



**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 boxes are a special modification of the MINI-SCREEN controllers to include the 2NO/1NC relay module (MSA-RM-2), the addition of a one-channel External Device Monitoring (EDM) input, and the addition of quick disconnects for Emitter, Receiver, and machine interface.

The MSCA-1T3E-68377 is a Trip-output controller. Its primary instruction manual is part number 39022.

The information contained in this supplement either replaces or supplements some of the material in the manual. **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 2.8 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).



#### 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 2.9 Addition

### 2.9(s) MSA-RM-2 Relay Module (2NO/1CNC)

The MSA-RM-2 relay module has two normally open, series-connected (redundant contacts) forced-guided contacts from individual relays to form each FSD output. The complementary normally closed output (CNC Aux) is a parallel connection of two normally closed forced-guided contacts from the same relays as the FSD outputs. This configuration provides that the CNC Aux output is in an opposite state from the FSD outputs.

The complementary normally closed Auxiliary output (“CNC Aux”) is a non-safety related output.

Due to contact configuration and current rating, the MSA-RM-2 relay module should not be replaced by an MSA-RM-1 relay module, unless it is determined to be a suitable replacement by a Qualified Person. Please contact Banner Engineering Applications group for assistance.

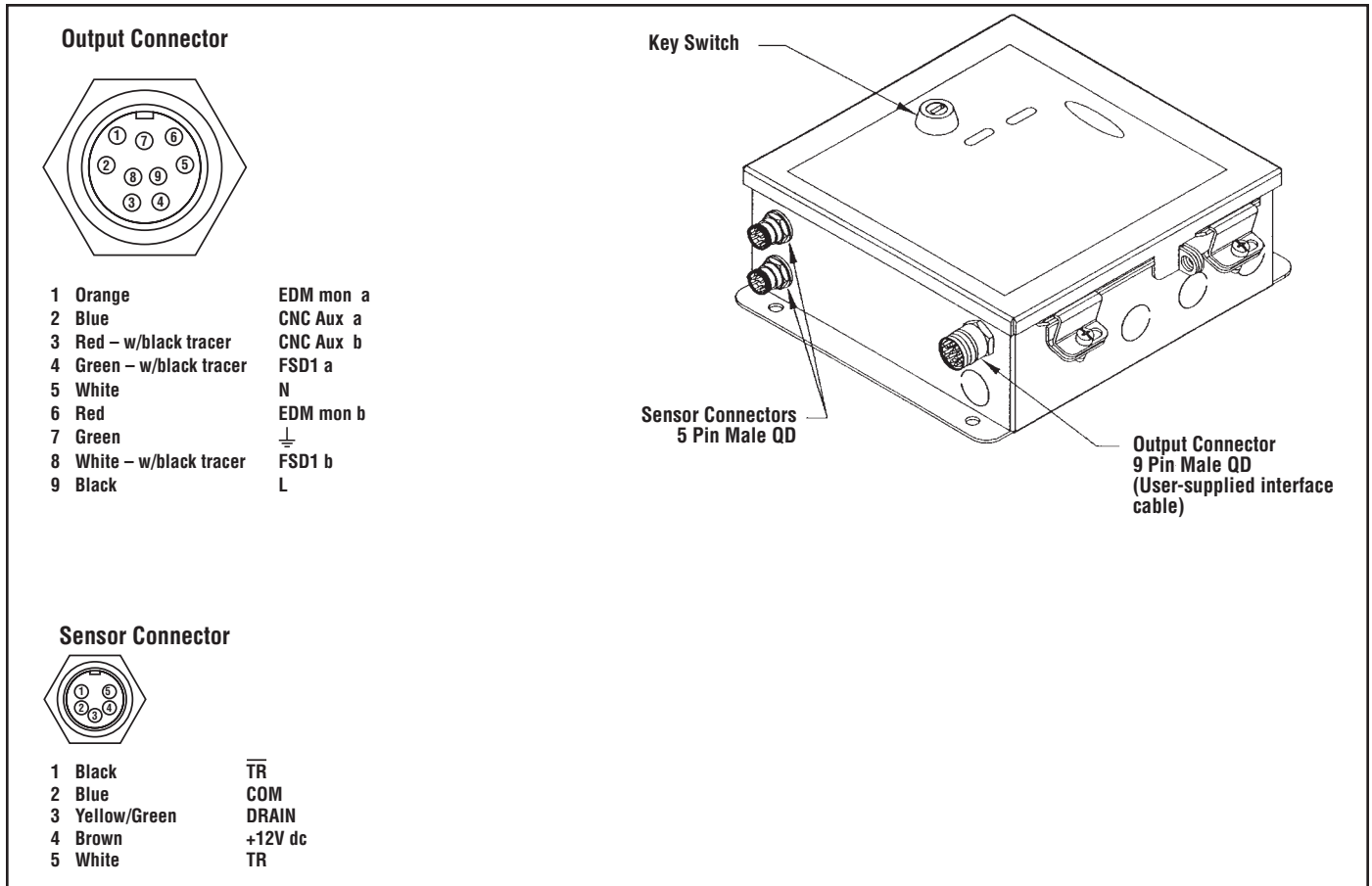


Figure 19 Addition  
Figure 19(s). Location and description of QD connectors

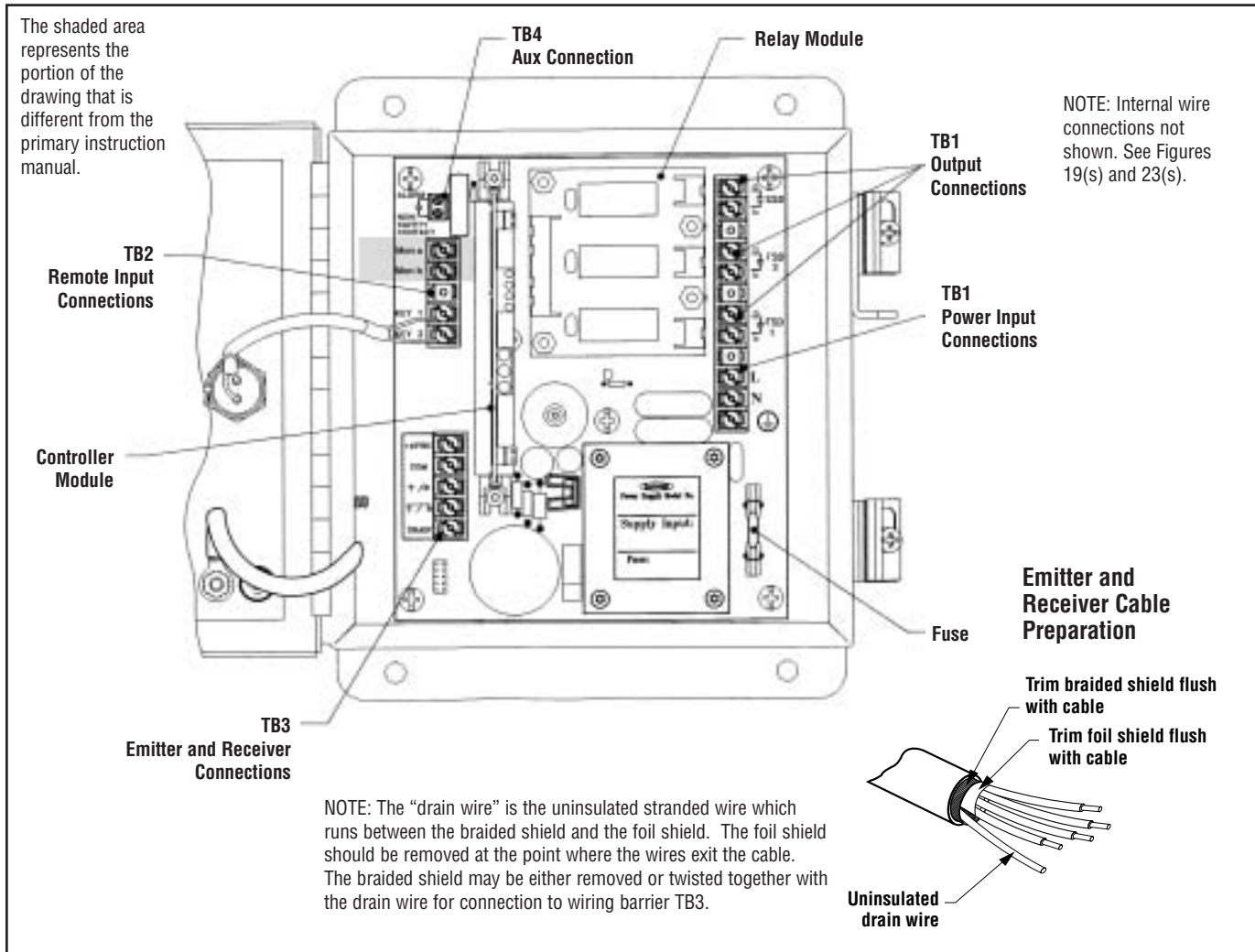


Figure 20 Replacement  
Figure 20(s). MINI-SCREEN System Electrical Connections

### 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.

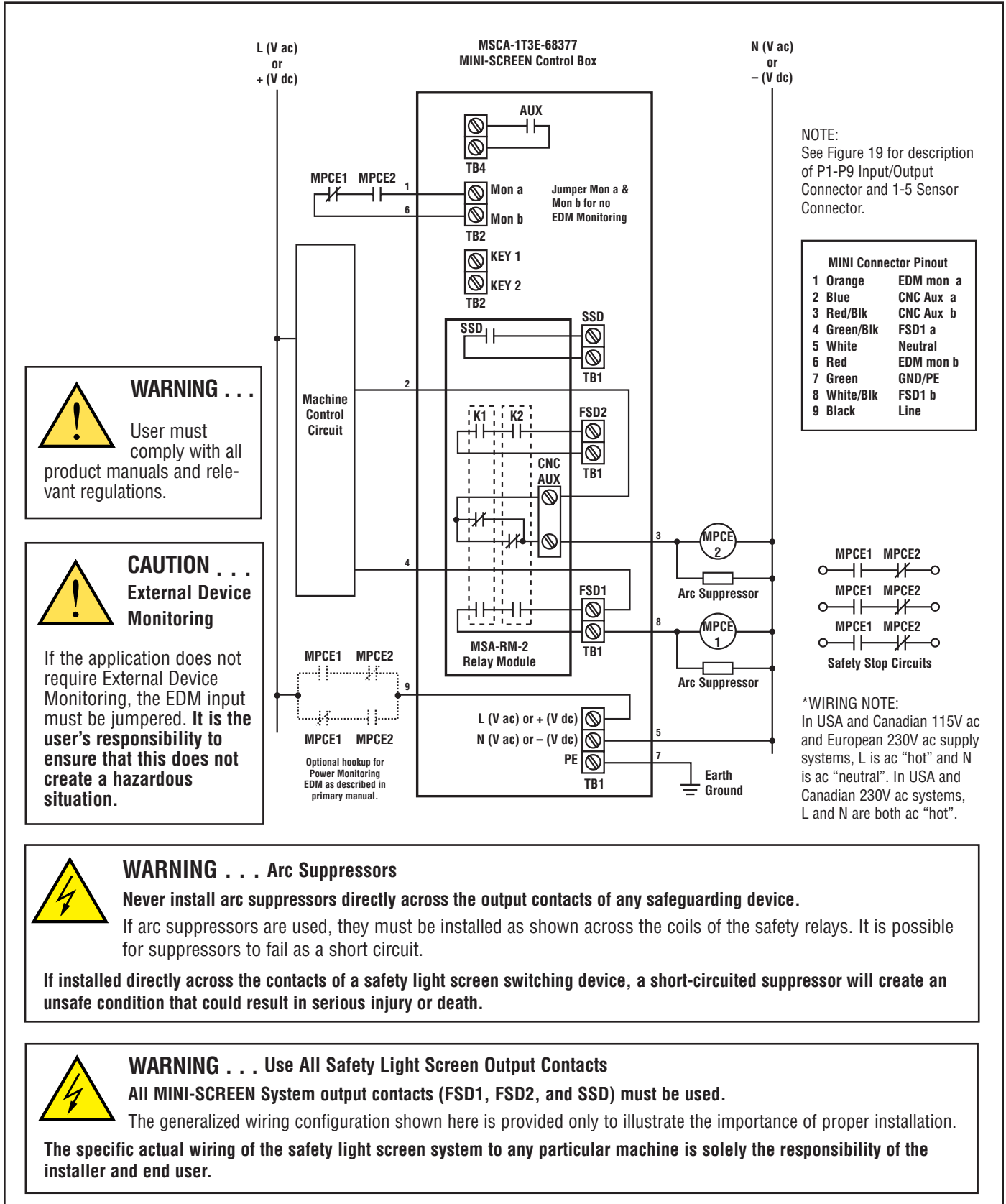


Figure 23 Replacement  
Figure 23(s). Generic Machine Interface, MINI-SCREEN MSCA-1T3E-68377 System with the MSA-RM-2 relay pack.

## 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 3.5.7 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).



#### 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 forced-guided 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 5.1 Addition

5.1(s) Troubleshooting Lockout Conditions











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

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.



**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 “<b>Test input</b>” 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 100ma.</p>
<p><b>Output configuration (FSD1, FSD2, and SSD)</b> (Replaces “<b>Output configuration</b>” category)</p>	<p>Forced-guided contacts relays,  <b>FSD1 and FSD2:</b> 250V ac at 6A max (resistive load)  <b>CNC:</b> 250V ac at 6A 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**

59658	<b>DEC-507C</b>	2.1 m (7') 5-pin Female both ends (20 ga)
47360	<b>DEC-515C</b>	5 m (15') 5-pin Female both ends (20 ga)
47361	<b>DEC-525C</b>	8 m (25') 5-pin Female both ends (20 ga)
52369	<b>DEC-540C</b>	12 m (40') 5-pin Female both ends (20 ga)
47362	<b>DEC-550C</b>	15 m (50') 5-pin Female both ends (20 ga)
52395	<b>DEC-560</b>	18 m (60') 5-pin Female both ends (16 ga)
52365	<b>DEC-570</b>	21 m (70') 5-pin Female both ends (16 ga)
52366	<b>DEC-5100</b>	30 m (100') 5-pin Female both ends (16 ga)
57137	<b>DEC-5125</b>	38 m (125') 5-pin Female both ends (16 ga)

**Section Addition**

**Replacement Parts, MINI-SCREEN Systems**

64800	<b>MSAB-1E</b>	Microprocessor control module (for MSCA-1T3E)
59689	<b>MSA-RM-2</b>	Replacement relay module with two N.O. FSDs and one C.N.C

**WARRANTY:** Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.