Installation Instructions
PHOTOSWITCH® Bulletin 45PVA Part Verification Array

IMPORTANT: SAVE THESE INSTRUCTIONS FOR FUTURE USE.

Description

The Allen-Bradley 45PVA is a photoelectric Parts Verification Array designed for bin picking applications and object detection in the parts assembly industry. When used as part of a suitably configured bin-picking system, the 45PVA effectively prevents mispicks to enhance efficiency and minimize down time. It is also the ideal solution to address the "error proofing" initiatives prevalent in the automotive industry.

The 45PVA uses an array of LEDs to create a light screen that can be spanned across bins at an assembly station. By mounting the sensors on parts bins and wiring them into a controller programmed with the necessary logic, a virtually error-free bin-picking process can be achieved. 'Job lights' on the 45PVA will not only show the assembler the bins required to complete the current process, but will also indicate the correct picking sequence. In the event the assembler attempts to pick an incorrect part, a selectable warning light on the 45PVA will illuminate to indicate the error; additional fault enunciation can be achieved via controller logic in conjunction with a tower light or audible alarm.

In addition to increasing efficiency and quality control by preventing faults in the bin-picking process, the 45PVA is instrumental in personnel stress reduction and the simplification of personnel training—especially in multi-lingual facilities.

Features

- Robust metal enclosure with super slim 13mm profile
- Large highly-visible job indicator lights
- Optional Red warning light indicator to notify operator of incorrect component selection
- Dip switch selectable lighting operation for job lights
- Transmitted beam or selectable retroreflective/diffuse sensing modes
- NPN or PNP dip switch selectable output reduces inventory
- Two frequency dip switch selectable cross talk protection
- Different sizes are available for different component racks. Transmitted beam models are available in four sizes (100 mm (4 in), 225 mm (9 in), 300 mm (12 in), and 375 mm (15 in)). Retroreflective/diffuse models are available in two sizes (100 mm (4 in) and 225 mm (9 in)).

General Specifications

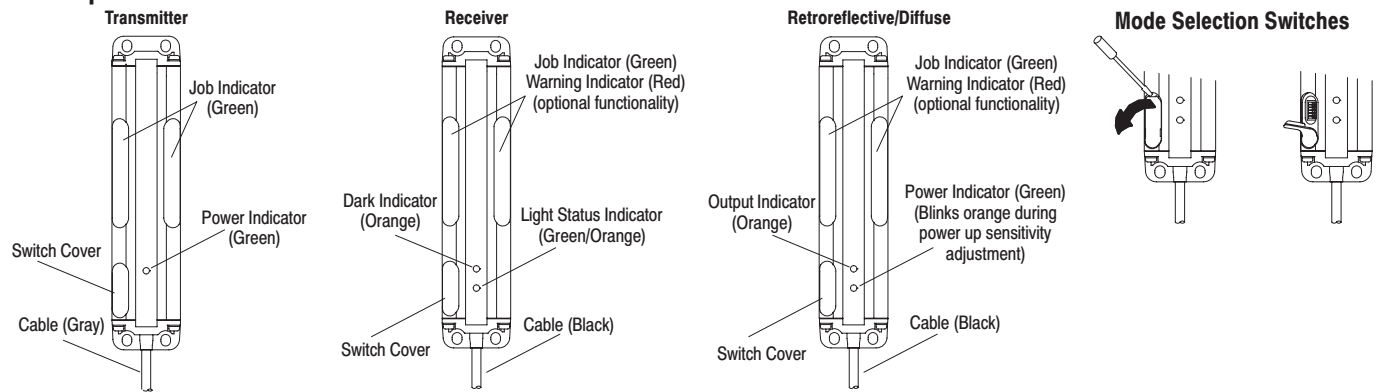| Description		45PVA–1LEB1–F4	45PVA–1LEB2–F4	45PVA–1LEB3–F4	45PVA–1LEB4–F4	45PVA–2LEA1–F4	45PVA–2LEA2–F4
Detection		Transmitted–Beam				Retroreflective/Diffuse	
Range		2m (Max.)				2 m (Retro Mode)/400 mm Gray Paper (Diffuse)	
Detection Object		35 mm (Min.) Opaque Object				Varies with distance (see chart)	
No. of Optical Axis		5	10	13	16	4	8
Detection Width		100 mm	225 mm	300 mm	375 mm	100 mm	225 mm
Optical Axis Pitch		25 mm				29 mm	
Power Supply		12 to 26V DC, Ripple 10% (Max.)					
Current Consumption (Max)		130 mA	140 mA	150 mA	155 mA	68 mA	78 mA
Output Mode		NPN/PNP Output Selectable; Rating: Current 50mA (30VDC) Max. Residual Voltage 2V or less					
Operation Mode		Light-on/Dark-on Selectable				Target Present = Output On	
Response Time	Standard	Light on: 35 ms Dark on: 25 ms	Light on: 68 ms Dark on: 42 ms	Light on: 70 ms Dark on: 42 ms	Light on: 94 ms Dark on: 58 ms	120 ms	
	Interference Protection	Light on: 45 ms Dark on: 28 ms	Light on: 84 ms Dark on: 52 ms	Light on: 88 ms Dark on: 54 ms	Light on: 116 ms Dark on: 72 ms	120 ms	
Light Source		Infrared LED, Wave-length 880 nm				Visible Red LED, 640 nm	
Indicator	Job/Warning	Large Green/Red					
	Power and Output	Power Indicator—Small Green LED; Receiver Light on Indicator—Small Green LED; Receiver Dark on Indicator—Small Orange LED				Power Indicator—Small Green LED (blinks orange during power up sensitivity adjustment). Output Indicators—Small Orange LED.	
Short Circuit Protection		Built-in					

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General Specifications (continued)

Description	45PVA–1LEB1–F4	45PVA–1LEB2–F4	45PVA–1LEB3–F4	45PVA–1LEB4–F4	45PVA–2LEA1–F4	45PVA–2LEA2–F4
Cross Talk Elimination	Selectable Frequency					
Material	Enclosure: Aluminum, Lens: Polycarbonate, End plate: Resin					
Wiring	4-Pin DC Micro Connection with 2m pigtail					

Environmental Characteristics

Ambient Light	10,000 lx (Max.)		
Operating Temperature—C (F)	0…50° (32…122°)		-10…50° (14…122°)
Storage Temperature—C (F)	−25…70° (−13…158°)		
Operating Humidity	35% to 85 %RH		
Enclosure Protection	IP 62		
Vibration Resistance	10Hz to 55Hz, 1.5mm Amplitude, 2 hours, X,Y and Z directions		
Shock Resistance	500 m/s^2 3 times X,Y and Z directions		
Dielectric Strength	1,000VAC for 1 minute		

Description

Transmitter — Job Indicator (Green), Power Indicator (Green), Switch Cover, Cable (Gray)

Receiver — Job Indicator (Green), Warning Indicator (Red) (optional functionality), Dark Indicator (Orange), Light Status Indicator (Green/Orange), Switch Cover, Cable (Black)

Retroreflective/Diffuse — Job Indicator (Green), Warning Indicator (Red) (optional functionality), Output Indicator (Orange), Power Indicator (Green) (Blinks orange during power up sensitivity adjustment), Switch Cover, Cable (Black)

Mode Selection Switches

Mode Selection Switches

Transmitted Beam

1. Job indicator mode
2. Job indicator speed control for flashing
3. Selectable operation mode (receiver only)
4. Selectable warning indicator (receiver only)
5. NPN/PNP selectable switch
6. Selectable frequency

Retroreflective/Diffuse

1. Operating mode selection
2. Automatic sensitivity adjustment ON/OFF
3. Output Normally Open/Normally Closed
4. Selectable warning indicator
5. NPN/PNP selectable switch
6. Selectable frequency

Factory Default Settings

Flash	1	Light
Fast	2	Slow
Dark_on	3	Light_on
Warning_on	4	Warning_off
PNP	5	NPN
A	6	B

Diffuse	1	Retro
Auto Adjust	2	Auto Adj Off
N.O.	3	N.C.
Warning_on	4	Warning_off
PNP	5	NPN
Freq A	6	Freq B

Note: Only operate the mode selection switches with the power supply turned off.

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1. **Job indicator mode (transmitted beam)**
   Either a steady light or flashing light mode can be selected.
   Operating mode selection (retro/diffuse)
   Retroreflective or diffuse operating mode can be selected

2. **Job indicator speed control for flashing (transmitted beam)**
   The flashing speed can be selected as slow or fast.
   Automatic sensitivity adjustment ON/OFF (retro/diffuse)
   The automatic sensitivity adjustment can be turned on or off. (Regardless of this setting, sensitivity is always adjusted when the power is turned on.)

3. **Selectable operation mode (transmitted beam receiver)**
   The output mode of the receiver can be selected for light or dark operate.
   Output Normally Open/Normally Closed (retro/diffuse)
   The output mode can be selected for Normally Open or Normally Closed.

4. **Selectable warning indicator**
   Select the warning indicator mode.

5. **NPN/PNP selectable switch**
   Select the transistor mode for the output and the job indicator input.
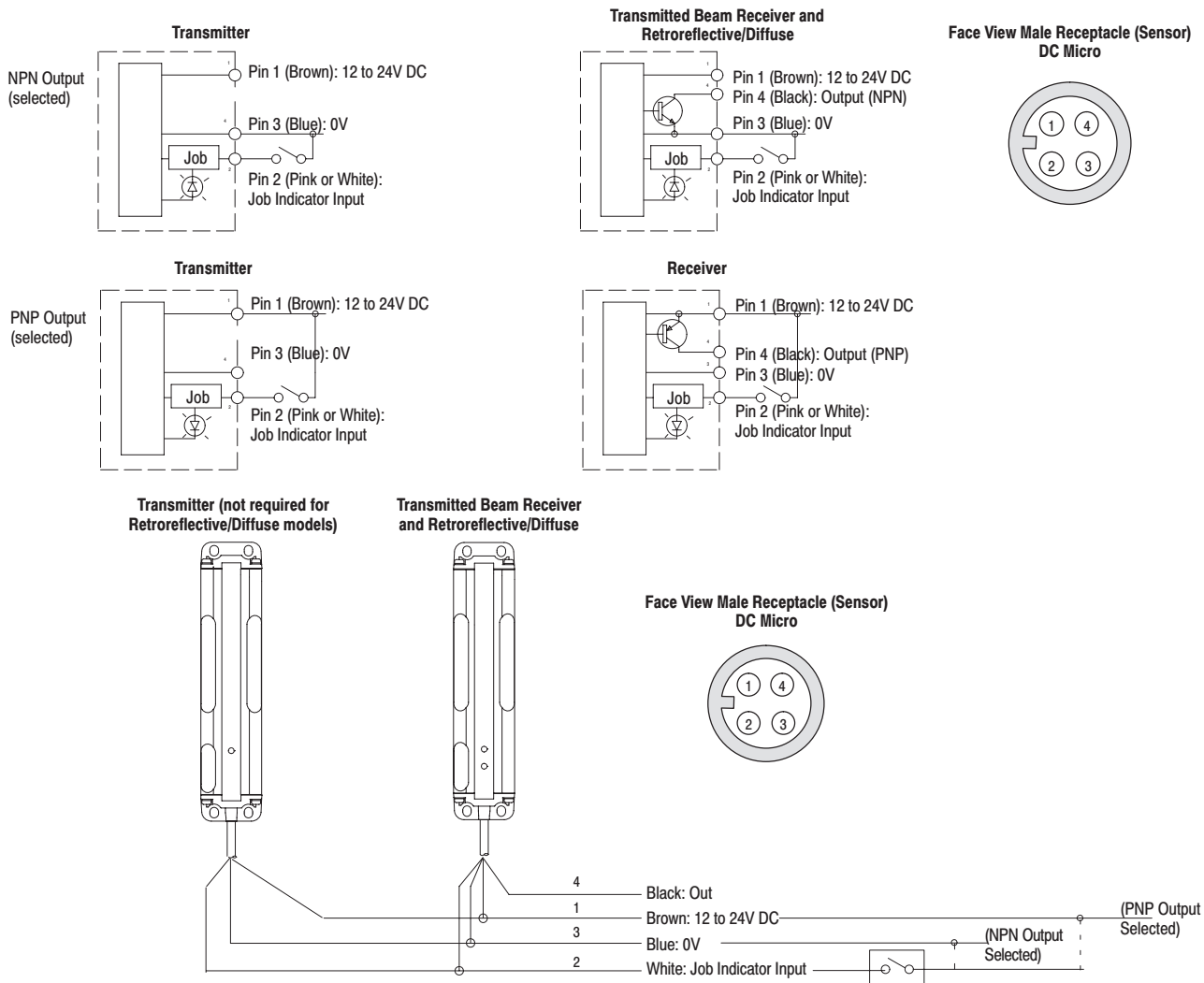   NPN Output (PNP Input)
   PNP Output (NPN Input)

6. **Selectable frequency**
   The frequency can be switched to eliminate crosstalk.

Input/Output Circuit and Wiring

The NPN/PNP input of the job indicator and the NPN/PNP output are selected by mode switch.

Transmitter

NPN Output (selected)

Pin 1 (Brown): 12 to 24V DC
Pin 3 (Blue): 0V
Job
Pin 2 (Pink or White): Job Indicator Input

Transmitted Beam Receiver and Retroreflective/Diffuse

Pin 1 (Brown): 12 to 24V DC
Pin 4 (Black): Output (NPN)
Pin 3 (Blue): 0V
Job
Pin 2 (Pink or White): Job Indicator Input

Face View Male Receptacle (Sensor) DC Micro

1 4
2 3

Transmitter

PNP Output (selected)

Pin 1 (Brown): 12 to 24V DC
Pin 3 (Blue): 0V
Job
Pin 2 (Pink or White): Job Indicator Input

Receiver

Pin 1 (Brown): 12 to 24V DC
Pin 4 (Black): Output (PNP)
Pin 3 (Blue): 0V
Job
Pin 2 (Pink or White): Job Indicator Input

Transmitter (not required for Retroreflective/Diffuse models)

Transmitted Beam Receiver and Retroreflective/Diffuse

Face View Male Receptacle (Sensor) DC Micro

1 4
2 3

4   Black: Out
1   Brown: 12 to 24V DC   (PNP Output Selected)
3   Blue: 0V   (NPN Output Selected)
2   White: Job Indicator Input

Note: Warning light requires no wiring. It is triggered using internal logic when the input is off (low) and the target is present.

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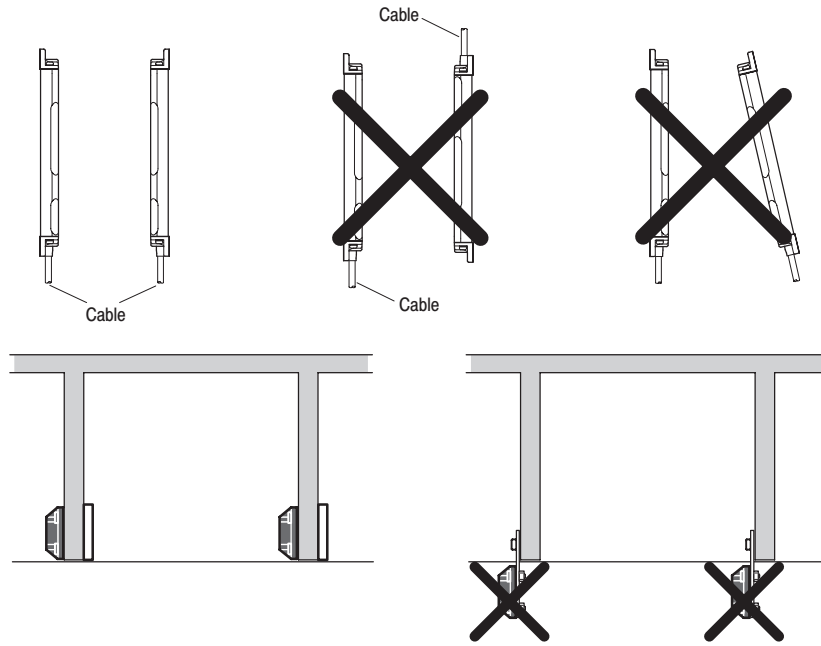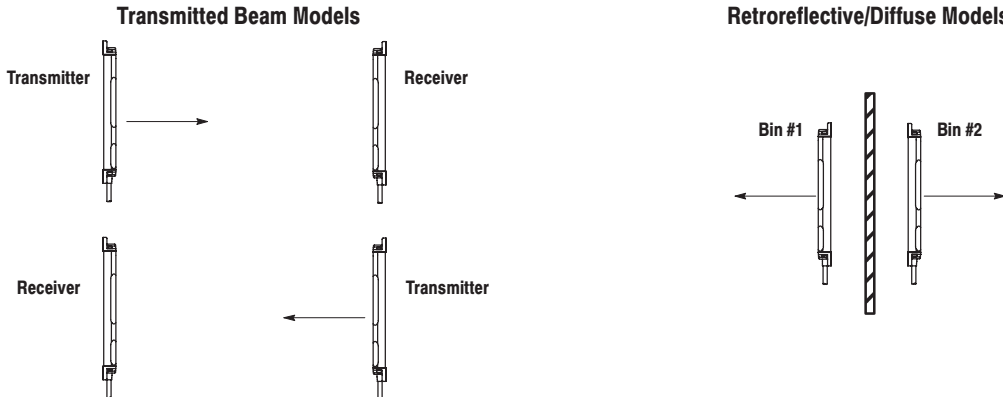
Installation

Cross–Talk Elimination

When two or more sensors are installed close together the sensors may interfere with each other and not operate correctly. In that case, flip the frequency switch on one set of sensors. For transmitted beam, transmitter and receiver pairs must be set to the same frequency.

Transmitted Beam Models
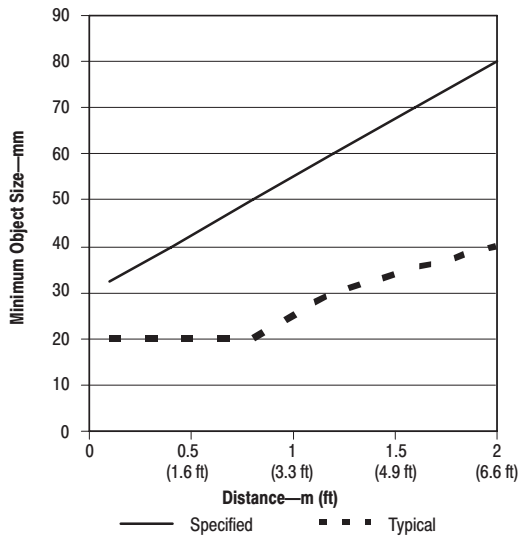
Retroreflective/Diffuse Models
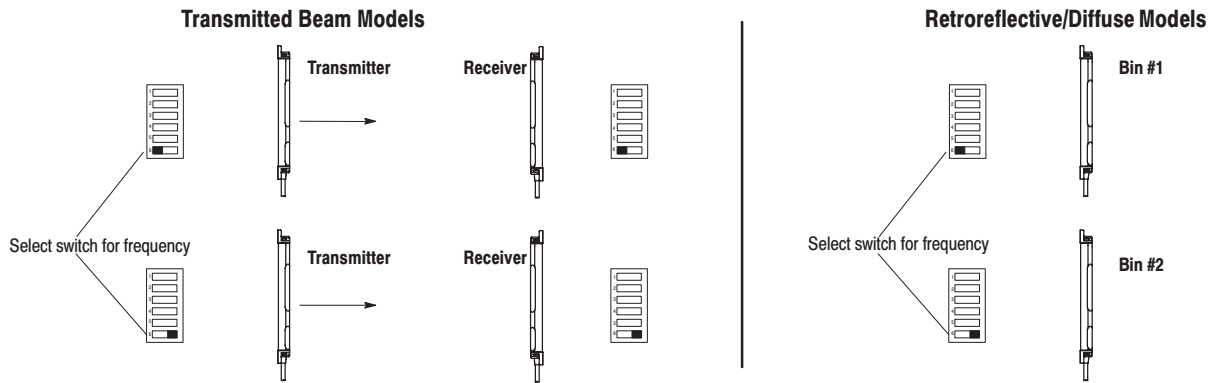
An additional method for dealing with sensor cross talk interference is by alternating the direction of transmitter/receiver pairs. The same effect can be achieved with the retro/diffuse model by setting the units up back to back.
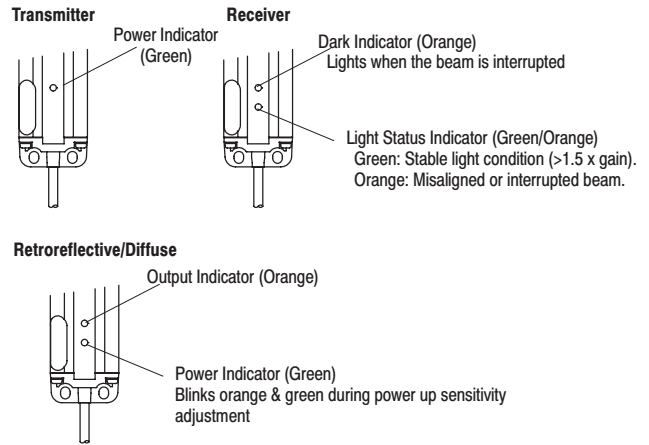

Transmitted Beam Models

Retroreflective/Diffuse Models

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Minimum Detectable Object Size

Retroreflective Mode

Minimum Object Size—mm vs **Distance—m (ft)**

X-axis: 0, 0.5 (1.6 ft), 1 (3.3 ft), 1.5 (4.9 ft), 2 (6.6 ft)

Y-axis: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90

——— Specified   - - - Typical

Operating Indicator

Transmitter

Power Indicator (Green)

Receiver

Dark Indicator (Orange)
Lights when the beam is interrupted

Light Status Indicator (Green/Orange)
Green: Stable light condition (>1.5 x gain).
Orange: Misaligned or interrupted beam.

Retroreflective/Diffuse

Output Indicator (Orange)

Power Indicator (Green)
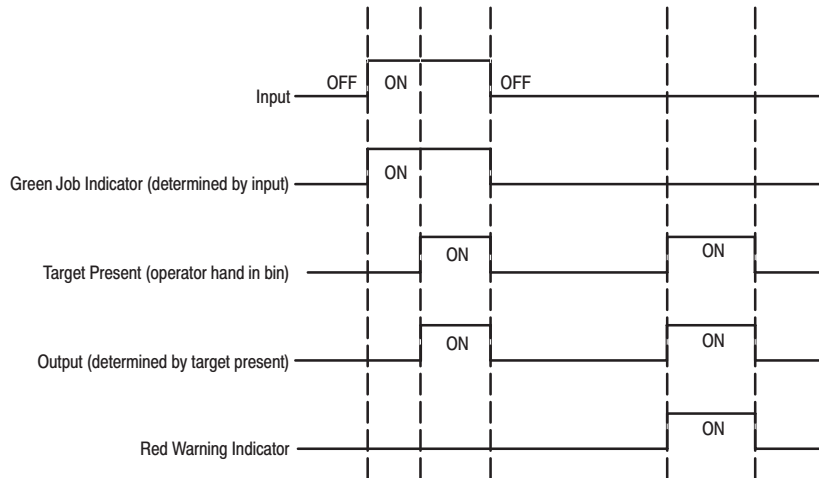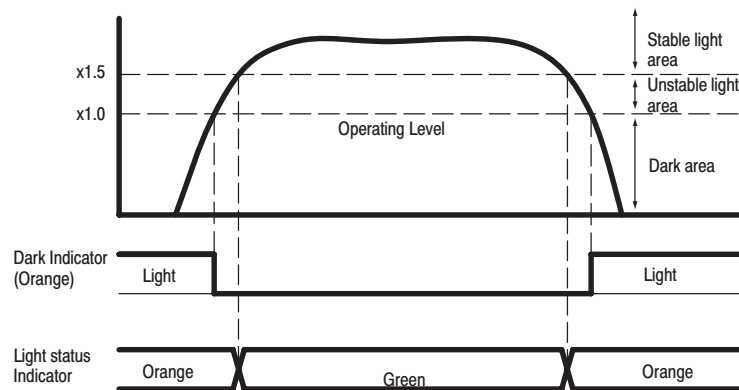Blinks orange & green during power up sensitivity adjustment

Job Indicator & Warning Indicator

The green job indicator LED is on when the input to the PVA is on. The output signal is turned on when the target is present (when in Dark On or Normally Open mode). For example, when the operator's hand is in the bin. The red warning indicator is on when the target is present and the input is off.
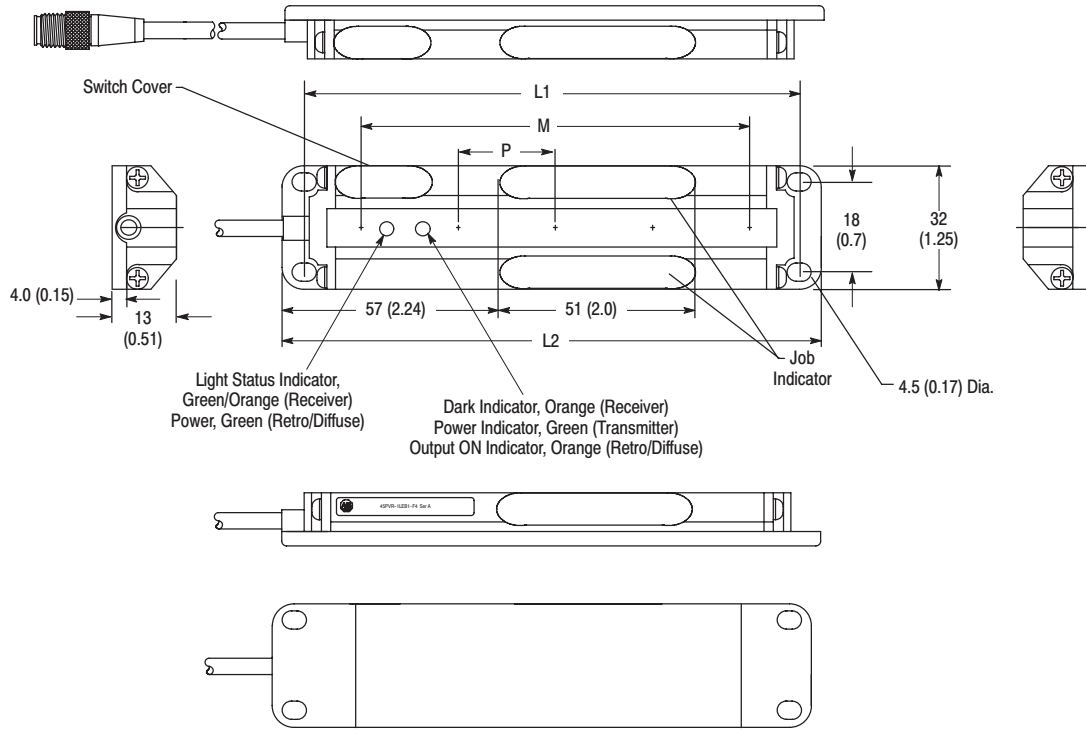

Input: OFF, ON, OFF

Green Job Indicator (determined by input): ON

Target Present (operator hand in bin): ON, ON

Output (determined by target present): ON, ON

Red Warning Indicator: ON

Light Margin and Operating Indicators (transmitted beam receiver only)

Stable light area
x1.5
Unstable light area
x1.0
Operating Level
Dark area

Dark Indicator (Orange): Light / Light

Light status Indicator: Orange / Green / Orange

Note: Use a dry, soft cloth for cleaning the lens and case. Lightly wipe it off. Never use solvents such as thinner.

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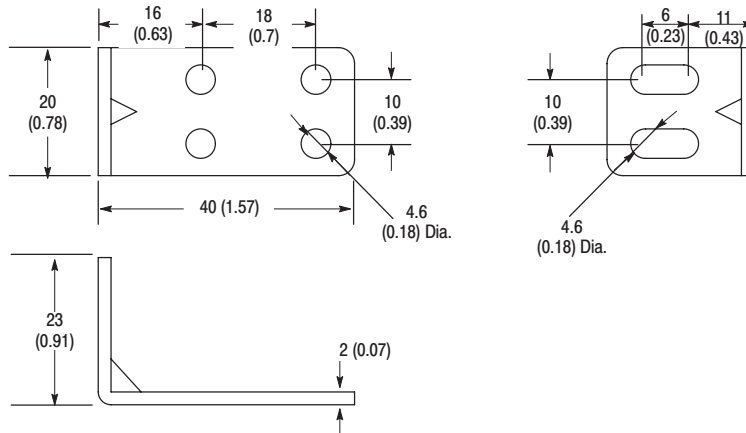**Allen-Bradley**

Dimensions—mm (inches)

Switch Cover

L1

M

P

4.0 (0.15)

13 (0.51)

18 (0.7)

32 (1.25)

57 (2.24)

51 (2.0)

L2

Job Indicator

4.5 (0.17) Dia.

Light Status Indicator,
Green/Orange (Receiver)
Power, Green (Retro/Diffuse)

Dark Indicator, Orange (Receiver)
Power Indicator, Green (Transmitter)
Output ON Indicator, Orange (Retro/Diffuse)

Cat. No.	Dimensions—mm (inches)				
	N ❶	M	L1	L2	P
45PVA–1LEB1–F4	5	100 (3.9)	130 (5.1)	140 (5.5)	25 (1.0)
45PVA–1LEB2–F4	10	225 (8.9)	255 (10.0)	265 (10.4)	25 (1.0)
45PVA–1LEB3–F4	13	300 (11.8)	330 (13.0)	340 (13.4)	25 (1.0)
45PVA–1LEB4–F4	16	375 (14.8)	405 (16.0)	415 (16.3)	25 (1.0)
45PVA–2LEA1–F4	4	87 (3.4)	130 (5.1)	140 (5.5)	29 (1.1)
45PVA–2LEA2–F4	8	203 (8.0)	255 (10.0)	265 (10.4)	29 (1.1)

❶ N = Number of optical axis.

Accessories

Mounting Brackets

#60–2773 (2 brackets)
(included)

16 (0.63)

18 (0.7)

20 (0.78)

10 (0.39)

40 (1.57)

4.6 (0.18) Dia.

6 (0.23)

11 (0.43)

10 (0.39)

4.6 (0.18) Dia.

23 (0.91)

2 (0.07)
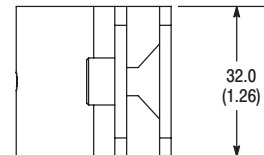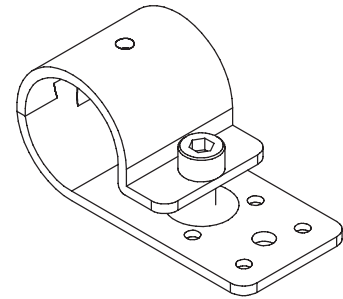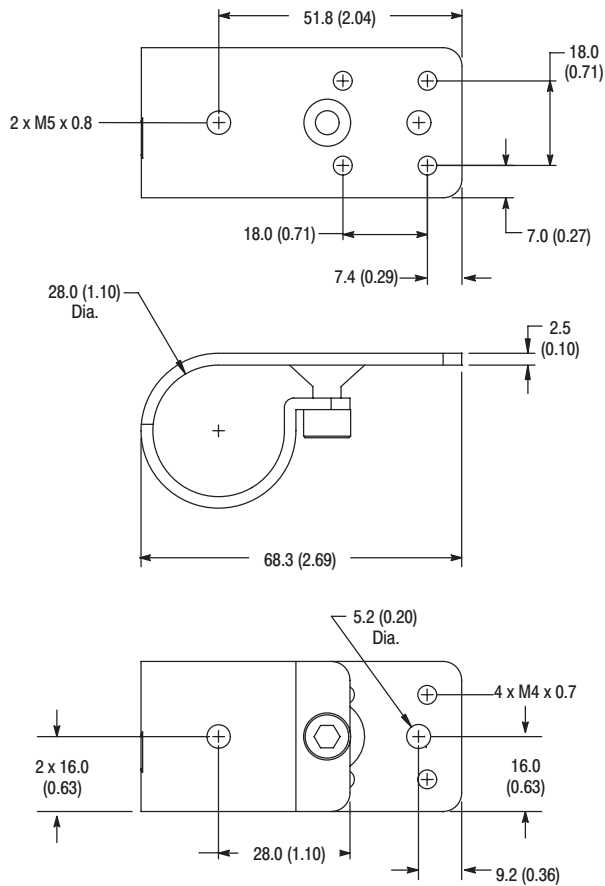
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Optional Mounting Brackets

Mounting brackets available as an option (not included with sensor).

Plastic Bracket
#60–2779 (2 brackets)

34.0 (1.34)

17.0 (0.67)

7.6 (0.30)

18.0 (0.71)

20.1 (0.79)

7.4 (0.29)

4.4 (0.17)

18.8 (0.74)

26.9 (1.06) Dia.

66 (2.60)
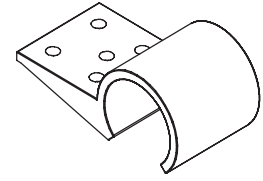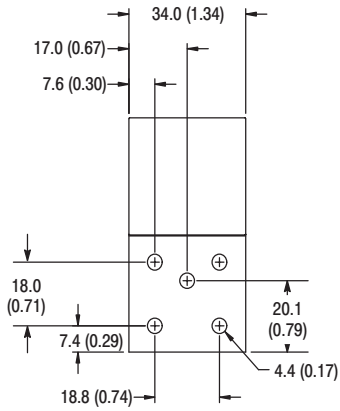
Metal Bracket
#60–2772 (2 brackets)

51.8 (2.04)

18.0 (0.71)

2 x M5 x 0.8

18.0 (0.71)

7.4 (0.29)

7.0 (0.27)

28.0 (1.10) Dia.

2.5 (0.10)

68.3 (2.69)

5.2 (0.20) Dia.

4 x M4 x 0.7

2 x 16.0 (0.63)

16.0 (0.63)

32.0 (1.26)

28.0 (1.10)

9.2 (0.36)

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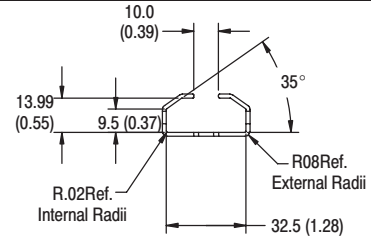
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Protective Metal Bracket
#60–277x–1 (2 brackets for transmitted beam models)
#60–278x–1 (1 bracket for retro/diffuse models)
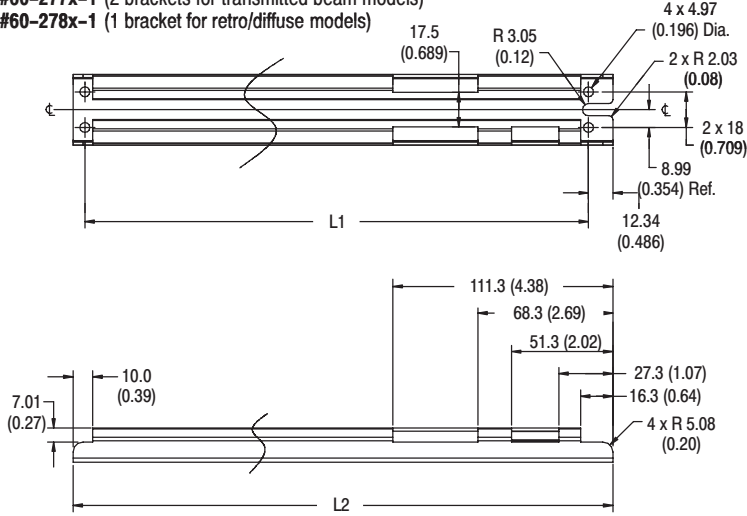
Cat. No. (2 brackets)	Cat. No. (1 bracket)	L1	L2	Material
60–2775–1	**60–2785–1**	130.0 (5.11)	148.36 (5.84)	Galvanized Steel
60–2776–1	**60–2786–1**	254 (10.03)	273.35 (10.76)	
60–2777–1	**NA**	330 (12.99)	348.36 (13.71)	
60–2778–1	**NA**	405 (15.94)	423.34 (196.6)	

Reflective Tape (included with retroreflective/diffuse models)

Cat. No.	For use with	Dimensions—mm (inches)		
		W	**L**	
92–122	**45PVA–2LEA1–F4**	50 (2)	120 (4.7)	
92–123	**45PVA–2LEA2–F4**	50 (2)	245 (9.6)	

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