



4600 Series Safety Light Curtains

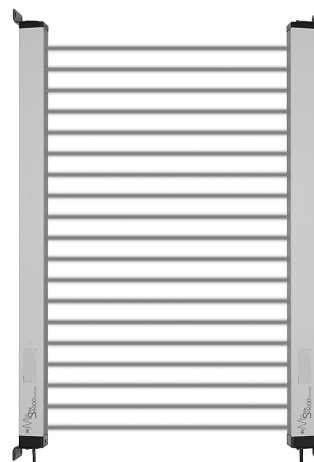
MiniSafe MS4600-14

MiniSafe MS4600-20

MiniSafe MS4600-30

OptoFence OF4600-50

Installation and Operating Manual



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Important Note:

This manual provides installation and operating information on the following models:

- MiniSafe MS4600-14
- MiniSafe MS4600-20
- MiniSafe MS4600-30
- OptoFence OF4600-50

Where information is common to all models the term “4600 system” will be used. Where information is given for a specific model the model number will be used.



4600 Series Safety Light Curtain

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1 IMPORTANT SAFETY WARNINGS

1

⚠ WARNING! Read and understand this section prior to installing the 4600 system.

A 4600 system is a general purpose presence sensing device designed to guard personnel working around moving machinery.

Whether a specific machine application and 4600 system installation complies with safety regulations depends on the proper application, installation, maintenance and operation of the 4600 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 4600 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 4600 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 4600 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 4600 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 4600 system.
- Perform only the test and repair procedures outlined in this manual.
- Follow all procedures in this manual for proper operation of the 4600 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

Individual Beam Indicators

External Device Monitoring (MPCE Monitoring)

Automatic Start Mode

Start interlock Mode

Start/Restart interlock Mode

Adjustable Mounting Brackets

Floating Blanking

Exact Channel Select

Two Safety (PNP) Outputs

Auxiliary Output

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

2.2 OPTIONAL FEATURES

Machine Test Signal (MTS)

DeviceNet Interface

Auxiliary Output Mode Options (Alarm or Follow)

Auxiliary Output Configuration Option (NPN or PNP)

3 SYSTEM COMPONENTS AND INDICATORS

3

Refer to "Figure 3-1" on page A-9 for the location of the components and indicators listed below.

Table 3-1 System Components Identification

Chart #		Chart #	
1	RECEIVER	11	TRANSMITTER
2	Individual Beam Indicators (one for each beam) – Red	12	Status Indicator – Yellow
3	Removable End Cap, Access to configuration switches	13	Transmitter connections (without Machine Test Signal)
4	Program button (must remove security screw)		L Drain – Uninsulated Wire
5	Channel Select or Floating Blanking Indicator – Amber		M +24 VDC – White Wire
6	interlock or alarm Indicator – Yellow		N 0 VDC – Brown Wire
7	machine stop Indicator – Red	14	Synchronization Beam
8	machine run Indicator – Green	15	Detection Zone
9	Receiver connections		
	I Start – Grey Wire	16	Transmitter connections (with Machine Test Signal)
	J OSSD 2 – Yellow Wire		L Drain – Uninsulated Wire
	C OSSD1 – Green or Orange Wire		M +24 VDC – White Wire
	D 0 VDC – Brown Wire		N 0 VDC – Brown Wire
	E Drain – Uninsulated Wire		O MTS – Blue Wire
	F +24 VDC – White Wire		P MTS Return – Black Wire
	G Auxiliary Out – Blue or Violet Wire		
	H MPCE – Pink Wire		
10	Inside Receiver End Cap		
	A Switch A		
	B Switch B		
	K Connector		

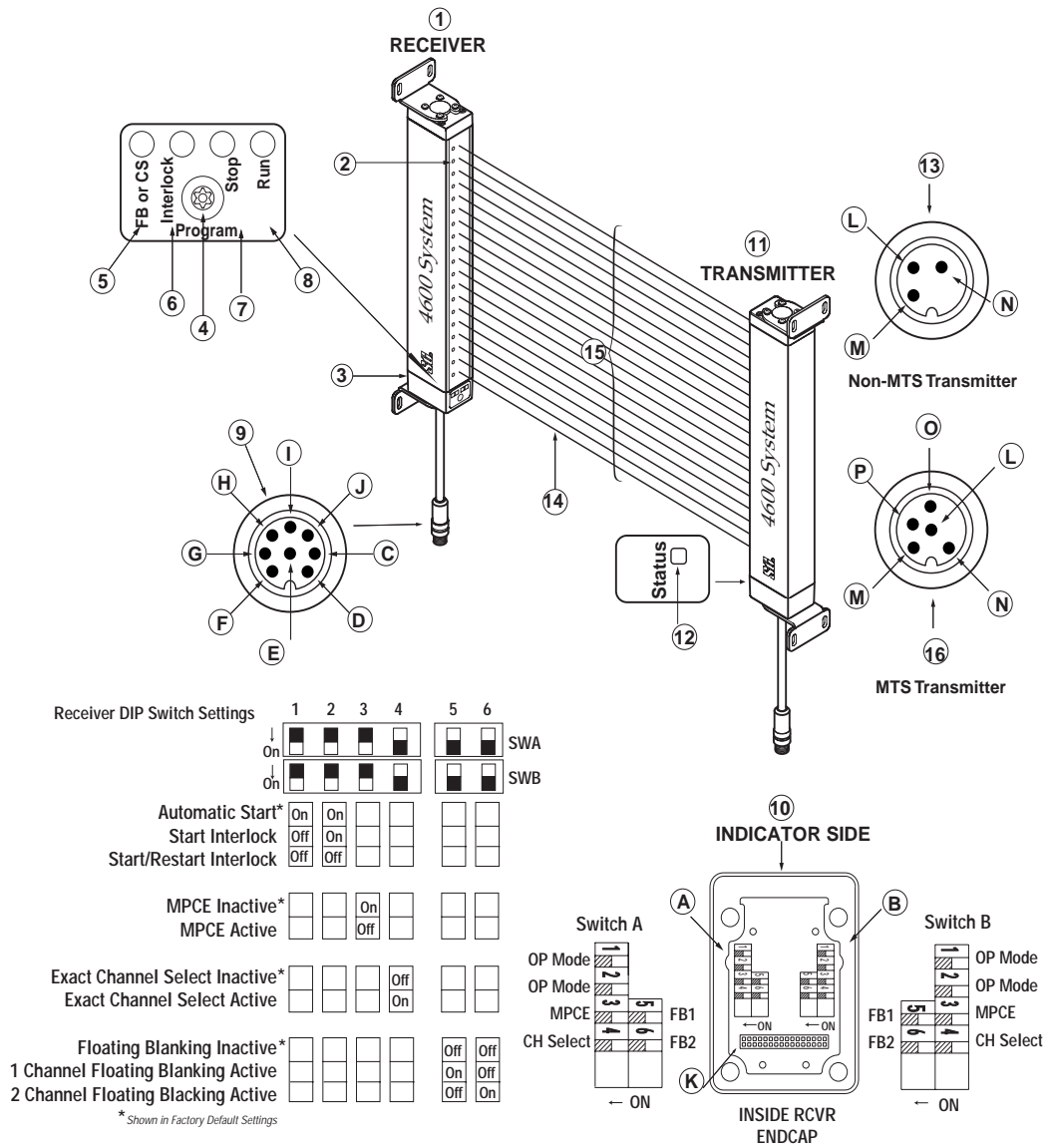


Figure 3-1 System Drawing

4 SYSTEM OPERATION

4

A 4600 system is a microprocessor-controlled, infrared transmitted-beam safety light curtain. The system consists of a receiver assembly and a transmitter assembly. The receiver and transmitter assemblies are not physically interconnected.

4600 system is used where personnel protection is required. Typical applications include mechanical power presses, robotic work cells, filter presses, injection molders, food processing equipment and automated assembly equipment.

4.1 OPERATING STATES

The operating condition of a 4600 system is described in terms of states. The following operating states exist for the 4600 system.

4.1.1 MACHINE RUN

The two receiver safety outputs are in the ON state, the green machine run indicator is lit, and the auxiliary output is in a state consistent with its configuration. See *Section 7.2* on page 18. The protected machine is allowed to operate. Pressing and releasing the start button has no effect.

4.1.2 MACHINE STOP

The two receiver safety outputs are in the OFF state, the red machine stop indicator is lit, and the auxiliary output is in a state consistent with its configuration. See *Section 7.2* on page 18. The protected machine is not allowed to operate.

4.1.3 INTERLOCK

The two receiver safety outputs are in the OFF state, the red machine stop indicator and yellow interlock indicator are lit. The auxiliary output is in a state consistent with its configuration. See *Section 7.2* on page 18. 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.

4.1.4 ALARM

The two receiver safety outputs are in the OFF state, the red machine stop indicator is lit, the yellow interlock indicator is flashing, and the auxiliary output is in the OFF state. The alarm state does not allow the protected machine to operate. The primary difference between alarm and interlock is that the 4600 system will remain in the alarm state until the alarm is corrected, regardless of power cycling or an external start button press and release.

4.2 OPERATING MODES

System operating modes determine the start-up and operating behavior of a 4600 system. Operating mode definitions rely on the operating states presented above. Operating mode selection is performed via configuration switches in the removable cap on the bottom of the receiver.

NOTE! *If internal alarms are detected by the 4600 system during power-up or operation, it will enter the alarm state with its safety outputs in the OFF state.*

4.2.1 AUTOMATIC START

A 4600 system will power-up with its safety and auxiliary 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 4600 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 4600 system will automatically change from machine stop to machine run.

4.2.2 START INTERLOCK

The 4600 system will power-up with its safety outputs OFF, and, if no alarms are detected, enter the interlock state. To enter the machine run state, the detection zone must be clear (or an Exact Channel Select pattern satisfied), 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 4600 system will change from machine run to machine stop. Once the detection zone is clear, the 4600 system will automatically change from machine stop to machine run.

4.2.3 START/RESTART INTERLOCK

A 4600 system will power-up with its safety outputs OFF, and, if no alarms are detected, enter the interlock state. To enter the machine run state, the detection zone must be clear (or an Exact Channel Select pattern satisfied), 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 4600 system will change from machine run to interlock. The 4600 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 4600 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.

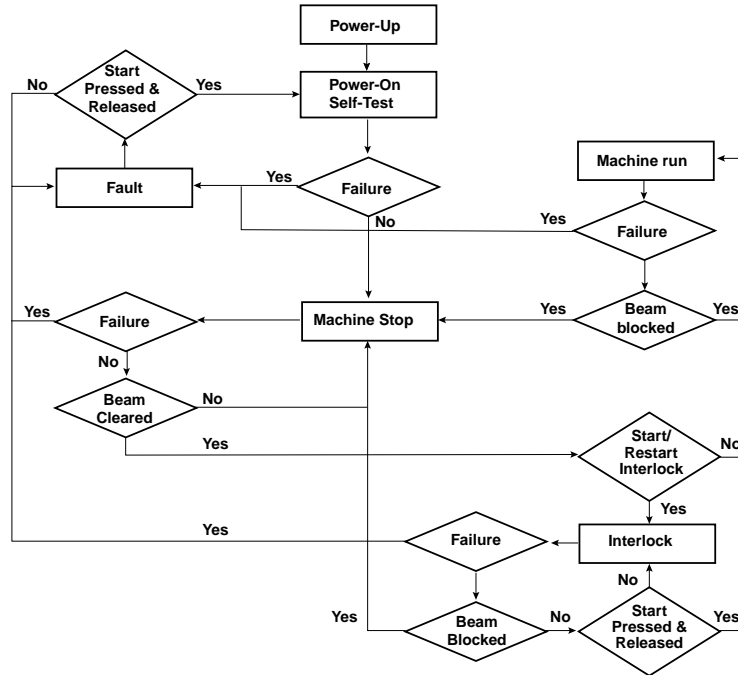


Figure 4-1 Functional Flow Diagram

4.3 OPERATING MODE SELECTION

Operating mode is selected by setting positions 1 and 2 of Switches A and B, located inside the receiver end cap. Refer to *Table 4-1*. Any mismatch between the settings of Switch A and B will result in an alarm condition. To access Switches A and B, remove the four captive screws which secure the largest receiver end cap. Set these switches before mounting the receiver.

⚠ Warning! *Disconnect power before removing end caps.*

Table 4-1 Operating Mode Switch Settings

OPERATING MODE	SWITCH A		SWITCH B	
	1	2	1	2
<i>Automatic Start (default setting)</i>	ON	ON	ON	ON
<i>Start interlock</i>	OFF	ON	OFF	ON
<i>Start/Restart interlock</i>	OFF	OFF	OFF	OFF
<i>Not Allowed</i>	ON	OFF	ON	OFF

5 DETECTION OPTIONS

5

⚠ Warning! *Use of Exact Channel Select and/or Floating Blanking will make the 4600 system less sensitive to objects in the detection zone. Improper use of either can result in severe injury to personnel. Exact Channel Select may require a hard barrier guard (see “9.2.1 Additional Guarding” on page A-24), Exact Channel Select or Floating Blanking may require an increase in the safety distance. Read the following section carefully.*

5.1 EXACT CHANNEL SELECT (ECS)

ECS disables selected, fixed areas of the detection zone by masking off specific, fixed beam locations. ECS is helpful when stationary objects such as tooling and fixtures permanently obstruct a portion of the detection zone.

ECS requires that any portion of the detection zone which is blocked remain blocked. If the obstruction is removed the 4600 system will enter a machine stop state. The synchronization beam (the beam nearest to the cable) cannot be selected. Also, one additional beam must remain unblocked. A channel is defined as one transmitter/receiver pair or “beam”.

See *Table 5-1, “System Response to Exact Channel Select,”* on page A-13 for a diagram of 4600 system response during operation with ECS active.