



Safe 4 and Safe 2 POC Light Curtain Migration

Bulletin Number 445L



Allen-Bradley

by ROCKWELL AUTOMATION

Reference Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Notes:

A number of older Allen-Bradley® GuardShield™ safety light curtains will be obsoleted and no longer be available for sale. This publication suggests examples of how to convert these existing light curtain applications to safety light curtains with the latest technologies.

The products that are described in this publication can be used in various ways. Therefore, designers must verify that all steps have been taken to help assure that each application and use of this control equipment meets all performance and safety requirements. Designers must consider applicable laws, regulations, codes, and standards.

The wiring diagrams in this publication are intended as examples. Since many variables and requirements are associated with any particular installation, Rockwell Automation does not assume responsibility or liability for actual use based on these examples.

This publication is intended for machine safeguarding system designers who have been adequately trained in the design and use of safeguarding systems and risk assessments.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated Table 1	9
Updated Cat. Nos. in Table 2	10
Updated Cat. Nos. in Table 4	12
Updated Table 11	19

About This Publication

This document provides conversion details from the Safe 4 and Safe 2 POC light curtains. POC is an acronym for point of operation control, typically where an operator has direct access to a hazard through the light curtain. POC light curtains have two resolutions: 14 mm (0.55 in.) for finger detection or 30 mm (1.18 in.) for hand protection.

This document excludes the PAC type light curtains. PAC is an acronym for perimeter access control. PAC light curtains are used in applications that require full body detection.

For further assistance in replacing 445L PAC devices, contact Technical Support (rok.auto/support).

Benefits

The 450L light curtain provides the following additional benefits

- Single stick transceiver
- Functionality provided by a plug-in module
- Cat 4 PLe and SIL 3 rating
- Full active design (no passive zones at top or bottom of the stick)

Conversion Concerns

Manufacturers, distributors, integrators, and you recognize that product obsolescence is a fact of the industrial business cycle. This document attempts to provide a more cost-effective recommendation for converting the 445L Safe 4 and Safe 2 light curtains to the state-of-the-art 450L light curtain family. Consider the following major concerns.

Range

Range is the distance between the transmitter and receiver. For this migration, the range is the first consideration.

Protective Height/Resolution

Protective height is the length of the field that the light curtain detects. The stick length of the 445L Safe 4 light curtain is longer than the protective field. Therefore, you must confirm that the migration is to an equivalent or larger protective field length or perform a risk assessment if a shorter length is selected.

Resolution is the ability of the light curtain to detect certain size objects. Finger detection is acceptable at 14 mm (0.55 in.) and hand detection at 30 mm (1.18 in.). The migration suggestions in this document maintain the resolutions from the 445L Safe 4 light curtain to 450L or 440L light curtains. Perform a risk assessment before changes are made to the resolution. This assessment can require the light curtains to be relocated depending on the hazard.

Electrical Connections

The 445L Safe 4 light curtains have 5-pin QD connectors. This document shows migration to light curtains that have similar electrical connections, to eliminate, or minimize wiring changes.

Mounting

The 445L Safe 4 and 450L light curtains have similar housing features. These features also allow the 445L Safe 4 mounting brackets to be used by the preferred migration path to the 450L light curtains. This approach simplifies the migration as it minimizes the installation changes.

If you determine that the best migration path is to the 440L light curtain, the mounting brackets must be changed.

Response Time

Response time is the time that is required to perform the safety function. For each conversion, the comparable response time is provided. An increase in the response time can require that you adjust the safety distance. A risk assessment must be performed if the migration is to a longer response time (see [SAFEBOOK-RM002](#) for further information on the safety distance calculation).

Output Load Capability

Output load capability is the ability of the light curtain safety OSSD outputs to switch loads. The 445L Safe 4 light curtain has a limit of 300 mA; which is less than the 500 mA switching capability of either the 450L or the 440L light curtains.

OSSD Pulse Testing

The 445L Safe 4 and 450L light curtains use pulse testing on the OSSD safety outputs to detect short circuits to 24V, 0V, and to each other. The 440L light curtain does not use pulse testing; instead, short circuits are checked by creating a short delay between the turn on of the OSSD safety outputs.

This section is provided for informational purposes only. Both methods of detecting short circuits on the OSSD safety signals are adequate for their safety ratings and cannot influence the decision to migrate to one light curtain or the other.

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
GuardShield™ Safe 4 and Safe 4 PAC Safety Light Curtains User Manual, publication 445L-UM001	Provides detailed information to install, wire, configure, troubleshoot, and use the GuardShield Safe 4 and Safe 4 PAC safety light curtains.
GuardShield Safe 2 and Safe 2 PAC Safety Light Curtains User Manual, publication 445L-UM002	Provides detailed information to install, wire, configure, troubleshoot, and use the GuardShield Safe 2 and Safe 2 PAC safety light curtains.
GuardShield Safety Light Curtain User Manual, publication 450L-UM001	Provides detailed information to install, wire, configure, troubleshoot, and use the GuardShield 450L safety light curtains.
GuardShield Type 4 and GuardShield Remote Teach User Manual, publication 440L-UM003	Provides detailed information to install, wire, configure, troubleshoot, and use the GuardShield 440L Type 4 safety light curtains.
GuardShield Type 2 Safety Light Curtain Installation, publication 440L-IN011	Provides detailed information to install, wire, configure, troubleshoot, and use the GuardShield Type 2 safety light curtains.
System Design for Control of Electrical Noise, publication GMC-RM001	Provides a thorough review of the installation and grounding of noisy components and what can be done to minimize their potential for injecting noise into the system.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.
Safety Book 5, Safety-related Control Systems for Machinery, publication SAFEBK-RM002	Provides principles, standards, and implementation of safety-related control systems for machinery.

You can view or download publications at rok.auto/literature.

445L Safe 4 POC Light Curtain

Range

The first criteria for determining the best migration path is the range of the 445L Safe 4 POC light curtain. The 445L Safe 4 light curtain has three ranges of resolution:

- 0...9 m (0...29.5 ft) with 14 mm (0.55 in.) resolution
- 0...18 m (0...59 ft) with 30 mm (1.18 in.) resolution
- 5...30 m (16.4...98.4 ft) with 30 mm (1.18 in.) resolution

[Table 1](#) compares the range of the 445L Safe 4 light curtain to the 450L-B, 450L-E, and the 440L Type 4 light curtains. The preferred solution is to migrate to the 450L-B light curtain. The second preference is to migrate to the 450L-E light curtain. The alternative is to migrate to the 440L light curtain.

For long range applications where the 30 mm (1.18 in.) 445L Safe 4 light curtain is used at the range of 16...30 m (52...98.42 ft), two sets of light curtains must be used to cover the distance.

For small range applications where a 445L Safe 4 light curtain with hand resolution [30 mm (1.18 in.)] is installed at an operating distance smaller than 0.9 m (2.95 ft), a 450L with finger [14 mm (0.55 in.)] resolution [operating range >0.5 m (1.64 ft)] or a 440L with hand [30 mm (1.18 in.)] resolution must be considered.

For small range applications where the 14 mm (0.55 in.) 445L Safe 4 light curtain is installed at a distance smaller than 0.5 m (1.64 ft), a 440L light curtain with finger resolution must be considered.

Table 1 - Range Comparison

Resolution [mm (in.)]	Range [m (ft)]			
	445L Safe 4	450L-B	450L-E	440L Type 4
14 (0.55)	0...9 (0...29.5)	0.5...4 (1.64...13.12)	0.5...9 (1.64...29.53)	0.3...7 (0.98...22.9)
30 (1.18)	0...18 (0...59)	0.9...7 (2.95...22.97)	0.9...16.2 (2.95...53.15)	0.3...16 (0.98...52)
	5...30 (16.4...98.4)	—	Need two light curtains for ranges between 18...30 m (59...98.4 ft)	

Protective Height

Protective height is that portion of the light curtain that is designed to detect the presence of an object, typically a finger (with 14 mm (0.55 in.) resolution), or a hand (with 30 mm (1.18 in.) resolution).

The 445L Safe 4 light curtain has protective heights from 120...1920 mm (4.72 ...75.6 in.), in increments of 120 mm (4.72 in.). The 450L light curtain has protective heights from 150...1950 mm (5.9...76.77 in.) in increments of 150 mm (5.9 in.). The 440L Type 4 light curtain has protective heights from 160...1760 mm (6.3...69.2 in.) in increments of 160 mm (6.3 in.). In cases where the protective height between the 445L Safe 4 light curtain and the alternative safety light curtain differs, 445L Safe 4 provides all alternatives with a longer protective height (see [Table 2...Table 4](#)).

Table 2 - 445L Safe 4 Light Curtains to 450-B Light Curtains [mm (in.)]

Resolution	From 445L Safe 4 Light Curtain		To 450L-B Light Curtain	
	Protective Height	Cat. No.	Protective Height	Cat. No.
14 (0.55)	120 (4.7)	445L-P4L0120YD	150 (5.9)	450L-B4FN0150YD
	240 (9.4)	445L-P4L0240YD	300 (11.8)	450L-B4FN0300YD
	360 (14.2)	445L-P4L0360YD	450 (17.7)	450L-B4FN0450YD
	480 (19.9)	445L-P4L0480YD	600 (23.6)	450L-B4FN0600YD
	600 (23.6)	445L-P4L0600YD	600 (23.6)	450L-B4FN0600YD
	720 (28.3)	445L-P4L0720YD	750 (29.5)	450L-B4FN0750YD
	840 (33.1)	445L-P4L0840YD	900 (35.4)	450L-B4FN0900YD
	960 (37.8)	445L-P4L0960YD	1050 (41.3)	450L-B4FN1050YD
	1080 (42.5)	445L-P4L1080YD	1200 (47.2)	450L-B4FN1200YD
	1200 (47.2)	445L-P4L1200YD	1200 (47.2)	450L-B4FN1200YD
	1320 (52.0)	445L-P4L1320YD	1350 (53.1)	450L-B4FN1350YD
	1440 (56.7)	445L-P4L1440YD	1500 (59.1)	450L-B4FN1500YD
	1560 (61.4)	445L-P4L1560YD	1650 (65.0)	450L-B4FN1650YD
	1680 (66.1)	445L-P4L1680YD	1800 (70.9)	450L-B4FN1800YD
	1800 (70.9)	445L-P4L1800YD	1800 (70.9)	450L-B4FN1800YD
	1920 (75.6)	445L-P4L1920YD	1950 (76.8)	450L-B4FN1950YD
30 (1.18)	120 (4.7)	445L-P4S0120YD	150 (5.9)	450L-B4HN0150YD
	240 (9.4)	445L-P4S0240YD	300 (11.8)	450L-B4HN0300YD
	360 (14.2)	445L-P4S0360YD	450 (17.7)	450L-B4HN0450YD
	480 (19.9)	445L-P4S0480YD	600 (23.6)	450L-B4HN0600YD
	600 (23.6)	445L-P4S0600YD	600 (23.6)	450L-B4HN0600YD
	720 (28.3)	445L-P4S0720YD	750 (29.5)	450L-B4HN0750YD
	840 (33.1)	445L-P4S0840YD	900 (35.4)	450L-B4HN0900YD
	960 (37.8)	445L-P4S0960YD	1050 (41.3)	450L-B4HN1050YD
	1080 (42.5)	445L-P4S1080YD	1200 (47.2)	450L-B4HN1200YD
	1200 (47.2)	445L-P4S1200YD	1200 (47.2)	450L-B4HN1200YD
	1320 (52.0)	445L-P4S1320YD	1350 (53.1)	450L-B4HN1350YD
	1440 (56.7)	445L-P4S1440YD	1500 (59.1)	450L-B4HN1500YD
	1560 (61.4)	445L-P4S1560YD	1650 (65.0)	450L-B4HN1650YD
	1680 (66.1)	445L-P4S1680YD	1800 (70.9)	450L-B4HN1800YD
	1800 (70.9)	445L-P4S1800YD	1800 (70.9)	450L-B4HN1800YD
	1920 (75.6)	445L-P4S1920YD	1950 (76.8)	450L-B4HN1950YD

Table 3 - 445L Safe 4 Light Curtains to 450L-E Light Curtains [mm (in.)]

Resolution	From 445L Safe 4 Light Curtain		To 450L-E Light Curtain	
	Protective Height	Cat. No.	Protective Height	Cat. No.
14 (0.55)	120 (4.7)	445L-P4L0120YD	150 (5.9)	450L-E4FL0150YD
	240 (9.4)	445L-P4L0240YD	300 (11.8)	450L-E4FL0300YD
	360 (14.2)	445L-P4L0360YD	450 (17.7)	450L-E4FL0450YD
	480 (19.9)	445L-P4L0480YD	600 (23.6)	450L-E4FL0600YD
	600 (23.6)	445L-P4L0600YD	600 (23.6)	450L-E4FL0600YD
	720 (28.3)	445L-P4L0720YD	750 (29.5)	450L-E4FL0750YD
	840 (33.1)	445L-P4L0840YD	900 (35.4)	450L-E4FL0900YD
	960 (37.8)	445L-P4L0960YD	1050 (41.3)	450L-E4FL1050YD
	1080 (42.5)	445L-P4L1080YD	1200 (47.2)	450L-E4FL1200YD
	1200 (47.2)	445L-P4L1200YD	1200 (47.2)	450L-E4FL1200YD
	1320 (52.0)	445L-P4L1320YD	1350 (53.1)	450L-E4FL1350YD
	1440 (56.7)	445L-P4L1440YD	1500 (59.1)	450L-E4FL1500YD
	1560 (61.4)	445L-P4L1560YD	1650 (65.0)	450L-E4FL1650YD
	1680 (66.1)	445L-P4L1680YD	1800 (70.9)	450L-E4FL1800YD
	1800 (70.9)	445L-P4L1800YD	1800 (70.9)	450L-E4FL1800YD
	1920 (75.6)	445L-P4L1920YD	1950 (76.8)	450L-E4FL1950YD
30 (1.18)	120 (4.7)	445L-P4S0120YD	150 (5.9)	450L-E4HL0150YD
	240 (9.4)	445L-P4S0240YD	300 (11.8)	450L-E4HL0300YD
	360 (14.2)	445L-P4S0360YD	450 (17.7)	450L-E4HL0450YD
	480 (19.9)	445L-P4S0480YD	600 (23.6)	450L-E4HL0600YD
	600 (23.6)	445L-P4S0600YD	600 (23.6)	450L-E4HL0600YD
	720 (28.3)	445L-P4S0720YD	750 (29.5)	450L-E4HL0750YD
	840 (33.1)	445L-P4S0840YD	900 (35.4)	450L-E4HL0900YD
	960 (37.8)	445L-P4S0960YD	1050 (41.3)	450L-E4HL1050YD
	1080 (42.5)	445L-P4S1080YD	1200 (47.2)	450L-E4HL1200YD
	1200 (47.2)	445L-P4S1200YD	1200 (47.2)	450L-E4HL1200YD
	1320 (52.0)	445L-P4S1320YD	1350 (53.1)	450L-E4HL1350YD
	1440 (56.7)	445L-P4S1440YD	1500 (59.1)	450L-E4HL1500YD
	1560 (61.4)	445L-P4S1560YD	1650 (65.0)	450L-E4HL1650YD
	1680 (66.1)	445L-P4S1680YD	1800 (70.9)	450L-E4HL1800YD
	1800 (70.9)	445L-P4S1800YD	1800 (70.9)	450L-E4HL1800YD
	1920 (75.6)	445L-P4S1920YD	1950 (76.8)	450L-E4HL1950YD

Table 4 - 445L Safe 4 Light Curtains to 440L Type 4 Light Curtains [mm (in.)]

Resolution	From 445L Safe 4 Light Curtain		To 440L Light Curtain	
	Protective Height	Cat. No.	Protective Height	Cat. No.
14 (0.55)	120 (4.7)	445L-P4L0120YD	160 (6.3)	440L-P4J0160YD
	240 (9.4)	445L-P4L0240YD	320 (12.5)	440L-P4J0320YD
	360 (14.2)	445L-P4L0360YD	480 (18.8)	440L-P4J0480YD
	480 (19.9)	445L-P4L0480YD	480 (18.8)	440L-P4J0480YD
	600 (23.6)	445L-P4L0600YD	640 (25.1)	440L-P4J0640YD
	720 (28.3)	445L-P4L0720YD	800 (31.4)	440L-P4J0800YD
	840 (33.1)	445L-P4L0840YD	960 (37.7)	440L-P4J0960YD
	960 (37.8)	445L-P4L0960YD	1120 (44.0)	440L-P4J1120YD
	1080 (42.5)	445L-P4L1080YD	1120 (44.0)	440L-P4J1120YD
	1200 (47.2)	445L-P4L1200YD	1280 (50.3)	440L-P4J1280YD
	1320 (52.0)	445L-P4L1320YD	1440 (56.6)	440L-P4J1440YD
	1440 (56.7)	445L-P4L1440YD	1440 (56.6)	440L-P4J1440YD
	1560 (61.4)	445L-P4L1560YD	1600 (65.0)	440L-P4J1600YD
	1680 (66.1)	445L-P4L1680YD	1760 (69.2)	440L-P4J1760YD
	1800 (70.9)	445L-P4L1800YD	–	–
	1920 (75.6)	445L-P4L1920YD	–	–
30 (1.18)	120 (4.7)	445L-P4S0120YD	160 (6.3)	440L-P4K0160YD
	240 (9.4)	445L-P4S0240YD	320 (12.5)	440L-P4K0320YD
	360 (14.2)	445L-P4S0360YD	480 (18.8)	440L-P4K0480YD
	480 (19.9)	445L-P4S0480YD	480 (18.8)	440L-P4K0480YD
	600 (23.6)	445L-P4S0600YD	640 (25.1)	440L-P4K0640YD
	720 (28.3)	445L-P4S0720YD	800 (31.4)	440L-P4K0800YD
	840 (33.1)	445L-P4S0840YD	960 (37.7)	440L-P4K0960YD
	960 (37.8)	445L-P4S0960YD	1120 (44.0)	440L-P4K1120YD
	1080 (42.5)	445L-P4S1080YD	1120 (44.0)	440L-P4K1120YD
	1200 (47.2)	445L-P4S1200YD	1280 (50.3)	440L-P4K1280YD
	1320 (52.0)	445L-P4S1320YD	1440 (56.6)	440L-P4K1440YD
	1440 (56.7)	445L-P4S1440YD	1440 (56.6)	440L-P4K1440YD
	1560 (61.4)	445L-P4S1560YD	1600 (65.0)	440L-P4K1600YD
	1680 (66.1)	445L-P4S1680YD	1760 (69.2)	440L-P4K1760YD
	1800 (70.9)	445L-P4S1800YD	–	–
	1920 (75.6)	445L-P4S1920YD	–	–

All light curtains in this publication are available with 5-pin QD connectors. These connectors minimize changes to the wiring.

For 440L light curtains with an integrated laser alignment, change the listed catalog number in [Table 4](#) from 440L-xP4yzzzzYD to 440L-xP4LyzzzzYD.

Connections

Transmitter Connection

The 450L light curtain uses plug-in modules to determine functionality. To convert from the 445L Safe 4 light curtain to 450L light curtain (B and E versions), the following two plug-in modules are required:

- Transmitter: Catalog number 450L-APT-PW-5
- Receiver: Catalog number 450L-APR-ON-5

Table 5 - Transmitter Pinout Descriptions

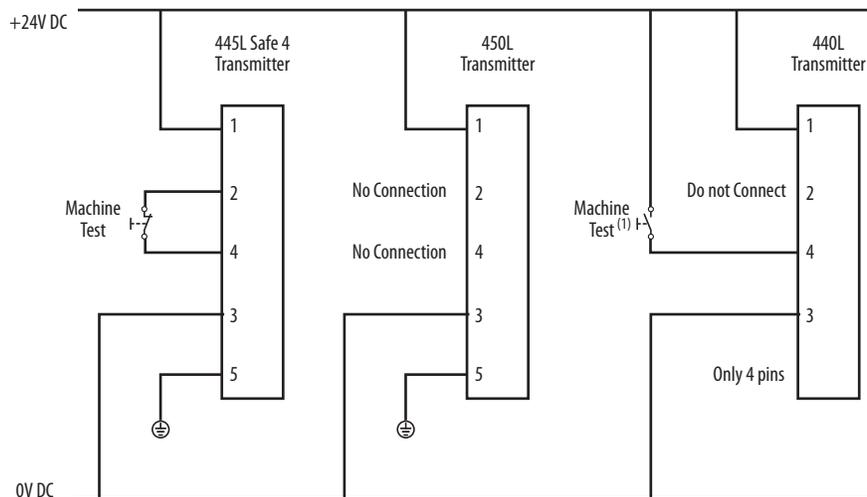
View	Pin	445L Safe 4	450L-B and 450L-E	440L Type 4
	1	+24V	+24V	+24V
	2	Test 2	No connection	Do not connect
	3	0V	0V	0V
	4	Test 1	No connection	Test ⁽¹⁾
	5	Ground (PE)	Ground (PE)	No Pin

Transmitter Test Function

The transmitter test function allows you to turn off the transmitter at any time. This function is often used to verify that the light curtain is operating properly. If the application requires the use of the test function, then you must consider migration to the 440L light curtain. [Figure 1](#) compares the schematic of the transmitter test functions.

- 445L Safe 4: Short Pin 2 to Pin 4 when test function is not needed.
- 450L: No test function.
- 440L: Pin 4 is left open when test function is not needed. Pin 2 must remain unconnected. If the polarity of the test function requires inversion, the 440L transmitter DIP switch 2 must be set to ON.

Figure 1 - Transmitter Test Schematics (a)



(a) See [Transmitter Test Function on page 13](#).

Receiver Connection

The receiver QD connections are interchangeable.

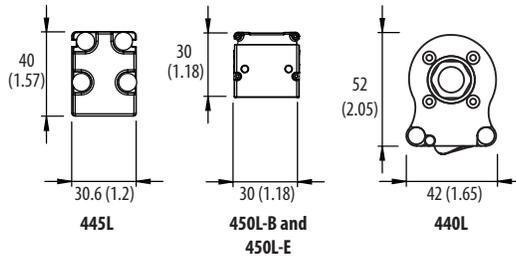
Table 6 - Receiver Pinout Description

View	Pin	445L Safe 4	450L	440L
	1	+24V	+24V	+24V
	2	OSSD 2	OSSD 2	OSSD 2
	3	0V	0V	0V
	4	OSSD 1	OSSD 1	OSSD 1
	5	Ground (PE)	Ground (PE)	No connection

Housing

Figure 2 shows the comparison of the housing cross-sections of the light curtains that are referenced in this document. The 445L Safe 4 and 450L light curtains have similar housing sizes. This size is significant as the mounting brackets for the 445L Safe 4 light curtain can be used with the 450L light curtain as well. Migration to the 440L light curtain requires changes to the mounting brackets.

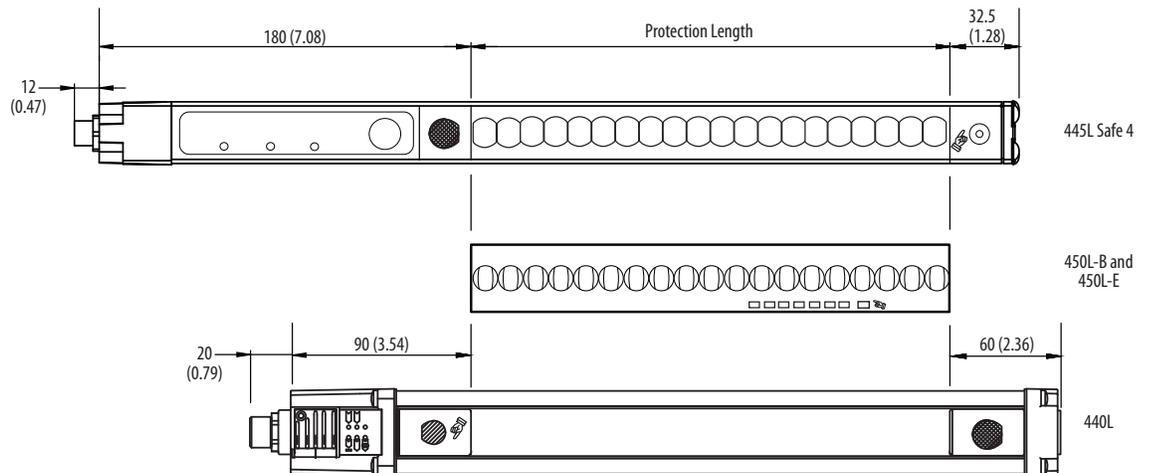
Figure 2 - Cross Section Comparison of Housing



Overall Housing Length

Figure 3 shows a comparison of the protective length to the overall housing length. The housing length of the 445L Safe 4 and 440L light curtains is longer than the protective length. The length of the housing of the 450L light curtain is equal to the length of the protective field.

Figure 3 - Protection Length Compared to Housing Length [mm (in.)]



445L Safe 4 Mounting Brackets

The mounting brackets for the 445L Safe 4 light curtain can be used by the 450L light curtains. Depending on the installation, the position of the brackets must be changed as the 450L has no dead zone, which shortens the distance between the mounting points (see [Figure 3](#)). The mounting brackets for the 440L light curtains are different and require further considerations by you. [Table 7](#) shows the various types of mounting brackets for the 445L Safe 4, 450L, and 440L light curtains.

Table 7 - Mounting Bracket Types

Bracket Type	445L Safe 4 and 450L Light Curtains		440L Light Curtain			
	Description	Cat No.	Description	Cat No.		
Standard 445L Safe 4 light curtain		Shipped with 445L Safe 4 light curtain after April 2017. Optional for 450L light curtain.	450L-AM-SM		End-cap mounting brackets that are shipped with all 440L light curtains.	440L-AF6101
Old standard 445L Safe 4 light curtain		Shipped with 445L Safe 4 light curtain before May 2017. Optional for 450L light curtain.	445L-AF6140	No equivalent for 440L light curtain.		—
Vertical		Optional for 445L Safe 4 and 450L light curtains.	445L-AF6144	No equivalent for 440L light curtain.		—
Swivel		Optional for 445L Safe 4 and 450L light curtains.	445L-AF6141	The standard end-cap mounting brackets provide swivel adjustments.		—
Shock mount		Optional for 445L Safe 4 and 450L light curtains.	445L-AF6142		Other kits available. Optional for 440L light curtain.	440L-AF6120
Standard 450L-B and 450L-E light curtains		Shipped with every 450L light curtain. Cannot be used with 445L Safe 4 light curtain.	450L-AM-TBM		—	440L-AF6108

IMPORTANT

- The 450L-AM-SM is not shipped with each 450L light curtain.
- The 450L-AM-TBM is shipped with every 450L light curtain.

Mounting Bracket Dimensions

Figure 4 - 450L-AM-TBM Type 4 Mounting Brackets [mm (in.)]

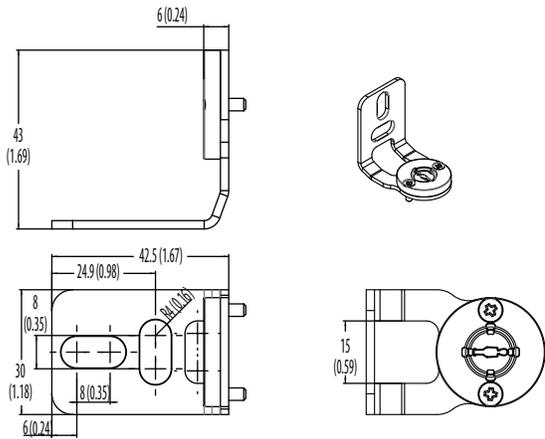
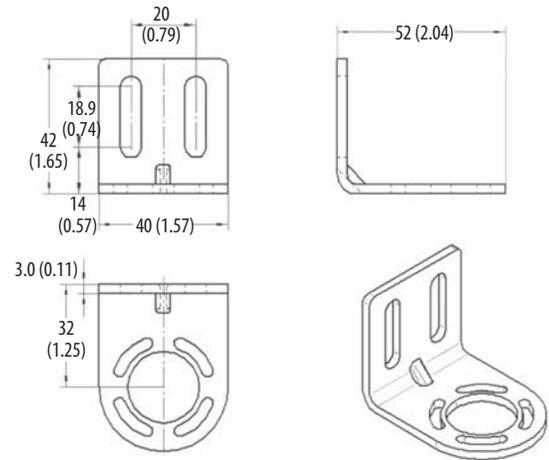


Figure 5 - 440L Type 4 Mounting Brackets [mm (in.)]



Laser Alignment

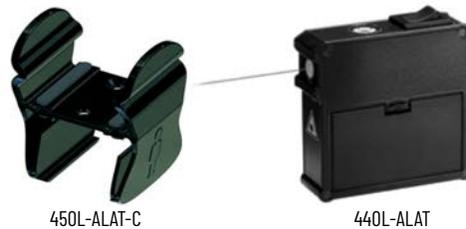
The 445L Safe 4 light curtain has laser alignment. The 445L Safe 4 light curtain aligns with two points: one at the top of the light curtain and one at the bottom of the light curtain.

The 440L Type 4 is available with integrated laser alignment similar to the 445L Safe 4 (top and bottom).

The 450L-E has integral laser alignment; it creates a linear series of spots that appear along the length of the opposite transceiver.

The 450L-B does not have integrated laser alignment. An external alignment laser, which can be snapped on the 450L-B stick, is optionally available. Use the catalog number 440L-ALAT laser with the catalog number 450L-ALAT-C snap-on bracket ([Figure 6](#)).

Figure 6 - Laser Alignment Bracket and Laser



Response Time

Response time is dependent on the height of the protective field of the light curtain. [Table 8](#) and [Table 9 \(page 18\)](#) compare the response times of the 445L Safe 4 to the 450L and 440L light curtains.

For shorter protection heights, the response time of the 445L Safe 4 light curtain is faster than the response time of the 450L-B or 440L light curtains. In this case, the safety distance must be recalculated. This calculation can require the location of the light curtain to be moved further away from the hazard. The 450L-E light curtain response time in [Table 8](#) is for basic ON/OFF applications. See publication [450L-UM001](#), for the response times for advanced applications.

Table 8 - Response Time Comparison for the 450L Light Curtain [mm (in.)]

Resolution	From 445L Safe 4 Light Curtain		To 450L Light Curtain		
	Protective Height	Response Time (ms)	Protective Height	450L-B Response Time (ms)	450L-E Response Time (ms)
14 (0.55)	120 (4.7)	10.5	150 (5.9)	15	9
	240 (9.4)	15.8	300 (11.8)	15	9
	360 (14.2)	21.2	450 (17.7)	15	9
	480 (19.9)	26.3	600 (23.6)	15	9
	600 (23.6)	34.6	600 (23.6)	15	9
	720 (28.3)	36.8	750 (29.5)	15	9
	840 (33.1)	42.2	900 (35.4)	15	9
	960 (37.8)	47.5	1050 (41.3)	16	9
	1080 (42.5)	52.8	1200 (47.2)	17	9
	1200 (47.2)	58.1	1200 (47.2)	17	9
	1320 (52.0)	63.4	1350 (53.1)	19	9
	1440 (56.7)	68.7	1500 (59.1)	20	9
	1560 (61.4)	74	1650 (65.0)	22	9
	1680 (66.1)	79.3	1800 (70.9)	23	9
1800 (70.9)	84.6	1800 (70.9)	23	9	
1920 (75.6)	85.5	1950 (76.8)	25	9	
30 (1.18)	120 (4.7)	7.9	150 (5.9)	13	9
	240 (9.4)	10.5	300 (11.8)	13	9
	360 (14.2)	13.2	450 (17.7)	13	9
	480 (19.9)	15.8	600 (23.6)	13	9
	600 (23.6)	18.5	600 (23.6)	13	9
	720 (28.3)	21.1	750 (29.5)	13	9
	840 (33.1)	23.8	900 (35.4)	13	9
	960 (37.8)	26.3	1050 (41.3)	13	9
	1080 (42.5)	29.1	1200 (47.2)	13	9
	1200 (47.2)	31.6	1200 (47.2)	13	9
	1320 (52.0)	34.3	1350 (53.1)	13	9
	1440 (56.7)	37	1500 (59.1)	13	9
	1560 (61.4)	39.6	1650 (65.0)	13	9
	1680 (66.1)	42.3	1800 (70.9)	14	9
1800 (70.9)	44.9	1800 (70.9)	14	9	
1920 (75.6)	47.6	1950 (76.8)	15	9	

Table 9 - Response Time (with no Beam Coding) for 440L Light Curtain [mm (in.)]

Resolution	From 445L Safe 4 Light Curtain		To 440L Light Curtain	
	Protective Height	Response Time	Protective Height	Response Time
14 (0.55)	120 (4.7)	10.5	160 (6.3)	20
	240 (9.4)	15.8	320 (12.5)	20
	360 (14.2)	21.2	480 (18.8)	20
	480 (19.9)	26.3	480 (18.8)	20
	600 (23.6)	34.6	640 (25.1)	20
	720 (28.3)	36.8	800 (31.4)	20
	840 (33.1)	42.2	960 (37.7)	20
	960 (37.8)	47.5	1120 (44.0)	20
	1080 (42.5)	52.8	1120 (44.0)	20
	1200 (47.2)	58.1	1280 (50.3)	20
	1320 (52.0)	63.4	1440 (56.6)	20
	1440 (56.7)	68.7	1440 (56.6)	20
	1560 (61.4)	74	1600 (65.0)	25
	1680 (66.1)	79.3	1760 (69.2)	25
	1800 (70.9)	84.6	–	–
1920 (75.6)	85.5	–	–	
30 (1.18)	120 (4.7)	7.9	160 (6.3)	20
	240 (9.4)	10.5	320 (12.5)	20
	360 (14.2)	13.2	480 (18.8)	20
	480 (19.9)	15.8	480 (18.8)	20
	600 (23.6)	18.5	640 (25.1)	20
	720 (28.3)	21.1	800 (31.4)	20
	840 (33.1)	23.8	960 (37.7)	20
	960 (37.8)	26.3	1120 (44.0)	20
	1080 (42.5)	29.1	1120 (44.0)	20
	1200 (47.2)	31.6	1280 (50.3)	20
	1320 (52.0)	34.3	1440 (56.6)	20
	1440 (56.7)	37	1440 (56.6)	20
	1560 (61.4)	39.6	1600 (65.0)	20
1680 (66.1)	42.3	1760 (69.2)	20	

Output Load Capability

The 450L and 440L light curtains have higher output load capability than the 445L Safe 4 light curtain. [Table 10](#) shows the output load capability of the light curtains. All three light curtains have output short-circuit protection.

Table 10 - Output Load Capability

Load Type	445L Safe 4 POC	450L	440L
DC	300 mA	500 mA	500 mA

445L Safe 2 POC Light Curtain

The 445L Safe 2 POC has many of the same features as the 445L Safe 4 POC light curtain including:

- Connections
- Housing size
- Standard mounting
- Shock mounting
- Laser alignment
- Response time
- Output load capability

Range

The first criteria to determine the best migration path is the range of the 445L Safe 2 light curtain. The 445L Safe 2 POC light curtain is only available in 30 mm (1.18 in.) resolution.

[Table 11](#) compares the range of the 445L Safe 2 light curtain to the 450L-B, 450L-E, and 440L Type 2 light curtains. The preferred solution is to migrate to the 450L-B light curtain; the second preferred migration is to the 450L-E light curtain. The alternative is to migrate to the 440L Type 2 light curtain.

The 445L Safe 2 and 440L Type 2 light curtains meet the light curtain standard IEC61496 for Type 2. The 450L-B and 450L-E light curtains meet the light curtain standard IEC61496 for Type 4. Type 4 light curtains have a higher safety rating than Type 2.

Table 11 - Range Comparison

Resolution [mm (in.)]	Range [m (ft)]			
	445L Safe 2	450L-B	450L-E	440L Type 2
30 (1.18)	0..18 (0...59)	0.9...7 (2.95...22.97)	0.9...16.2 (2.95...53.15)	0.3...16 (0.98...52)

Protective Height

Protective height is that portion of the light curtain that is designed to detect the presence of an object, typically a hand.

The 445L Safe 2 has protective heights from 120...1920 mm (4.72...75.59 in.), in increments of 120 mm (4.72 in.). The 450L light curtain has protective heights from 150...1950 mm (5.9...76.77 in.) in increments of 150 mm (5.9 in.). The 440L Type 2 light curtain has protective heights from 160...1760 mm (6.3...69.29 in.) in increments of 160 mm (6.3 in.).

[Table 12...Table 14](#) show the recommended conversions from the 445L Safe 2 light curtain to either the 450L-B, 450L-E, or 440L Type 2 light curtain.

Table 12 - 445L Safe 2 to 450L-B Light Curtain Conversion [mm (in.)]

Resolution	From 445L Safe 2 Light Curtain		To 450L-B Light Curtain	
	Protective Height	Cat. No.	Protective Height	Cat. No.
30 (1.18)	120 (4.7)	445L-P2S0120YD	150 (5.9)	450L-B4HN0150YD
	240 (9.4)	445L-P2S0240YD	300 (11.8)	450L-B4HN0300YD
	360 (14.2)	445L-P2S0360YD	450 (17.7)	450L-B4HN0450YD
	480 (19.9)	445L-P2S0480YD	600 (23.6)	450L-B4HN0600YD
	600 (23.6)	445L-P2S0600YD	600 (23.6)	450L-B4HN0600YD
	720 (28.3)	445L-P2S0720YD	750 (29.5)	450L-B4HN0750YD
	840 (33.1)	445L-P2S0840YD	900 (35.4)	450L-B4HN0900YD
	960 (37.8)	445L-P2S0960YD	1050 (41.3)	450L-B4HN1050YD
	1080 (42.5)	445L-P2S1080YD	1200 (47.2)	450L-B4HN1200YD
	1200 (47.2)	445L-P2S1200YD	1200 (47.2)	450L-B4HN1200YD
	1320 (52.0)	445L-P2S1320YD	1350 (53.1)	450L-B4HN1350YD
	1440 (56.7)	445L-P2S1440YD	1500 (59.1)	450L-B4HN1500YD
	1560 (61.4)	445L-P2S1560YD	1650 (65.0)	450L-B4HN1650YD
	1680 (66.1)	445L-P2S1680YD	1800 (70.9)	450L-B4HN1800YD
	1800 (70.9)	445L-P2S1800YD	1800 (70.9)	450L-B4HN1800YD
	1920 (75.6)	445L-P2S1920YD	1950 (76.8)	450L-B4HN1950YD

Table 13 - 445L Safe 2 to 450L-E Light Curtain Conversion [mm (in.)]

Resolution	From 445L Safe 2 Light Curtain		To 450L-E Light Curtain	
	Protective Height	Cat. No.	Protective Height	Cat. No.
30 (1.18)	120 (4.7)	445L-P2S0120YD	150 (5.9)	450L-E4HL0150YD
	240 (9.4)	445L-P2S0240YD	300 (11.8)	450L-E4HL0300YD
	360 (14.2)	445L-P2S0360YD	450 (17.7)	450L-E4HL0450YD
	480 (19.9)	445L-P2S0480YD	600 (23.6)	450L-E4HL0600YD
	600 (23.6)	445L-P2S0600YD	600 (23.6)	450L-E4HL0600YD
	720 (28.3)	445L-P2S0720YD	750 (29.5)	450L-E4HL0750YD
	840 (33.1)	445L-P2S0840YD	900 (35.4)	450L-E4HL0900YD
	960 (37.8)	445L-P2S0960YD	1050 (41.3)	450L-E4HL1050YD
	1080 (42.5)	445L-P2S1080YD	1200 (47.2)	450L-E4HL1200YD
	1200 (47.2)	445L-P2S1200YD	1200 (47.2)	450L-E4HL1200YD
	1320 (52.0)	445L-P2S1320YD	1350 (53.1)	450L-E4HL1350YD
	1440 (56.7)	445L-P2S1440YD	1500 (59.1)	450L-E4HL1500YD
	1560 (61.4)	445L-P2S1560YD	1650 (65.0)	450L-E4HL1650YD
	1680 (66.1)	445L-P2S1680YD	1800 (70.9)	450L-E4HL1800YD
	1800 (70.9)	445L-P2S1800YD	1800 (70.9)	450L-E4HL1800YD
	1920 (75.6)	445L-P2S1920YD	1950 (76.8)	450L-E4HL1950YD

Table 14 - 445L Safe 2 to 440L Type 2 Light Curtain Conversion [mm (in.)]

Resolution	From 445L Safe 2 Light Curtain		To 440L Type 2 Light Curtain	
	Protective Height	Cat. Nos.	Protective Height	Cat. No.
30 (1.18)	120 (4.7)	445L-P2S0120YD	160 (6.3)	440L-P2KA0160YD
	240 (9.4)	445L-P2S0240YD	320 (12.5)	440L-P2KA0320YD
	360 (14.2)	445L-P2S0360YD	480 (18.8)	440L-P2KA0480YD
	480 (19.9)	445L-P2S0480YD	480 (18.8)	440L-P2KA0480YD
	600 (23.6)	445L-P2S0600YD	640 (25.1)	440L-P2KA0640YD
	720 (28.3)	445L-P2S0720YD	800 (31.4)	440L-P2KA0800YD
	840 (33.1)	445L-P2S0840YD	960 (37.8)	440L-P2KA0960YD
	960 (37.8)	445L-P2S0960YD	960 (37.8)	440L-P2KA0960YD
	1080 (42.5)	445L-P2S1080YD	1120 (44.0)	440L-P2KA1120YD
	1200 (47.2)	445L-P2S1200YD	1280 (50.3)	440L-P2KA1280YD
	1320 (52.0)	445L-P2S1320YD	1440 (56.6)	440L-P2KA1440YD
	1440 (56.7)	445L-P2S1440YD	1440 (56.6)	440L-P2KA1440YD
	1560 (61.4)	445L-P2S1560YD	1600 (65.0)	440L-P2KA1600YD
	1680 (66.1)	445L-P2S1680YD	1760 (69.2)	440L-P2KA1760YD
	1800 (70.9)	445L-P2S1800YD		
1920 (75.6)	445L-P2S1920YD			

IMPORTANT The 440L Type 2 receiver is only available with an 8-pin connector. Publication [440L-IN01](#) provides details for the connection and response time.

Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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