24V dc
- Choose from two models:
  - **MSCC-2L2M** with latch output and 2 N.O. FSDs
  - **MSCC-2L3M** with latch output and 2 N.O. FSDs & 1 N.C. Aux.
- Fixed blanking
- Easily configured one- or two-beam floating blanking
- Full-featured Muting function including:
  - Input from two or four Muting Devices
  - Selectable monitored Mute Lamp output (see SSA-ML-W page 116)
  - Selectable Backdoor Timer
  - Override inputs
  - Selectable directional muting capability
- Selectable External Device Monitoring (EDM)
- Control-reliable redundant output relays
- Welded steel box enclosure with tough black polyester paint finish

## MINI-SCREEN Muting Metal Box Controller Specifications

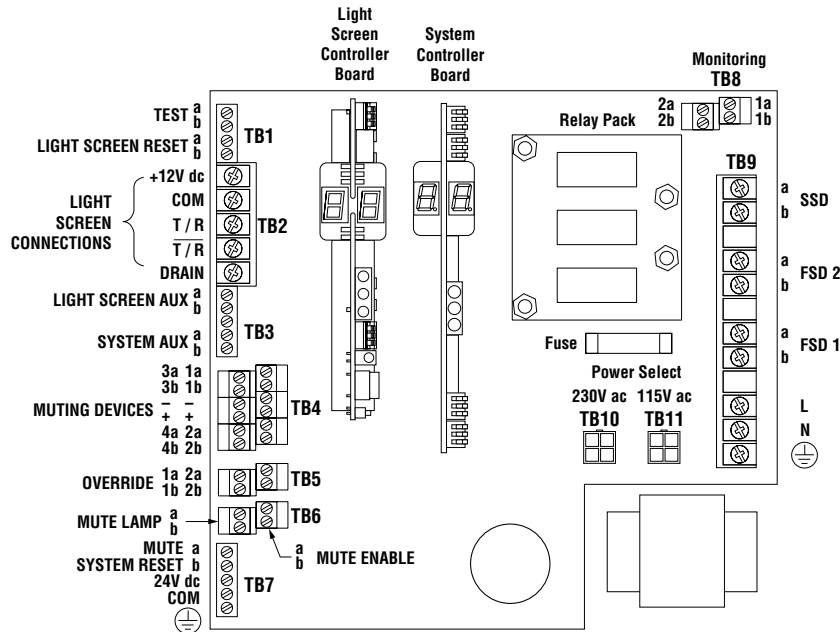
<b>System Power Requirements</b>	115V ac (50/60Hz) ± 15% @ 500 mA (50 VA), 230V ac (50/60Hz) ± 15% @ 250 mA (50 VA), or 24V dc ±15%, 10% maximum ripple, @ 2.5 A (60 W)																								
<b>Fuse Rating</b>	<b>115V ac:</b> 1.0 A @ 250V ac (supplied) <b>230V ac:</b> 500 mA @ 250V ac <b>24V dc:</b> Internal resettable																								
<b>Response Time</b>	Less than 58 ms using emitter/receiver with 114 mm (4.5") to 406 mm (16") defined area Less than 70 ms using emitter/receiver with 508 mm (20") to 813 mm (32") defined area Less than 82 ms using emitter/receiver with 914 mm (36") to 1219 mm (48") defined area																								
<b>Status LED Indicators</b>	<p><b>Light Screen Indicators (left column of LEDs):</b></p> <table border="0"> <thead> <tr> <th></th> <th><b>Solid LED</b></th> <th><b>Flashing LED</b></th> </tr> </thead> <tbody> <tr> <td><b>Red</b></td> <td>BLOCKED</td> <td>LOCKOUT</td> </tr> <tr> <td><b>Green</b></td> <td>CLEAR</td> <td>BLANKING ON</td> </tr> <tr> <td><b>Yellow</b></td> <td>RESET</td> <td>Double Flash = Waiting for Light Screen Key Reset at Power-up Single Flash = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area clear</td> </tr> </tbody> </table> <p><b>System Indicators (right column of LEDs):</b></p> <table border="0"> <thead> <tr> <th></th> <th><b>Solid LED</b></th> <th><b>Flashing LED</b></th> </tr> </thead> <tbody> <tr> <td><b>Red</b></td> <td>OVERRIDE</td> <td>LOCKOUT</td> </tr> <tr> <td><b>Green</b></td> <td>OUTPUT ON (FSD1 &amp; FSD2 closed)</td> <td>(Not Applicable)</td> </tr> <tr> <td><b>Yellow</b></td> <td>RESET (System)</td> <td>Double Flash = Waiting for System Key Reset at Power-up Single Flash = Waiting for System Key Reset at latched condition (manual reset of system after blockage has been removed)</td> </tr> </tbody> </table>		<b>Solid LED</b>	<b>Flashing LED</b>	<b>Red</b>	BLOCKED	LOCKOUT	<b>Green</b>	CLEAR	BLANKING ON	<b>Yellow</b>	RESET	Double Flash = Waiting for Light Screen Key Reset at Power-up Single Flash = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area clear		<b>Solid LED</b>	<b>Flashing LED</b>	<b>Red</b>	OVERRIDE	LOCKOUT	<b>Green</b>	OUTPUT ON (FSD1 & FSD2 closed)	(Not Applicable)	<b>Yellow</b>	RESET (System)	Double Flash = Waiting for System Key Reset at Power-up Single Flash = Waiting for System Key Reset at latched condition (manual reset of system after blockage has been removed)
	<b>Solid LED</b>	<b>Flashing LED</b>																							
<b>Red</b>	BLOCKED	LOCKOUT																							
<b>Green</b>	CLEAR	BLANKING ON																							
<b>Yellow</b>	RESET	Double Flash = Waiting for Light Screen Key Reset at Power-up Single Flash = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area clear																							
	<b>Solid LED</b>	<b>Flashing LED</b>																							
<b>Red</b>	OVERRIDE	LOCKOUT																							
<b>Green</b>	OUTPUT ON (FSD1 & FSD2 closed)	(Not Applicable)																							
<b>Yellow</b>	RESET (System)	Double Flash = Waiting for System Key Reset at Power-up Single Flash = Waiting for System Key Reset at latched condition (manual reset of system after blockage has been removed)																							
<b>Diagnostic Displays</b>	<p><b>Light Screen Diagnostic Display</b> (left window) is a two-digit numeric display that indicates the cause of lockout conditions.</p> <p><b>System Diagnostic Display</b> (right window) is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time, in seconds, remaining for the backdoor timer.</p>																								

MINI-SCREEN Muting Metal Box Controller Specifications (cont'd)	
<b>Controls and Adjustments</b>	<ul style="list-style-type: none"> <li>• Light Screen Key Reset after power-up and light screen lockouts</li> <li>• Selection switches to enable floating blanking</li> <li>• Program switches to enable fixed blanking</li> <li>• Light Screen and System Auto Power-up selection switches</li> <li>• System Key Reset after power-up, system lockouts, and latched conditions</li> <li>• Selection switches for Monitored or Non-Monitored Muting Indicator</li> <li>• Selection switches for One-Way or Two-Way (directional/non-directional) Muting</li> <li>• Selection switches for One-Channel, Two-Channel Monitoring or No Monitoring (EDM)</li> <li>• Selection switches for Backdoor Timer settings and Mute-on-Power-Up</li> </ul>
<b>Light Screen and System Reset Inputs</b>	Terminals must be closed for a minimum of 0.05 seconds in order to guarantee a reset. The switching device must be capable of switching 15-50V dc at 20-100 mA.
<b>External Device Monitoring (EDM) Input(s)</b>	Two pairs of terminals are provided to monitor the state of external devices that are being controlled by the FSD outputs. The device must be capable of switching 15-50V dc at 20-100 mA.
<b>Mute Enable Input</b>	Terminals must be closed in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-50V dc at 20-100 mA.
<b>Override Inputs</b>	The two-channel inputs must be closed within 3 seconds of each other (simultaneity requirement) and held closed during the 10-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-50V dc at 20-100 mA.
<b>Muting Device Input</b>	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be “closed” within 3 seconds of each other (simultaneity requirement) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-50V dc at 20-100 mA.
<b>Light Screen and System Aux. Monitor Relay Outputs</b>	Reed relay; 125V ac/dc max. at 500 mA max. (10VA maximum, resistive load)
<b>Output Configuration (FSD1, FSD2, SSD)</b>	<p>Forced-guided contact relay (resistive load).</p> <p><b>MSCC-..2:</b> FSD1 &amp; 2, SSD = 250V ac max., 4 amp max.</p> <p><b>MSCC-..3:</b> FSD1 &amp; 2, CNC = 250V ac max., 6 amp max.; SSD = 250V ac max., 4 amp max.</p> <p><b>Mechanical life:</b> 10,000,000 operations (minimum).</p> <p><b>Electrical life:</b> 100,000 operations (typical @ 1.0kVA switching power).</p> <p><i>Arc suppression is recommended when switching inductive loads. See Warning on page 271.</i></p>
<b>Mute Lamp Output</b>	<p>A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be within 10 mA to 360 mA.</p> <p><b>Maximum Switching Voltage:</b> 30V dc</p> <p><b>Maximum Switching Current:</b> 360 mA</p> <p><b>Minimum Switching Current:</b> 10 mA</p> <p><b>Saturation Voltage:</b> ≤1.5V dc</p>
<b>Auxiliary DC Supply Output</b>	24V dc ± 25%, 500 mA max
<b>Enclosure</b>	<p><b>Size:</b> See dimensions on next page.</p> <p><b>Material:</b> Welded steel box with black polyester powder paint finish.</p> <p><b>Rating:</b> NEMA 13; IEC IP64</p>
<b>Connections</b>	See page 273 for general hookup information.
<b>Operating Conditions</b>	<p><b>Temperature:</b> 0° to +50°C (+32° to 122°F)</p> <p><b>Relative humidity:</b> 95% maximum (non-condensing)</p>
<b>FMEA Tested</b>	Per requirements of IEC61496-1 (type 4)
<b>Applications</b>	Use of fixed blanking requires sensors with 16 or more light beams. Up to 12 beams or 30% of the total number of beams in the array may be blanked, whichever is less. Call factory for applications assistance if a greater number of blanked beams is required.
<b>Certifications</b>	Approvals in process. Contact factory for update.

**MSCC-2L2M/2L3M Metal Box Controller Dimensions**



**MSCC-2L2M/2L3M Metal Box Controller Internal Features**



Note: TB3 Emitter/Receiver Color Codes

- Brown = +12V dc
- Blue = COM
- White = T/R
- Black = T/R
- Uninsulated = Drain



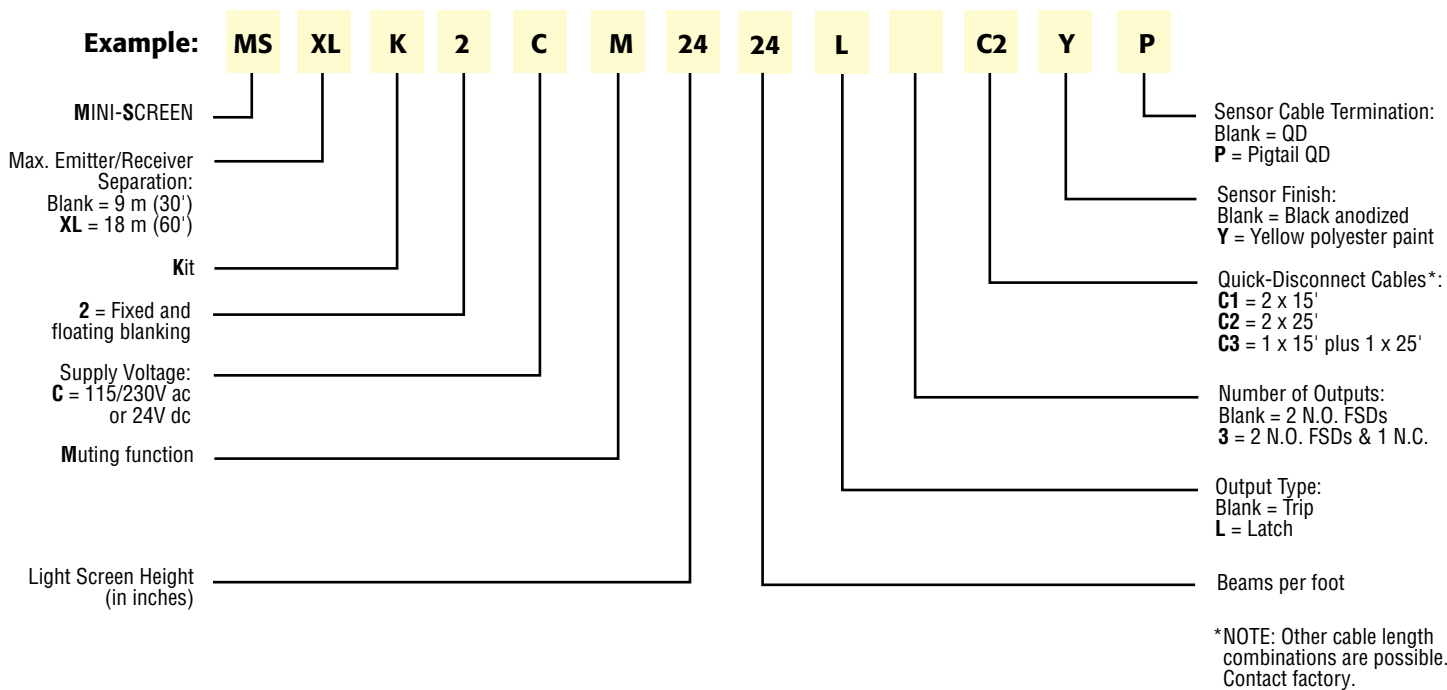
**MSCC-2L2M/2L3M Metal Box Controller Kits Model Numbering Scheme**



MINI-SCREEN systems may be purchased as a kit which contains a controller, an emitter and receiver of equal length and range, standard mounting brackets, and a pair of interconnecting cables.

The resultant model number in this example is: **MSXLK2CM2424LC2YP**, which includes the following components:

- Metal box controller model **MSCC-2L2M**: with muting function, latching outputs and 2 N.O. FSDs
- Emitter and receiver models **MSXLE2424YP** and **MSXLR2424YP**: 18 m (60') range, 610 mm (24") high defined area, 25.4 mm (1.00") minimum object detection, yellow housing, and pigtail QD connector
- Two cables model **QDC-525C**: 8 m (25') long






# MULTI-SCREEN® Dual Safety Light Screen Metal Box Controller

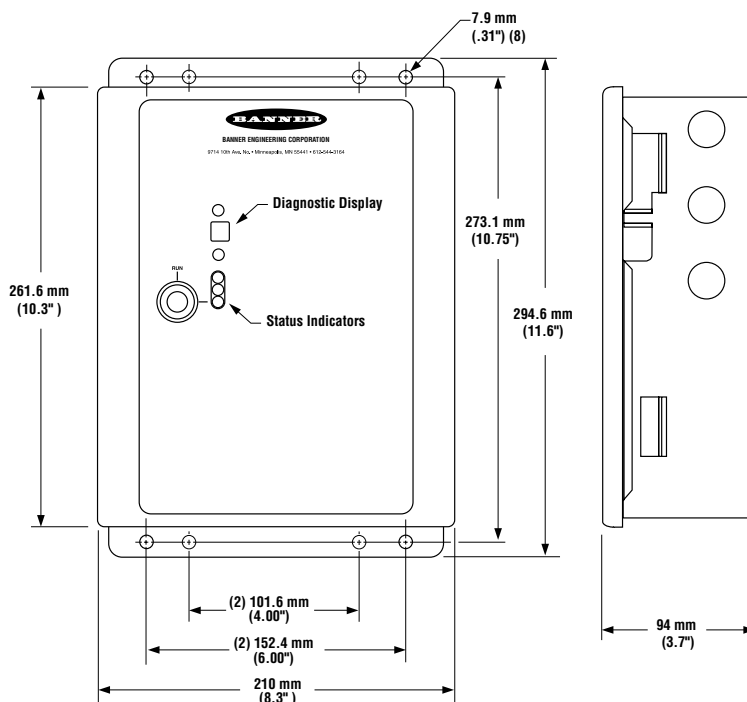


- **MUSC-1** for 115V ac, 230V ac or 24V dc operation
- MULTI-SCREEN System uses two pairs of sensors (MINI-SCREEN or MACHINE/PERIMETER-GUARD or a combination) to provide point-of-operation guarding for two areas on the same machine
- Control box contains a power supply, a plug-in microprocessor controller module to control sensing logic, and a relay board with replaceable output relays
- 115V ac, 230V ac or 24V dc operation
- One- or two-beam floating blanking feature allows objects to move through the defined area without tripping the final switching device
- Welded steel enclosure with tough black polyester powder finish; rated NEMA13, IEC IP64

## MULTI-SCREEN MUSC-1 Metal Control Box Specifications

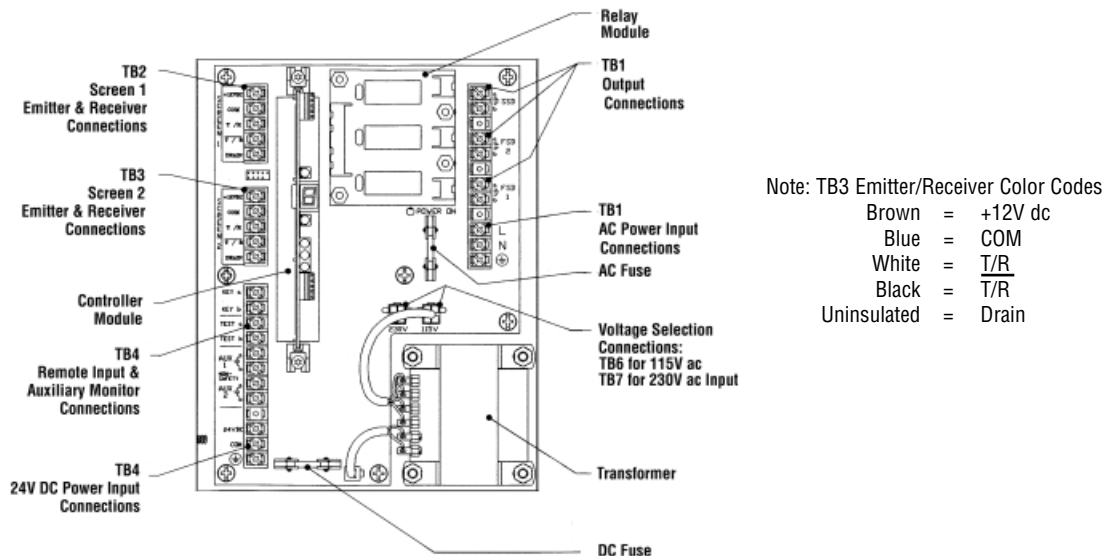
<b>System Power Requirements</b>	<b>MUSC-1:</b> 115V ac ±15% (50/60 Hz), 85 VA, or 230V ac ±15% (50/60 Hz), 85 VA, or 24V dc ±15%, 10% maximum ripple, 2.5 amps max
<b>Fuse Rating</b>	<b>115V ac :</b> 1 amp, 250V (3 AG or 5x20 mm slow blow) <b>230V ac:</b> ½ amp, 250V (3 AG or 5x20 mm slow blow) <b>24V dc:</b> 3 amp, 250V (3 AG or 5x20 mm slow blow)
<b>Status Indicators (on control module and receiver)</b>	<b>Red</b> = BLOCKED <b>Flashing red</b> = LOCKOUT <b>Green</b> = CLEAR <b>Flashing green</b> = BLANKING ON <b>Yellow</b> = RESET <b>Double-flashing yellow</b> = Waiting for Power-up Key Reset <b>Single-flashing yellow</b> = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area is clear.
<b>Diagnostic Indicators</b>	Single-digit numeric display indicates cause of lockout condition
<b>Controls and Adjustments</b>	Keyed Reset of system lockout conditions Blanking selection switches Auto Power Up selection switches
<b>Auxiliary Monitor Relay</b>	Reed relay; 125V ac or dc max., 500 mA max. (10VA maximum, resistive load)
<b>Output Configuration: (FSD1, FSD2, and SSD)</b>	Forced-guided contact relays, 250V ac max., 4 amps max., (resistive load) <b>Mechanical life:</b> 10,000,000 operations (minimum) <b>Electrical life:</b> 100,000 operations (typical) at full rated load <i>Arc suppression is recommended when switching inductive loads. See Warning on page 271.</i>
<b>Enclosure</b>	<b>Size:</b> see dimensions on next page. <b>Material:</b> welded steel box with black polyester powder paint finish. <b>Rating:</b> NEMA 13, IEC IP64
<b>Connections</b>	See page 274 for general hookup information.
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (+32° to +122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>FMEA Tested</b>	Per requirements of proposed first edition of UL 491 Standard, BS6491 and IEC 61496-1
<b>Certifications</b>	 IEC 61496-1 & 2, TYPE 4  Presence Sensing Device LISTED  LISTED

**MULTI-SCREEN Dimensions**



Optical Safety Systems

**MULTI-SCREEN Internal Features**



**Selection of Components for MULTI-SCREEN Systems**




MULTI-SCREEN uses two pairs of sensors which may be different sensing ranges, heights and families (MINI-SCREEN or MACHINE-/PERIMETER-GUARD, or a combination). Therefore, kits are not available. Emitters, receivers and cables must be purchased separately. See pages 90 and 124 for emitter/receiver information, and pages 110 and 128 for cable information.

To determine which light screens (MINI-SCREEN and/or MACHINE-/PERIMETER-GUARD) will meet your application needs, see the Minimum Object Sensitivity Charts in the Appendix on pages 260 and 270.

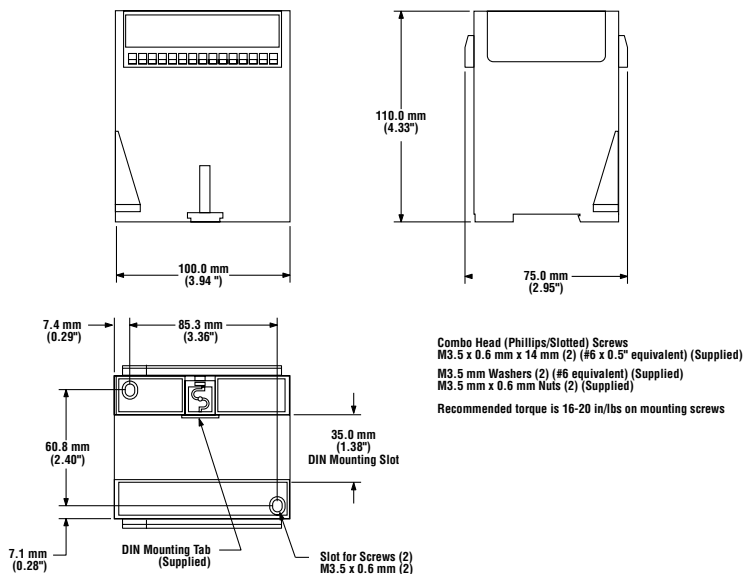
# MINI-SCREEN® DIN Module Controllers



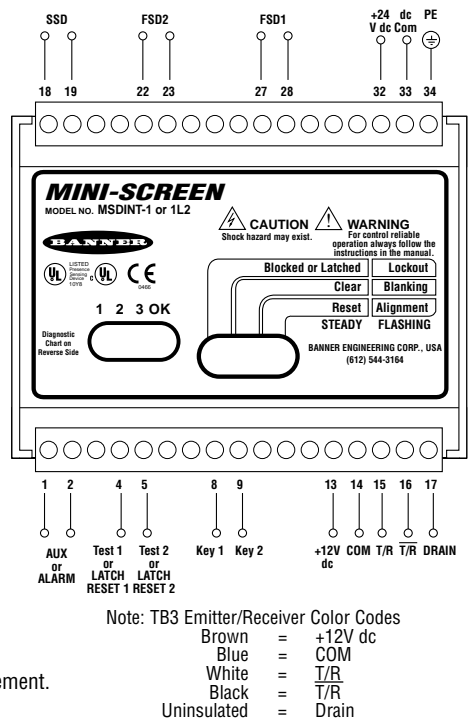
- Two models of 24V dc control module:
  - **MSDINT-1** with trip output for point-of-operation guarding
  - **MSDINT-1L2** with latch output for perimeter guarding
- Selectable two-beam floating blanking which allows objects (usually workpiece material) up to 20 mm (0.8") in cross section to move through the defined area at any point without tripping the final switching devices
- Selectable auto power-up mode for applications where a key reset is difficult to perform
- Polycarbonate housing designed to bolt directly to enclosure backplate or mount onto standard 35 mm DIN rail
- Removable plug-in wiring blocks

MINI-SCREEN DIN Module Controller Specifications							
<b>System Power Requirements</b>	24V dc ±15%, 10% maximum ripple, 1.5 amps. max.						
<b>Fuse Rating</b>	2 amp, 250V (3 AG or 5x20 mm slow blow)						
<b>Response Time</b>	Less than 48 ms using emitter/receiver with 114 mm (4.5") to 406 mm (16") defined area Less than 60 ms using emitter/receiver with 508 mm (20") to 813 mm (32") defined area Less than 72 ms using emitter/receiver with 914 mm (36") to 1219 mm (48") defined area						
<b>Status Indicators (on control module and receiver)</b>	<table border="0"> <tr> <td><b>Red</b> = BLOCKED</td> <td><b>Flashing red</b> = LOCKOUT</td> </tr> <tr> <td><b>Green</b> = CLEAR</td> <td><b>Flashing green</b> = BLANKING ON</td> </tr> <tr> <td><b>Yellow</b> = RESET</td> <td><b>Double-flashing yellow</b> = Waiting for Power-up Key Reset</td> </tr> </table> <p><b>Single-flashing yellow</b> = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area is clear.</p>	<b>Red</b> = BLOCKED	<b>Flashing red</b> = LOCKOUT	<b>Green</b> = CLEAR	<b>Flashing green</b> = BLANKING ON	<b>Yellow</b> = RESET	<b>Double-flashing yellow</b> = Waiting for Power-up Key Reset
<b>Red</b> = BLOCKED	<b>Flashing red</b> = LOCKOUT						
<b>Green</b> = CLEAR	<b>Flashing green</b> = BLANKING ON						
<b>Yellow</b> = RESET	<b>Double-flashing yellow</b> = Waiting for Power-up Key Reset						
<b>Diagnostic Indicators</b>	Four LEDs indicate cause of lockout conditions Diagnostic LEDs are visible through a window in the control module cover						
<b>Controls and Adjustments</b>	Keyed Reset of system lockout conditions Blanking selection switches Auto Power Up on-off switches						
<b>Auxiliary Monitor or Alarm Relay</b>	Reed relay; 125V ac or dc max., 500 mA max. (10VA maximum, resistive load)						
<b>Output Configuration (FSD1, FSD2, and SSD)</b>	Forced-guided contact relays, 250V ac max., 4 amps max., (resistive load) <b>Mechanical life:</b> 10,000,000 operations (minimum) <b>Electrical life:</b> 100,000 operations (typical @ 1.0 K va switching power) <i>Arc suppression is recommended when switching inductive loads. See Warning on page 271.</i>						
<b>Enclosure</b>	<b>Size:</b> see dimensions on next page. <b>Material:</b> polycarbonate <b>Rating:</b> NEMA 1, IEC IP20						
<b>Connections</b>	See page 275 for general hookup information.						
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (+32° to +122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)						
<b>Certifications</b>	 IEC 61496-1 & 2, TYPE 4  Presence Sensing Device LISTED  UL 1998 Safety Software Certified						

**MINI-SCREEN DIN Module Controller Dimensions**



**MINI-SCREEN DIN Module Controller Features**



Wiring blocks may be unplugged from the module, leaving wiring intact for easy module replacement.

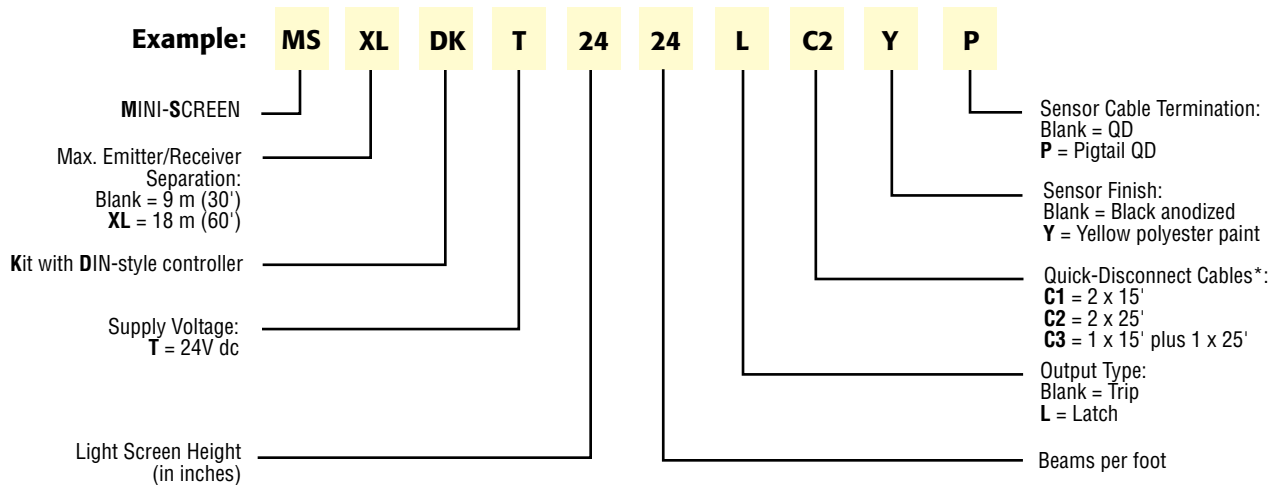
**MINI-SCREEN DIN Module Controller Kits Model Numbering Scheme**



MINI-SCREEN systems may be purchased as a kit which contains a controller, an emitter and receiver of equal length and range, standard mounting brackets, and a pair of interconnecting cables. See page 269 for a complete listing of possible kit models.

The resultant model number in this example is: **MSXLDKT2424LC2YP**, which includes the following components:

- Metal box controller model **MSDINT-1L2**: 24V dc, latching outputs
- Emitter and receiver models **MSXLE2424YP** and **MSXLR2424YP**: 18 m (60') range, 610 mm (24") high defined area, 25.4 mm (1.00") minimum object detection, yellow housing, and pigtail QD connector
- Two cables model **QDC-525C**: 8 m (25') long



\*NOTE: Other cable length combinations are possible. Contact factory.




Optical Safety Systems

# MINI-SCREEN® Dual Safety Light Screen DIN Module Controllers

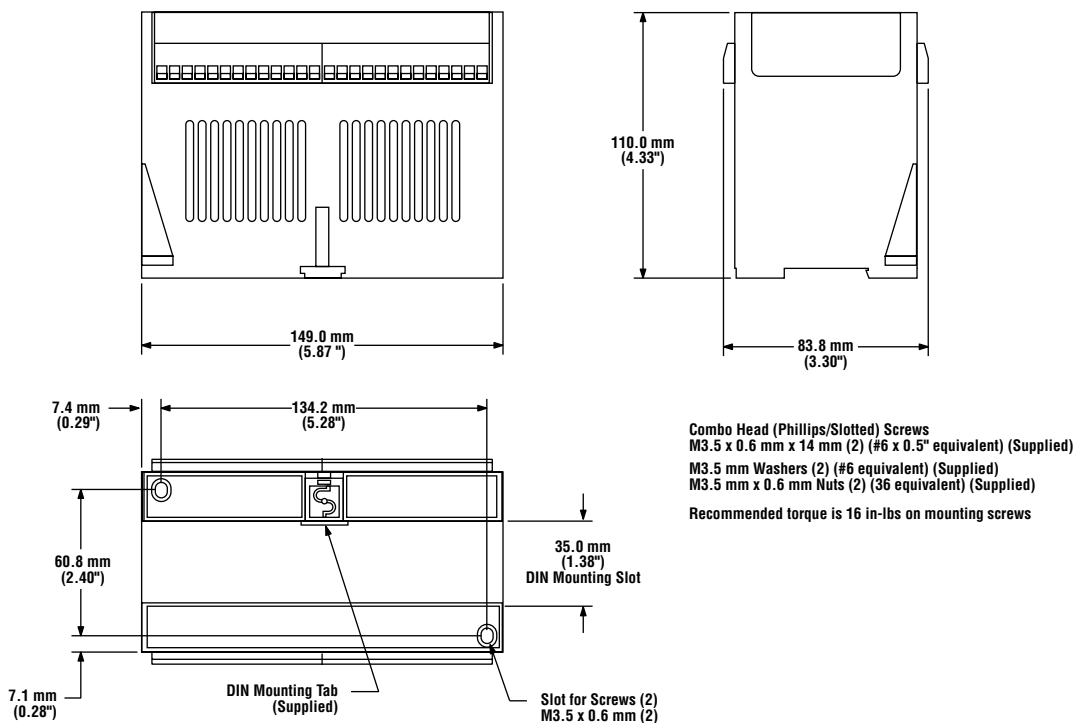


- Two models:
  - **MDSINT-1T2** with trip output
  - **MDSINT-1L2** with latch output
- 24V dc operation
- Removable plug-in wiring blocks
- One control module operates two MINI-SCREEN emitter/receiver sensor pairs; sensor pairs may be different heights or have different sensing ranges
- Includes input for emergency stop switch
- Selectable one- and two-beam floating blanking allows objects to move through the defined area at any point without tripping the final switching devices
- Selectable auto power-up mode for applications where a key reset is difficult to perform
- Separate alignment indicators for each sensor pair
- Polycarbonate housing designed to bolt directly to enclosure backplate or mount onto standard 35 mm DIN rail

## Dual Safety Light Screen DIN Module Controller Specifications

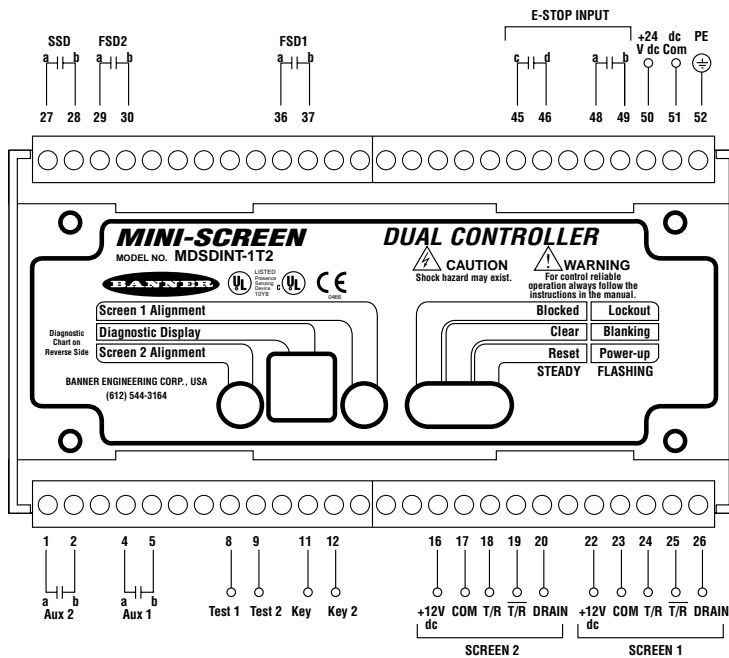
<b>System Power Requirements</b>	24V dc ±15%, 10% maximum ripple, 2.5 amps max.
<b>Fuse Rating</b>	3 amp, 250V (3AG or 5x20mm slow blow)
<b>Response Time</b>	<b>Light Screen:</b> Less than 48 ms using emitter/receiver with 114 mm (4.5") to 406 mm (16") defined area Less than 60 ms using emitter/receiver with 508 mm (20") to 813 mm (32") defined area Less than 72 ms using emitter/receiver with 914 mm (36") to 1219 mm (48") defined area  <b>E-Stop:</b> Less than 15 ms
<b>Status Indicators (on control box and receiver)</b>	<b>Red</b> = BLOCKED <b>Flashing red</b> = LOCKOUT <b>Green</b> = CLEAR <b>Flashing green</b> = BLANKING ON <b>Yellow</b> = RESET <b>Double-flashing yellow</b> = Waiting for Power-up Key Reset <b>Single-flashing yellow</b> = ALIGNMENT. Flash rate increases with the number of sensing beams "made", solid yellow when aligned and defined area is clear.
<b>Diagnostic Indicator</b>	Single-digit alphanumeric display indicates cause of lockout condition.
<b>Controls and Adjustments</b>	Keyed Reset of system lockout conditions Blanking selection switches Auto Power Up on-off switches
<b>Emergency Stop Switch Input</b>	Emergency stop switch must offer two normally closed contacts and be capable of switching 50 mA @ 30V dc. Simultaneity < 100 ms. Total resistance, including wiring and all switches, must not exceed 30Ω for proper operation. Functional stop category 0 per NFPA 79 and EN 418, Safety Category 4 per EN 954-1.
<b>Auxiliary Monitor Relay</b>	Reed relay; 125V ac or dc max., 500 mA max. (10VA maximum, resistive load)
<b>Output Configuration (FSD1, FSD2, and SSD)</b>	Forced-guided contact relays, 250V ac max., 4 amps max. (resistive load). <b>Mechanical life:</b> 10,000,000 operations (minimum). <b>Electrical life:</b> 100,000 operations (typical @ 1.0 K va switching power). <i>Arc suppression is recommended when switching inductive loads. See Warning on page 271.</i>
<b>Enclosure</b>	<b>Size:</b> see dimensions on next page. <b>Material:</b> Polycarbonate <b>Rating:</b> NEMA 1, (IP 20)
<b>Connections</b>	See page 276 for general hookup information.
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50°C (+32° to 122°F) <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>FMEA Tested</b>	Per requirements of proposed first edition of IEC 61496-1 (type 4)
<b>Certifications</b>	 Pending: MDSINT-1L2   UL 1998 Safety Software Certified

Dual MINI-SCREEN Dimensions



Wiring blocks may be unplugged from the module, leaving wiring intact for easy module replacement.

Dual MINI-SCREEN Features



Note: TB3 Emitter/Receiver Color Codes  
 Brown = +12V dc  
 Blue = COM  
 White = T/R  
 Black = T/R  
 Uninsulated = Drain

Selection of Components for Dual MINI-SCREEN Systems

Dual MINI-SCREEN uses two pairs of sensors which may be different heights and/or have different sensing ranges. Therefore, kits are not available. Emitters, receivers and cables must be purchased separately. See pages 90 and 91 for emitter/receiver information and pages 110 and 111 for cable information.

# MINI-SCREEN® Cables



- A “twisted pair” is incorporated for noise immunity on RS485 data communication lines; coupling nut is chrome-plated brass
- All cables are PVC-jacketed and have a straight quick-disconnect (QD) connector molded onto the sensor end

NOTE: Total cable length (emitter cable length plus receiver cable length) must be less than 53 m (175'). Cable runs of greater than 50' for emitter or receiver must be 16 gauge.

## MINI-SCREEN Emitter and Receiver Cables

Model	Cable Type	Length*	Wire	Termination	Dimensions	Pinout
QDC-515C QDC-525C QDC-550C	Cut-to-length	5 m (15') 8 m (25') 15 m (50')	20 ga	5-pin Mini-style Female connector on one end		<b>Female Connector (sockets)</b>
QDC-5100 QDC-5150	Cut-to-length	30 m (100') 45 m (150')	16 ga	5-pin Mini-style Female connector on one end		
DEC-515C DEC-525C DEC-550C	Extension	5 m (15') 8 m (25') 15 m (50')	20 ga	5-pin Mini-style Female connector on both ends		
DEC-570 DEC-5100 DEC-5125	Extension	21 m (70') 30 m (100') 38 m (125')	16 ga	5-pin Mini-style Female connector on both ends		
DEC2-515C DEC2-525C DEC2-550C	Extension	5 m (15') 8 m (25') 15 m (50')	20 ga	5-pin Mini-style Female connector on one end and Male connector on other end		<b>Male Connector (pins)</b>
DEC2-575 DEC2-5100	Extension	23 m (75') 30 m (100')	16 ga	5-pin Mini-style Female connector on one end and Male connector on other end		



MINI-SCREEN Emitter and Receiver Cables

Model	Cable Type	Length*	Wire	Termination	Dimensions	Pinout
PMC-510C*	Cut-to-length	3.3 m (10')	20 ga	5-pin Mini-style Panel-mount Male connector on one end		<p><b>Male Connector (pins)</b></p>
PMC-510*	Cut-to-length	3.3 m (10')	16 ga	5-pin Mini-style Panel-mount Male connector on one end		
PMC-510CLP*	Cut-to-length	3.3 m (10')	20 ga	5-pin Mini-style Panel-mount Male connector on one end		
PMCF-510C**	Cut-to-length	3.3 m (10')	20 ga	5-pin Mini-style Panel-mount Female connector on one end		<p><b>Female Connector (sockets)</b></p>

\* For use with DEC-5xxx double-ended cables  
 \*\* For use with DEC2-5xxx double-ended cables

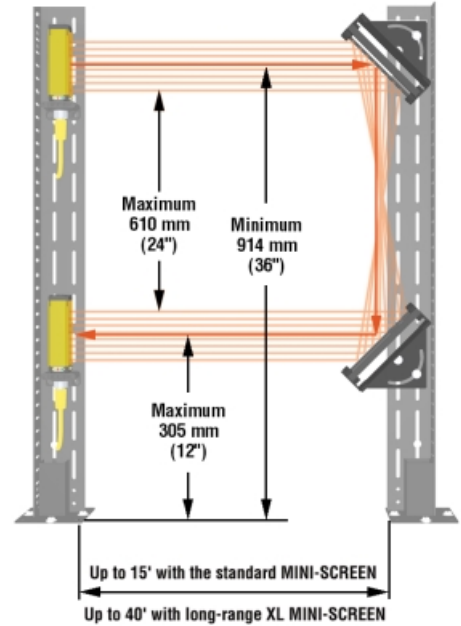
Optical Safety Systems

# ACCESS-GUARD™ Bracket System



- A compact, reliable, cost-effective option for guarding personnel access to an area of hazardous machine motion
- Multiple beams generate a protective screen of infrared light between the hazardous area and personnel
- For use with 4" MINI-SCREEN Safety Light Screen Systems
- Both emitter and receiver mount on the same bracket stand, simplifying mounting, installation wiring, and maintenance
- Choose from 2 kits: the complete ACCESS-GUARD Kit or individual Mirror with Bracket Kits for applications whose sensors and mirrors mount directly to another surface\*

## Beam placement requirements for access guarding applications



### ACCESS-GUARD Kits

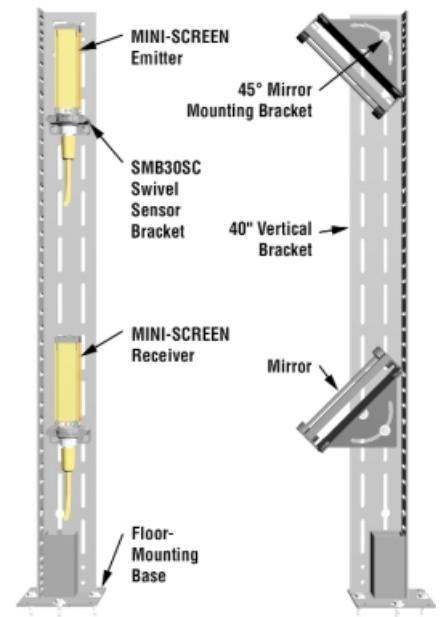
Model	Description	Required
MSA-PMS-K40	ACCESS-GUARD Kit	1
MSA-MBM-K45	Mirror with Bracket Kit	2

### ACCESS-GUARD Individual Components

Model	Description	Number Included	
		ACCESS-GUARD Kit	Mirror w/Bracket Kit
USA-PMS-40	40" Vertical Bracket	2	–
MSA-SB-1	Floor-mounting Base	2	–
MSMB-MSM-45	45° Mirror Mounting Bracket	2	1
MSM4A	Mirror w/hardware	2	1
SMB30SC	Swivel Sensor Bracket	2	–
	Post Level	1	–
	M4 7x12 mm PPHMS Screws	8	4
	M4 Keys Locknuts	8	4
	M6 1x3/4 Screws	8	2
	M6 Keys Nuts	8	2
	M6 Flat Washers	8	4
	M10-1 18 mm Hex Screws	16	–
	M10 Flat Washers	8	–

\* Requires a 4" (112.5 mm) MINI-SCREEN System for operation.  
 Mirror with Bracket Kit includes one mirror and one bracket, with hardware

## ACCESS-GUARD System Bracket and Mirror Kit Components



Either ACCESS-GUARD Kit may be purchased complete, or any of the components may be purchased separately.

**MINI-SCREEN Emitter and Receiver Modifications**

Model Suffix	Modification	Description	Dimensions
P	Pigtail Quick-Disconnect	Any MINI-SCREEN emitter or receiver may be built with a 305 mm (12") cable pigtail quick-disconnect connector substituted for the 5-pin integral connector	<p>305 mm (12") Pigtail</p> <p>13 mm R. (0.5") Minimum Bend</p>

**MINI-SCREEN Controller Modifications**


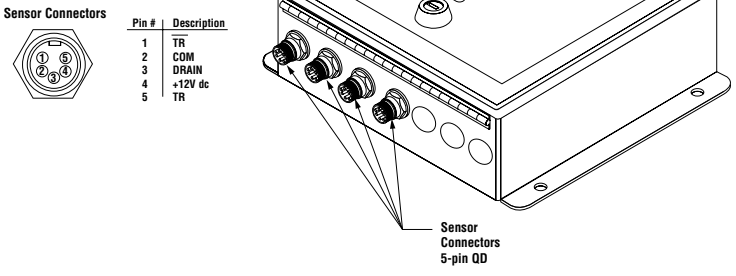
Banner will quote special MINI-SCREEN systems or components, including modifications to sensors and/or controllers. Following are three examples of special MINI-SCREEN controllers.

Model	Modifications	Cable Used	Connectors and Features																																						
<b>MSCA-1-48614</b>  Base Controller Model: <b>MSCA-1</b> (see page 94)  	Added two 5-pin connectors for emitter and receiver	DEC-5..C (see pg 110)	<p><b>Sensor Connectors</b></p> <table border="1"> <thead> <tr> <th>Pin #</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>TR</td></tr> <tr><td>2</td><td>COM</td></tr> <tr><td>3</td><td>DRAIN</td></tr> <tr><td>4</td><td>+12V dc</td></tr> <tr><td>5</td><td>TR</td></tr> </tbody> </table> <p><b>Input/Output Connector</b></p> <table border="1"> <thead> <tr> <th>Pin #</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>A</td><td>L</td></tr> <tr><td>B</td><td>N</td></tr> <tr><td>C</td><td>GND</td></tr> <tr><td>D</td><td>FSD1 a</td></tr> <tr><td>E</td><td>FSD1 b</td></tr> <tr><td>F</td><td>FSD2 a</td></tr> <tr><td>G</td><td>FSD2 b</td></tr> <tr><td>H</td><td>SSD a</td></tr> <tr><td>J</td><td>SSD b</td></tr> <tr><td>K</td><td>AUX a</td></tr> <tr><td>L</td><td>AUX b</td></tr> </tbody> </table> <p>Sensor Connectors 5-pin Euro QD</p> <p>Input/Output Connector 11-pin QD</p>	Pin #	Description	1	TR	2	COM	3	DRAIN	4	+12V dc	5	TR	Pin #	Description	A	L	B	N	C	GND	D	FSD1 a	E	FSD1 b	F	FSD2 a	G	FSD2 b	H	SSD a	J	SSD b	K	AUX a	L	AUX b		
	Pin #	Description																																							
1	TR																																								
2	COM																																								
3	DRAIN																																								
4	+12V dc																																								
5	TR																																								
Pin #	Description																																								
A	L																																								
B	N																																								
C	GND																																								
D	FSD1 a																																								
E	FSD1 b																																								
F	FSD2 a																																								
G	FSD2 b																																								
H	SSD a																																								
J	SSD b																																								
K	AUX a																																								
L	AUX b																																								
Added one 11-pin connector for power input and control output connections	Cable and mating connector are customer-supplied																																								
<b>MSCA-1-50040</b>  Base Controller Model: <b>MSCA-1</b> (see page 94)	Added two 5-pin connectors for emitter and receiver	DEC-5..C (see pg 110)	<p><b>Sensor Connectors</b></p> <table border="1"> <thead> <tr> <th>Pin #</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>TR</td></tr> <tr><td>2</td><td>COM</td></tr> <tr><td>3</td><td>DRAIN</td></tr> <tr><td>4</td><td>+12V dc</td></tr> <tr><td>5</td><td>TR</td></tr> </tbody> </table> <p><b>Output Connector</b></p> <table border="1"> <thead> <tr> <th>Pin #</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>SSD a</td></tr> <tr><td>2</td><td>FSD2 a</td></tr> <tr><td>3</td><td>FSD2 b</td></tr> <tr><td>4</td><td>FSD1 a</td></tr> <tr><td>5</td><td>FSD1 b</td></tr> <tr><td>6</td><td>SSD b</td></tr> <tr><td>7</td><td>AUX a</td></tr> <tr><td>8</td><td>AUX b</td></tr> </tbody> </table> <p><b>Input Connector</b></p> <table border="1"> <thead> <tr> <th>Pin #</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>Ground</td></tr> <tr><td>2</td><td>L</td></tr> <tr><td>3</td><td>N</td></tr> </tbody> </table> <p>Sensor Connectors 5-pin Euro QD</p> <p>Output Connector 8-pin QD</p> <p>Input Connector 3-pin QD</p>	Pin #	Description	1	TR	2	COM	3	DRAIN	4	+12V dc	5	TR	Pin #	Description	1	SSD a	2	FSD2 a	3	FSD2 b	4	FSD1 a	5	FSD1 b	6	SSD b	7	AUX a	8	AUX b	Pin #	Description	1	Ground	2	L	3	N
	Pin #	Description																																							
	1	TR																																							
2	COM																																								
3	DRAIN																																								
4	+12V dc																																								
5	TR																																								
Pin #	Description																																								
1	SSD a																																								
2	FSD2 a																																								
3	FSD2 b																																								
4	FSD1 a																																								
5	FSD1 b																																								
6	SSD b																																								
7	AUX a																																								
8	AUX b																																								
Pin #	Description																																								
1	Ground																																								
2	L																																								
3	N																																								
Added one 8-pin connector for output connections	QDC-8.. (see pg 79)																																								
Added one 3-pin connector for power input	MBCC-3.. (see pg 79)																																								

Optical Safety Systems

**MINI-SCREEN Controller Modifications**

Banner will quote special MULTI-SCREEN Dual Light Screen systems or components, including modifications to sensors and/or controllers. Following are three examples of special MULTI-SCREEN controllers.

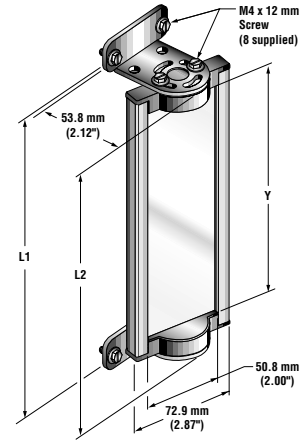
Model	Modifications	Cable Used	Connectors and Features
<p><b>MUSC-1-50265</b></p> <p>Base Controller Model: MUSC-1 (see page 104)</p> 	<p>Added four 5-pin connectors for emitter and receiver</p>	<p>DEC-5..C (see pg 110)</p>	

Model	Modification
<p><b>MSCT-2-50277</b></p> <p>Base Controller Model: MSCT-2 (see page 98)</p>	<p><b>Remote programming of fixed blanking:</b></p> <p>Controller is wired with a 2 m (6') cable to allow external connection of remote Program/Run switch and Program Set switch</p>
<p><b>MSCD-2-58701</b></p> <p>Base Controller Model: MSCD-2 (see page 98)</p>	<p><b>Up to 24 fixed blanked beams:</b></p> <p>Controller is modified to allow fixed blanking of up to 24 beams, versus up to 12 beams for the standard model. This configuration works only with 914 mm (36") sensors.</p>
<p><b>MSCD-2-50527</b></p> <p>Base Controller Model: MSCD-2 (see page 98)</p>	<p><b>Up to 32 fixed blanked beams:</b></p> <p>Controller is modified to allow fixed blanking of up to 32 beams, versus up to 12 beams for the standard model. This configuration works only with 1219 mm (48") sensors.</p>
<p><b>MSCD-2-51694</b></p> <p>Base Controller Model: MSCD-2 (see page 98)</p>	<p><b>Programming of fixed blanking using front panel key switch:</b></p> <p>Controller is supplied with a key switch on the control box door used for programming of fixed blanking. To set blanking, hold key switch in "PROGRAM MODE" for 1/2 to 2 seconds.</p>

**MSM Series Corner Mirrors**

- Rear-surface glass mirrors rated at 85% efficiency for the guarding of multi-sided applications with one emitter/receiver pair.
- Small and lightweight; two mounting brackets and hardware included.
- Once mounted, a unique mirror end cap design allows 360° rotation of the mirror.

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



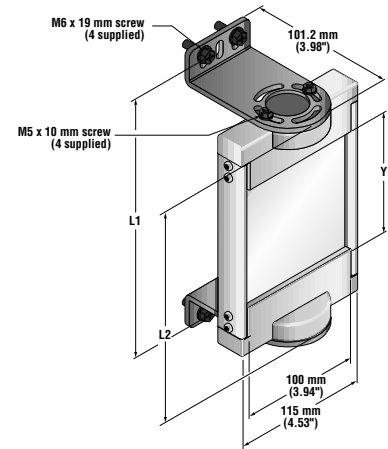
Note: Brackets may be inverted from the positions shown above, decreasing dimension L1 by 56.9 mm (2.24") and maximum rotation to ±45°.

Optical Safety Systems

**SSM Series Corner Mirrors**

- Rear-surface glass mirrors rated at 85% efficiency for the guarding of multi-sided applications with one emitter/receiver pair.
- Robust construction, two mounting brackets and hardware included.

Mirror Model	Reflective Area Y	Mounting L1	Height L2
SSM-100	100 mm (3.9")	211 mm (8.3")	178 mm (7.0")
SSM-150	150 mm (5.9")	261 mm (10.3")	228 mm (9.0")
SSM-250	250 mm (9.8")	361 mm (14.2")	328 mm (12.9")
SSM-375	375 mm (14.8")	486 mm (19.1")	453 mm (17.8")
SSM-475	475 mm (18.7")	586 mm (23.1")	553 mm (21.8")
SSM-550	550 mm (21.7")	661 mm (26.0")	628 mm (24.7")
SSM-675	675 mm (26.6")	786 mm (31.0")	753 mm (29.6")
SSM-825	825 mm (32.5")	936 mm (36.9")	903 mm (35.6")
SSM-975	975 mm (38.4")	1086.4 mm (42.8")	1053 mm (41.5")
SSM-1175	1175 mm (46.3")	1286.4 mm (50.6")	1253 mm (49.3")
SSM-1275	1275 mm (50.2")	1386.4 mm (54.6")	1353 mm (53.3")
SSM-1475	1475 mm (58.1")	1586.4 mm (62.5")	1553 mm (61.1")
SSM-1675	1675 mm (65.9")	1786.4 mm (70.3")	1753 mm (69.0")
SSM-1900	1900 mm (74.8")	1945 mm (76.7")	1978 mm (77.9")



Note: Brackets may be inverted from the positions shown above, decreasing dimension L1 by 58 mm (2.3")

**MINI-SCREEN Polycarbonate Lens Shields**

Lens Shield Model Number	Sensor Length	Lens Shield Length
MSS4	102 mm (4")	5.4"
MSS8	204 mm (8")	9.4"
MSS12	306 mm (12")	13.4"
MSS16	406 mm (16")	17.4"
MSS20	508 mm (20")	21.4"
MSS24	610 mm (24")	25.3"
MSS28	711 mm (28")	29.3"
MSS32	813 mm (32")	33.3"
MSS36	914 mm (36")	37.3"
MSS40	1016 mm (40")	41.3"
MSS44	1118 mm (44")	45.3"
MSS48	1219 mm (48")	49.3"



**LAT-1 Laser Alignment Tool**

Model	Description
LAT-1	Self-contained visible-beam laser tool for alignment of any MINI-SCREEN emitter/receiver pair. Includes retroreflective target material and three mounting clips
MSA-LAT-1	Clip-on target from MINI-SCREEN



**Explosion-Proof Enclosures**

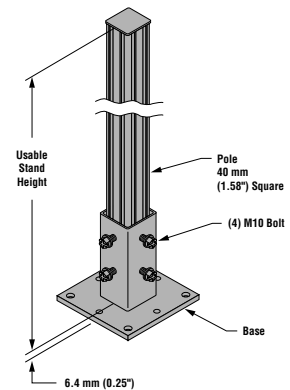
Model	Description
MS-XPE-32	For 20", 24", or 28" MINISCREEN emitters or receivers.
MS-XPE-43	For 32", 36", or 40" MINI-SCREEN emitters or receivers.



**MSA Series Stands (Base is included)\***

Stand Model	Useable Stand Height	Overall Stand Height
MSA-S24-1	19"	24"
MSA-S42-1	37"	42"
MSA-S66-1	61"	66"
MSA-S84-1	79"	84"

\* Available without a base by adding the suffix "NB" to model number. For example, MSA-S24-1NB



Miscellaneous Accessories

Model	Description
MSA-MBM-K45	45° Mirror Bracket and Mirror Kit
MSA-SB-1	Stand Base
MSAMB	Mounting Kit to mount one emitter or receiver to MSA series stand
MSMB-MSM-45	45° Mirror Bracket
MSVM-1	Vibration Mounts for one sensor with 4 mm hardware
MSVM-2	Vibration Mounts (two standard 4 mm mounts)
MSVM-4	Vibration Mounts (for MS43..) for one sensor with 1/4-20 hardware
MSVM10-8	Vibration Mounts for two sensors with 10-32" hardware
PS-DINA-24	Power Supply Module for DIN Style controllers; 90 to 140V ac input; 24V dc @ 2 amp output
SSA-ML-W	Solid-state LED lamp for optical safety systems with muting function



Model SSA-ML-W shown

Optical Safety Systems

MINI-SCREEN Mounting Brackets

Model	Description	Dimensions
MSMB-1	<ul style="list-style-type: none"> <li>11-gage, black zinc plated, chromate dip finish</li> <li>1" mounting hole separation</li> <li>1 kit required per sensor</li> </ul>	
MSMB-2	<ul style="list-style-type: none"> <li>11-gage, black zinc plated, chromate dip finish</li> <li>Low-profile bracket</li> <li>1 kit required per sensor</li> </ul>	

MINI-SCREEN Mounting Brackets

Model	Description	Dimensions
<p><b>MSMB-3</b> (Included with each emitter and receiver)</p>	<ul style="list-style-type: none"> <li>• 11-gage, black zinc plated, chromate dip finish</li> <li>• Standard 1.75" mounting hole separation</li> <li>• 1 kit required per sensor</li> </ul>	<p><b>QD END</b></p> <ul style="list-style-type: none"> <li>34.8 mm (1.37")</li> <li>8.9 mm (0.35")</li> <li>6.4 mm (0.25")</li> <li>25.4 mm (1.00")</li> <li>19.1 mm (0.75")</li> <li>30.5 mm (1.20")</li> <li>ø6.8 mm (0.27") (2)</li> </ul> <p><b>NON-QD END</b></p> <ul style="list-style-type: none"> <li>34.8 mm (1.37")</li> <li>8.9 mm (0.35")</li> <li>4.5 mm (4) (0.35")</li> <li>6.4 mm (0.25")</li> <li>19.1 mm (0.75")</li> <li>25.4 mm (1.00")</li> <li>72° ± 4° (4)</li> <li>36° ± 4° (4)</li> <li>ø6.8 mm (0.27") (2)</li> <li>ø13.2 mm (0.52") (2)</li> <li>R12.7 mm (0.50")</li> <li>24.6 mm (0.97")</li> <li>90°</li> <li>3 mm (0.12")</li> </ul> <p><b>RIGHT SIDE VIEW</b></p> <ul style="list-style-type: none"> <li>21.6 mm (0.85")</li> <li>8.9 mm (2) (0.35")</li> <li>4.8 mm (2) (0.19")</li> <li>57.2 mm (2.25")</li> <li>44.5 mm (1.75")</li> <li>6.4 mm (0.25")</li> <li>7.6 mm (2) (0.30")</li> <li>R 6.4 mm (0.25") (4)</li> <li>10.2 mm (2) (0.40")</li> </ul>
<p><b>MSMB-4</b></p>	<ul style="list-style-type: none"> <li>• 11-gage, black zinc plated, chromate dip finish</li> <li>• Retrofit for STI MS43</li> <li>• 1 kit required per sensor</li> </ul>	<p><b>QD END</b></p> <ul style="list-style-type: none"> <li>30.5 mm (1.20")</li> <li>19.05 mm (0.75")</li> <li>38.1 mm (1.50")</li> <li>30.5 mm (1.20")</li> </ul> <p><b>NON-QD END</b></p> <ul style="list-style-type: none"> <li>30.5 mm (1.20")</li> <li>4.5 mm (4) (0.18")</li> <li>2 x R6.4 mm (4) (0.25")</li> <li>24.1 mm (0.95")</li> <li>2 x R3.0 mm (0.12")</li> <li>2 x 6.9 mm (2) x (0.27")</li> <li>45.7 mm (1.80")</li> <li>22.8 mm (0.90")</li> <li>72° ± 4° (4)</li> <li>36° ± 4° (4)</li> <li>ø13.2 mm (0.52") (2)</li> <li>R12.7 mm (0.50")</li> <li>27.2 mm (1.07")</li> <li>90°</li> <li>3 mm (0.12")</li> <li>49.6 mm (1.95")</li> <li>11.4 mm (0.45")</li> <li>12.1 mm (2) (0.48")</li> <li>19.1 mm (2) (0.75")</li> <li>2.5 mm (2) (0.10")</li> </ul>
<p><b>MSMB-5</b></p>	<ul style="list-style-type: none"> <li>• 11-gage, black zinc plated, chromate dip finish</li> <li>• 1" mounting hole separation</li> <li>• Retrofit for Dolan Jenner Safe Scan 7</li> <li>• 1 kit required per sensor</li> </ul>	<p><b>NON-QD END</b></p> <ul style="list-style-type: none"> <li>152.4 mm (6.00")</li> <li>34.8 mm (1.37")</li> <li>38.1 mm (1.50")</li> <li>25.4 mm (1.00")</li> <li>6.3 mm (0.25")</li> <li>11.4 mm (0.45")</li> <li>13.4 mm (0.53")</li> <li>31.8 mm (1.25")</li> <li>125.5 mm (4.94")</li> <li>2x 6.6 mm (2) (0.27")</li> <li>54.6 mm (2.15")</li> <li>6.4 mm (0.25")</li> <li>3.1 mm (0.12")</li> <li>53.9 mm (2.10")</li> <li>4x 4.4 mm (0.18")</li> <li>ø 25.4 mm (1.00")</li> <li>ø 13.2 mm (0.52")</li> </ul> <p><b>QD END</b></p> <ul style="list-style-type: none"> <li>152.4 mm (6.00")</li> <li>38.1 mm (1.50")</li> <li>ø 30.5 mm (1.20")</li> <li>34.8 mm (1.37")</li> </ul>



**MINI-SCREEN Replacement Parts**

NOTE: Replacement parts outlined apply to controllers only. Emitters and receivers contain no field-replaceable components. If repair is necessary, return the unit to the factory. Do not attempt to repair an emitter or receiver yourself.

Model	Part Name	Controller
39022	MINI-SCREEN Manual	MSCA-1, MSCB-1, MSCT-1
42492	Dual MINI-SCREEN Manual	MUSC-1
44895	DIN MINI-SCREEN Manual	MSDINT-1, MSDINT-1L2
47295	Fixed Blanking MINI-SCREEN Manual	MSCD-2, MSCT-2
47297	Dual DIN MINI-SCREEN Manual	MDSINT-1T2/1L2
55702	MINI-SCREEN Manual	MSCA-1L2
61409	MINI-SCREEN Manual	MSCC-2L2M
BA2MB	Mounting Hardware Kit for one sensor	Any
MSDA-RM-1	Power Supply/Relay Board (24V dc)	MDSINT-1T2
MDSAB-1	Controller Board	MDSINT-1T2
MGA-GS-1	Ground Strap for Control Box Door	Any metal control box
MGA-GST-1	Ground Strap for Transformer	Any metal control box
MGA-K-1	Replacement Key for MGA-KS-1 Switch	Any
MSA-KS-1	Key Switch, Pre-wired (includes key)	Any metal control box
MGA-KSO-1	Key Switch, No wires (includes key)	Any DIN Controller
MSAB-1	Controller Module	MSC..-1 Series
MSAB-2	Controller Module	MSC..-2 Series
MSAL-1	Controller Module	MSC..-1L.. Series
MUSAB-1	Controller Module	MUSC-1
MSA-MH-1	Control Box Mounting Hardware	Any metal control box (except MUSC-1)
MUSA-MH-1	Control Box Mounting Hardware	MUSC-1
MUSA-MH-2	Control Box Mounting Hardware	MSCC-2L..M Series
MSDA-RM-1	Power Supply/Relay Board (24V dc)	MDSINT-1T2/1L2
MSMA-PSC-2	Power Supply Board	MSCC-2...M
MSA-PSA-1	Power Supply Board (115V ac)	MSCA-1
MSA-PSA-2	Power Supply Board (115V ac)	MSCA-1L2
MSA-PSB-1	Power Supply Board (230V ac)	MSCB-1
MSA-PSB-2	Power Supply Board (230V ac)	MSCB-1L2
MSA-PSD-2	Power Supply Board (115/230V ac)	MSCD-2
MSA-PST-1	Power Supply Board (24V dc)	MSCT-1
MSA-PST-2	Power Supply Board (24V dc)	MSCT-2
MDSA-PTB-1	Terminal Block, positions 1-26	MDSINT-1T2/1L2
MDSA-PTB-2	Terminal Block, positions 27-52	MDSINT-1T2/1L2
MSA-PTB-1	Terminal Block, positions 1-17	MSDINT-1/1L2
MSA-PTB-2	Terminal Block, positions 18-34	MSDINT-1/1L2
MSDA-RM-1	Power Supply/Relay Board (24V dc)	MSDINT-1/1L2
MSA-RM-1	Relay Module	MSC..-..2
MSA-RM-2	Relay Module	MSC..-..3

\*NOTE: Instruction manuals are available at no charge for system evaluation. Visit Banner's website at [www.bannerengineering.com](http://www.bannerengineering.com), or contact your local Banner sales office.

<b>MINI-SCREEN Replacement Parts</b>		
<b>Model</b>	<b>Part Name</b>	<b>Controller</b>
<b>MSDAB-1</b>	Controller Board	MSDINT-1
<b>MDSAB-1</b>	Controller Board	MDSINT-1T2/1L2
<b>MSDAL-1</b>	Controller Board	MSDINT-1L2
<b>MUSA-PS-1</b>	Power Supply Board	MUSC-1
<b>MUSA-TA-1</b>	Transformer	MUSC-1
<b>STP-1</b>	Specified Test Piece (1.50")	As specified in instruction manual
<b>STP-2</b>	Specified Test Piece (0.75")	As specified in instruction manual
<b>STP-3</b>	Specified Test Piece (1.75")	As specified in instruction manual
<b>STP-4</b>	Specified Test Piece (1.25")	As specified in instruction manual
<b>STP-5</b>	Specified Test Piece (2.25")	As specified in instruction manual
<b>STP-6</b>	Specified Test Piece (3.00")	As specified in instruction manual
<b>STP-7</b>	Specified Test Piece (1.00")	As specified in instruction manual
<b>STP-8</b>	Specified Test Piece (2.00")	As specified in instruction manual
<b>STP-10</b>	Specified Test Piece (3.50")	As specified in instruction manual
<b>USMAB-1</b>	Muting System Controller	MSCC-2T.M
<b>USMAL-1</b>	Muting System Controller	MSCC-2L.M