



**WARNING . . .**  
It is very important to  
keep this document with  
its associated manual.

It contains information critical to the  
operation of the MINI-SCREEN Systems.



## Description

The associated control box is a special modification of the MINI-SCREEN controller to include the 6NO relay module (MSA-RM-6), the addition of a one-channel External Device Monitoring (EDM) input, the addition of trip/latch select, and the addition of quick disconnects for Emitter, Receiver, and machine interface.

The MSCA-1S6-64209 and MSCA-1S6-72718 control boxes replace the “Auto Power-up” feature with “TRIP/LATCH Output Select.” **Any reference to “Auto Power-up” in the primary instruction manual has been replaced as follows or should be now considered “TRIP Output.”**

Examples:

- “Auto Power-up is ON” becomes “TRIP Output has been selected,” or
- “Auto Power-up is OFF” becomes “LATCH Output has been selected.”

The information contained in this supplement either replaces or supplements some of the material in those manuals. **It is very important to keep this document with its associated manual.** Both contain information critical to the operation of this MINI-SCREEN Safety Light Screen system.

A section number or figure number will be listed, followed by the word “replacement” or “addition”. If an item is a replacement, that entire item is to be replaced with the information that follows and the material contained within the original manual is to be ignored. If the item is an addition, the material in the original manual is still valid, in addition to the material contained in this supplement.

## Section 2 Addition

### 2. Overview of MINI-SCREEN System Operation

Remove reference to “Auto Power-up (Section 2.2)” [second bullet item] and replace with “Trip/Latch Output Select” (Section 2.2(s)).

## Section 2.2 Replacement

### 2.2 (s) Trip/Latch Output Select

The MSCA-1S6-64209 and MSCA-1S6-72718 control boxes can be configured for Trip Output (automatic reset) or Latch Output (monitored manual reset) via a pair of DIP switches located on the controller module inside the control box. See Figure 18 of the primary manual and Section 3.4(s) in this supplement.

#### Trip Output

Upon power-up, when the controller module has been configured for Trip Output, the FSD and SSD outputs will automatically close once power is applied, the self-test is accomplished, and the defined area is clear. If the defined area is blocked at power-up, only the SSD closes. The FSD Outputs will close once the interruption of the defined area is removed (a GREEN condition). In either case, no external input or reset is required.

Trip Output is typically used only in situations where the individual is continually sensed by the defined area or in situations where supplemental safeguards prevent the initiation of hazardous motion while an individual is within the safeguarded space. See Section 3.2.1.1(s) “Pass-through hazards.”

A manual reset must still be performed to recover from a lockout condition.

#### Latch Output

Upon power-up, when the controller module has been configured for Latch Output, the SSD output will automatically close once power is applied, and the self-test is accomplished.

For the FSD Outputs to close, the defined area must be clear of interruptions (a GREEN condition) and a monitored manual reset must be accomplished (e.g. a key reset). To perform a monitored manual reset, close the “KEY 1/KEY 2” input for approximately 1/2 to 2 seconds, and then re-open the input. The FSD Outputs will close once the “open-close-open” action occurs.

The MINI-SCREEN controller must be manually reset after power-up and after any interruptions of the defined area are cleared. The location for the manual reset (e.g. a normally open key switch) must comply with the warning in Section 2.10(s).

Latch Output is typically used in situations where the individual can pass through the sensing field and become clear such that the MINI-SCREEN can not prevent hazardous motion. See Section 3.2.1.1(s) “Pass-through hazards.”



**WARNING . . .**  
**Initiation of Dangerous Motion**

**Application of the MINI-SCREEN System must not initiate dangerous machine motion.** Machine control circuitry must be designed so that one or more initiation devices must be engaged to start the machine, after the MINI-SCREEN is placed into Run mode (closes its FSD outputs).

**CAUTION . . .**

If the application does not require External Device Monitoring, the EDM input must be jumpered. **It is the user's responsibility to ensure that this does not create a hazardous situation.**

**Section 2.8 Addition****2.8(s) External Device Monitoring (EDM)**

Two terminals are provided for monitoring the state of external devices, such as MPCEs; see Figure 20(s). These terminals are labeled "Mon a" and "Mon b" at TB2. The MINI-SCREEN EDM inputs can be configured in two ways: One-channel monitoring, or No monitoring. See Section 3.5.5(s) for external hookup.

**One-Channel Monitoring:** A series connection of closed monitor contacts that are forced-guided (or captive contact) from each device controlled by the MINI-SCREEN. The monitor contacts *should* open when the FSD outputs close (a clear condition), but this is not required. The EDM input must be closed within 200 milliseconds of the FSD outputs opening (a blocked condition) or a lockout will occur; see Section 5.1(s).

**No Monitoring:** The EDM input ("Mon a" and "Mon b") must be jumpered if EDM is not used. If external device monitoring is set for No Monitoring, the user must ensure that any single failure of the external devices will not result in a hazardous condition and will prevent a successive machine cycle (see Section 2.7, Control Reliability).

**WARNING . . .  
Use FSD Outputs in  
Pairs**

One contact from each relay (FSD1 and FSD2) must be used together, as shown in Figure 23(s), to control each individual hazard. Each FSD output consists of a single normally open contact from one relay; **contacts from both FSD relays must be used to ensure proper operation.**

**Section 2.9 Addition****2.9(s) MSA-RM-6 Relay Module (6NO)**

The MSA-RM-6 relay module has six normally open, forced-guided contacts from FSD1 and FSD2 relays to form each FSD output. Each FSD output consists of a single normally open contact from one relay; contacts from both relays must be used to ensure proper operation.

One contact from each relay (FSD1 and FSD2) must be used together, as shown in Figure 23(s), to control each individual hazard.


Example (other combinations are possible):  
Terminals FSD1a/b interfaced with FSD2a/b  
Terminals FSD1c/d interfaced with FSD2c/d  
Terminals FSD1e/f interfaced with FSD2e/f

**Section 2.10 Addition**  
**2.10(s) External Key Reset**

The Key Reset switch that is normally found on the control box front cover has been removed, and has been rewired to the Output Connector (see Figure 19(s) in this document). The user must supply a means to reset the MINI-SCREEN system if a latch condition occurs (after clearing an interruption of the defined area), or after a lockout condition (see Section 5 of the primary instruction manual).

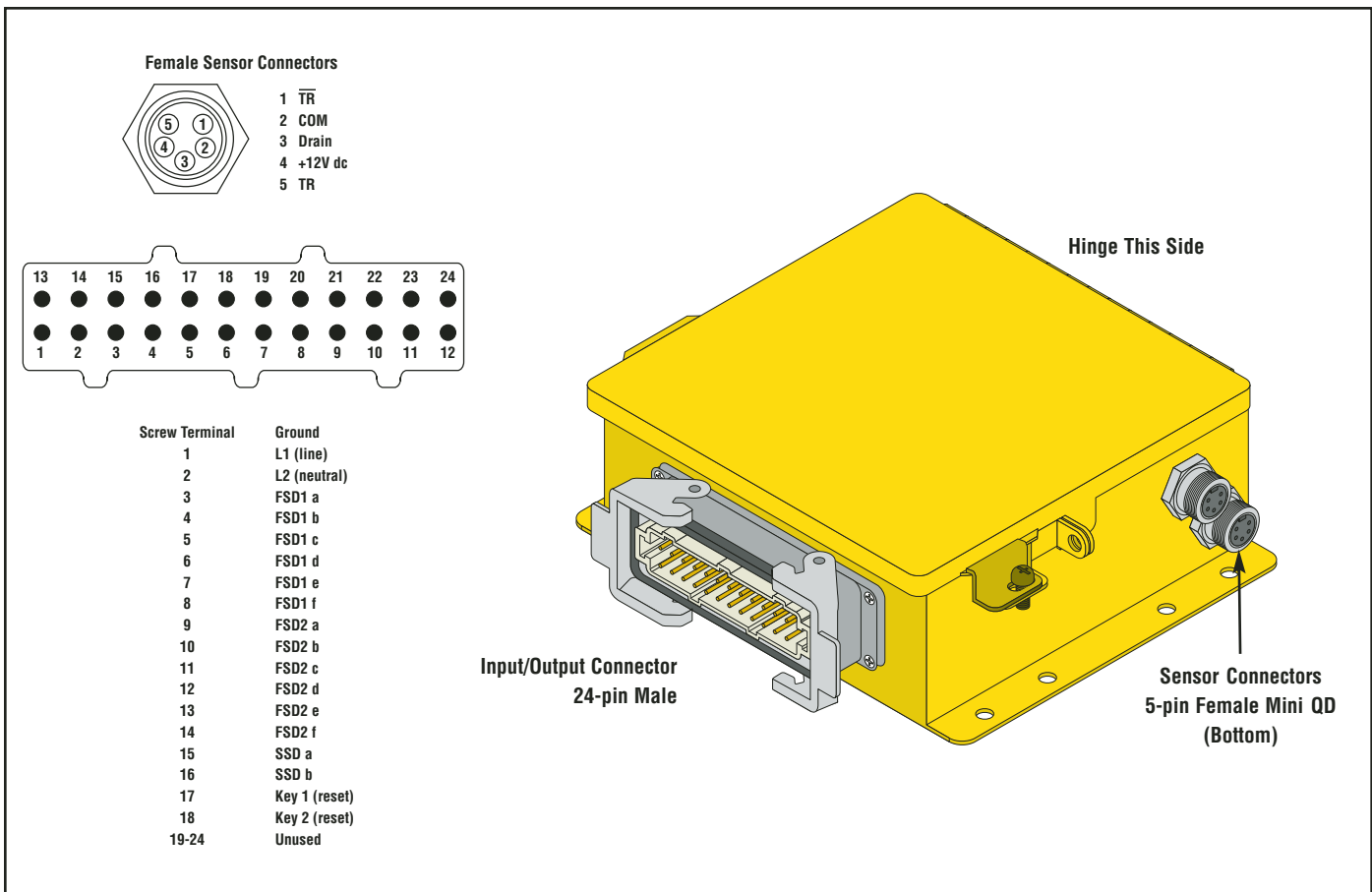
All reset switches must be located outside the guarded area, where the switch operator has a full and unobstructed view of the entire guarded area and any associated hazards while the reset is performed. The reset switch also must not be reachable from within the guarded area and must be protected (through the use of rings, or guards, for example) against unauthorized or inadvertent operation.

The reset switch must be a normally open switch that is held closed for approximately 0.5 seconds, and then re-opened to accomplish the reset. In the associated primary instruction manual, the "RUN" position is the open condition of the switch; the "RESET" position is closed. The switch must be capable of switching 15 to 50V dc at 20 to 100 mA.



**WARNING . . .**  
**Reset Switch Location**

**Any external System Reset switch(es) must be accessible only from outside, and in full view of, the hazardous area. Reset switches must also be out of reach from within the safeguarded space, and must be protected against unauthorized or inadvertent operation** (e.g., through the use of rings or guards). If any areas are not visible from the Reset switches, additional means of safeguarding must be provided as described by the ANSI B11 series of safety requirements or other appropriate standards.



**Figure 19 Addition**  
**Figure 19(s). Location and description of QD connectors**



**WARNING . . .**  
**Use of MINI-SCREEN**  
**Systems for Perimeter**  
**Guarding**

**If a MINI-SCREEN System is installed for perimeter guarding, the system MUST require actuation of a Reset switch before initiating the dangerous machine motion following an interruption of the defined area.**

If a MINI-SCREEN System is used for perimeter guarding, the Machine Primary Control Elements (MPCEs) of the guarded machine must be wired so that the FSD outputs of the control box cause a latched response of the MPCEs. The MPCEs must be reset only by actuation of a Reset switch.

**The Reset switch must be located outside of, and not be accessible from within, the area of dangerous motion, and it must be positioned so that the area of dangerous motion may be observed by the switch operator during the reset operation.**

Additional safeguarding, as described by the ANSI B11 series of safety requirements or other appropriate standards, must be used if any space between either defined area and any danger point is large enough to allow a person to stand undetected by the MINI-SCREEN System. **Failure to observe this warning could result in serious bodily injury or death.**

### Section 3.2.1.1 Addition

#### 3.2.1.1(s) Pass-Through Hazards

A “pass-through hazard” is associated with applications where personnel may pass through a safeguard (at which point the hazard stops or is removed), and then may continue into the hazardous area. Subsequently, their presence is no longer detected, and the safeguard can not prevent the start or restart of the machine. The related danger is the unexpected start or restart of the machine while personnel are within the hazardous area.

In the use of safety light screens, a pass-through hazard typically results from large separation/safety distances calculated from long stopping times, large minimum object sensitivities, reach over, reach through, or other installation considerations. A pass-through hazard can be generated with as little as 75mm (3") between the defined area and the machine frame or hard guarding.

#### Reducing or Eliminating Pass-Through Hazards

Measures must be taken to eliminate or reduce pass-through hazards. One solution is to ensure that personnel are continually sensed while within the hazardous area. This can be accomplished by using supplemental safeguarding, including: safety mats, area scanners, and horizontally mounted safety light screens. While it is recommended to eliminate the pass-through hazard altogether, this may not be possible due to cell or machine layout, machine capabilities, or other application considerations.

An alternate method is to ensure that once the safeguarding device is tripped it will latch, and require a deliberate manual action to reset. This type of supplemental safeguarding relies upon the location of the Reset switch as well as safe work practices and procedures to prevent an unexpected start or restart of the guarded machine.

The Reset switch or actuating control must be positioned outside the guarded area, and provide the switch operator with a full unobstructed view of the entire guarded area and any associated hazards as the reset is performed. The Reset switch or actuating control must not be reachable from within the guarded area and must be protected (through the use of rings or guards) against unauthorized or inadvertent operation. A key-actuated Reset switch provides some operator control, as the key can be removed by the operator and taken into the guarded area. However, this does not prevent unauthorized or inadvertent resets due to spare keys in the possession of others, or additional personnel entering the safeguarded area unnoticed.

The reset of a safeguard must not initiate hazardous motion. Also, before each reset of the safeguard is performed, safe work procedures require that a start-up procedure be followed and that the individual verifies that the entire hazardous area is clear of all personnel. If any areas can not be observed from the Reset switch location, additional supplemental safeguarding must be used: at minimum, visual and audible warnings of machine start-up.

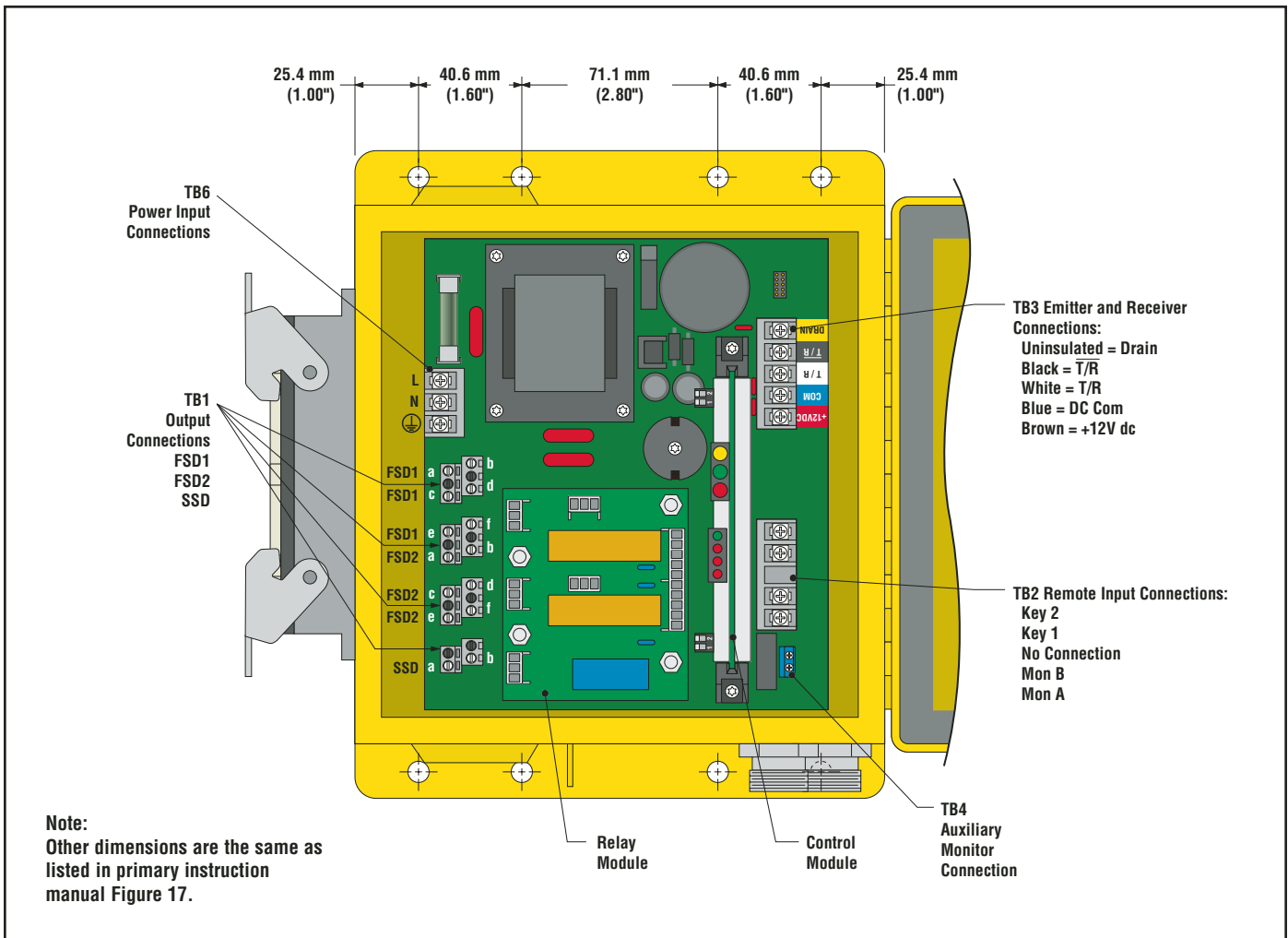


Figure 20 Replacement  
Figure 20(s). MINI-SCREEN System Electrical Connections

### Section 3.4 Addition

## 3.4(s) Controller Module Configuration

Replace all references in Section 3.4 and Figure 18 of “Auto Power-up” with “TRIP/LATCH Output Select.”

Replace the sub-paragraph titled “Auto Power-up Feature ON or OFF” with the following:

### **Trip/Latch Output Select (Auto/Manual Reset)**

Locate the DIP switches to configure the receiver for Trip Output (Auto Reset) or Latch Output (Manual Reset) as described by Figure 18. If Trip Output is selected, the FSD/SSD outputs will turn ON as soon as power is applied, the unit passes an internal self-test/synchronization, and recognizes that all beams are clear. The Trip Output will also automatically reset after all interruptions of one or more beam(s) have been cleared. If Latch Output is selected, the MINI-SCREEN requires a monitored manual reset at power-up and each time all interruptions of one or more beam(s) have been cleared. Switch #2 must be set identically at both banks A and B.

Regardless of the setting of this switch, a key reset is always necessary to recover from an internal lockout condition.

See Sections 2.2(s), 2.10(s), and 3.2.1.1(s) for Warnings and further information.

### Section 3.5.2 Replacement

## 3.5.2(s) External Device Monitoring and System Power

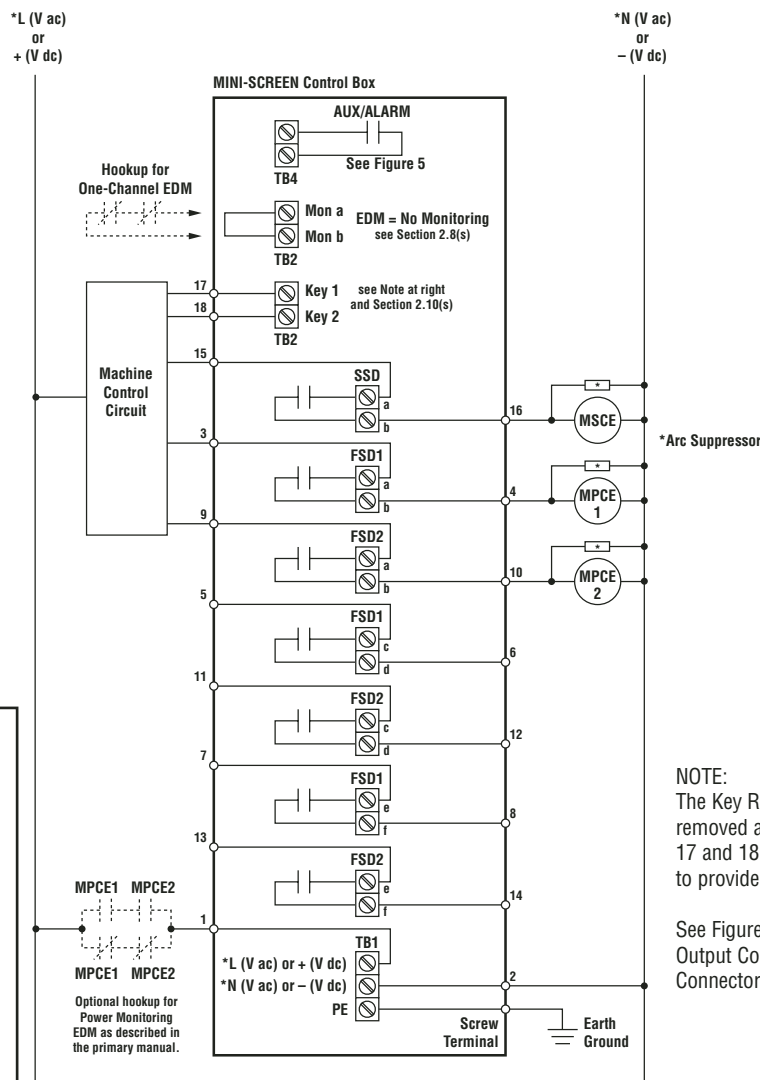
### **(Temporary Connection)**

For the initial checkout procedure, the External Device Monitoring (EDM) must be temporarily configured for “No Monitoring” (jumper TB2 Mon a and Mon b); refer to Figure 20(s) and Section 2.8(s). This will allow the MINI-SCREEN System to be checked out as a stand-alone system, before permanent connections are made to the guarded machine.

Verify that the power has been removed from the machine or that power is not available to the machine controls or actuators. Also verify that the machine controls (MPCEs) are not connected to the FSD and SSD outputs at this time. Permanent connections will be made after MINI-SCREEN initial checkout; see Section 3.5.5(s).

Connection of System AC power (115V ac) is at the L and the N terminals of control box wiring barrier TB1. All wiring must comply with NEC and local wiring codes. Do not operate the MINI-SCREEN System without a proper earth ground connection at either of the  $\oplus$  symbols.





**CAUTION . . . External Device Monitoring**

If the application does not require External Device Monitoring, the EDM input must be jumpered. **It is the user's responsibility to ensure that this does not create a hazardous situation.**

**NOTE:**  
The Key Reset switch has been removed and re-wired to terminals 17 and 18 of the Output connector to provide an external Key Reset.

See Figure 19 for description of 1-24 Output Connector and 1-5 Sensor Connectors (not shown).

**WARNING . . . Arc Suppressors**

**Never install arc suppressors directly across the output contacts of any safeguarding device.**

If arc suppressors are used, they must be installed as shown across the coils of the safety relays. It is possible for suppressors to fail as a short circuit.

**If installed directly across the contacts of a safety light screen switching device, a short-circuited suppressor will create an unsafe condition that could result in serious injury or death.**

**WARNING . . . Use FSD Outputs in Pairs**

One contact from each relay (FSD1 and FSD2) must be used together to control each individual hazard. Each FSD output consists of a single normally open contact from one relay; contacts from both relays must be used to ensure proper operation.

Figure 23(s) shows hookup for only one hazard to be controlled. For additional MPCEs (i.e., MPCE3/MPCE4, and MPCE5/MPCE6), duplicate hookup as drawn for MPCE1/MPCE2.

Figure 23 Replacement  
Figure 23(s). Generic Machine Interface, MINI-SCREEN System



**WARNING . . .**

If the application does not require External Device Monitoring, the EDM input must be jumpered. **It is**

**the user's responsibility to ensure that this does not create a hazardous situation.**

### **NOTICE Regarding MPCE Monitoring Hookup**

It is strongly recommended that one normally closed monitoring contact of each MPCE be wired (as shown in Figure 23 of the primary instruction manual) as MPCE monitor. If this is done, proper operation of the MPCEs will be verified. **MPCE monitoring contacts must be used in order to maintain control reliability.**

## **Section 3.5.5 Replacement**

### **3.5.5(s) External Device Monitoring**

#### **(Permanent Connection)**

After the initial checkout of Section 3.5.3 has been successfully completed, remove the EDM bypass circuit, installed in Section 3.5.2(s). Then connect the External Device Monitoring input to the closed monitoring contacts of the MPCEs. Refer to the NOTICE Regarding MPCE Monitoring Hookup, at right.

TB2 provides connection terminals for the External Device Monitoring input (Mon a and Mon b), and is located at the upper left corner of the control box. External Device Monitoring (EDM) must be wired in one of two configurations: One-Channel Monitoring, or No Monitoring; see Section 2.8(s).

After power is connected to the MINI-SCREEN System and the output relay contacts are connected to the machine to be guarded, the operation of the MINI-SCREEN System with the guarded machine must be verified before the combined System may be put into service. To do this, a Qualified Person must perform the Commissioning Checkout Procedure described in Section 6.2 of the primary instruction manual.

## **Section 3.5.6 Replacement**

### **3.5.6(s) Auxiliary Relay Output**

The MSCA-1S6-64209/MSCA-1S6-72718 controllers have an Auxiliary Monitor Relay output. See Figure 5 in the primary instruction manual for operating status condition and output status.

**The action of the Auxiliary Monitor Relay contact** “follows” the action of output relays FSD1 and FSD2. The Auxiliary Monitor Relay contact is a light-duty contact used for *control functions that are not safety-related*. A typical use is to communicate with a programmable logic controller (PLC). The switching capacity of the Auxiliary Monitor Relay is 125V ac or dc max., 500mA max. Connection to the Auxiliary Monitor Relay contact is made at wiring barrier TB4.

## **Section 3.5.7 Addition**

### **3.5.7(s) Accessory Connections at Terminal Strip TB2**

NOTE: The “Remote Test Input” has been replaced by the External Device Monitoring input. See Section 2.8 of the primary instruction manual and Section 2.8(s).

Section 5.1 Addition

5.1(s) Troubleshooting Lockout Conditions

An additional error code will indicate if the EDM input requirements have not been satisfied. See Figure 24(s).

An EDM error will be caused by:

- an open EDM input when the MINI-SCREEN controller tries to close its FSD outputs. The EDM input must be closed before the system is reset (either manually or automatically).
- the EDM input is slow to close once the MINI-SCREEN opens its FSD outputs and issues a stop command to the machine (i.e., more than 200 ms).

To troubleshoot an EDM error (flashing #7 or “E”), perform the following:

**If monitoring MPCEs with EDM input:**

- **If the MINI-SCREEN is in a lockout condition** (flashing #7), measure the dc voltage across Mon a and Mon b at TB4 with a voltmeter.
- If the measurement is approximately 32V dc, there is likely an open circuit caused by a broken wire, a loose connection, or an MPCE that failed in an energized condition (e.g., a welded relay contact of a forced-guided relay). It should not be possible to reset the MINI-SCREEN in this condition.
- If the measurement is approximately 0V dc, there is likely a closed circuit. The problem is likely a slow or sticky MPCE, causing the EDM input to close 200 ms after the FSDs open. The symptoms may include an intermittent lockout that allows the MINI-SCREEN to be reset.
- If the measurement is between the two values (0 to 32V dc), a connection or a contact may have become resistive. Depending on the severity, this may result in intermittent operation.

To troubleshoot further:

- Remove power from the machine and from the MINI-SCREEN system.
- Disconnect FSD1, FSD2, and the SSD output.
- Remove existing wiring from EDM input at Mon a and Mon b, and replace with a jumper.
- Apply power to the MINI-SCREEN system only.
- **If the MINI-SCREEN can be reset**, the fault is probably in either the external wiring associated with the N.C. contacts of the MPCEs or in the MPCEs themselves. One or both of the MPCEs could be at fault; typically both MPCEs should be replaced in this situation. A failure of an MPCE could include slow/sluggish reacting, sticky contacts, contact weld, or other faults that cause inconsistent or slow response.
- **If the MINI-SCREEN can not be reset** and the “E” error code is still displayed, replace the controller card or see Section 5.3 of the primary instruction manual.

**If not monitoring MPCEs with the EDM input:**

- Verify that a jumper is installed at Mon a and Mon b of TB2.
- Verify that EDM input connections are correct and not loose.
- With the jumper wire in place, measure the dc voltage between the jumper wire and com (TB3). If the measurement is not approximately 17V dc, replace the controller and/or see Section 5.3 of the primary instruction manual.
- If the MINI-SCREEN can not be reset and the “E” error code is still displayed, replace the controller card or see Section 5.3 of the primary instruction manual.











Error No.	ERROR Type/Action
 0	<b>System is OK</b>
1  1	<b>Relay Signal Error</b> <ul style="list-style-type: none"> <li>• Replace Relay Module</li> <li>• Replace Controller</li> <li>• Replace Power Supply</li> </ul>
2  2	<b>Key Input Error</b> <ul style="list-style-type: none"> <li>• Check Key Position</li> <li>• Replace Key Switch</li> </ul>
1 2  3	<b>Controller Error</b> <ul style="list-style-type: none"> <li>• Replace Controller</li> </ul>
4  4	<b>Receiver Error</b> <ul style="list-style-type: none"> <li>• Check Receiver Cable</li> <li>• Replace Receiver</li> </ul>
1 4  5	<b>Emitter Error</b> <ul style="list-style-type: none"> <li>• Check Emitter Cable</li> <li>• Replace Emitter</li> </ul>
2 4  6	<b>Communication Error</b> <ul style="list-style-type: none"> <li>• Check Cable Connections</li> <li>• Observe Noise Indicator</li> <li>• Replace Emitter/Receiver</li> </ul>
1 2 4  7	<b>DIP Switch Error</b> <ul style="list-style-type: none"> <li>• Check Switch Settings</li> <li>• Replace Controller</li> </ul>
 8*	<b>CPU Error</b> <ul style="list-style-type: none"> <li>• Replace Controller</li> </ul> <p>* (Green LED OFF)</p>
1 2 4  E†	<b>EDM Error</b> <ul style="list-style-type: none"> <li>• EDM Open at Reset</li> <li>• EDM Open at 200 ms</li> <li>• Check EDM Wiring</li> </ul> <p>† (Red LEDs Flashing)</p>
NOTE: Flashing error 4 LED indicates noisy environment	

Figure 24 Addition  
 Figure 24(s). Additional error codes

**Glossary Addition**

**External Device Monitoring (EDM)**

A means by which the safety light screen or other electro-sensitive protective equipment monitors the state of external control devices. (IEC61496-1)

NOTE: EDM is also known as “MPCE monitoring” and “relay back-checking.”

**Replacement Control Box Specifications Categories**

<p><b>EDM input</b> (Replaces “Test input” category)</p>	<p>Terminals must be closed before controller attempts to reset (close) the FSD outputs after clearing an interruption of the defined area. The EDM input should open when the FSD outputs close (a clear condition), but this is not required. The EDM input must be closed within 200 milliseconds of the FSD outputs opening (a blocked condition) or a lockout will occur. The contacts of the monitored device must be capable of switching 15-50V dc at 20 to 100 mA.</p>
<p><b>Output configuration (FSD1, FSD2, and SSD)</b> (Replaces “Output configuration” category)</p>	<p>Forced-guided contacts relays,  <b>FSD1 and FSD2:</b> 250V ac at 4A max (resistive load)  <b>SSD:</b> 250V ac at 4A max (resistive load)  <b>Mechanical life:</b> 10,000,000 operations (minimum)  <b>Electrical life:</b> 100,000 operations (typical @ 1.0kVA switched power, resistive load)                      Arc suppression is recommended when switching inductive loads. See Warning in Figure 23(s).</p>

**Section Replacement**

**Cables**

**Two cables required per system, one per sensor**

62765	<b>DEC2-507C</b>	2.1 m (7') 5-pin Male to Female (20 ga)
62793	<b>DEC2-515C</b>	5 m (15') 5-pin Male to Female (20 ga)
62794	<b>DEC2-525C</b>	8 m (25') 5-pin Male to Female (20 ga)
62795	<b>DEC2-550C</b>	15 m (50') 5-pin Male to Female (20 ga)
62796	<b>DEC2-575</b>	23 m (75') 5-pin Male to Female (16 ga)
62797	<b>DEC2-5100</b>	30 m (100') 5-pin Male to Female (16 ga)

Other cable lengths available upon request.

**Section Addition**

**Replacement Parts, MINI-SCREEN Systems**

67713	<b>MSAS-1E</b>	Microprocessor control module (for MSCA-1S6-64209)
72159	<b>MSAS-1E-72159</b>	Microprocessor Control Module (for MSCA-1S6-72718)
66547	<b>MSA-RM-6</b>	Replacement relay module with six N.O. FSDs
66548	<b>MSA-PSA-6T</b>	Replacement power supply (for MSCA-1S6)



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