A-GAGE® EZ-ARRAY™ with IO-Link v1.1

Quick Start Guide

To view or download the latest technical information about this product, including specifications, dimensions, accessories, and wiring, go to www.bannerengineering.com. Search for the instruction manual, part number 222662. This Quick Start Guide provides basic configuration and use instructions when the receiver interface is used. Instructions for using the IO-Link v1.1 interface are available in the instruction manual.



- A cost-effective, two-piece measuring light curtain designed for quick and simple installations with the sophistication to handle the toughest sensing applications
- Excels at high-speed, precise process monitoring and inspection, profiling, and web-guiding applications
- A comprehensive combination of scanning options:
  - 16 measurement (scan analysis) modes
  - Three scanning methods
  - Selectable beam blanking
  - Selectable continuous or gated scan initiation
  - Selectable threshold setting for semi-transparent applications
  - Two analog outputs, two discrete outputs
  - Communication via IO-Link v1.1 interface
- Outstanding 4 meter range with 5 mm beam spacing
- Available in 12 lengths from 150 mm to 2400 mm
- Excellent 5 mm minimum object detection or 2.5 mm edge resolution, depending on scanning method
- Receiver user interface for quick, intuitive setup of many common applications:
  - Six-position DIP switch for setting scan mode, measurement mode, analog slope, discrete output 2 option (complementary measurement or alarm operation)
  - Two push buttons for gain method selection and alignment/ blanking
  - Seven Zone LEDs for instant alignment and beam blockage information
  - Three-digit display for sensing information and diagnostics
- Advanced configuration via IO-Link v1.1 communication interface, COM2 or COM3 selectable
- Remote teach wire option for alignment, gain settings, inverted display, and DIP switch disable

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

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System Components

A typical A-GAGE EZ-ARRAY has four components: an emitter and a receiver, each with an integral quick-disconnect (QD) fitting, plus an 8-pin QD cordset for the emitter and for the receiver.

For applications that use the IO-Link interface, an additional cable splitter is used to convert the receiver 8-pin connector to a compatible M12 connector.

Figure 1. Components



Models

Emitter	Receiver with IO-Link v1.1	Receiver Discrete Output [1]	Receiver Analog Output	Array Length Y [2]	Total Beams
EA5E150Q	**EA5R150XK2Q**	PNP	Voltage (0-10 V)	150 mm (5.9 in)	30
EA5E300Q	**EA5R300XK2Q**	PNP	Voltage (0-10 V)	300 mm (11.8 in)	60
EA5E450Q	**EA5R450XK2Q**	PNP	Voltage (0-10 V)	450 mm (17.7 in)	90
EA5E600Q	**EA5R600XK2Q**	PNP	Voltage (0-10 V)	600 mm (23.6 in)	120
EA5E750Q	**EA5R750XK2Q**	PNP	Voltage (0-10 V)	750 mm (29.5 in)	150
EA5E900Q	**EA5R900XK2Q**	PNP	Voltage (0-10 V)	900 mm (35.4 in)	180
EA5E1050Q	**EA5R1050XK2Q**	PNP	Voltage (0-10 V)	1050 mm (41.3 in)	210
EA5E1200Q	**EA5R1200XK2Q**	PNP	Voltage (0-10 V)	1200 mm (47.2 in)	240
EA5E1500Q	**EA5R1500XK2Q**	PNP	Voltage (0-10 V)	1500 mm (59.1 in)	300
EA5E1800Q	**EA5R1800XK2Q**	PNP	Voltage (0-10 V)	1800 mm (70.9 in)	360
EA5E2100Q	**EA5R2100XK2Q**	PNP	Voltage (0-10 V)	2100 mm (82.7 in)	420
EA5E2400Q	**EA5R2400XK2Q**	PNP	Voltage (0-10 V)	2400 mm (94.5 in)	480

Overview

The A-GAGE® EZ-ARRAY™ measuring light screen is ideal for such applications as on-the-fly product sizing and profiling, edge-guiding and center-guiding, loop tensioning control, hole detection, parts counting, and similar uses.

Emitters and receivers are available with arrays from 150 to 2400 mm (5.9 in to 94.5 in) long. The emitter has a column of infrared light emitting diodes (LEDs) spaced 5 mm apart; their light is collimated and directed toward the receiver, positioned opposite the emitter, which has photodiodes on the same 5 mm pitch. The light from each emitter LED is detected by the corresponding receiver photodiode.

This sophisticated light curtain is capable of detecting opaque cylindrical objects as small as 5mm in diameter or measuring part edges within 2.5 mm, depending on the scanning method selected . The sensing range is 400 mm to 4 m (16 in to 13 ft) on standard models and 30 mm to 1500 mm (1.18 in to 59 in) on the short-range, low-contrast models. [3]

Short range, low contrast models are available for applications requiring a shorter distance between emitter and receiver or where detection and profiling of non-opaque targets is needed. Detection of glass or other clear objects is possible with this system.

1 Discrete Output 1 is push-pull (IO-Link)
2 Models with array lengths 1050mm and longer ship with a center bracket as well as two end-cap brackets.
3 Contact the factory for short-range, low-contrast models.

The EZ-ARRAY's two-piece design makes it economical and easy to use. Controller functionality is built into the receiver housing. It can be configured for many straightforward applications using the six-position DIP switch on the front of the receiver (the receiver user interface).The IO-Link communication interface provides the capability for more advanced control and monitoring. See IO-Link Overview on page 4.

The emitter and receiver housings can be side-mounted or end-cap-mounted using the included end-cap brackets; longer models also include a center bracket.

Beam synchronization is achieved via the 8-conductor sensor cables. Individual LEDs and a 3-digit diagnostic display on the receiver provide ongoing visual sensing status and diagnostic information. Comprehensive data is available to a process controller via a combination of four outputs: two analog and two discrete (discrete output 1 is an IO-Link output). The IO-Link output provides a discrete output (SIO mode) or a communication interface (IO-Link mode).

Figure 2. Application

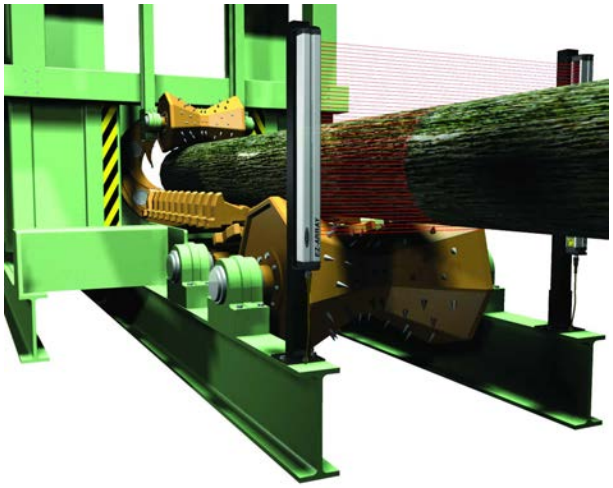
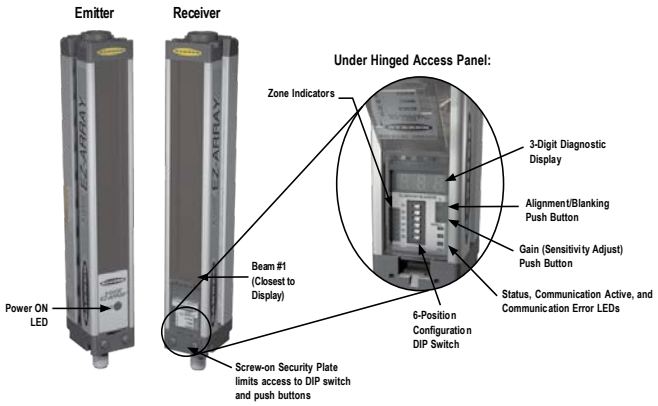


Figure 3. Emitter and Receiver



Diagnostic programming and easy-to-see indicators on the receiver simplify physical alignment and troubleshooting; more advanced diagnostics are available via the IO-Link v1.1 interface.

The alignment/blanking button automatically equalizes the excess gain of each beam for reliable object detection throughout the array. This routine need not be performed again unless the sensing application changes, or if the emitter and/or receiver is moved.

Configurable beam blanking accommodates machine components and fixtures that must remain in or move through the light screen. Blanking may be set using the receiver interface, the teach wire, or the IO-Link v1.1 interface.

The EZ-ARRAY light screen provides a wide selection of sensing and output options, including measurement ("scan analysis") modes and scanning methods that can determine a target object's location, overall size, total height, or total width, or the number of objects. Scanning may be continuous or controlled by a gate sensor.

Status Indicators

Both the emitter and receiver provide ongoing visual indication of operating and configuration status.

The emitter has a red LED that signals proper operation (ON when power is applied).

Table 1: Emitter status indicators

LED	Color	Description
Status LED	Red ON	Status OK
	Red Flashing at 1 Hz	Error

The receiver has a bright Status LED that indicates overall sensing status (OK, marginal alignment, and hardware error). Two other LEDs indicate whether communication is active or if there is an error. Seven Zone indicators each communicate the blocked/aligned status of one-seventh of the total array. A 3-digit diagnostic display provides further diagnostic information: number of beams blocked, whether blanking is configured, and error codes. See the Instruction Manual for more information on the error codes.

Table 2: Receiver and IO-Link status indicators

LED Indicator	Color	Description
7-Zone Indicators	Red	Blocked channels within the zone
	Green	All channels are clear within the zone
Status	Red	Marginal alignment or hardware error; check the 3-digit display
	Green	System is okay
COMM	Amber On	IO-Link mode

LED Indicator	Color	Description
	Amber Off	SIO mode
Error	Red	IO-Link error; check the cabling or master controller

Zone Indicators (Beams Blocked Segment)

Seven LEDs represent emitter/receiver alignment status. They provide a visual aid for sensor alignment and monitoring objects within the sensor's field of view. The sensor array is partitioned into seven equal segments, each of which is represented by one of the seven LEDs. The LED closest to DIP switch S6 (see Configuration via DIP Switch or IO-Link v1.1 Interface on page 4) represents the group of optical channels closest to the receiver display (the "bottom" group). The LED closest to DIP switch 1 represents the far segment of channels.

These LEDs illuminate either green or red. When an LED is green, no unblanked beams are obstructed in that segment. When the LED is red, one or more beams in that segment is obstructed.

Three-Digit Display

The 3-digit display has slightly different functions during normal operation, alignment, and gain adjust modes. In normal operation the display indicates the current numerical value of measurement mode 1. The display also identifies the following activated sensor functions: blanking and locked-out user interface/electronic configuration, as shown in Electronic Configuration Indicator on page 4.

During blanking mode, the display reads "**n**", followed by the number of blocked beams in the array. During alignment mode, it reads "**A**", followed by the number of blocked, unblanked beams; a period follows the A ("**A.**") if blanking is configured.

During gain adjust mode, the display reads " $_{L}$ " followed by "**1**" or "**2**" to indicate the gain level. (A "**1**" represents high excess gain, and a "**2**" represents low contrast.)

If a sensing error occurs, the display reads "**c**" followed by a number that corresponds to the recommended corrective action. Refer to for more information.

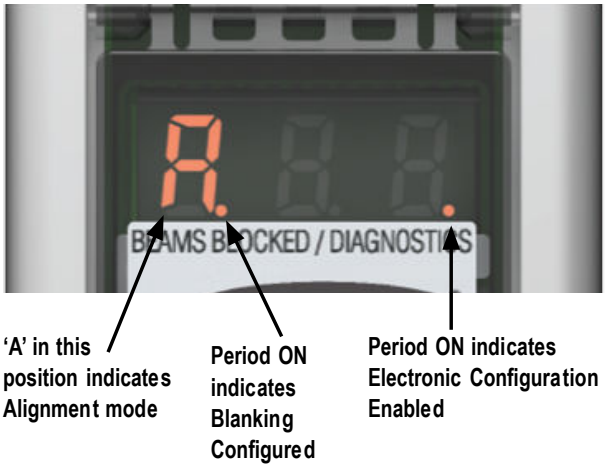
Blanking Indicator

The Blanking indicator will be visible (ON) when the blanking feature is enabled. It appears as a period following the first digit of the display.

Electronic Configuration Indicator

The Electronic Configuration indicator is on when the sensor configuration is defined by the IO-Link v1.1 interface and not the DIP switch. When electronic configuration is enabled, the DIP switch is ignored.

Figure 4. Electronic configuration indicator



Configuration via DIP Switch or IO-Link v1.1 Interface

Commonly used configuration options can be set up easily via a six-position DIP switch located behind a hinged clear access panel on the front of the receiver.

Access to the DIP switch can be prevented by using the screw-on security plate to hold the clear access panel closed or by disabling them via the IO-Link v1.1 interface.

IO-Link Overview

For the latest IO-Link protocol and specifications, please visit the web site at http://www.io-link.com

IO-Link is a point-to-point communication link between master and slave. It can be used to automatically parameterize sensors and transmit process data.

Inverting the 3-Digit Display

When the sensors is mounted in an inverted position, invert the 3-digit display for readability. The periods on the three seven-segment indicators do not move when the display is inverted.

Scanning Method

One of three scanning methods may be configured:

- Straight Scan
- Single-edge Scan
- Double-edge Scan (1, 2, 4, 8, 16, or 32 steps)

Sensor response time is a function of sensor length and scanning method. Maximum scan times are shown in Maximum Scan Times in SIO Mode on page 6.

Scanning Method	Straight Scan		Single-Edge Scan	Double-Edge Scan (per Edge)					
	Low-Contrast	High-Excess-Gain		Step Size (Number of Beams)					
				1	2	4	8	16	32
Minimum Object Detection Size*	5 mm (0.2")	10 mm (0.4")	10 mm (0.4")	10 mm (0.4")	20 mm (0.8")	30 mm (1.2")	50 mm (2")	90 mm (3.6")	170 mm (6.8")
Edge Resolution	5 mm (0.2")	5 mm (0.2")	2.5 mm (0.1")	2.5 mm (0.1")	2.5 mm (0.1")	2.5 mm (0.1")	2.5 mm (0.1")	2.5 mm (0.1")	2.5 mm (0.1")
*MODS determined using a rod target object									

Straight Scan

Straight Scan is the default mode, in which all beams are scanned in sequence, from the display end to the far end of the array. This scanning method provides the smallest object detection size.

Straight scan is used when low-contrast sensitivity is selected or when single-edge and double-edge scan cannot be used. The edge resolution is 5 mm (0.2 in). When low-contrast sensing is selected (used when measuring semi-transparent objects), the minimum object detection size is 5 mm (0.2 in) diameter. When high-excess-gain sensing is selected, the minimum object detection size is 10 mm (0.4 in).

Single-Edge Scan

Single-Edge Scan is used to measure the height of a single object. This scanning method is commonly used for box height measurement. For single-edge scan, the receiver always activates the first beam channel (or "bottom" beam, nearest the display). When the first beam is blocked, the sensor performs a binary search to hunt for the last beam blocked, as follows:

1. The receiver scans only the first beam until it is blocked.
2. When the first beam is blocked, the sensor looks to see whether the middle beam is blocked or made (unblocked).
3. If the middle beam is made (unblocked), the sensor checks the bottom quarter beam; if the middle beam is blocked, the sensor checks the top quarter beam.
4. The routine continues to divide the number of beams in half until the edge is found.

Single-edge scan can be used only for single, solid objects that block the first beam (closest to the display). Because the receiver checks only the first beam until it is blocked, single-edge scan will not function when the item to be measured does not block the first beam. Single-edge scan is also ineffective if the object does not present a continuous blocked pattern.

Single-edge scan works only when the high-excess-gain setting is enabled. When single-edge scan is selected, the sensor object detection size is 10 mm and edge resolution is 2.5 mm.

Double-Edge Scan

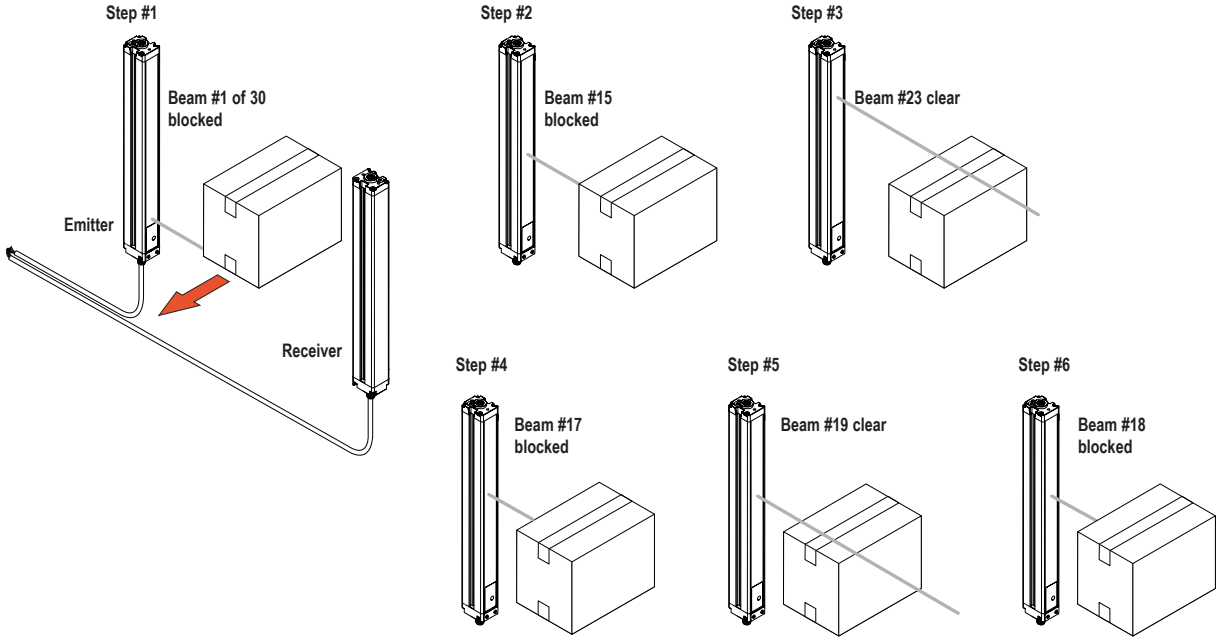
Double-edge scan is used to detect two edges of a single object, for example, to determine box width measurements. Double-edge scan requires the selection of a step size: 1, 2, 4, 8, 16 or 32 beams.

The sensor uses the steps to "skip" over beams, as follows:

1. The sensor activates beam 1 (closest to the sensor display end).
2. The sensor activates the next beam, determined by the step size. (For example, if the step size is 2, beam 3 is next; if the step size is 8, beam 9 is next.)
3. As long as the activated beam is made (unblocked), the sensor continues the stepping routine until a blocked beam is found.
4. When a blocked beam is found, a binary search is conducted to find the object's "bottom" edge.
5. When the bottom edge is found, the sensor continues to step through the array until it finds the next unblocked beam.
6. Another binary search is performed to find the second edge.

Similar to single-edge scan, double-edge scan has some restrictions: the object should provide a solid obstruction; the size of the object determines the maximum step size. Double-edge scan can be used to detect up to three objects. Like single-edge scan, double-edge scan works only when the high-excess-gain setting is selected. When double-edge scan is selected, the sensor object detection size varies, depending on the step size, but edge resolution is 2.5 mm.

Figure 5. Double-edge scan



Maximum Scan Times in SIO Mode

Table 3: Maximum scan times (in milliseconds) during SIO mode

Array Length	Straight Scan	Single-Edge Scan	Double-Edge Scan					
			Step 1 Beam	Step 2 Beams	Step 4 Beams	Step 8 Beams	Step 16 Beams	Step 32 Beams
150 mm (5.9 in)	2.8	1.5	3.4	2.8	2.5	2.4	1.9	N/A
300 mm (11.8 in)	5.0	1.5	5.9	4.1	3.2	2.8	2.3	2.1
450 mm (17.7 in)	7.1	1.6	8.5	5.5	4.2	4.0	3.2	2.5
600 mm (23.6 in)	9.3	1.6	11.0	6.8	4.9	4.2	4.0	2.8
750 mm (29.5 in)	11.4	1.7	13.5	8.1	5.7	4.6	4.5	4.5
900 mm (35.4 in)	13.6	1.7	16.0	9.5	6.1	4.7	4.6	4.6
1050 mm (41.3 in)	15.7	1.8	18.6	10.8	6.8	5.2	4.8	4.8
1200 mm (47.2 in)	17.9	1.8	21.1	12.2	7.4	5.5	4.9	4.9
1500 mm (59.1 in)	22.2	1.9	26.1	14.8	9.0	6.4	5.3	4.9
1800 mm (70.9 in)	26.5	2.0	31.2	17.5	10.5	7.3	6.0	5.6
2100 mm (82.7 in)	30.8	2.8	36.3	20.2	12.0	8.2	6.7	5.6
2400 mm (94.5 in)	35.1	2.8	41.4	22.9	13.5	9.1	7.4	5.9

When communicating over IO-Link, there is a minimum cycle time of 18 ms for COM2 or 6 ms for COM3. The maximum scan time will be the greater between the SIO scan time and the IO-Link cycle time.

Scan times are also dependent on analog filter speed. Refer to the instruction manual for more information.

Gain Configuration

The EZ-ARRAY provides two gain options for straight scan applications: high excess gain and low contrast. The gain method can be selected using the receiver push button, the receiver remote teach wire, or the IO-Link v1.1 interface.

High (maximized) excess gain is suited for detecting opaque objects and for reliable sensing in dirtier environments where objects to be detected are 10 mm or larger. The high excess gain method is always used in single- and double-edge scan. The high excess gain option has a minimum blocked threshold level, which provides reliable sensing at higher excess gain levels.

The low-contrast setting is used for sensing semi-transparent materials and for detecting objects as small as 5 mm (straight scan only). In low-contrast operation, only a portion of a beam must be blocked for detection to occur. In low-contrast operation, the sensor sets an individual threshold for each optical channel during the alignment process; this process equalizes the signal strength to allow semi-transparent object detection.

When using the IO-Link v1.1 interface, low-contrast sensing provides a fine-tune sensitivity setting of 15% to 50%. When using the receiver interface, low-contrast sensitivity is always 30%.

On short range, low contrast models, sensitivity can be set between 3% to 20% when using the IO-Link v1.1 interface. When using the receiver interface, low contrast sensitivity is always 7%.

Table 4: Gain configuration settings

Gain Setting	Scan Method	EZ-ARRAY MODS [4]	EZ-ARRAY Resolution
Low Contrast	Straight Scan	5 mm	5 mm
	Single-edge Scan	-	-
	Double-edge Scan	-	-
High Excess Gain	Straight Scan	10 mm	5 mm
	Single-edge Scan	10 mm	2.5 mm
	Double-edge Scan	Depends on step size	2.5 mm / edge 5 mm total (both edges)

Optical Alignment

The objective of the optical alignment process is to adjust the emitter light level to maximize sensor performance. Perform the alignment procedure at installation and again whenever the emitter and/or receiver is moved.

During the alignment procedure, the receiver polls each beam channel to measure excess gain and performs a gain adjustment for each beam. When the system exits the alignment procedure, each channel's signal strength is stored in non-volatile memory.

The procedure can be performed using the receiver remote wire, the receiver interface push button or the IO-Link v1.1 interface. The receiver's Alignment push button may be disabled, by configuration thru the IO-Link v1.1 interface.

1. After the electrical connections are made, power up the emitter and receiver.
2. Verify that input power is present to both emitter and receiver; the emitter Status indicator and the receiver Status LED should be ON green. If the receiver Status LED is on red (and a "**c**" appears on the 3-digit display), refer to the error codes.

   Note: At power-up, all Zone indicators are tested (flash red), then the number of blocked beams is displayed.
3. Observe the receiver indicators.
4. Optimize Alignment and Maximize Excess Gain:
   a. Verify that the emitter and receiver are pointed squarely at each other. A straightedge or level can help determine the direction the sensor is facing.
   b. Slightly loosen the sensor mounting screws and rotate one sensor to the left and right, noting the positions where the receiver Zone indicators turn from green to red; repeat with the other sensor.
   c. Center each sensor between the noted positions and tighten the end cap mounting screws, making sure to maintain the positioning. The sensor windows should directly face each other.
5. After optimum optical alignment is verified, proceed to configuration, via the remote teach wire, the receiver interface, or the IO-Link v1.1 interface and complete the electronic alignment. This further alignment step adjusts the emitted light level of each beam for the application, to maximize sensing performance.

[4] MODS: Minimum Object Detection Size

Figure 6. Optical alignment

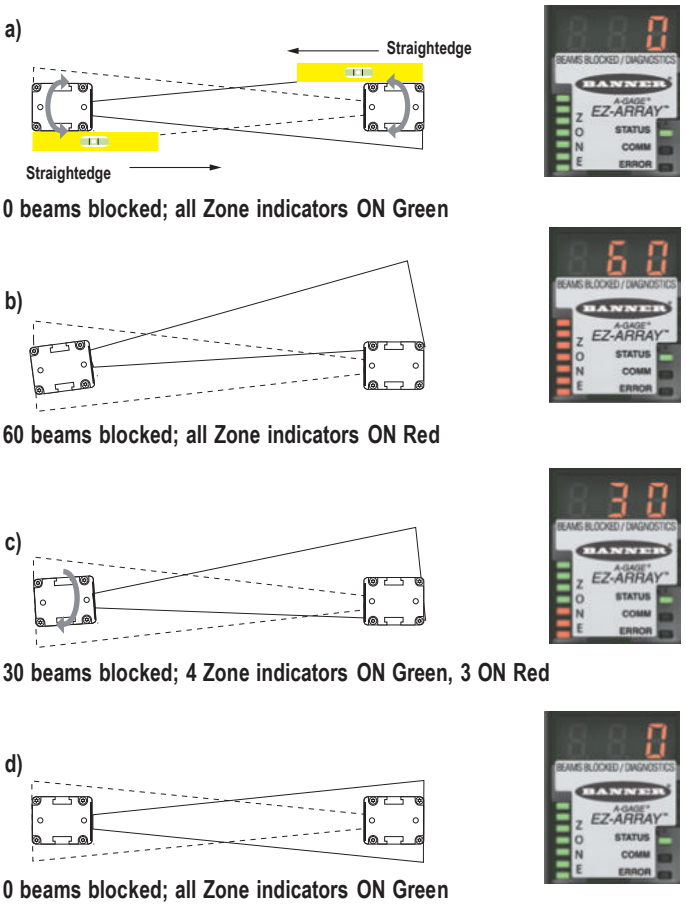


Table 5: Receiver interface indicators during alignment

	All Beams Either Clear or Blanked	Some Beams Blocked or Mis-Aligned	Out of Alignment
Zone Indicators	All ON Green	Some ON Red (zones with blocked beams) Some ON Green (zones with all clear beams)	All ON Red (Some beams blocked in each zone)
Receiver Status Indicator	ON Green	ON Green	ON Green
3-Digit Display	0 (Number of blocked beams)	Number of blocked beams	Total number of beams in the array

Blanking

If a machine fixture or other equipment blocks one or more sensing beams, the affected beam channels may be blanked. The blanking option causes the receiver to ignore the status of blanked beams for measurement mode calculations.

For example, if a machine fixture blocks one or more beams during sensing, the output data will be incorrect; if the beams blocked by the fixture are blanked, the output data will be correct. Blanking may be configured using the receiver's Alignment push button, the receiver remote wire, or the IO-Link v1.1 interface.

Measurement Mode Selection

The outputs may be configured for any of the measurement (scan analysis) modes, which refer to specific beam locations, quantities of beams, or edge transitions. Note that not all measurement mode options are available when the receiver interface is used for configuration.

When using the IO-Link v1.1 interface for configuration, discrete output 2 can have NPN or PNP polarity (regardless of model), be normally open or normally closed, and be assigned to any of the measurement modes. Discrete output 1 has the same configuration options as discrete output 2, except for NPN or PNP polarity. Discrete output 1 is the IO-Link output and is a dedicated push-pull output. When using the receiver interface, limited output configuration combinations may be selected (see Configuration via DIP Switch or IO-Link v1.1 Interface on page 4).

Note: Array beams are numbered in sequence (beam 1 located nearest the sensor display). The "first beam" referenced in the following descriptions is the beam nearest the sensor display.

"Beam Location" Modes

First Beam Blocked (FBB)
The location of the first blocked beam.

First Beam Made (FBM)
The location of the first made (unblocked) beam.

Last Beam Blocked (LBB)
The location of the last blocked beam.

Last Beam Made (LBM)
The location of the last made beam.

Middle Beam Blocked (MBB)
The location of the beam midway between the first and last blocked beams.

"Beam Total" Modes

Total Beams Blocked (TBB)
The total number of blocked beams.

Total Beams Made (TBM)
The number of beams made.

Contiguous Beams Blocked (CBB)
The largest number of consecutively blocked beams.

Contiguous Beams Made (CBM)
The largest number of consecutively made beams.

Outside Dimension (OD)
The inclusive distance (measured in beams) from the first blocked beam to the last blocked beam.

Inside Dimension (ID)
The number of made beams, between the first and last blocked beams.

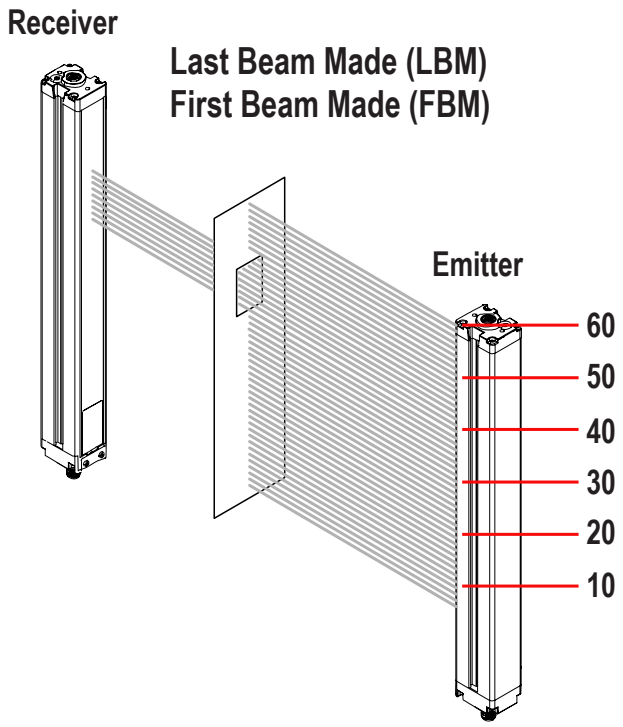
Transitions (TRN)
The number of changes from blocked to clear status and from clear to blocked status. (If beams 6–34 are blocked, then there is a clear-to-blocked transition from beam 5 to bream 6, and a blocked-to-clear transition from beam 34 to beam 35.) Transition mode can be used to count objects within the array.

Contiguous First Beam Blocked (CFBB)
The location of the first blocked beam in the largest group of adjacent blocked beams.

Contiguous Last Beam Blocked (CLBB)
The location of the last blocked beam in the largest group of adjacent blocked beams.

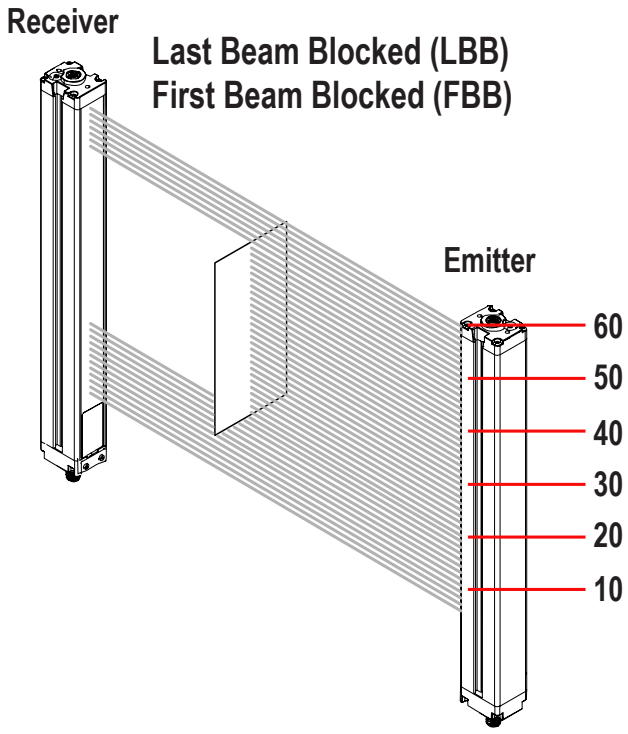
Carpet Nap and Carpet Edge
These measurement modes are used to measure the location of carpet backing and tuft and are selectable only via the IO-Link v1.1 interface and only when the Scan Type **Carpet Nap** is selected. The modes can be measured from either end of the sensor, but at least 10 beams (2 in) must be blocked from one edge.

Figure 7. Measurement mode - LBM-FBM



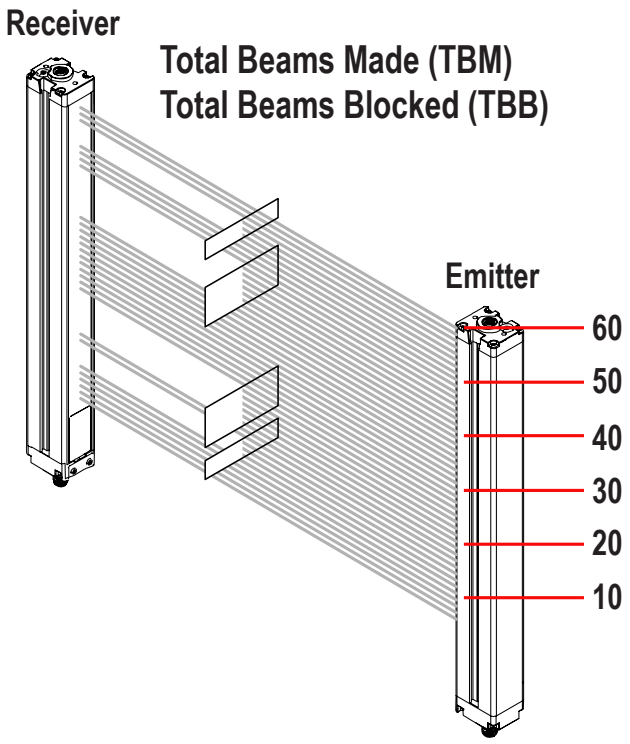
In Last Beam Made mode, the last beam is #50 of 60. In First Beam Made mode, the first beam is #40 of 60.

Figure 8. Measurement mode - LBB-FBB



In Last Beam Blocked mode, the last beam is #55 of 60. In First Beam Blocked mode, the first beam is #20 of 60.

Figure 9. Measurement mode - TBM-TBB



In Total Beams Made mode, 38 of 60 possible beams are made. In Total Beams Blocked mode, 22 of 60 possible beams are blocked.

Outputs

All models have two analog outputs and two discrete outputs (discrete output 1 is an IO-Link output).

The analog outputs are 0–10 V. They may be configured (via DIP switch or IO-Link interface) for either a positive or negative slope.

Discrete output 1 is always used for measurement; discrete output 2 may be used either for alarm or measurement operation (selectable via DIP switch or IO-Link interface). When the receiver interface is used, discrete output 1 and analog output 1 follow the same measurement mode. When the IO-Link interface is used for configuration, discrete output 2 has full configurability, including measurement mode, NPN or PNP polarity, and normally open or normally closed operation. Discrete output 1 has the same configurability as discrete output 2, except for NPN or PNP polarity. Discrete output 1 is a dedicated push-pull output.

Analog Output Configuration

Analog output configuration assigns analog outputs 1 and 2 to one of the measurement modes described in Measurement Mode Selection. When the selected measurement mode involves first or last beam blocked or made (unblocked), the assigned output will vary in proportion to the beam number identified during a scan. When the measurement mode involves total beams blocked or made, that assigned output will vary in proportion to the total beams counted during a scan.

Analog outputs may have a filter setting (to smooth the output) and Zero Value (to specify the output value when the measurement mode value is zero) set in the IO-Link v1.1 interface. For more information, refer to the IO-Link Data Reference Guide (p/n 220588).

Discrete Output Configuration

Discrete Output 1; Receiver Interface

When the receiver interface is used for configuration, the measurement mode assigned to discrete output 1 is the same as that assigned to analog output 1. When the analog output detects a target present, discrete output 1 conducts (normally open).

Discrete Output 2; Receiver Interface

Discrete output 2 (only) has two options: alarm and complementary (measurement) operation.

Alarm—Output 2 energizes when the receiver detects a sensor error (such as a disconnected cable) or whenever the excess gain of one or more beams becomes marginal.

Complementary (Measurement)—Discrete output 2 operation is complementary to discrete output 1 (when output 1 is ON, output 2 is OFF, and vice versa).

Discrete Output 1 and 2 Configuration; IO-Link v1.1 Interface

When the IO-Link v1.1 interface is used for configuration, the discrete outputs have more options: either discrete output can be assigned to any of the measurement modes, high and low set points can be added, the outputs can be inverted, and hysteresis values can be set, as well as a scan number to smooth output performance. Discrete output 2 can be assigned to alarm mode via the IO-Link v1.1 interface also.

Refer to the instruction manual for more information.

Specifications

Emitter/Receiver Range
Standard models: 400 mm to 4 m (16 in to 13 ft)

Supply Power Requirements
Emitter/Receiver Pair (Exclusive of Discrete Load): Less than 9 W
Power-up delay: 2 seconds

Current Draw at 24 V DC

Length (mm)	Emitter (mA)	Receiver (mA)
150	10	10
300	20	25
450	30	40
600	40	60
750	50	75
900	60	90
1050	70	105
1200	80	120
1350	85	135
1500	95	150
1650	105	170
1800	115	185
1950	125	200
2100	135	215
2250	140	230
2400	150	245

Sensor Positional Resolution
Straight Scan: 5 mm (0.2 in)
Double-Edge Scan: 2.5 mm (0.1 in)
Single-Edge Scan: 2.5 mm (0.1 in)

Two Analog Outputs
Voltage Sourcing: 0 to 10 V (maximum current load of 5 mA)

Scan Time
Scan times depend on scan mode and sensor length. Straight scan times range from 2.8 to 26.5 ms. For all combinations, see Maximum Scan Times in SIO Mode on page 6.

Process Data
Available Process Data depends on what scan mode the sensor is in.
Straight Scan
- Active Measurements Only
- Straight Scan Measurements
- Channel States/Reduced States

Single Edge Scan
- Edge Scan Measurements
- Active Measurements Only

Double Edge Scan
- Edge Scan Measurements
- Active Measurements Only

Channel states show individual blocked or clear channel states. Lengths > 1200 mm have logical OR pairs or logical AND pairs, for example, CH1+CH2, CH3+CH4, etc.

Connections
IO-Link Interface: The receiver uses a cable splitter that converts the 8-pin connector to a compatible M12 IO-Link connector
Other sensor connections: 8-conductor quick-disconnect cables (one each for emitter and receiver), ordered separately; PVC-jacketed cables measure 5.8 mm diameter, have shield wire; 22-gauge conductors

Construction
Aluminum housing with clear-anodized finish; acrylic lens cover

IO-Link Interface
Baud Rate: 38,400 bps for COM2; 230,400 bps for COM3
Process Data Width: 240 bits

Minimum Object Detection Size
Straight Scan, Low-Contrast: 5 mm (0.2 in)
Straight Scan, High-Excess-Gain: 10 mm (0.4 in)
See Scanning Method on page 5 for other scan mode values; size is tested using a rod.

Beam Spacing
5 mm (0.2 in)

Field of View
Nominally ±3°

Light Source
Infrared LED

System Configuration (Receiver Interface)
6-position DIP switch: Used to set scanning type, measurement modes, analog slope, and discrete output 2 function (see Configuration via DIP Switch or IO-Link v1.1 Interface on page 4)
Push Buttons: Two momentary push buttons for alignment and gain level selection

System Configuration
IO-Link Interface: Supplied IODD files provide all configuration options of receiver interface, plus additional functionality

Supply Voltage (Limit Values)
Emitter: 12 V DC to 30 V DC
Receiver Models: 18 V DC to 30 V DC

Teach Input (Receiver Gray Wire)
Low: 0 to 2 V
High: 6 to 30 V or open (input impedance 22 K ohms)

Two Discrete Outputs
Protected against false pulse on power-up and continuous overload or short circuit.

Discrete Output 1 (SIO Mode)
Type: Solid-State Push-Pull
Rating: 100 mA maximum (sourcing or sinking)
ON-State Saturation Voltage: less than 3 V at 100 mA (sourcing or sinking)

Discrete Output 2
Type: Solid-State NPN or PNP (current sinking or sourcing)
Rating: 100 mA maximum
OFF-State Leakage Current: NPN: less than 200 µA at 30 V DC; PNP: less than 10 µA at 30 V DC
ON-State Saturation Voltage: NPN: less than 1.6 V at 100 mA; PNP: less than 2.0 V at 100 mA

Environmental Rating
IP65

Operating Conditions
–40 °C to +70 °C (–40 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Certifications

Emitter and Receiver Dimensions

All measurements are listed in millimeters, unless noted otherwise.

Figure 10. Dimensions drawing

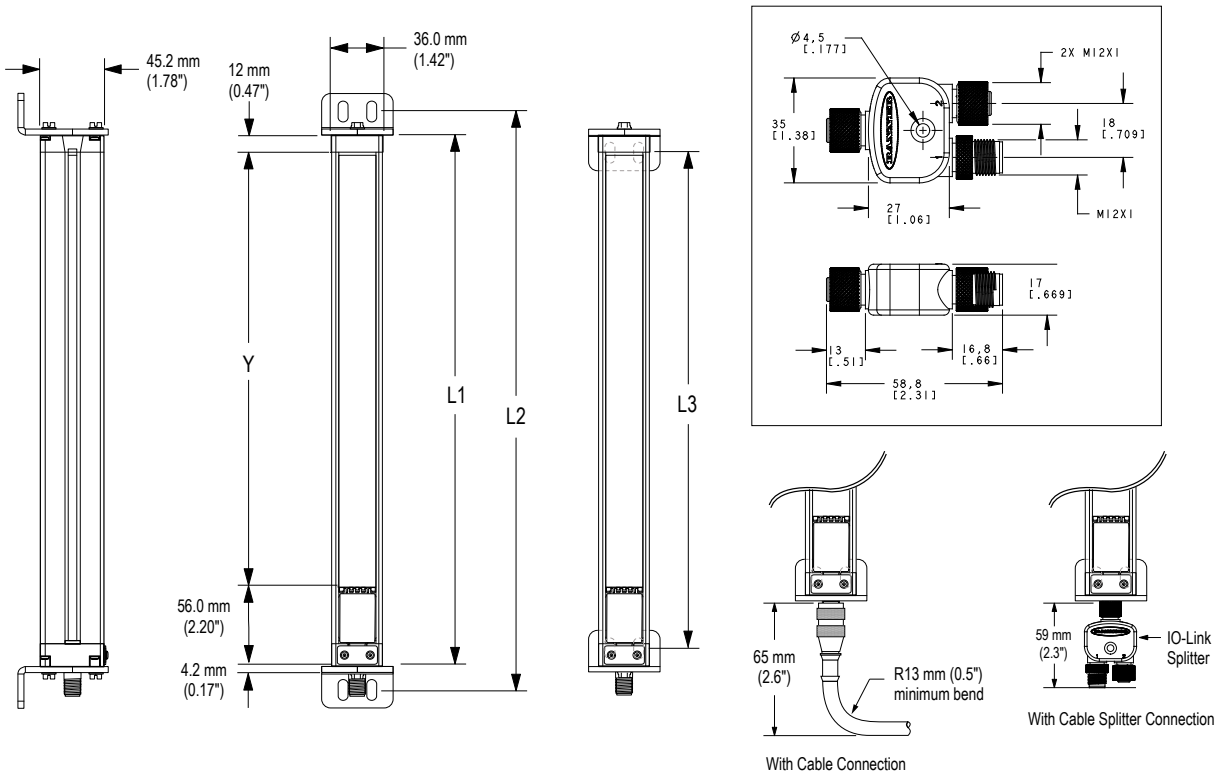


Table 6: Dimensions for each model

Emitter or Receiver Model	Housing Length L1	Distance Between Bracket Holes L2 L3		Defined Area Y
EA5..150..	227 mm (8.9 in)	260 mm (10.2 in)	199 mm (7.8 in)	150 mm (5.9 in)
EA5..300..	379 mm (14.9 in)	412 mm (16.2 in)	351 mm (13.8 in)	300 mm (11.8 in)
EA5..450..	529 mm (20.8 in)	562 mm (22.1 in)	501 mm (19.7 in)	450 mm (17.7 in)
EA5..600..	678 mm (26.7 in)	704 mm (27.7 in)	650 mm (25.6 in)	600 mm (23.6 in)
EA5..750..	828 mm (32.6 in)	861 mm (33.9 in)	800 mm (31.5 in)	750 mm (29.5 in)
EA5..900..	978 mm (38.5 in)	1011 mm (39.8 in)	950 mm (37.4 in)	900 mm (35.4 in)
EA5..1050..	1128 mm (44.4 in)	1161 mm (45.7 in)	1100 mm (43.3 in)	1050 mm (41.3 in)
EA5..1200..	1278 mm (50.3 in)	1311 mm (51.6 in)	1250 mm (49.2 in)	1200 mm (47.2 in)
EA5..1500..	1578 mm (62.1 in)	1611 mm (63.4 in)	1550 mm (61.0 in)	1500 mm (59.1 in)
EA5..1800..	1878 mm (73.9 in)	1911 mm (75.2 in)	1850 mm (72.8 in)	1800 mm (70.9 in)
EA5..2100..	2178 mm (85.7 in)	2211 mm (87.0 in)	2150 mm (84.6 in)	2100 mm (82.7 in)
EA5..2400..	2478 mm (97.6 in)	2511 mm (98.9 in)	2450 mm (96.4 in)	2400 mm (94.5 in)

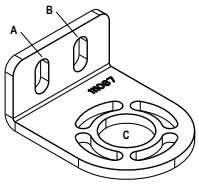
Standard Bracket Dimensions

Dimensions are identical for model EZA-MBK-11N stainless steel brackets.

EZA-MBK-11

- Two end-cap replacement brackets for one emitter/receiver
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

Hole center spacing: A to B = 20
Hole size: A , B = 15 × 7, C = ø 21.5

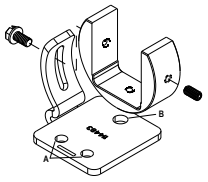


Supplied with emitters and receivers over 1050 mm.

EZA-MBK-12

- Two-piece center bracket for one emitter/receiver
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

Hole center spacing: A = 20, A to B = 36
Hole size: A = ø 7, B = ø 8.3



Accessories

Replacement Parts

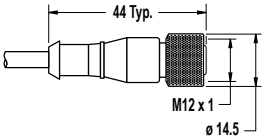
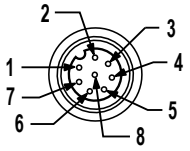
Description		Model
Access cover with label - receiver		**EA5-ADR-1**
Access cover security plate (includes 2 screws, wrench)		**EZA-TP-1**
Wrench, security		**EZA-HK-1**
Standard bracket kit with hardware (includes 2 end brackets and hardware to mount to MSA Series stands)	Black	**EZA-MBK-11**
	Stainless Steel	**EZA-MBK-11N**
Center bracket kit (includes 1 bracket and hardware to mount to MSA Series stands)		**EZA-MBK-12**

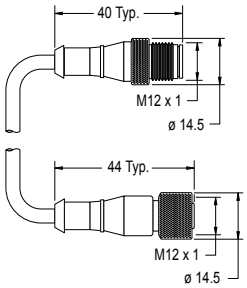
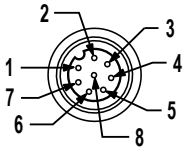
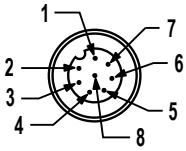
Alignment Aids

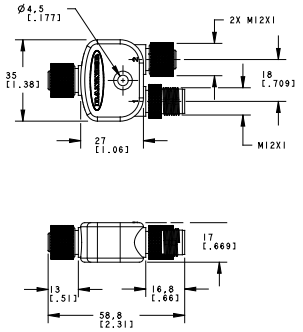
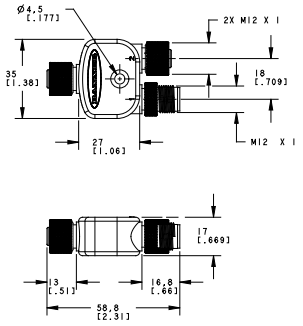
Model	Description
LAT-1-SS	Self-contained visible-beam laser tool for aligning any EZ-ARRAY emitter/receiver pair. Includes retroreflective target material and mounting clip.
EZA-LAT-SS	Replacement adaptor (clip) hardware for EZ-ARRAY models
EZA-LAT-2	Clip-on retroreflective LAT target
BRT-THG-2-100	2-inch retroreflective tape, 100 ft
BT-1	Beam Tracker

Cordsets and Connections

8-Pin Threaded M12 Cordsets with Shield—Single Ended

Model	Length	Style	Dimensions	Pinout (Female)	
MAQDC-806	2 m (6.56 ft)	Straight			
MAQDC-815	5 m (16.4 ft)				
MAQDC-830	10 m (32.81 ft)				
MAQDC-850	15 m (49.21 ft)			1 = White 2 = Brown 3 = Green 4 = Yellow	5 = Gray 6 = Pink 7 = Blue 8 = Red

8-Pin Threaded M12 Cordsets—Double Ended					
Model (8-pin/8-pin) [5]	**Length**	**Style**	**Dimensions**	**Pinout**	
DEE2R-81D	0.3 m (1 ft)	Female Straight/ Male Straight		Female  Male 	
DEE2R-83D	0.91 m (3 ft)				
DEE2R-88D	2.44 m (8 ft)				
DEE2R-815D	4.57 m (15 ft)				
DEE2R-825D	7.62 m (25 ft)				
DEE2R-850D	15.24 m (50 ft)				
DEE2R-875D	22.86 m (75 ft)				
DEE2R-8100D	30.48 m (100 ft)			1 = Brown 2 = Orange/Black 3 = Orange 4 = White	5 = Black 6 = Blue 7 = Green/Yellow 8 = Violet

IO-Link Cable Splitters			
Model	**Length**	**Description**	
CSB-M1250M1280	0 m	8-pin female to split 5-pin male and 8-pin female, M12, straight, with shield (IO-Link pin 2 is Voltage Output 1)	
CSB-M1240M1280*	0 m	8-pin female to split 4-pin male and 8-pin female, M12, straight, with shield (IO-Link pin 2 is Discrete Output 2)	

* Shipped with all EZ-ARRAY IO-Link receivers

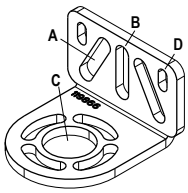
[5] Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add the suffix "**B**" to the model number (example, **DEE2R-81DB**)

Accessory Mounting Brackets and Stands

EZA-MBK-20

- Adapter brackets for mounting to engineered/slotted aluminum framing such as 80/20™ and Unistrut™. Angled slots allow mounting to 20 mm to 40 mm dual channel and center slot. allows mounting to single channel framing
- Retrofit for Banner MINI-SCREEN®
- Order **EZA-MBK-20U** for bracket with M5 and M6 mounting hardware

Hole size: A = ø7 × 25 (2); B = ø7 × 18; C = ø21.5; D = ø4.8 × 10.2;



See for standard brackets. Order one EZA-MBK-20 bracket per sensor, two per pair.

Note: Standard brackets shipped with sensors connect directly to MSA series stand, using hardware included with the stands.

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