PresencePLUS

Model P1B65Q

Pixel-Counting Sensor

Instruction Manual

BANNER®

Contents

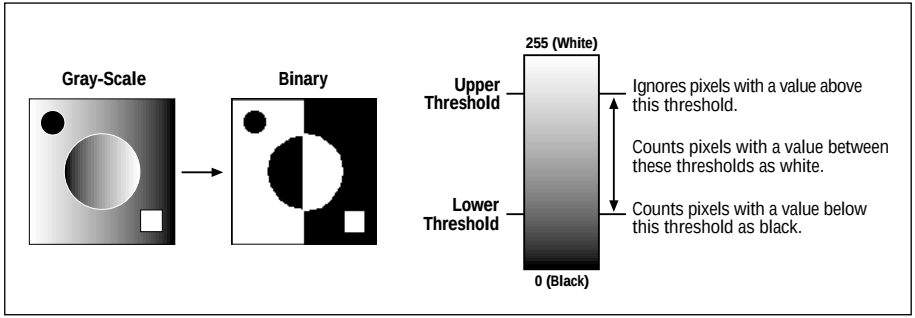
Product Description

The PresencePLUS™ Pixel-Counting Sensor Model P1B65Q houses a 512 x 384 CMOS pixel array and a programmable microprocessor. The sensor captures a gray-scale image, converts the image to binary format based on adjustable gray-scale thresholds, counts the number of white or black pixels, and judges the image as “PASS” or “FAIL” by comparing the counts to reference counts.

An image is captured in response to a signal from a user-supplied trigger input device. The trigger device is typically a presence-sensing device such as a photoelectric sensor that delivers an input signal coincident with the passage of the leading or trailing edge of an object to be inspected.

The binary value of each pixel is determined by two adjustable gray-scale thresholds. The lower threshold defines the division between “light” and “dark”. The sensor counts all light pixels as white and all dark pixels as black. The upper threshold defines the limit above which pixels will be ignored. The sensor may be set to count either black or white pixels and to accept a percentage above or below reference pixel counts.

The remote PresencePLUS™ Controller Model PRC1 is used to configure trigger input, signal output, and lighting options and to program all other sensor parameters. While the sensor is in operation, the controller may be used to view captured images and monitor sensor performance.

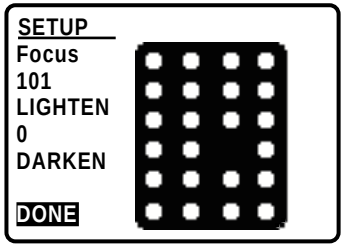


Gray-scale images are converted to black and white by comparing the value of each pixel to adjustable gray-scale thresholds

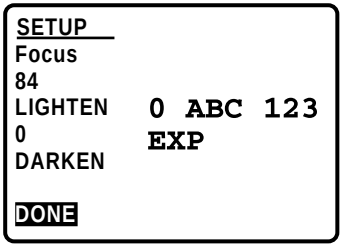
For more information about programming and operating the sensor, see page 14.

Application Examples

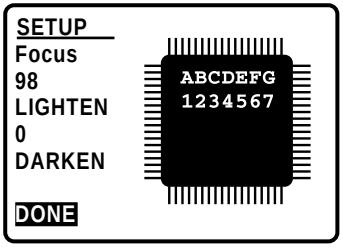
The PresencePLUS sensor is a solution to many inspection applications where a defect can occur anywhere within the sensor’s field of view, and where a configuration of multiple discrete sensors is either cost-prohibitive or mechanically impractical. The inspection examples shown on the next page illustrate a few application possibilities.



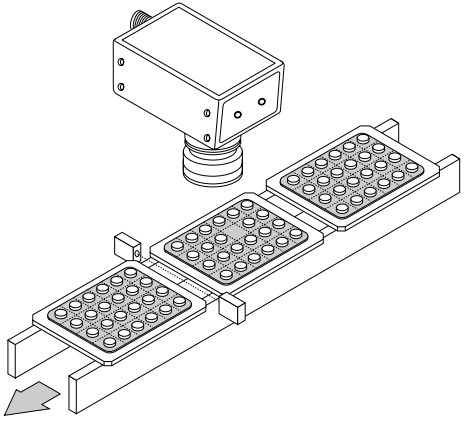
Controller LCD Display



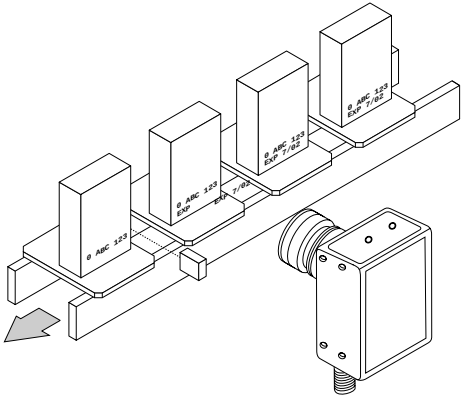
Controller LCD Display



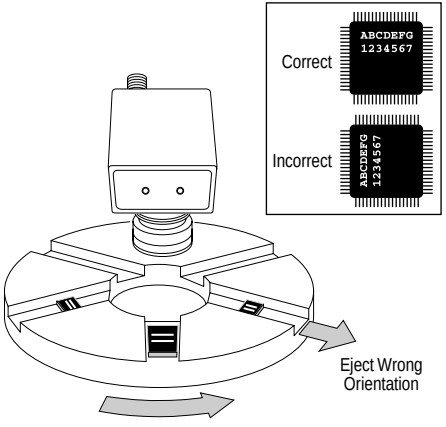
Controller LCD Display



Missing Tablet Detection



Missing Date/Lot Code Inspection and Print Quality Control



IC Orientation Inspection

SYSTEM COMPONENTS

The PresencePLUS Sensor P1B65Q requires several other components to create a working system: controller, cable, lens, mounting bracket (if needed), light source, trigger device (user-supplied), and power supply (user-supplied).

Controller

The PresencePLUS Controller PRC1 is required to configure and program the sensor and to monitor sensor performance (see page 14).

Cables

Banner offers three 6-conductor quick-disconnect cable choices:

- **MQDC-606** 2 m (6.5') long
- **MQDC-615** 5 m (15') long
- **MQDC-630** 9 m (30') long

Lenses

Banner offers three C-mount lens choices:

- **LCF08** 8 mm
- **LCF12** 12 mm
- **LCF16** 16 mm

The lens may be user-supplied. For information about how to select a lens, see page 23.

Mounting Brackets

Banner offers two mounting bracket choices:

- **SMBPBM** Base-mounting bracket
- **SMBPCM** Column-mounting bracket

For bracket dimension details, see pages 20-21.

Light Sources

Banner offers two light source choices:

- **HFFW5100** Fluorescent ring lamp
- **LEDR140** Visible red LED ring lamp

The fluorescent ring lamp supplies the greater amount of light. The LED ring lamp should be reserved for high-contrast sensing applications.

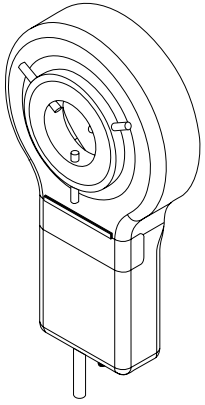
A polarizing lens kit, model **LEDRPFK**, is available for the LED ring lamp, which makes it the first choice when sensing at 90° to a shiny surface.

The light source may be user-supplied. For more information, see page 9.

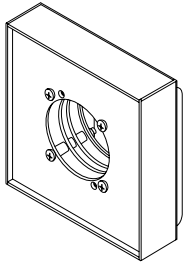
Kits

Banner offers seven PresencePLUS kit choices which include a P1B65Q sensor, PRC1 controller, MQDC-615 cable, bracket, and light source. For kit details, see page 27.

Light Source (select one):



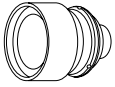
Fluorescent Ring Lamp
Model HFFW5100



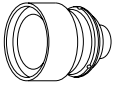
Visible Red LED Ring Lamp
Model LEDR140

Polarizing Filter Kit
Model LEDRPFK

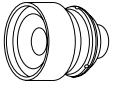
C-Mount Lens (select one):



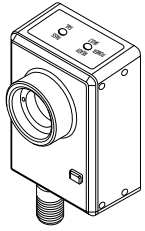
16 mm
Model LCF16



12 mm
Model LCF12



8 mm
Model LCF08

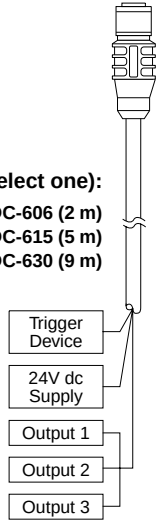


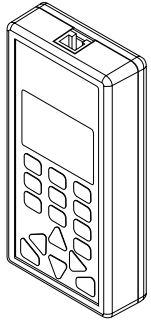
PresencePLUS Sensor
Model P1B65Q

Coil Cord
(supplied with PRC1)

Quick-Disconnect Cable (select one):

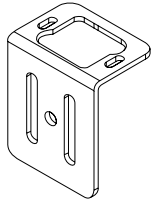
Model MQDC-606 (2 m)
Model MQDC-615 (5 m)
Model MQDC-630 (9 m)



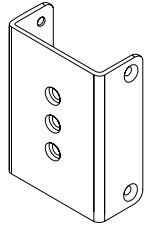


PresencePLUS Controller
Model PRC1

Mounting Bracket (select one):



Base-Mounting Bracket
Model SMBPBM



Column-Mounting Bracket
Model SMBPCM

Changing Lens Filters

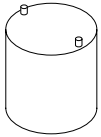
The lens filter is located behind the lens, held in place with a retainer ring.

To add or remove a filter, use the tool supplied with the sensor to remove and replace the retainer ring.

A red filter is pre-installed in each sensor for use with the LED light source LEDR140. Remove this red filter if using the fluorescent ring lamp HFFW5100 or other white light source.

When using the polarizing kit LEDRPFK, install the polarizing filter on top of the red filter (see page 12).

NOTE: When using more than one filter, the order of the filters will not affect performance.



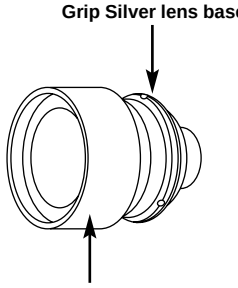
Retainer Ring Tool

Mounting the Lens

Remove the protective cover from the sensor. Remove the two protective covers from the lens. Install the lens onto the sensor by gripping the silver lens base and turning clockwise (RH thread).

NOTE: Do not install by gripping and turning the plastic lens shroud. Also, see CAUTION, below.

After focusing the lens, use the supplied Allen wrench to lock the lens by clockwise rotation (RH thread), finger tight, in the three set screws on the base of the lens.



Appropriate Sensing Environment

The sensing location must meet the following criteria for reliable operation:

- Stable ambient temperature: 0 to 50°C (+32 to 122°F)
- Ambient relative humidity: 35 to 90%, non-condensing
- Stable ambient lighting: no large, quick changes in light level; no direct or reflected sunlight
- No significant vibration or mechanical shock
- No liquid splash
- No contact with corrosive or volatile materials or atmosphere
- Minimal dust or dirt

CAUTION . . .
Avoid damage to sensor caused by electrostatic discharge (ESD).
Use a properly-connected ESD wrist strap or other proven method for preventing electrostatic discharges when installing a lens or attaching a cable.

Mounting the Sensor

The P1B65Q sensor has ten M4 x 0.7 tapped holes: four on each side and two on the base. The sensor is supplied with four M4 sockethead cap screws, washers, and lockwashers, and a 3 mm Allen wrench.

The sensor may be secured to a Banner-supplied mounting bracket, or to any flat surface up to 2.0 mm (0.08") thick.

For dimensional details of the sensor and brackets, see pages 19-21.

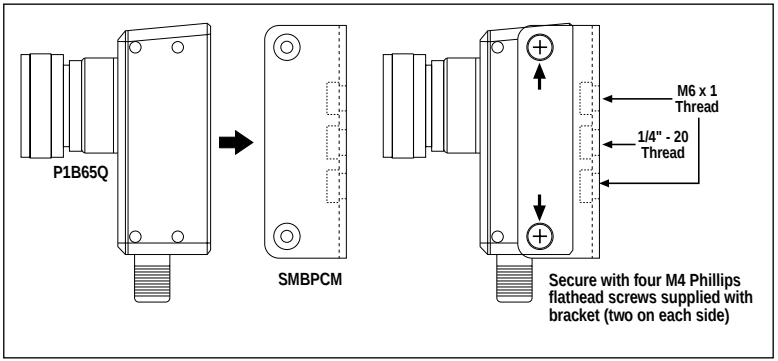
Securing to Mounting Brackets

Banner offers two mounting bracket choices:

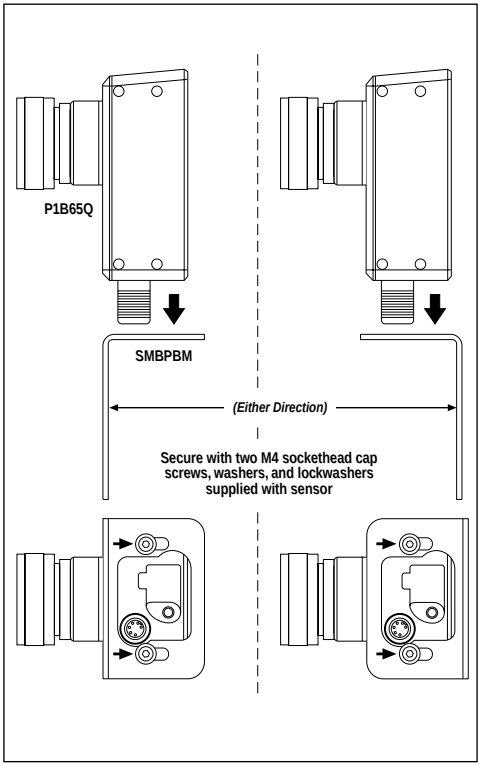
- Column-mounting bracket SMBPCM
- Base-mounting bracket SMBPBM

Secure the sensor to the column-mounting bracket with the four M4 Phillips flathead screws supplied with the bracket (two on each side).

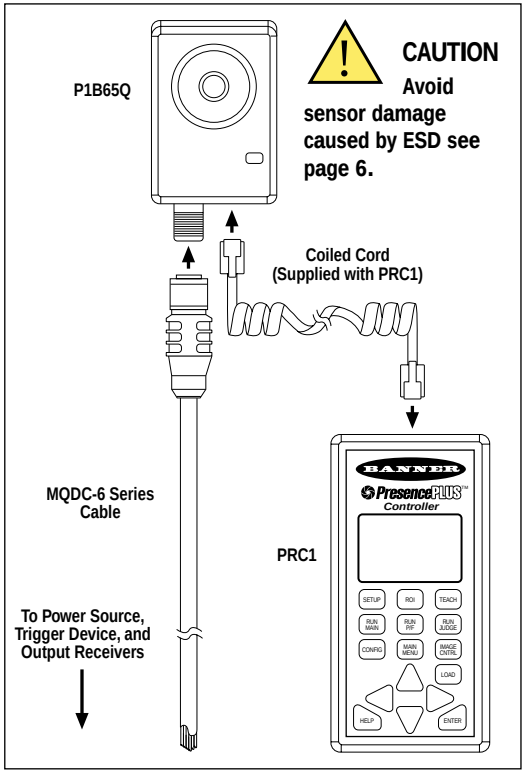
Secure the sensor to the base-mounting bracket with two of the M4 sockethead cap screws, washers, and lockwashers supplied with the sensor.



Column-Mounting Bracket SMBPCM



Base-Mounting Bracket SMBPBM



Controller Connection to the Sensor

Connecting Cables

Before connecting cables, be sure the power supply is OFF. See CAUTION on page 6. For complete sensor specifications and hookup diagrams, see pages 17-18.

Power

The power source is user-supplied.

Alone, the sensor requires 22 to 26V dc; with a maximum current of 250 mA (exclusive of loads and the current required by the PRC1 controller and optional LEDR140 light source).

Using the PRC1 controller, the maximum current is 450 mA. Using the LEDR140 light source, the maximum current is 550 mA. Using both, the maximum current is 750 mA.

Connect the **Brown** wire of the sensor cable (MQDC-6 Series) to +V and the **Blue** wire to dc common. Attach the connector end of the cable to the sensor.

Controller

A coiled cord with modular plugs is supplied with the PRC1 controller.

Insert one plug into the controller and the other plug into the sensor. Be sure the plugs click into place.

Trigger Input

Connect the **Pink** wire of the sensor cable to the user-supplied trigger device.

The default trigger input setting accepts signals from a trigger device with an NPN (current sinking) output. If the trigger device output is PNP (current sourcing), use the PRC1 controller to reconfigure the sensor.

Signal Output

The sensor provides three SPST solid-state contacts which may be individually programmed for either NPN (current sinking) or PNP (current sourcing). Each output is capable of switching up to 26V dc max at 50 mA max. Outputs are protected against continuous overload or short circuit.
Note: Output loads must not be returned to any voltage greater than +V.

Configure the sensor cable output wires as follows: **White** = Output #1, **Black** = Output #2, **Gray** = Output #3. Use the PRC1 controller to set sensor output parameters.

Selecting a Light Source

Selection and orientation of lighting is of critical importance to sensing success.

Banner offers two front lighting sources that attach directly to the sensor:

- Fluorescent ring lamp HFFW5100
- Visible red LED ring lamp LEDR140

Many user-supplied lighting configurations are possible, including back-lighting schemes. For additional information about lighting a particular sensing application, contact Banner's factory applications engineers at the address or numbers listed on the back cover.

Fluorescent Ring Lamp

The HFFW5100 fluorescent ring lamp provides the most light for illuminating large sensing areas and judging low-contrast sensing applications.

This light source provides uniform, white lighting to the sensor field of view. The 25 kHz high-frequency, flicker-free illumination eliminates false camera response commonly caused by standard 50/60 Hz fluorescent lamps.

The fluorescent lamp is powered by a supplied transformer for connection to a standard 115V ac receptacle and may also be powered by 220V ac.

Lamp life is rated at 7,000 hours, and the bulb is replaceable. See the Operator Manual supplied with the HFFW5100 for more information.

LED Ring Lamp

The LEDR140 ring lamp may be used for short-range applications to approximately 150 mm (6") and should be used only when the sensing contrast (the light-to-dark ratio of object features) is high. The LED lamp is the best choice when sensing exactly perpendicular (90°) to a shiny surface. A polarizing filter kit is available for this type of sensing application.

The LED lamp is a solid-state light source using 140 visible red LEDs, connects to the front of the sensor, and is powered by the sensor's power supply.

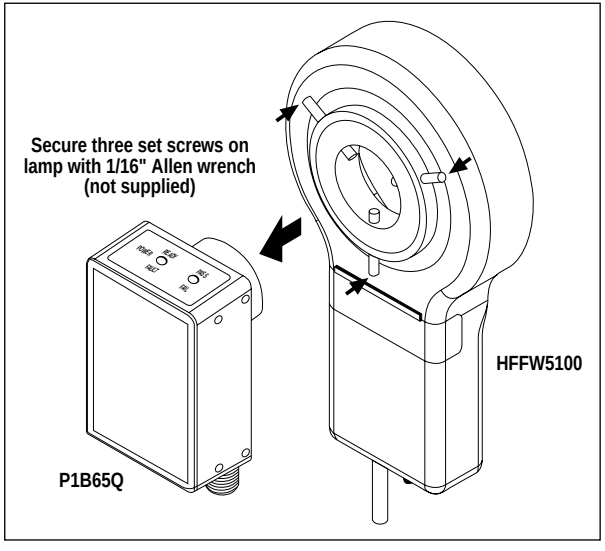
Useful life of the LED lamp is rated at 10,000 hours (LED ON time).

Polarizing Filter Kit

If it is necessary to mount the sensor at a 90° angle to a shiny surface, the LEDRPFK polarizing filter kit provides filters for the LED ring lamp and the sensor to reduce the negative effects of strong, direct light reflections.

The polarizing filters reduce the working range of the sensor.

To eliminate direct reflections and to avoid the need for polarizing filters, angle the sensor approximately 15° (or more) from perpendicular to a shiny surface.



Installing the HFFW5100 Fluorescent Ring Lamp

Installing the Fluorescent Ring Lamp

The HFFW5100 fluorescent ring lamp attaches directly to the sensor, behind the lens. (Remove the lens before installing the ring lamp.)

Lock the HFFW5100 in place by tightening the three Allen head set screws on the lamp with a 1/16" Allen wrench (not supplied).

The lamp has a grounded, 3-prong power supply for connection to a standard 115V ac receptacle. The HFFW5100 may also be powered by 220V ac.

NOTE: *When using this, or any white light source, remove the red filter that is preinstalled behind the sensor lens (see page 6).*

Installing the LED Ring Lamp

The LEDR140 ring lamp attaches directly to the front of the sensor.

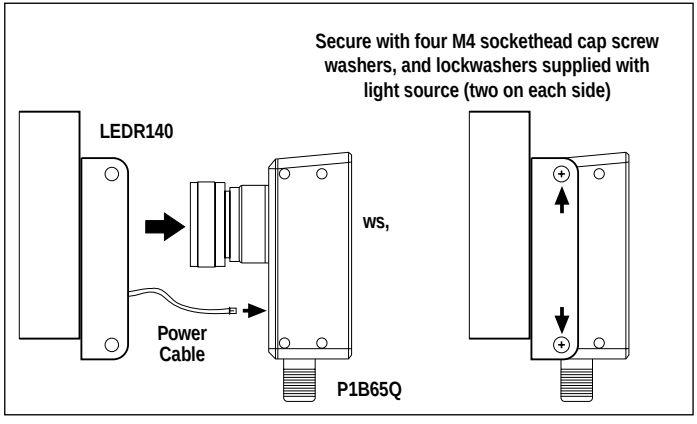
Mount the lens (see page 6).

Connect the power cable on the LEDR140 directly to the port on the front of the sensor.

Power to the port is supplied by the sensor and enabled by setting the **LIGHTS** option to **Strobed** (default) with the PRC1 controller.

Secure the lamp with the four M4 sockethead cap screws, washers, and lockwashers supplied with the light source (two on each side).

NOTE: *When using this light source, ensure that the red filter is installed in the sensor, behind the lens (see page 6).*

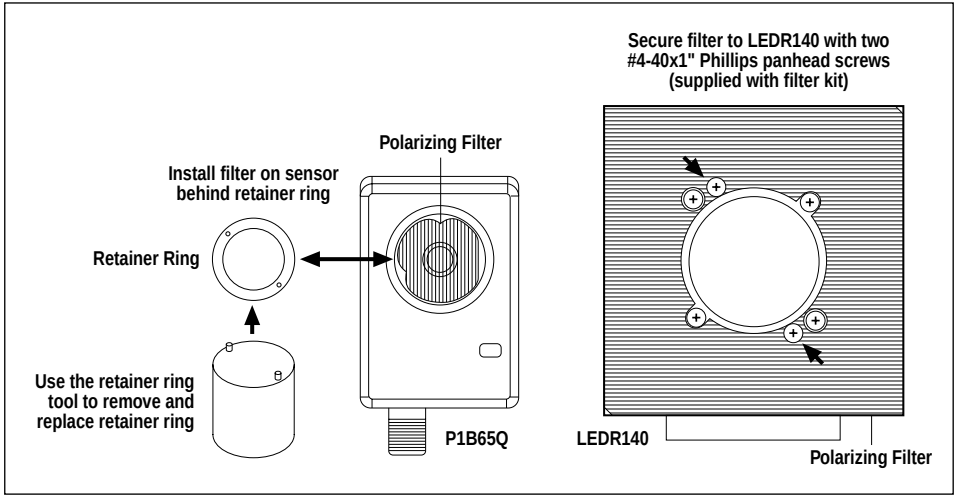


Installing the LEDR140 Ring Lamp

CAUTION . . .

Avoid damage to sensor caused by electrostatic discharge (ESD).

Use a properly-connected ESD wrist strap or other proven method for preventing electrostatic discharges when installing a lens or attaching a cable.



Installing the Polarizing Filter Kit LEDRPFK

Installing the Polarizing Filter Kit

The LEDRPFK polarizing filter kit provides polarizing filters for both the LEDR140 light source and the P1B65Q sensor.

To ensure correct alignment of the two polarizing planes, each filter is shaped to fit only in one direction, as shown in the illustration on this page.

Remove the protective plastic covering from both sides of each filter.

Secure the polarizing filter to the LEDR140 ring lamp with the two #4-40 x 1" Phillips panhead screws supplied with the filter kit.

The sensor filter installs behind the lens. Remove the lens and use the retainer ring tool (supplied with the sensor) to remove the retainer ring. Insert the polarizing filter on top of the red filter, and replace the retainer ring. Remount the lens.

NOTE: *Take care not to fingerprint the filters. If necessary, carefully clean the filters using only lens or window cleaner.*

Status Indicators

Two LEDs on the top of the sensor indicate the current sensor and judgment status.

Sensor Status Indicator

When this indicator is **flashing yellow**, the power is ON and the sensor is powering up (initializing its parameters and executing self-diagnostics).

When this indicator is **solid yellow**, the power is ON, the sensor is *not* running and will *not* process (judge) triggers. It will, however, accept setup operations from the controller.

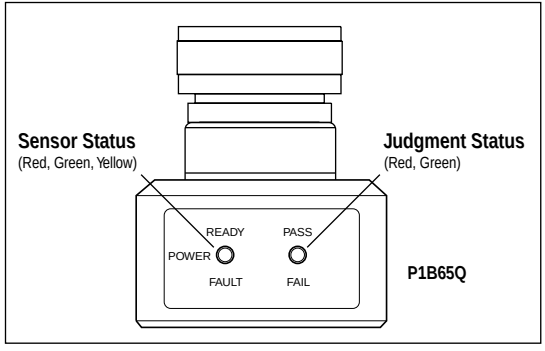
When this indicator is **green**, the power is ON and the sensor is in RUN mode and READY to process (judge) triggers.

When this indicator is **red**, the power is ON and a hardware FAULT has been detected.

Judgment Status Indicator

When this indicator is **green**, the judgment result of the last trigger was PASS.

When this indicator is **red**, the judgment result of the last trigger was FAIL.



Status Indicators

Programming and Monitoring the Sensor

The PresencePLUS P1B65Q sensor is programmed and monitored using the companion PresencePLUS PRC1 hand-held remote control microprocessor.

NOTE: *For complete sensor programming and monitoring instructions, see the PresencePLUS PRC1 Controller Instruction Manual (P/N 57413), supplied with each controller.*

The controller easily attaches to the sensor with a modular coiled cord and obtains power from the sensor for operation. The controller writes all programmed parameters to the sensor. After programming the sensor, the controller may be detached and used with another sensor.

Programming options, monitoring options, and captured images are displayed on the controller's LCD screen. Arrow buttons on the controller's keypad are used to select options, adjust values, and navigate from screen to screen. Function buttons provide quick access to the most frequently used screens.

Depending on the sensing application requirements, programming the sensor involves up to three steps: SETUP, ROI, and TEACH.

In the first step, the SETUP mode is used to adjust the target object within the sensor's pixel array, run the auto-exposure routine, focus the sensor's lens, and lighten or darken the image.

In the second step, the ROI mode may be used to define a Region of Interest (ROI) within the array for judgment or to mask an area to exclude from judgment.

In the third step, the TEACH mode is used to "teach" the sensor to recognize good and (optionally) bad images by presenting a number of product examples. The controller uses the pixel counts from these examples to determine judgment criteria for subsequent sensor operation. Judgment criteria may be manually adjusted.

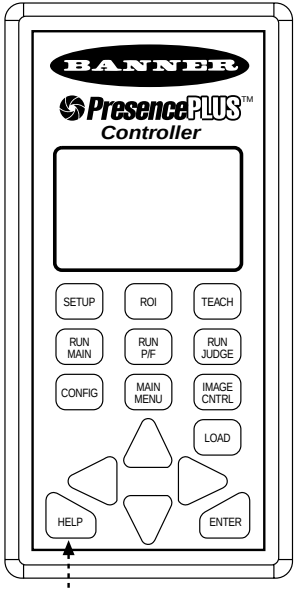
If the application does not require defining an ROI, masking, or teaching bad product, the QUICK START option provides a simple one-step SETUP, TEACH, and RUN sequence. The resulting judgment criteria may be manually adjusted.

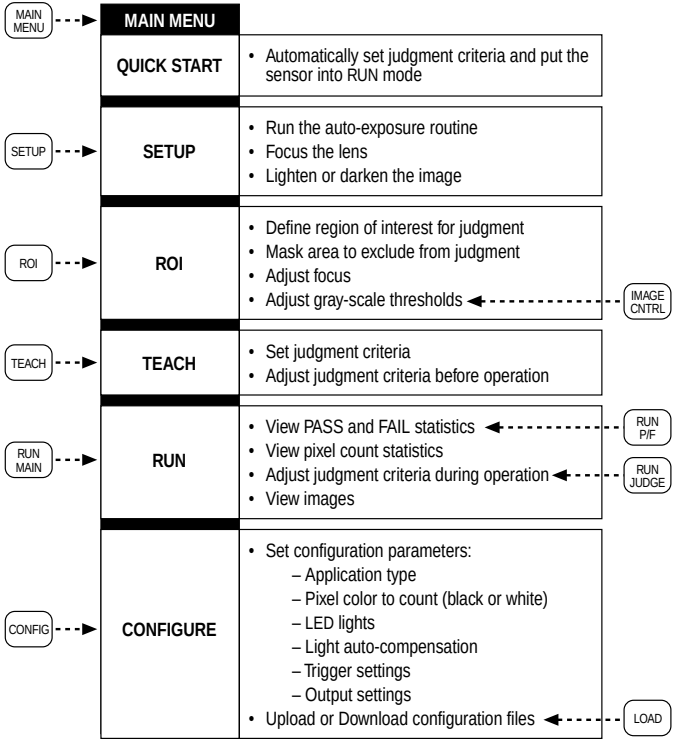
CONFIGURE screens are used to program parameters that typically only need to be set once. Configuration parameters include selecting the application type (to enable the most appropriate auto-exposure settings), which pixel color to count (white or black), lighting options, trigger settings, and output settings.

Up to four different sets of parameters may be uploaded from the sensor to the controller and saved as files. This feature allows parameters to be downloaded to the sensor when setting up different product runs or programming more than one sensor.

After the sensor has been programmed and configured, the controller is used to put the sensor into RUN mode. While the sensor is in operation, RUN screens may be used to monitor PASS/FAIL and pixel count statistics, view captured images, or adjust configuration settings and gray-scale thresholds.

Controller Keypad





Cleaning the System

Regularly remove any dust or dirt from the sensor using a soft cloth.

Cleaning the Lens

Regularly remove any dust, dirt, or fingerprints from the sensor's lens.

1. Blow off dust using anti-static compressed air.
2. If necessary, use a lens cloth and lens cleaner or window cleaner to wipe off remaining debris. Do not use any other chemicals for cleaning.

Cleaning the Light Source

Regularly remove any dust, dirt, or fingerprints from the LED or fluorescent light source.

1. Blow off dust using anti-static compressed air.
2. If necessary, use a lens cloth and lens cleaner or window cleaner to wipe off remaining debris. Do not use any other chemicals for cleaning.

Replacing the Light Source

Replacing the Fluorescent Ring Lamp

Replace the lamp in the HFFW5100 light source every 7,000 hours.

1. Disconnect the power and all other cables from the sensor.
2. Loosen the three set screws on the light source using a 1/16" Allen wrench.
3. Follow the Lamp Replacement procedure provided in the HFFW5100 Operator Manual supplied with the light source.
4. Reinstall the light source (see page 10).

Replacing the LED Ring Lamp

Replace the LEDR140 lamp when required.

1. Disconnect the power and all other cables from the sensor.
2. Remove the four screws that secure the LED ring lamp to the sensor.
3. Separate the LED ring lamp from the sensor until the power cable is accessible and detach the cable.
4. Install the new LED ring lamp (see page 11).

PresencePLUS Sensor P1B65Q

Supply Voltage and Current

22 to 26V dc; 250 mA max (exclusive of loads and the current required by the PRC1 controller and optional LEDR140 light source)

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Array Size

512 x 384 CMOS pixel array

Output Configuration

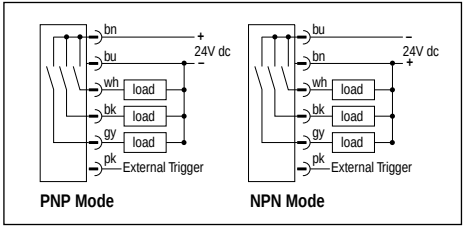
Three SPST solid-state contacts which may be individually programmed for either NPN (sinking) or PNP (sourcing)

Output Rating

50 mA max, each output

OFF-state leakage current < 100 µA

ON-state saturation voltage < 1V at 50 mA (NPN); < 2V at 50 mA (PNP)



Wiring Diagram

Output Protection Circuitry

Protected against continuous overload or short circuit

Sensor Response Time

Each of the three outputs switch within 50 milliseconds from the leading edge of the trigger input signal. Additional delay may be programmed.

Trigger Input

The sensor may be configured to accept either a current sinking (NPN) or current sourcing (PNP) input. Internal pullup (NPN) or pulldown (PNP) is provided:

NPN mode:

ON < 2V at 3 mA maximum

OFF >10V

PNP mode:

ON > 10V at 3 mA maximum

OFF < 2V

2 microsecond min. pulse width is required for either mode

Sensor Status Indicator

Yellow (flashing): Power ON, sensor initializing and executing self-diagnostics

Yellow (solid): Power ON, sensor not in RUN mode

Green: Power ON, sensor in RUN mode, READY to process triggers

Red: Power is ON, hardware fault has been detected

(Continued on page 18)

PresencePLUS Sensor P1B65Q (*Cont.*)

Judgment Status Indicator
Green: Result of last trigger was PASS
Red: Result of last trigger was FAIL

Construction
Housing is aluminum with anodized and painted finish

Lens Mount
Standard C-mount (1"-32 UN)

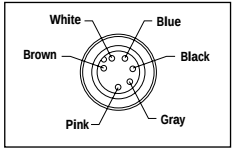
Environmental Rating
IP20; NEMA 1

Connections
6-pin Euro-style quick-disconnect fitting for connection to the MQDC-6 Series cable

Cables are ordered separately

Operating Temperature
0 to 50°C (+32 to 122°F)

Maximum Relative Humidity
90% at 50°C (non-condensing)



Sensor P1B65Q Pin Out Diagram Corresponding to MQCD-Series Quick-Disconnect Cable

LED Ring Lamp LEDR140

Supply Voltage and Current
22 to 26V dc; 300 mA max

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Peak Spectral Emission
660 nm

Useful Life
When operated within specifications, output will decrease 20% to 30% after 10,000 hours and 30% to 40% after 20,000 hours. Setting the **AUTO COMP** feature to **On** will extend use well beyond 20,000 hours.

Connections
3-pin connector for connection to the front of the sensor

Operating Temperature
0 to 50°C (+32 to 122°F)

Maximum Relative Humidity
90% at 50°C (non-condensing)

Application Notes
Use the red filter (supplied with the sensor) behind the lens when using this light source.

Use the polarizing filter kit LEDRPFK when sensing at right angles to a shiny surface.

Fluorescent Ring Lamp HFFW5100

Supply Voltage and Power
120/220V ac (50-60 Hz); 14W max

Color Temperature
5100K

Frequency
25 kHz

Lamp Life
7,000 hours (replaceable)

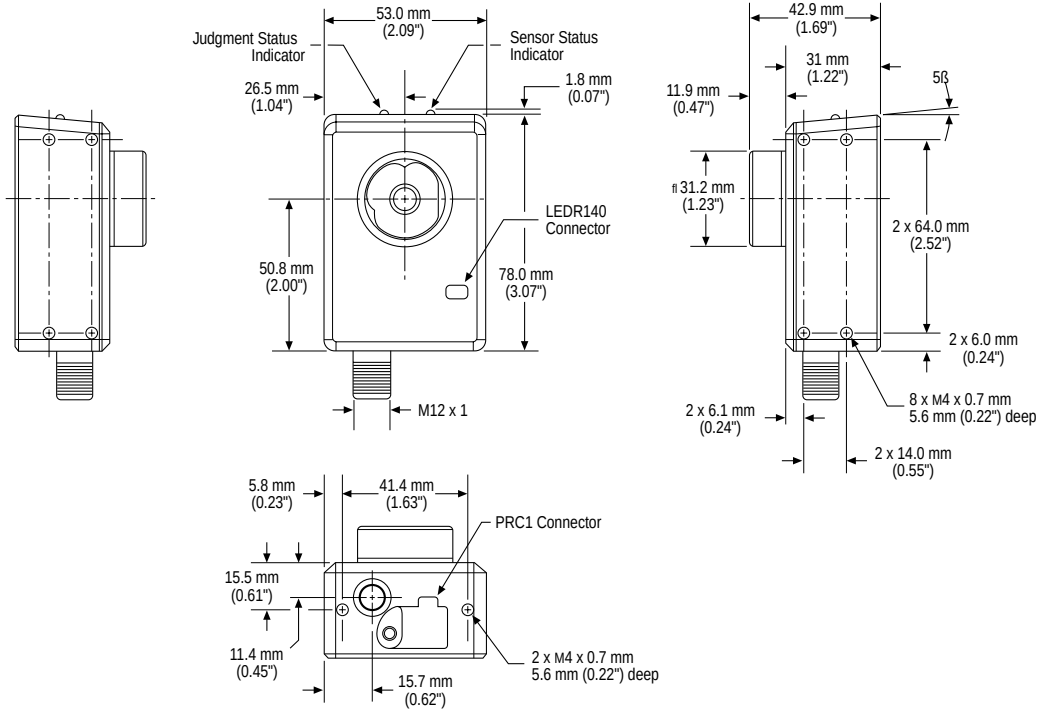
Connections
PVC-jacketed 2 m (6.5 ft) cable; power supply module with 3-pin grounded ac connector at supply end of cable

Operating Temperature
0 to 40°C (+32 to 104°F)

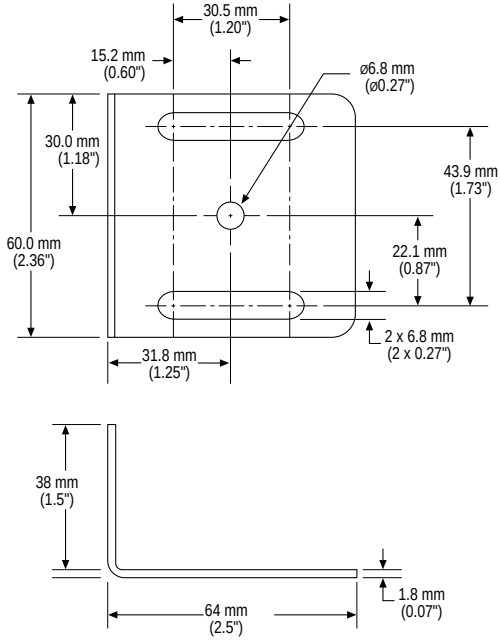
Maximum Relative Humidity
80% at 40°C (non-condensing)

Application Notes
Remove the red filter (supplied with the sensor) from behind the lens when using this light source

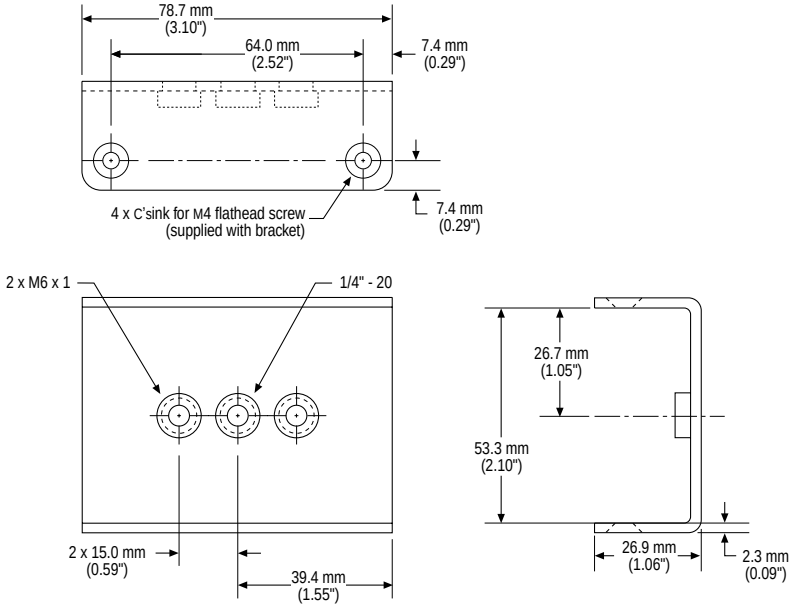
PresencePLUS Sensor P1B65Q



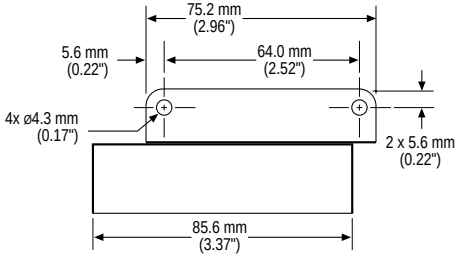
Base-Mounting Bracket SMBPBM

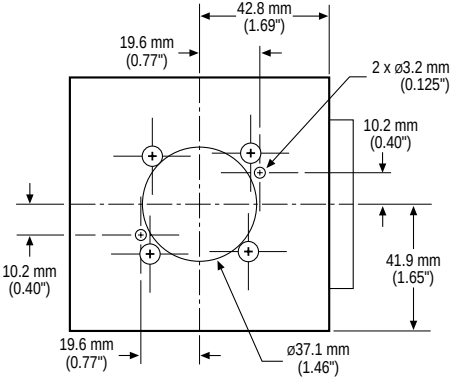


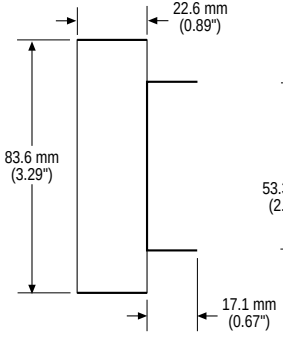
Column-Mounting Bracket SMBPCM

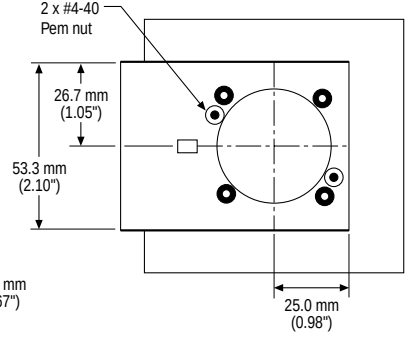


LED Ring Lamp LEDR140









Types of Lenses

Banner offers three lens choices:

- 8 mm (8 mm focal length) LCF08
- 12 mm (12 mm focal length) LCF12
- 16 mm (16 mm focal length) LCF16

Any user-supplied C-mount style lens may be used.

Lens Selection Criteria

To select the best lens for any application, consider the following lens performance criteria:

- Size of the inspection area (field of view)
- Lens-to-object distance, and any distance variation between the sensor and the object (depth of field)
- Required sensing accuracy (resolution)

The lens performance data in this manual is plotted for the recommended sensing range of from 75 to 300 mm (approximately 3" to 12"). For data concerning shorter or longer sensing distances, or for general help with lens selection, contact Banner's factory applications engineers at the address or numbers listed on the back cover.

Field of View

Field of view is the area captured within the pixel array. Because the array is rectangular in shape at 512 x 384 pixels, vertical and horizontal field of view values are not equal.

The vertical field of view is the smaller value, and is parallel to a line drawn down the sensor length from top to bottom, through the center of the lens.

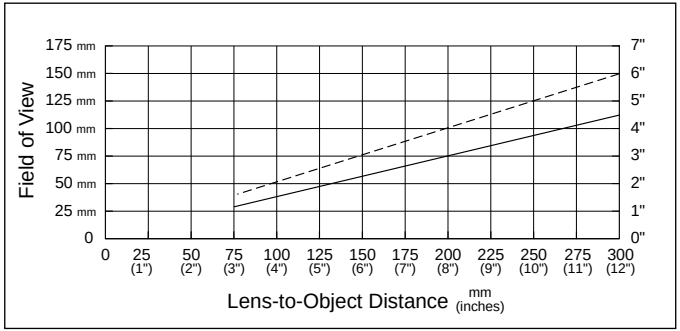
The horizontal field of view is the larger value, and is parallel to a line drawn across the sensor width through the center of the lens, and at right angles to the vertical field of view.

To increase the field of view, increase the lens-to-object distance or use a lens with a shorter focal length.

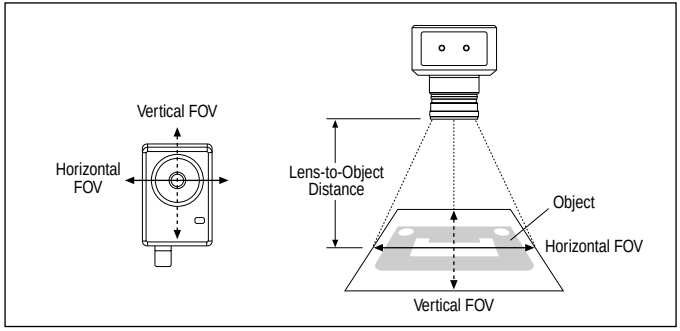
To reduce the field of view, decrease the lens-to-object distance or use a lens with a longer focal length.

The graphs on page 24 plot the effect of lens-to-object distance on field of view for each type of Banner lens choice.

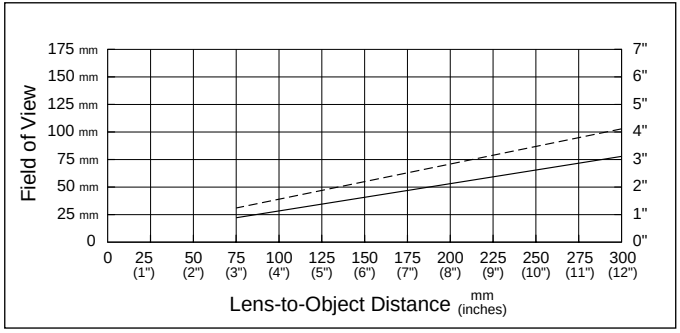
The top (dashed) line is the horizontal field of view and the lower (solid) line is the vertical field of view.



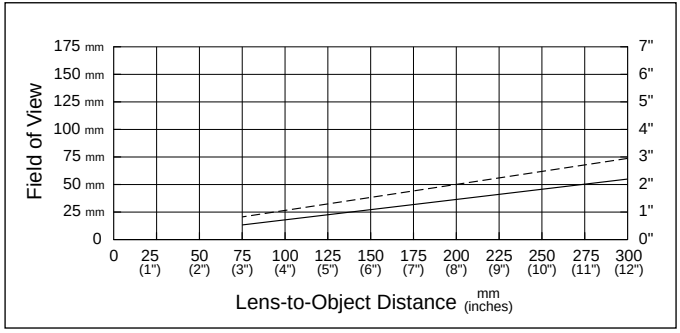
Distance vs. Field of View – 8 mm Lens LCF08



Field of View



Distance vs. Field of View – 12 mm Lens LCF12



Distance vs. Field of View – 16 mm Lens LCF16

Depth of Field

Depth of field (focus tolerance) is the area in front of and beyond the optimal point of focus in which the image quality remains acceptable.

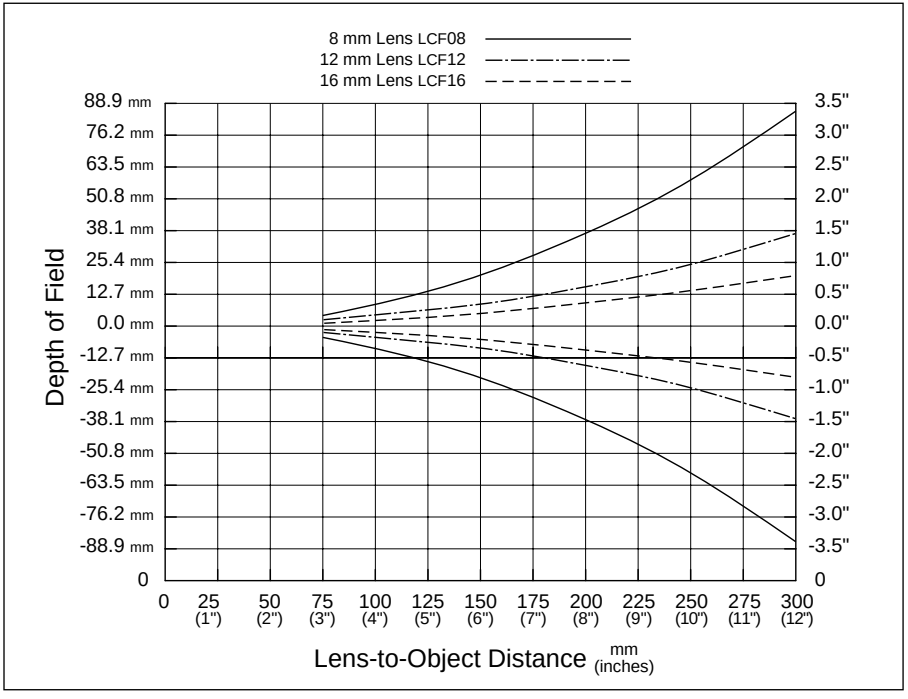
More depth of field accommodates a variable distance between the object and the sensor; for example, if the object or the sensor moves.

Less depth of field reduces interference from the area behind the image you want to capture.

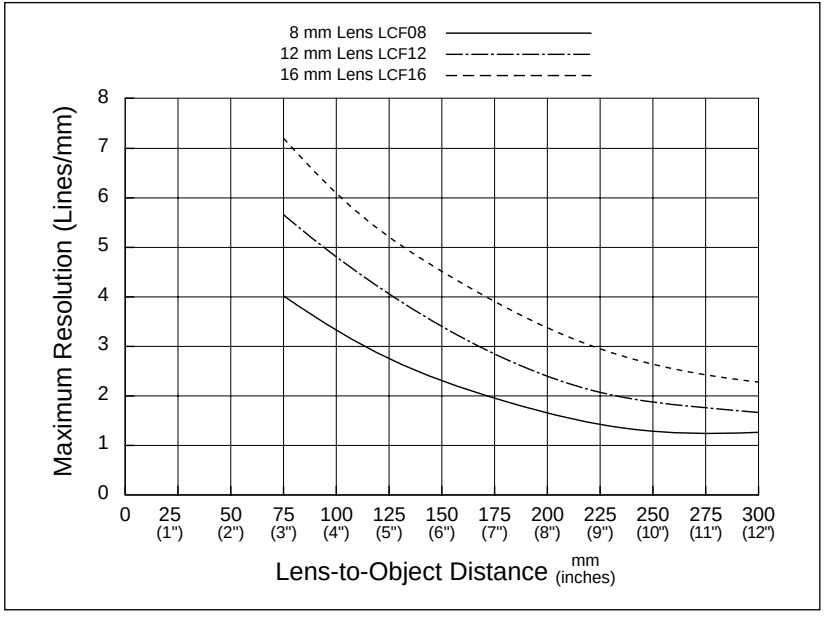
To achieve more depth of field, increase the distance from the lens to the object or use a lens with a shorter focal length.

To achieve less depth of field, reduce the distance from the lens to the object or use a lens with a longer focal length.

The graph on this page plots the effect of lens-to-object distance on depth of field for each type of Banner lens choice.



Distance vs. Depth of Field – 8 mm, 12 mm, and 16 mm Lenses (LCF08, LCF12, and LCF16)



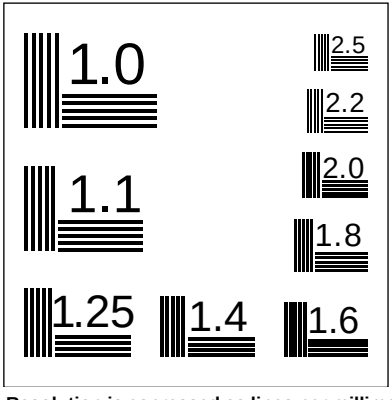
Distance vs. Maximum Resolution – 8 mm, 12 mm, and 16 mm Lenses (LCF08, LCF12, and LCF16)

Resolution

Resolution is expressed as the number of lines per millimeter the sensor can clearly distinguish.

To increase resolution, reduce the lens-to-object distance or use a lens with a longer focal length.

The graph on this page plots the effect of lens-to-object distance on resolution for each type of Banner lens choice.



Resolution is espressed as lines per millimeter

Components & Accessories	Model	P/N
PresencePLUS Sensor	**P1B65Q**	56519
PresencePLUS Controller	**PRC1**	56520
Quick-Disconnect Cable – 2 m	**MQDC-606**	56913
Quick-Disconnect Cable – 5 m	**MQDC-615**	56914
Quick-Disconnect Cable – 9 m	**MQDC-630**	56915
Bracket – Base-Mounting	**SMBPBM**	56949
Bracket – Column-Mounting	**SMBPCM**	56947

Components & Accessories	Model	P/N
C-mount Lens – 8 mm	**LCF08**	57298
C-mount Lens – 12 mm	**LCF12**	57299
C-mount Lens – 16 mm	**LCF16**	56522
Light source – Fluorescent Ring Lamp	**HFFW5100**	57388
Light source – Visible Red LED Ring Lamp	**LEDR140**	56521
Replacement Bulb – Fluorescent Ring Lamp	**RFLW5100**	59391
Polarizing Filter Kit	**LEDRPFK**	58353

PresencePLUS Kits

			Sensor	Controller	QD Cable	Bracket		Light Source		Lens
Kit	Model	P/N	**P1B65Q**	**PRC1**	**MQDC-606**	**SMBPCM**	**SMBPBM**	**LEDR140**	**HFFW5100**	**LCF12**
1	**P1B65QK1**	57858	●	●	●					●
2	**P1B65QK2**	57859	●	●	●	●				●
3	**P1B65QK3**	57860	●	●	●		●			●
4	**P1B65QK4**	57861	●	●	●			●		●
5	**P1B65QK5**	57862	●	●	●				●	●
6	**P1B65QK6**	57863	●	●	●	●		●		●
7	**P1B65QK7**	57864	●	●	●	●			●	●

Binary
Permitting two possibilities; for example, 0 or 1, ON or OFF, black or white.

Bit
The smallest unit of computer memory. A bit is either ON or OFF. The sensor captures an 8-bit image. Each 8-bit pixel can display one of 256 shades of gray. When the sensor converts the gray-scale (8-bit) image to binary (1-bit) format, each pixel displays as either black or white.

Depth of field
The area before and beyond the optimal point of focus. More depth of field accommodates lens-to-object variance (movement). Less depth of field reduces background distraction.

Exposure time (Exposure)
The length of time the pixel array is exposed to light during an image capture, specified in milliseconds (ms).

FAIL
The judgment results are not acceptable based on judgment criteria as taught.

Field of view (FOV)
The image area captured within the pixel array.

Focal length
The distance between the rear nodal point of a lens and the focal plane, specified in millimeters. For example, an 8 mm lens has a focal length of 8 mm, and a 12 mm lens has a focal length of 12 mm (25 mm is approximately 1"). A shorter focal length provides a wider field of view and less depth of field.

Gray scale
A range of shades from pure white to pure black.

Gray-scale thresholds
Two adjustable values between 0 (black) and 255 (white) representing two shades of gray within a 256-level gray-scale.

The sensor judges each pixel as black or white according to where its value falls in relation to the upper threshold (highest number) and lower threshold (lowest number).

Judgment
The process the sensor uses to determine the outcome (PASS, FAIL, Fail High, or Fail Low) of the image capture by comparing the pixel count of the image to reference values.

Mask
A defined area within the ROI that is ignored during judgment.

PASS
The judgment results are acceptable based on judgment criteria as taught.

Pixel
The smallest “picture element” of an image for which the sensor determines an average brightness value. Each pixel within the sensor’s array is a discrete photosensitive cell that can collect and hold a photo charge.

Pixel array (Array)
The area on the sensor that captures the image – a 512 x 384 pixel grid.

Polarize
To orient light waves into a single direction. Two polarizers coupled together reduce the negative effects of light reflecting off a shiny surface.

Region of interest (ROI)

A defined area of the captured image within the pixel array that is judged. The image outside of an ROI is ignored.

Resolution

The quality of the image, expressed as the number of distinct lines per millimeter that the sensor can distinguish.

Sensor gain (Gain)

The amount of amplification of the pixel signal prior to processing by the sensor.

Trigger

An input signal to the sensor. Configurable trigger parameters determine how the sensor responds to the trigger.

Notes

WARRANTY: Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

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