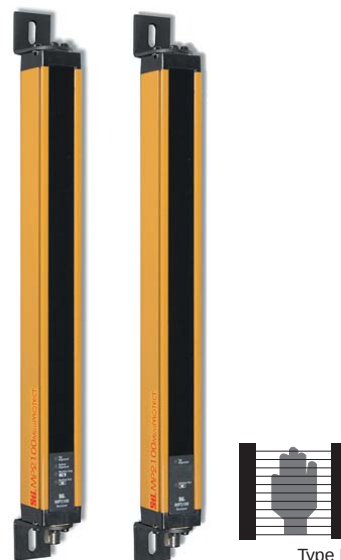




MiniProtect MP2100

Installation and Operating Manual



Type II

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WARNING! DO NOT use this Protective Light Curtain where a risk assessment has determined that control reliability is required, such as for hazardous machinery. Use only for equipment where the worst cast injury from an accident can be remedied by simple first aid, as determined by a thorough risk assessment. DO NOT use unless the device is installed, tested, and inspected according to STI's installation manual. This protective device meets the Type 2 requirements of IEC 61496. It DOES NOT meet U.S. OSHA 1910.217, ANSI B11, or ANSI/RIA R15.06 requirements.

If you are unsure of which model of light curtain to choose, contact STI (1/800/510-4357, or www.sti.com). Failure to comply with this warning could result in serious injury or death.



MP2100 Safety Light Curtain

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1 IMPORTANT SAFETY WARNINGS

1

⚠ WARNING! *Read and understand this section prior to installing the MP2100 system.*

DO NOT use this Protective Light Curtain where a risk assessment has determined that control reliability is required, such as for hazardous machinery. Use only for equipment where the worst cast injury from an accident can be remedied by simple first aid, as determined by a thorough risk assessment.

DO NOT use unless the device is installed, tested, and inspected according to STI's installation manual. This protective device meets the Type 2 requirements of IEC 61496. It DOES NOT meet U.S. OSHA 1910.217, ANSI B11, or ANSI/RIA R15.06 requirements.

If you are unsure of which model of light curtain to choose, contact STI (1/800/510-4357, or www.sti.com). Failure to comply with this warning could result in serious injury or death.

Whether a specific machine application and a MP2100 system installation complies with safety regulations depends on the proper application, installation, maintenance and operation of the MP2100 system. These items are the responsibility of the purchaser, installer and employer.

The employer is responsible for the selection and training of personnel to properly install, operate, and maintain the machine and its safeguarding systems. A MP2100 system should only be installed, verified and maintained by a *qualified* person. A qualified person is defined as “a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training or experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.” (ANSI B30.2-1983)

To use a MP2100 system the following requirements must be met:

- The guarded machine must be able to stop anywhere in its cycle. Do not use a safety light curtain on a press with a full-revolution clutch.
- The guarded machine must not present a hazard from flying parts.
- The guarded machine must have a consistent stopping time and adequate control mechanisms.
- Severe smoke, particulate matter and corrosives may degrade the efficiency of a safety light curtain. Do not use the MP2100 system in this type of environment.
- All applicable governmental and local rules, codes, and regulations must be satisfied. This is the employer's responsibility.
- All safety-related machine control elements must be designed so that a alarm in the control logic or failure of the control circuit does not lead to a failure to danger.
- Additional guarding may be required for access to dangerous areas not covered by the MP2100 system.
- Perform the STI test procedure at installation and after maintenance, adjustment, repair or modification to the machine controls, tooling, dies or machine, or the MP2100 system.
- Perform only the test and repair procedures outlined in this manual.
- Follow all procedures in this manual for proper operation of the MP2100 system.

The enforcement of these requirements is beyond the control of STI. The employer has the sole responsibility to follow the preceding requirements and any other procedures, conditions and requirements specific to his machinery.

2 SIGNIFICANT FEATURES

2.1 STANDARD FEATURES

Automatic Start Mode

Start/Restart interlock Mode (Optional)

Adjustable Mounting Brackets

Two Safety (PNP) Outputs

All intelligence in transmitter and receiver. No separate control box required.

2.2 SYSTEM COMPONENTS AND INDICATORS

Refer to “Figure 2-1” on page A-6 for the location of the components and indicators listed below.

Table 2-1 System Components Identification

Chart #		Chart #	
1	RECEIVER	7	TRANSMITTER
2	Machine Run Indicator – Green	8	Status Indicator – Yellow
3	Machine Stop Indicator – Red	9	Power Indicator - Green
4	Top Alignment Indicator - Yellow	10	Detection Zone
5	Bottom Alignment Indicator - Yellow	11	Synchronization Beam
6	Receiver connections		

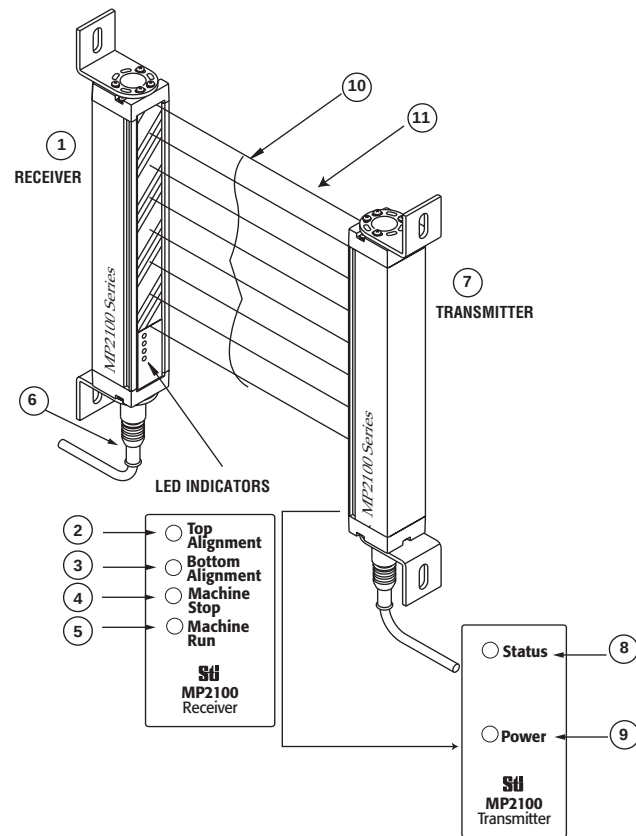


Figure 2-1 System Drawing

3 SYSTEM OPERATION

A MP2100 system is a microprocessor-controlled, infrared transmitted-beam protective light curtain. The system consists of a receiver assembly and a transmitter assembly. The receiver and transmitter assemblies are not physically interconnected.

The MP2100 system is used for personnel guarding, where the possibility of minor injury may exist. It may also be used for process safeguarding, where the contamination of sensitive components is of major concern.

⚠ WARNING: DO NOT use this Protective Light Curtain where a risk assessment has determined that control reliability is required, such as for hazardous machinery. Use only for equipment where the worst cast injury from an accident can be remedied by simple first aid, as determined by a thorough risk assessment.

DO NOT use unless the device is installed, tested, and inspected according to STI's installation manual. This protective device meets the Type 2 requirements of IEC 61496. It DOES NOT meet U.S. OSHA 1910.217, ANSI B11, or ANSI/RIA R15.06 requirements.

If you are unsure of which model of light curtain to choose, contact STI (1/800/510-4357, or www.sti.com). Failure to comply with this warning could result in serious injury or death.

3.1 OPERATING STATES

The operating condition of a MP2100 system is described in terms of states. The following operating states exist:

3.1.1 MACHINE RUN



The two receiver safety outputs are in the ON state, the green machine run indicator is lit, the protected machine is allowed to operate.

3.1.2 MACHINE STOP



The two receiver safety outputs are in the OFF state, the red machine stop indicator is lit, the protected machine is not allowed to operate.

3.1.3 INTERLOCK

The two receiver safety outputs are in the OFF state, the red machine stop indicator is lit. The interlock state does not allow the protected machine to operate until the detection zone is clear of obstructions and the start button is pressed and released.

3.2 OPERATING MODES

System operating modes determine the start-up and operating behavior of a MP2100 system. Operating mode definitions rely on the operating states presented above.

NOTE! If internal faults are detected by the MP2100 system during power-up or operation, it will enter the Interlock state with its safety outputs in the OFF state.

3.2.1 AUTOMATIC START

A MP2100 system will power-up with its safety outputs OFF, and, if the detection zone is not obstructed, enter the machine run state. In this state, when an object is sensed entering the detection zone, the MP2100 system will change from machine run to machine stop and remain in this state until the obstruction is removed. Once the detection zone is clear, the MP2100 system will automatically change from machine stop to machine run.

3.2.2 START/RESTART INTERLOCK

A MP2100 system will power-up with its safety outputs OFF and enter the interlock state. To enter the machine run state, the detection zone must be clear, and then the operator must press and release the Start button. In the machine run state, when an object is sensed entering the detection zone the MP2100 system will change from machine run to interlock. The MP2100 system will remain in the interlock state even after the obstruction is removed from the detection zone. To enter the machine run state, the operator must press and release the start button. If any obstruction is present in the detection zone when the start button is pressed and released, the MP2100 system will remain in the interlock state.

NOTE! The definitions above mention a start button. See Section 10–“Connecting to the Machine Control Circuit” for wiring of the start button.

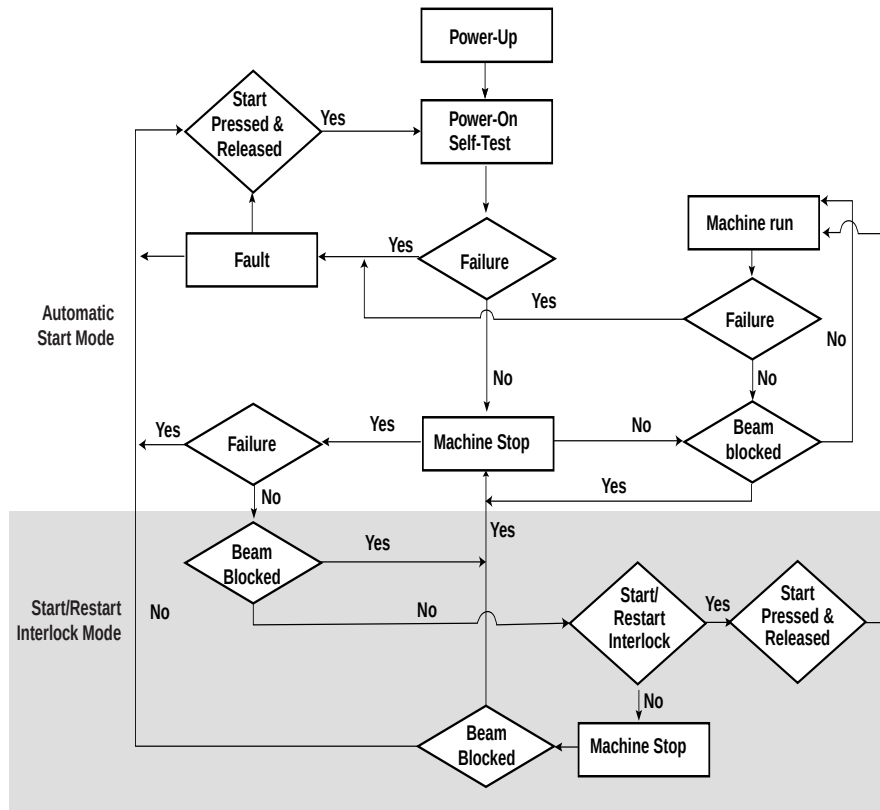


Figure 3-1 Functional Flow Diagram

3.3 OPERATING MODE SELECTION

The mode of operation is **only** factory configurable, it needs to be selected at the time of purchase. If the operation mode need to be changed, the unit must be returned for re-configuration to STI.

4 OUTPUTS

4

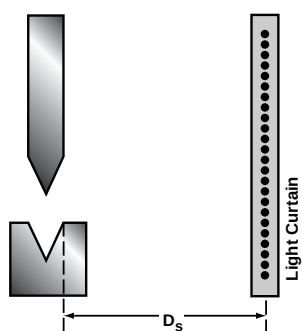
4.1 SAFETY OUTPUTS

⚠ WARNING! *This product is designed for use on a 24 VDC, negative ground (protective earth) electrical system only. Never connect the MP2100 system to a positive ground (protective earth) system. With a positive ground (protective earth) wiring scheme, certain simultaneous shorts of both safety outputs may not be detected and the guarded machine may not stop resulting in severe operator injury.*

The MP2100 system receiver supplies two independent PNP-type, safety outputs to provide run/stop signals to the guarded machine. In the machine run state, the safety outputs are electrically conducting and source 500 milliamps of current at 24 VDC. In the machine stop state, the outputs are not electrically conducting.

5 SAFE MOUNTING DISTANCE

5



D_s is the minimum safe distance between the light curtain sensing field and the point of operation hazard (pinch point).

Figure 5-1 Safe Mounting Distance

⚠ WARNING! *Never install a MP2100 system without regard to the safety distance. If the MP2100 system is mounted too close to the point of operation hazard, the machine may not stop in time to prevent an operator injury.*

A MP2100 system must be mounted far enough from the machine danger zone so the machine will stop before a hand or other body part reaches the hazardous area. This distance is called the safety distance. It is a calculated number based on a formula. See figure 8-1 for an illustration of the safety distance.

Regardless of the calculated distance, a MP2100 system should never be mounted closer to point of operation hazard than specified. This is required by Table 0-10 in OSHA 1910.217.

5.1 EUROPEAN SAFETY DISTANCE FORMULAS

The following discussion is based on standard EN999 and applies to light curtains used in industrial environments.

5.1.1 SAFETY DISTANCE FORMULA FOR SYSTEMS WITH A MINIMUM OBJECT RESOLUTION OF 40 MM OR LESS

When the minimum object resolution of the system is 40 mm or less, use the following formula:

$$S = (K \times T) + C$$

where:

S = the minimum distance in millimeters, from the danger zone to the detection point, line, plane or zone.

$$K = 2000 \text{ mm/s}$$

T = the overall system stopping performance in seconds.

$$T = t_1 + t_2$$

t_1 = response time of the safety light curtain in seconds. This response time is given in Table *Table 10-1*.

t_2 = maximum stopping time of the machine in seconds.

$$C = 8(d - 14 \text{ mm}), \text{ but not less than zero.}$$

d = the minimum object detection of the MP2100 system in millimeters, which is 30 mm.

i.e.:

$$S = (2000 \text{ mm/s} \times T) + 8(d - 14 \text{ mm})$$

This formula applies for all minimum distances of S up to and including 500 mm. The minimum value of S shall not be less than 100 mm.

If S is found to be greater than 500 mm using the formula above, then the formula below can be used. In this case the minimum value of S shall not be less than 500 mm.

$$S = (1600 \text{ mm/s} \times T) + 8(d - 14 \text{ mm})$$

5.1.2 FACTORS AFFECTING THE SAFETY DISTANCE FORMULA

When light curtains are used for machine initiation, their minimum object resolution must be 30 mm or smaller (based on EN 999, other standards may vary). In this case the formula given in section 5.1.1 applies except that the minimum distance S shall be greater than 150 mm.

For parallel approach the formula for C becomes:

$$C = 1200 \text{ mm} - (0.4 \times H), \text{ but not less than } 850 \text{ mm}$$

H = the height of the detection zone above the floor in mm.

6 INSTALLATION

6.1 REFLECTIVE SURFACE INTERFERENCE

A reflective surface adjacent to the detection zone can deflect the optical beam and may cause an obstruction in the zone not to be detected. (See *Figure 6-1* and *Figure 6-2*.) The reflective surface may be part of the machine, mechanical guard or workpiece. Therefore, a minimum distance (d) must exist between the reflective object and the center line of the MP2100 detection zone. The Test Procedure (Appendix B) must be used to test for this condition.

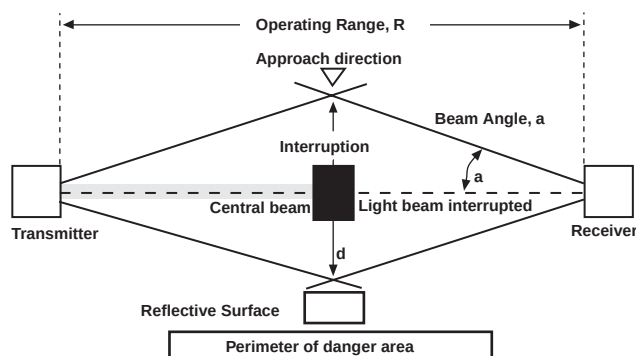


Figure 6-1 Correct Mounting Example with Proper Alignment.

The interruption is clearly detected. The reflective object is outside of the beam angle

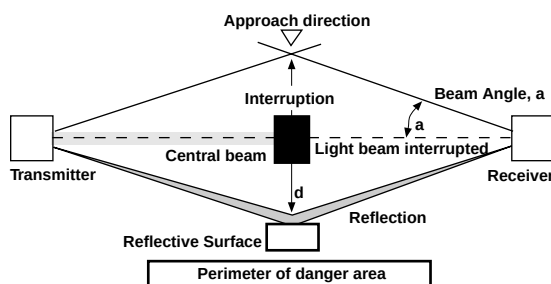


Figure 6-2 Unsafe Mounting Example

The interruption is not detected because of the reflection. The reflective object is inside the beam angle.

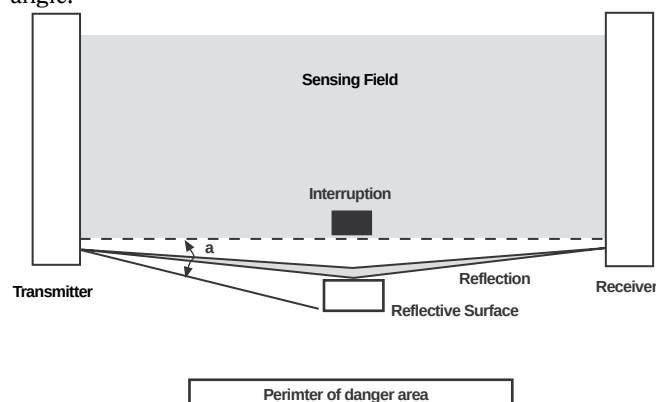


Figure 6-3 Unsafe Mounting Example

Interruption is not detected because of the reflection. Reflective surface interference may also appear above and below the sensing field.

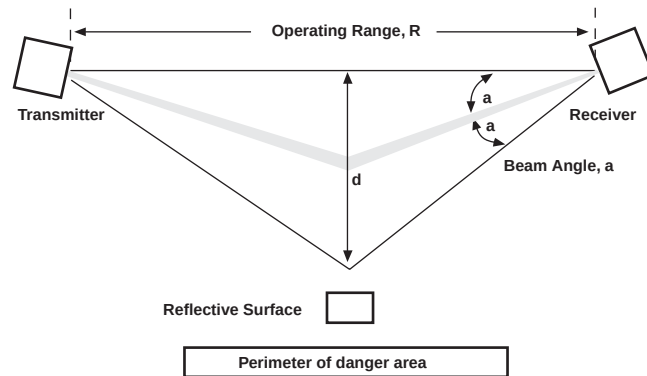


Figure 6-4 Worst Case Alignment Example

This example shows the minimum distance from the reflective surface, d , to one side of the beam center line.

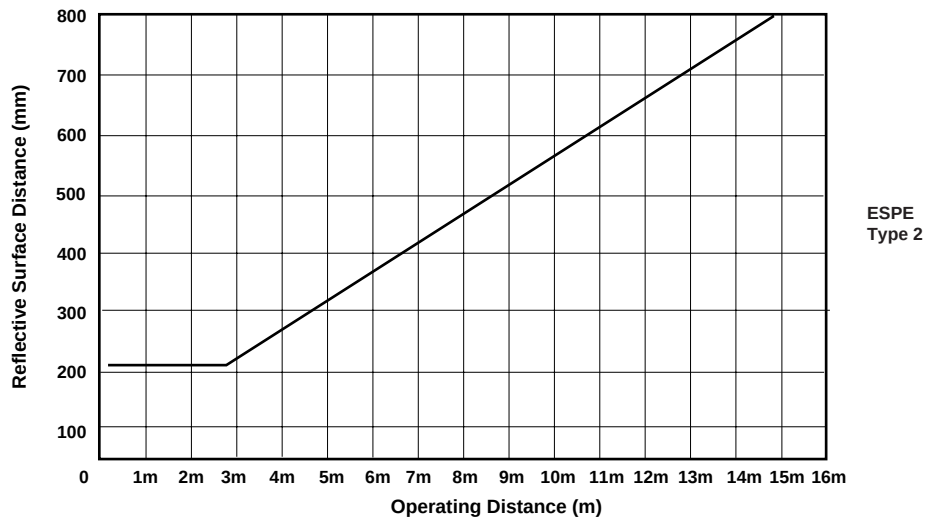


Figure 6-5 Minimum Distance from a Reflective Surface as a Function of Range

6.2 GENERAL CONSIDERATIONS

6.2.1 ADDITIONAL GUARDING

Areas of access to the point of hazardous operation not guarded by the MP2100 system must be protected by suitable means such as a fixed barrier guard, an interlocked guard or a safety mat. See *Figure 6-6*.

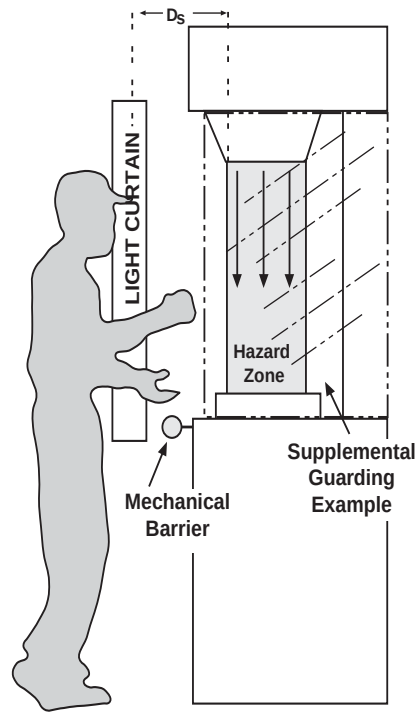


Figure 6-6 Correct Light Curtain Installation Example

6.2.2 INSTALLATION OF MULTIPLE SYSTEMS

When two or more MP2100 systems are mounted in close proximity and in alignment with each other, precautions should be taken to avoid one curtain interfering with another. This can be corrected by mounting the transmitters and receivers back-to-back or stacked. See *Figure 6-7* for reference.

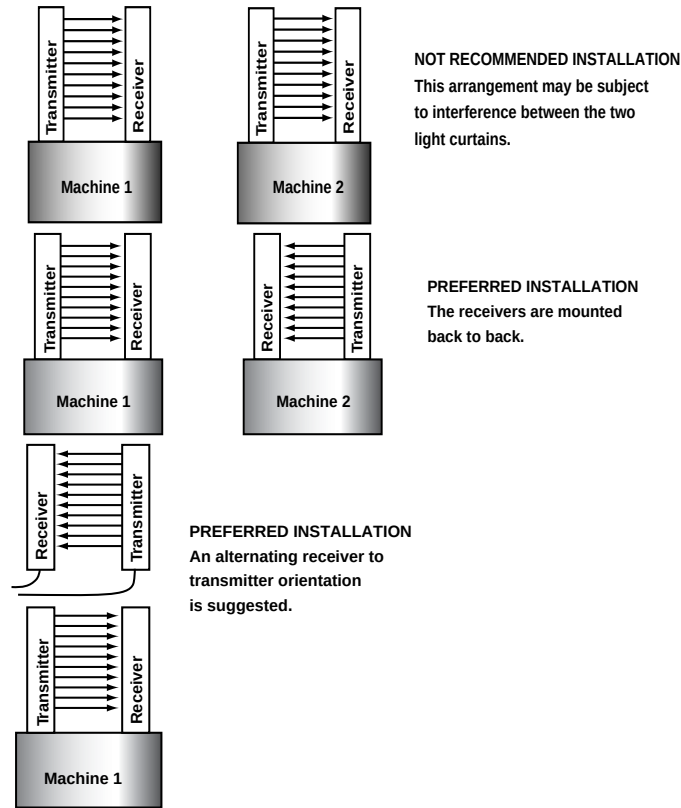


Figure 6-7 Multiple Light Curtain Installation Configurations

6.2.3 DETECTION ZONE

The MP2100 system detection zone is delineated by the indicator labels of the transmitter and receiver. The area outside these marks is not protected. Position the MP2100 system so that it is only possible to access the danger point through the detection zone. See *“Figure 10-1”* on page A-25

6.2.4 INPUT POWER REQUIREMENTS/CONNECTIONS

The MP2100 system operates directly from 24 VDC $\pm 20\%$. Power to the MP2100 system must come from a dedicated power supply which meets the requirements of IEC 60204-1 and IEC 61496-1, STI part number 42992 or equivalent. The MP2100 system internally generates voltages for its own use. No other devices should be connected to these voltages.

6.2.5 SPECIAL REQUIREMENTS FOR PERIMETER GUARDING

In perimeter guarding applications the MP2100 system detection zone is placed around the outside perimeter of a guarded machine or robot. This placement leaves space for personnel to stand between the detection zone and the hazardous machine.

In this case, the guarded machine must only be restarted using a switch located outside and with a full view of the area of hazardous motion. Operation of the MP2100 system in the start/restart interlock operating mode is suitable for perimeter guarding.

6.2.6 PRESENCE SENSING DEVICE INITIATION

Using the light curtain to initiate a machine after an object is removed from the sensing area is called Presence Sensing Device Initiation (PSDI). Use of PSDI places additional requirements on the guarding and safety controls. Contact STI for further information. Good sources of reference for PSDI include: ANSI RIA 15.06-1999, OSHA 1910.217(h), and ANSI B11.2-1995.

6.3 ALIGNMENT PROCEDURE

Physical alignment of the transmitter and receiver is easiest when the system is in the same plane and height. To ease the alignment process two yellow LED indicators are available on the MP2100. The MP2100 needs to be physically mounted (not fully tightened) with the electrical connection completed.

- Check that the power (green) LED and the Status (yellow) LED on the transmitter are both On.
- Check that the light curtain field is free/clear of any obstruction.
- With the receiver in a fixed position adjust the transmitter so that the top Alignment (yellow) LED is Off. This represents the alignment of the top LED.
- Rotate the transmitter until the Bottom Alignment (yellow) LED is Off. This represents the alignment of the bottom LED.
- The Machine Run (green) LED should be On.
- Rotate the transmitter, define and mark the area in which the Machine Run (green) LED is on. Then position the transmitter in the center of the marked area. Fully tighten the transmitter hardware.
- Rotate the receiver, define and mark the area in which the Machine Run (green) LED is on. Then position the receiver in the center of the marked area. Fully tighten the receiver hardware.
- Test the light curtain as indicated in Section 8—*Checkout and Test Procedures*.
- Refer to Table 6-1 *Receiver Indicators Status* below.

Receiver Indicators Status					
Machine Run	Machine Stop	Top Alignmet	Bottom Alignment	Status	Notes:
Green	Red	Yellow	Yellow		
OFF	ON	ON	ON	Misaligned	Top channel (sync beam) is blocked
OFF	ON	OFF	ON	Misaligned	Bottom channel is blocked
OFF	ON	ON	OFF	Aligned	Waiting for a start input, if in Interlock Mode
ON	OFF	OFF	OFF	Field Clear	Machine is running
OFF	ON	OFF	OFF	Field Blocked	Top and bottom channels are clear, other channels may be blocked or misaligned.

Table 6-1 Receiver Indicators Status

7 CONNECTING TO THE MACHINE CONTROL CIRCUIT

7

⚠ WARNING! This product is designed for use on a 24 VDC, negative ground (protective earth) electrical system only. Never connect the MP2100 system to a positive ground (protective earth) system. With a positive ground (protective earth) wiring scheme, certain simultaneous shorts of both safety outputs may not be detected and the guarded machine may not stop resulting in severe operator injury.

⚠ WARNING! Never use only a single safety output to control the machine. Should this single output fail, the machine may not stop, resulting in severe operator injury. The machine must be connected using both safety outputs.

DO NOT use this Protective Light Curtain where a risk assessment has determined that control reliability is required, such as for hazardous machinery. Use only for equipment where the worst cast injury from an accident can be remedied by simple first aid, as determined by a thorough risk assessment. **DO NOT** use unless the device is installed, tested, and inspected according to STI's installation manual. This protective device meets the Type 2 requirements of IEC 61496. It **DOES NOT** meet U.S. OSHA 1910.217, ANSI B11, or ANSI/RIA R15.06 requirements.

If you are unsure of which model of light curtain to choose, contact STI (1/800/510-4357, or www.sti.com). Failure to comply with this warning could result in serious injury or death.

7.1 ELECTRICAL CONNECTIONS

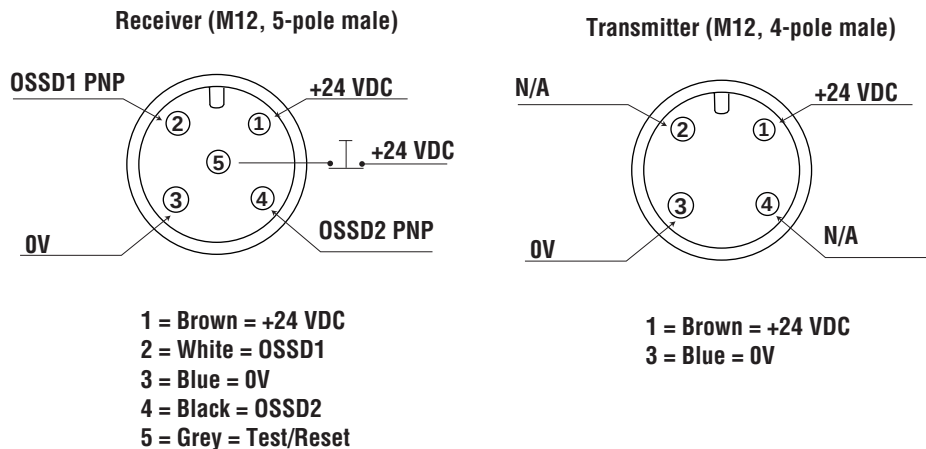


Figure 7-1 Electrical Connections on Receiver and Transmitter

7.2 CONNECTING TO A SAFETY MONITORING DEVICE

Connecting to Machine Control System Via Safety Monitoring Device

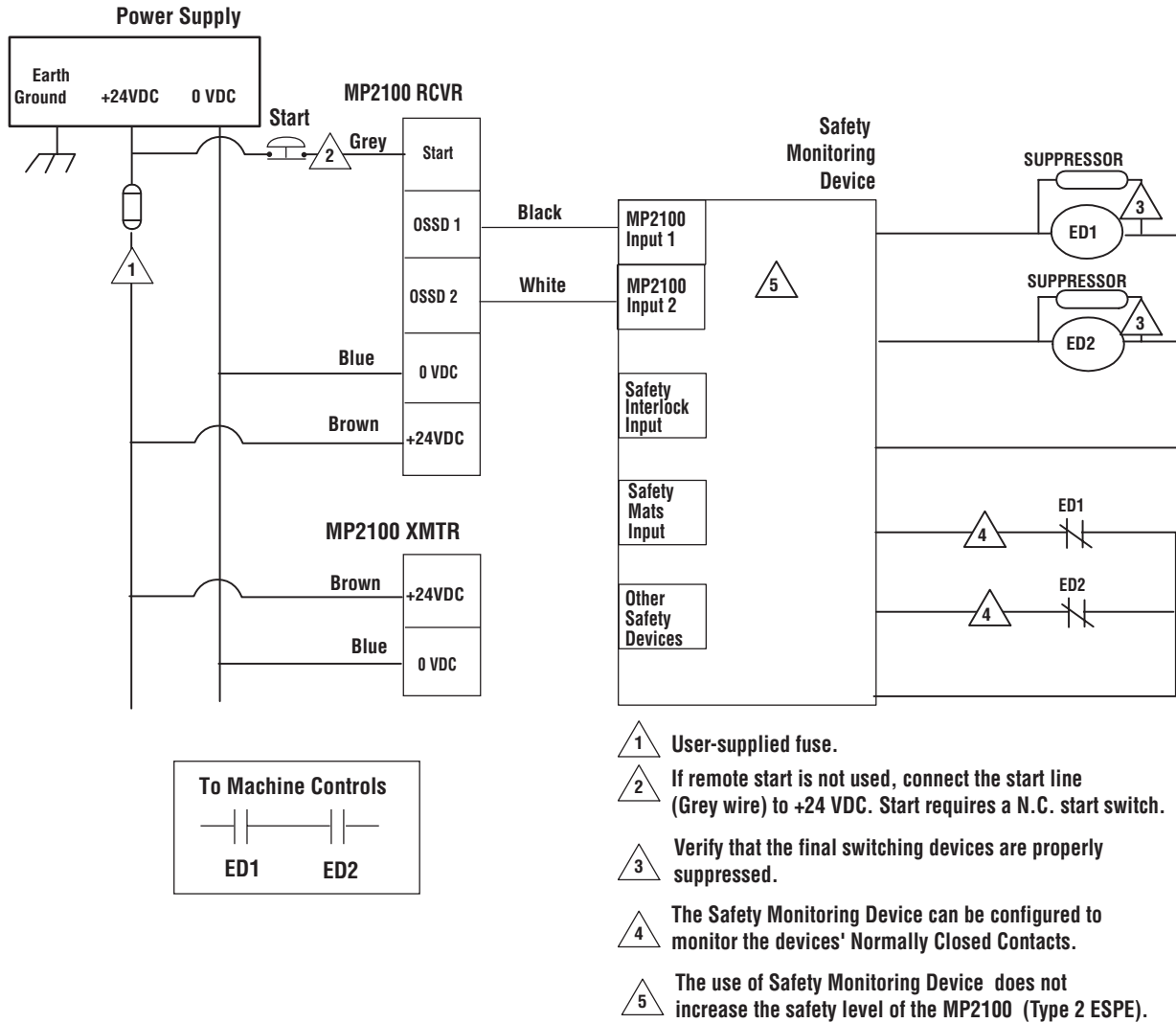


Figure 7-2 Connecting to a Safety Monitoring Device

7.3 CONNECTING VIA AN RM-1 MODULE

The STI RM-1 Module provides force-guided relay outputs for machine control. (OSSD) Safety outputs 1 and 2 are connected to the RM-1 and provide the power necessary to energize its relays. See *Figure 7-3* for the preferred connection method using the RM-1.

Connecting to Machine Control System Via RM1

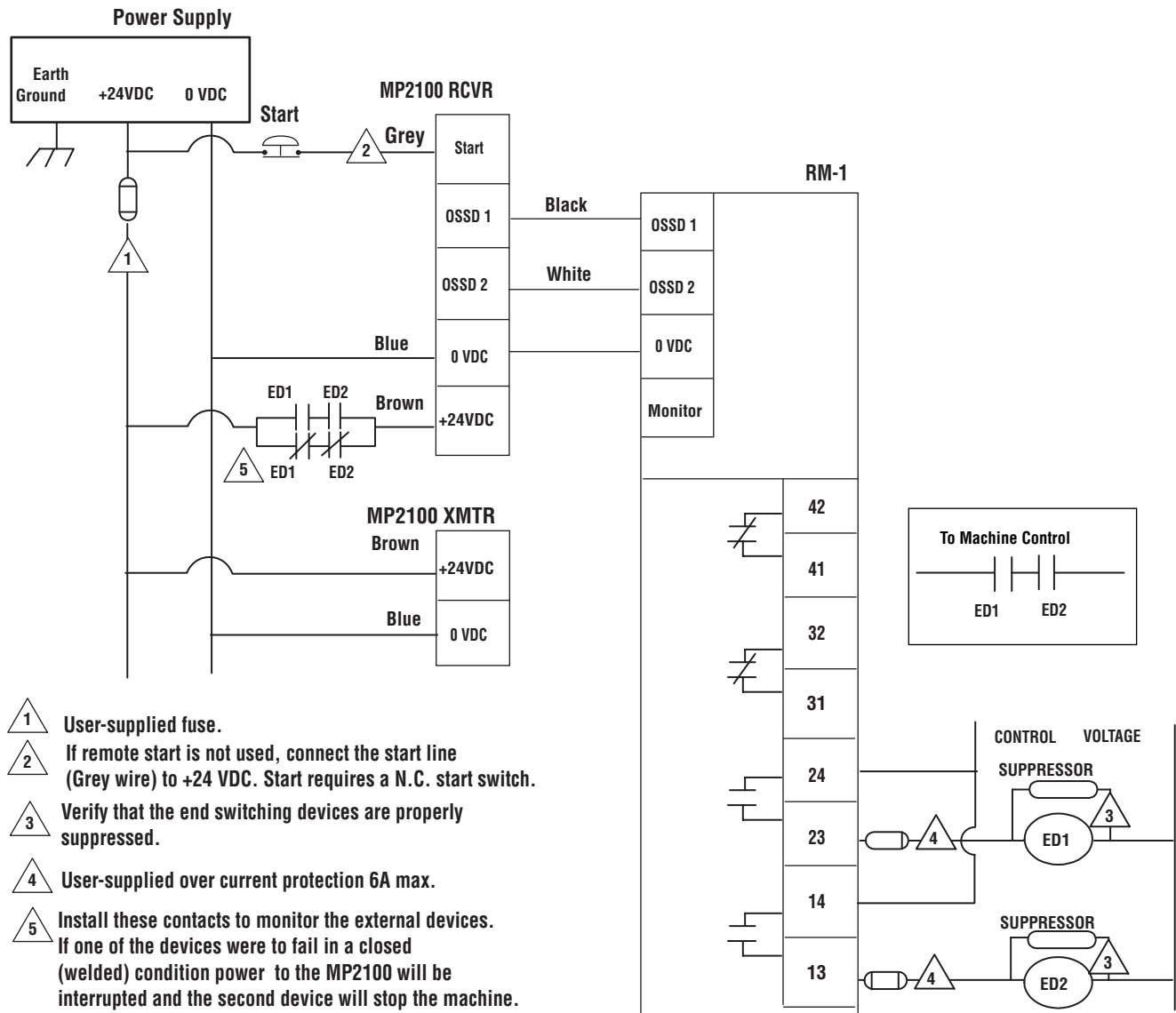


Figure 7-3 Connecting via an RM-1 Module

7.4 CONNECTING VIA AN RM-X MODULE

The STI RM-1 Module provides force-guided relay outputs for machine control. (OSSD) Safety outputs 1 and 2 are connected to the RM-X and provide the power necessary to energize its relays. See *Figure 7-4* for the preferred connection method using the RM-X.

Connecting to Machine Control System Via RM-X Module

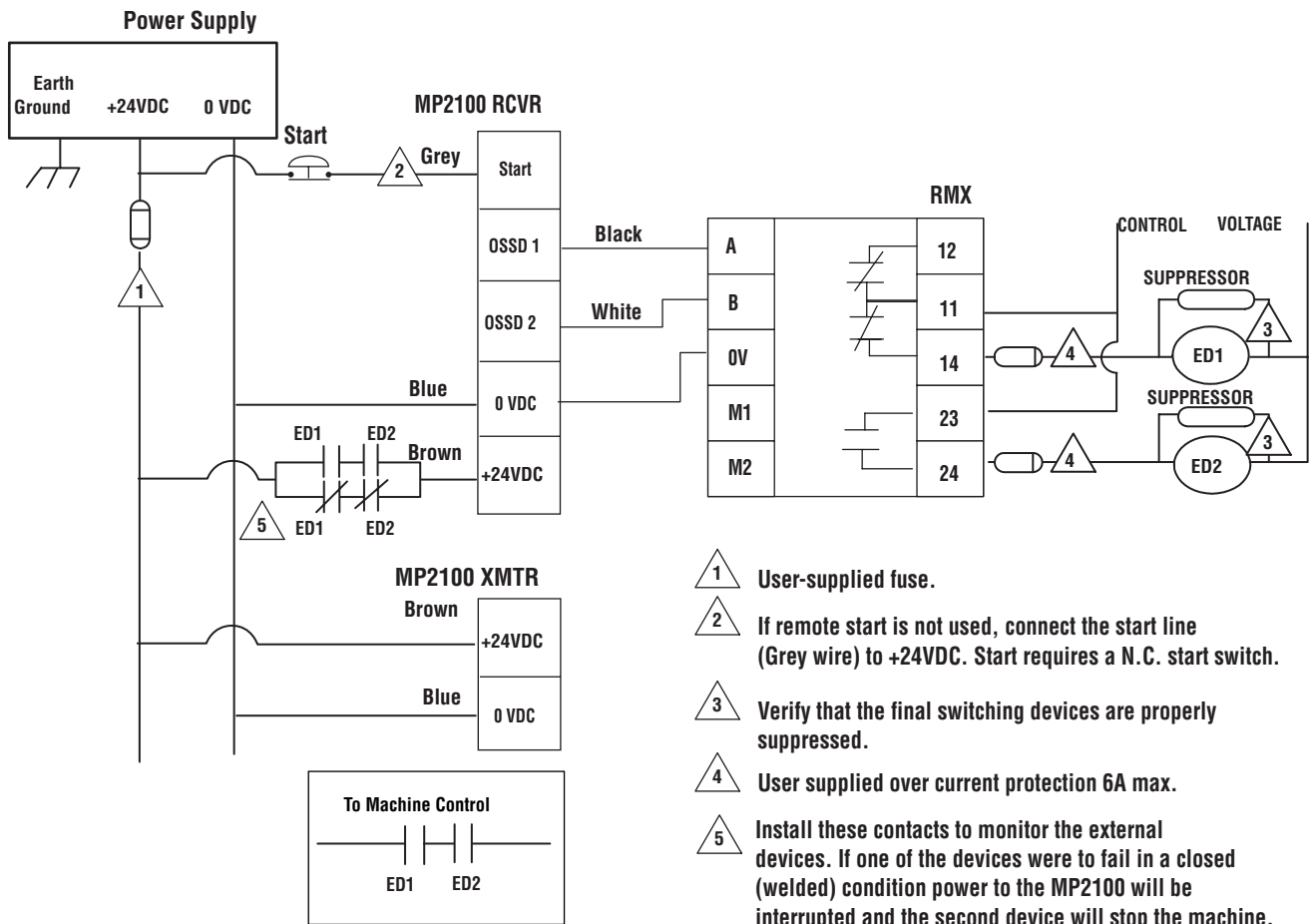
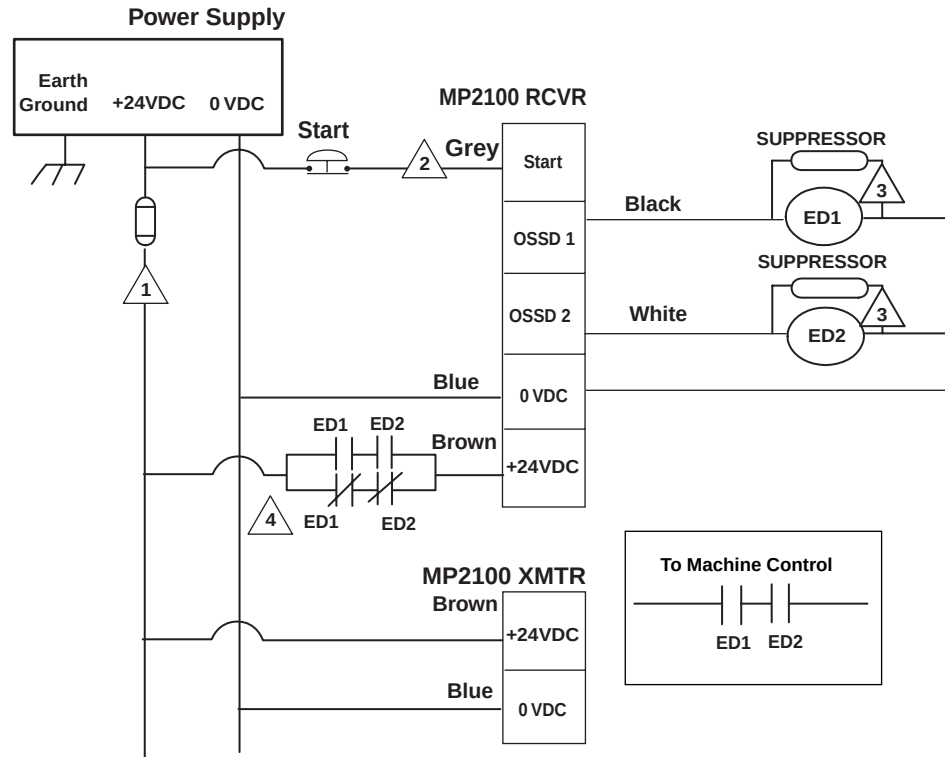


Figure 7-4 Connecting via an RM-X Module

7.5 CONNECTING VIA TWO FORCE-GUIDED RELAYS

FGR series relays provides force-guided relay outputs for machine control. See *Figure 7-5* for the preferred connection method using two force-guided relays.

Connecting to Machine Control System Via Two Forced Guided Relays



- 1** User-supplied fuse.
- 2** If remote start is not used, connect the start line (Grey wire) to +24 VDC. Start requires a N.C. start switch.
- 3** The external devices must be suppressed with the components provided in the Documentation Kit.
- 4** Install these contacts to monitor the external devices. If one of the devices were to fail in a closed (welded) condition power to the MP2100 will be interrupted and the second device will stop the machine.

Figure 7-5 Connecting Via Two Force-guided Relays

7.6 OPTIONAL GROUNDING METHOD

Each MP2100 head is designed to connect to ground (earth) by screwing the mounting brackets to a machine chassis that is earthed. If the installation does not allow this, it is recommended a wire (16-22 AWG) be added to one of the screws used to attach the mounting bracket to the endcap. The other end of the wire should be connected to ground (earth). The documentation kit includes ring lugs for this optional connection. See *Figure 7-6*.

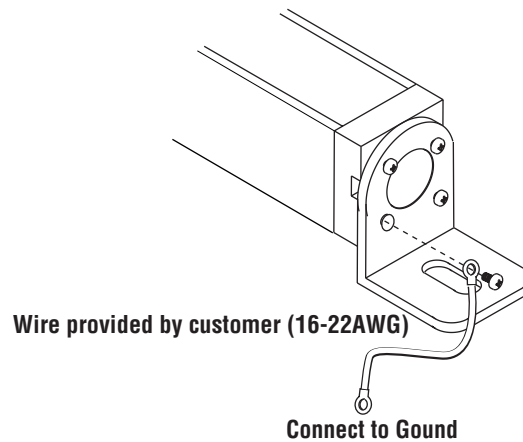


Figure 7-6 Optional Grounding

8 CHECKOUT AND TEST PROCEDURES

8

8.1 CHECKOUT PROCEDURE

Once the MP2100 system has been configured, mounted, aligned and properly connected to the machine control system, the initial Checkout Procedure detailed in Appendix A must be performed by qualified personnel. A copy of the checkout results should be kept with the machine records.

8.2 TEST PROCEDURE

⚠ WARNING! *The tests outlined in the Test Procedure in Appendix B must be performed at installation, according to the employer's regular inspection program and after any maintenance, tooling change, set up, adjustment, or modification to the MP2100 system or the guarded machine. Where a guarded machine is used by multiple operators or shifts, it is suggested that the test procedure be performed at each shift or operation change. Testing ensures that the light curtain and the machine control system work properly to stop the machine. Failure to test properly could result in serious injury to personnel.*

The Test Procedure must be performed by qualified personnel. To test the MP2100 system, use the STI-supplied test object.

When using a MP2100 system set for Automatic Start Mode operation, in conjunction with an RM-1 or RM-X relay module, it is necessary to verify that the RM-1 or RM-2 outputs can properly change state by causing an intentional beam break at least every change of shift or 24 hours of operation.

8.3 USING THE TEST OBJECT

When using the test object, guide it through the detection zone as shown below.

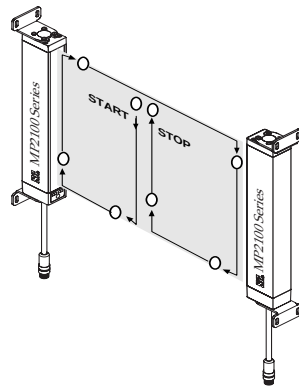


Figure 8-1 Test Object Pattern

9 CLEANING

Accumulation of oil, dirt and grease on the front filter of the MP2100 transmitter and receiver can effect the system operation. Clean filters with a mild detergent or glass cleaner. Use a clean, soft, lint-free cloth. The anodized MP2100 surfaces may be cleaned with a mild de-greasing cleaner or detergent.

10 SPECIFICATIONS AND ADDITIONAL INFORMATION

10

10.1 SYSTEM SPECIFICATIONS

Performance	
Protective Height	147 to 1470 mm (5.79 to 57.9 inches).
Operating Range	0.3 to 15 m (1 to 49 ft.).
Min. Object Resolution	30 mm (1.18 inches).
Response Time	See <i>Table 10-1</i> .
Effective Aperture Angle	± 5° per the requirements of IEC61496-1, -2 for a Type 2 ESPE
Safety Output	Two PNP each outputs sourcing 500 mA @ 24 VDC. (See note 2). Outputs are short-circuit protected.
Capacitive Load	100nF max.
Resistive Load	60 Ohms min.
Start/Restart	N.C. Input. 20mA @ 24VDC.
Power Input	Transmitter: 50 mA max. Receiver: 1.09 A max. Safety Output: OSSD1: 500 mA; OSSD2: 500mA. (See note 1). (Receiver 90mA + OSSD1 500mA max. + OSSD2 500mA max.
Power Supply	24VDC ± 20%. Must meet requirements of IEC 60204-1 and IEC 61496-1. STI part number 42992 or equivalent
Light Source	GaAlAs Light Emitting Diode, 880 nm.
Mechanical	
Cable Length	50 meters max. with (<100 Nf capacitive load and Vsupply = 24 VDC). Extension cables are available in lengths of 3, 10 and 30 meters.
Construction	Anodized aluminum.
Connections	M12 4-pole connector for transmitter; M12 5-pole connector for receiver.
Environmental	
Temperature	0 to 55°C (32 to 131°F).
Relative Humidity	95% maximum, non-condensing.
Enclosure Rating	IP65.
Indicator Lights	
Transmitter:	Power Applied, Interlock.
Receiver:	Machine Run, Machine Stop, Top Align, Bottom Align.
Shock	10g for 0.16 seconds; 1,000 shocks for each axis.
Vibration	10 - 55 Hz on all 3 axes
Approvals	The MP2100 series has been EC type examined to the requirements of IEC 61496-1, -2 for a Type 2 ESPE.
Specifications subject to change without notice.	

Note: 1: Total current required by two solid state safety outputs cannot exceed 1A. Total current requirement is the sum of transmitter (50mA max.), receiver(90mA) and OSSD1 (500mA max.) and OSSD2 (500mA max.).

Note 2: 24 VDC is nominal. Actual voltage is dependent upon supply, $V = V_{\text{supply}} - 1V$.

Specifications are subject to change without notice.

Table 10-1 Response Time

Model	Response Time
MP21-30-150	14ms
MP21-30-300	15ms
MP21-30-450	16ms
MP21-30-600	17ms
MP21-30-750	18ms
MP21-30-900	19ms
MP21-30-1050	20ms
MP21-30-1200	22ms
MP21-30-1350	23ms
MP21-30-1500	24ms

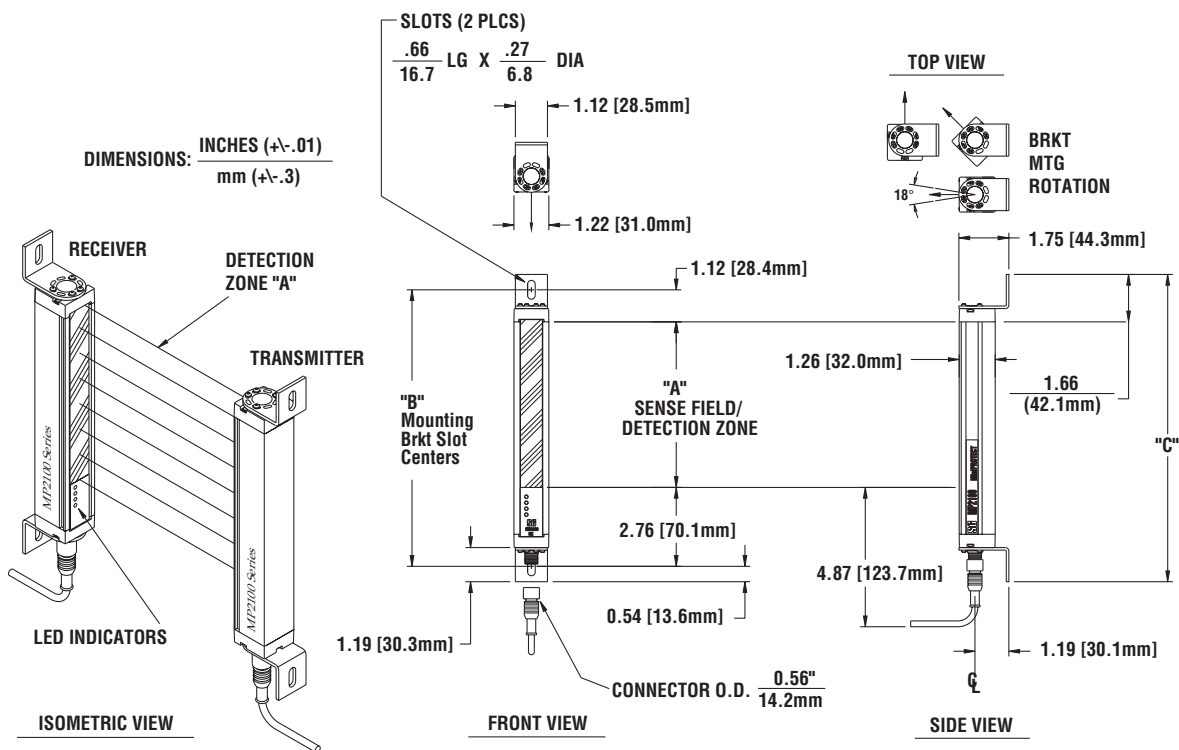


Figure 10-1 MP2100 Dimension Drawing

	150 mm	300 mm	450 mm	600 mm	750 mm	900mm	1050 mm
A	147.0/5.79	294.0/11.57	441.0/17.36	588.0/23.15	735.0/28.94	882.0/34.72	1029.0/40.51
B	245.6/9.67	392.6/15.45	539.6/21.24	686.6/27.03	833.6/32.82	980.6/38.60	1127.6/44.39
C	272.0/10.75	419.0/16.53	566.0/22.32	713.0/28.11	860.0/33.90	1007.0/39.68	1154.0/45.47

	1200 mm	1350 mm	1500mm
A	1176.0/46.304	1323.0/52.09	1470.0/57.87
B	1274.6/50.18	1421.6/55.97	1568.6/61.75
C	1301.0/51.26	1448.0/57.05	1595.0/62.83

Table 10-2 Transmitter and Receiver Lengths

10.2 SPARE PARTS

10.2.1 TRANSMITTERS MODEL NUMBERS

To order a spare transmitter, read the part number from your existing transmitter, or build a model number from the options given in the table below:

MP21-30-[1]-X

Example: MP21-30-300-X

❶ Information required. Represents system type. Designators and associated protection heights are listed below:

Designator	Protective Height (mm/inches)
150	147.0/5.79
300	294.0/11.57
450	441.0/17.36
600	588.0/23.15
750	735.0/28.94
900	882.0/34.72
1050	1029.0/40.51
1200	1176.0/46.30
1350	1323.0/52.09
1500	1470.0/57.87

10.2.2 RECEIVERS MODEL NUMBERS

To order a spare receiver, read the part number from your existing receiver, or build a model number from the options given in the table below:

MP21-30-[1]-[2]-R

Example: MP21-30-300-AS-R

❶ . Information required. Represents coverage height:

Designator	Protective Height (mm/inches)
150	147.0/5.79
300	294.0/11.57
450	441.0/17.36
600	588.0/23.15
750	735.0/28.94
900	882.0/34.72
1050	1029.0/40.51
1200	1176.0/46.30
1350	1323.0/52.09
1500	1470.0/57.87

2 . Information required. Represents specific features:

Designator	Description
AS	Automatic Start
RS	Start/Restart Interlock

Note: This feature is Factory Configured Only.

10.2.3 CABLES

Use the model numbers listed below to order spare cables.

Cable Length (m/ft.)	Receiver Part Number	Transmitter Part Number
3 m (9.8 ft.)	60661-0030	60660-0030
10 m (32.8 ft.)	60661-0100	60660-0100
30 m (98.5 ft.)	60661-0300	60660-0300

10.3 WARRANTY

STI warrants its products to be free from defects of material and workmanship and will, without charge, replace or repair any equipment found defective upon inspection at its factory, provided the equipment has been returned, transportation prepaid, within one year from the date of installation and not to exceed 18 months from date of factory shipment.

The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether expressed or implied by operation of law or otherwise including but not limited to any implied warranties of merchantability or fitness for a particular purpose. No representation or warranty, express or implied, made by any sales representative, distributor, or other agent or representative of STI which is not specifically set forth herein shall be binding upon STI. STI shall not be liable for any incidental or consequential damages, losses or expenses directly or indirectly arising from the sale, handling, improper application or use of the goods or from any other cause relating thereto and STI's liability hereunder, in any case, is expressly limited to repair or replacement (at STI's option) of goods.

Warranty is specifically at the factory or an STI authorized service location. Any on site service will be provided at the sole expense of the Purchaser at standard field service rates.

All associated equipment must be protected by properly rated electronic/electrical protection devices. STI shall not be liable for any damage due to improper engineering or installation by the purchaser or third parties. Proper installation, operation and maintenance of the product becomes the responsibility of the user upon receipt of the product.

10.4 PATENTS

Elements of the electronics and optics essential to meet the specifications and performance standards of STI controls are covered by one or more of the following U.S. Patent Numbers: 3,774,039; 3,867,628; 3,967,111; 3,996,476; 4,007,387; 4,101,784; 5,015,840; Design 255,031, and other patents pending.

10.5 TRADEMARKS

STI® is the registered trademark of Scientific Technologies Inc.

10.6 REPAIRS

STI offers product repair service at our factory. If you need repairs made to any STI product contact our Customer Service Department.

10.7 DOCUMENTATION CRITERIA

This publication has been carefully checked for accuracy and is believed to be fully consistent with the products it describes. However, STI does not assume liability for the contents of this publication, the examples used within, or the use of any product described herein. STI reserves the right to make changes to products and/or documentation without further notification.

11 GLOSSARY

11

11.1 GLOSSARY DEFINITIONS

Detection Zone: The zone within which a specified test piece will be detected by the MP2100 system.

MPCE: The electrically powered element that directly controls the normal operation of a machine in such a way that it is the last (in time) to function when machine operation is to be initiated or arrested.

OFF State: The state in which the output circuit is interrupted and does not permit current to flow.

ON State: The state in which the output circuit is complete and permits the flow of current.

Output Signal Switching Device (OSSD): The component of the safety light curtain connected to the machine control system which, when the light curtain detection zone is interrupted, responds by going to the OFF state. Also known as safety outputs.

Test Object: An opaque cylindrical object used to verify the detection capability of the MP2100 system.

12 TROUBLESHOOTING

The transmitter and receiver modules contain several status indicator leds. These leds can be used during initial setup or as a troubleshooting tool. Below are some possible faults and the recommended solutions.

Receiver Indicator Status				Fault Description	Suggested Solution
Machine Run Green	Machine Stop Red	Top Alignment Yellow	Bottom Alignment Yellow		
Off	Flashing	Flashing	Flashing	OSSD Fault	1. Check the output connections. 2. Check the output load if >0.1 uF, install a 510 ohm drain resistor. 3. Press the Test/Reset button for 0.5 sec. 4. Return to STI if problem persists.
Off	Off	Flashing	Flashing	Internal Fault Detected	1. Check the power supply rating. 2. Cycle power. 3. Press the Test/Reset button for 0.5 sec. 4. Return to STI if problem persists.
Off	Off	Off	Flashing	Machine Stopped	1. Check for proper alignment. 2. Cycle power. 3. Press the Test/Reset button for 0.5 sec. 4. Return to STI if problem persists.
Off	Off	Off	Off	Power Failure	1. Check for power connections. 2. Check the fuse.
Off	On	Off	Off	Machine Stopped	Check for proper alignment.
Transmitter Indicator Status				Fault Description	Suggested Solution
Power Green	Interlock Yellow				
On	Flashing			Internal Fault Detected	1. Check the power supply rating. 2. Cycle power. 3. Return to STI if problem persists.
Off	Off			Power Failure	1. Check for power connections. 2. Check the fuse.

Table 12-1 Troubleshooting Guide

APPENDIX A —CHECKOUT PROCEDURE

A.1 CHECKOUT PROCEDURE LOG

The following checkout procedure must be performed by qualified personnel during initial MP2100 system installation and at least every three months or more frequently depending on machine usage and company guidelines.

Machine Identification: _____ Date: _____

Item	Condition	Comments
1. Verify that the guarded machine is compatible with the type of machine which maybe used with the MP2100 system. See Section 1— <i>Important Safety Warnings</i> for further information.	☐ Pass ☐ Fail	
2. Verify that the mounting distance of the MP2100 system is equal to or greater than the minimum safe distance from the danger point. See Section 5— <i>Safe Mounting Distance</i> for further information.	☐ Pass ☐ Fail	
3. Determine that all access to the danger point not protected by the MP2100 system is guarded by other means, such as gates, fencing or other approved methods. Verify that all additional guarding devices are installed and operating properly.	☐ Pass ☐ Fail	
4. Make sure the operator is not able to stand between the MP2100 system detection zone and the machine danger point. Verify that the light curtain can only be reset from a position outside and within view of the hazardous machine area.	☐ Pass ☐ Fail	
5. Inspect the electrical connections between the guarded machine's control system and the MP2100 system. Verify that they are properly connected to the machine such that a stop signal from the MP2100 system results in an immediate halt of the machine's cycle. See Section 7— <i>Connecting To The Machine Control Circuit</i> .	☐ Pass ☐ Fail	
6. Record the test results in the machine log, then perform the Test Procedure.	☐ Pass ☐ Fail	

Technician

Signature: _____



APPENDIX B —TEST PROCEDURE

B.1 TEST PROCEDURE LOG

The following test procedure must be performed by qualified personnel during initial MP2100 system installation, according to the employer's regular inspection program and after any maintenance, adjustment or modification to the MP2100 system or the guarded machine. Testing ensures that the light curtain, safety system, and machine control system work together to properly stop the machine. Failure to test properly could result in serious injury to personnel. To test the MP2100 system, use the correct size test object.

Machine Identification: _____ Date: _____

Item	Condition	Comments
1. Disable the guarded machine. Apply power to the MP2100 system.	☐ Pass ☐ Fail	
2. Visually inspect the machine to ensure that access to the danger point is only through the MP2100 detection zone. If not, additional guarding, including mechanical barriers may be required. Verify that all additional guarding devices and barriers are installed and operating properly.	☐ Pass ☐ Fail	
3. Verify that the mounting distance of the MP2100 system is equal to or greater than the calculated minimum safety distance from the danger point. See Section 5— <i>Safe Mounting Distance</i> for further information. Ensure that the operator is not able to stand between the MP2100 detection zone and the danger point.	☐ Pass ☐ Fail	
4. Check for signs of external damage to the MP2100 system, the machine and the electrical cables and wiring. If damage is found, lock the machine off and report to the supervisor.	☐ Pass ☐ Fail	
5. Interrupt the MP2100 system detection zone with the proper size test object. Move the test object inside the perimeter (along the top, sides and bottom) of the detection zone and up and down through the center. At least one Individual Beam Indicator must be lit while the test object is anywhere in the detection zone. If in automatic start mode, verify that the red machine start light is lit. If in start/restart interlock mode, verify that the red machine stop and yellow interlock lights are on. Press and release start button before proceeding to step 6.	☐ Pass ☐ Fail	
6. Start the machine. While the machine is in motion, interrupt the detection zone with the test object. The machine should stop immediately. Never insert the test object into the dangerous parts of the machine. With the machine at rest, interrupt the detection zone with the test object. Verify that the machine will not start with the test object in the detection zone.	☐ Pass ☐ Fail	
7. Verify that the braking system is working properly. If the machine does not stop fast enough, adjust the braking system or increase the distance from the detection zone to the danger point.	☐ Pass ☐ Fail	
8. If the safety devices or the machine fails any of these tests, do not run the machine. Immediately tag or lockout the machine to prevent its use and notify the supervisor.	☐ Pass ☐ Fail	

Technician

Signature: _____