PresencePLUS

Model PRC1

Controller

Instruction Manual

BANNER®

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Attaching the Controller

The power may be ON while attaching the controller to the sensor.

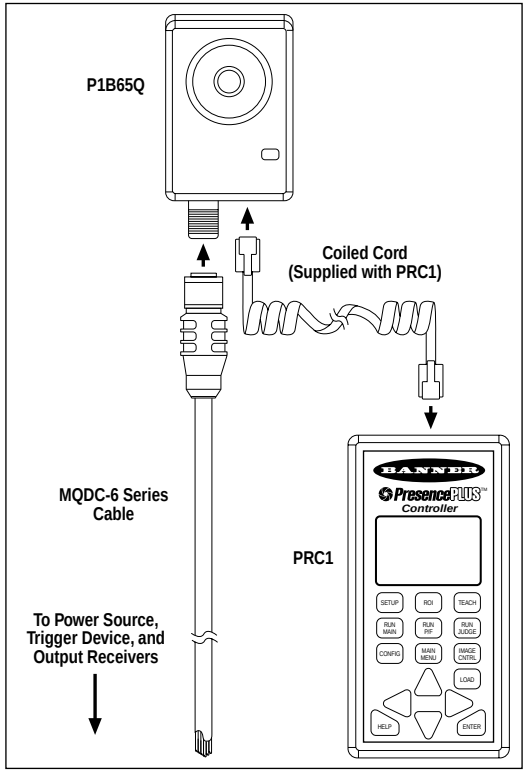
A coiled cord with modular plugs is supplied with the PRC1 controller. Insert one plug into the sensor and the other plug into the controller. Be sure they click into place.

NOTE: *For complete PresencePLUS sensor and system setup instructions, see the PresencePLUS P1B65Q Pixel-Counting Sensor Instruction Manual (P/N 56910), supplied with each sensor.*

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.



Controller Connection to the Sensor

Product Overview

The PresencePLUS™ Model PRC1 Controller is a hand-held remote programmer for the PresencePLUS™ Model P1B65Q Pixel-Counting Sensor. The controller is used to program the sensor and monitor sensor performance.

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.

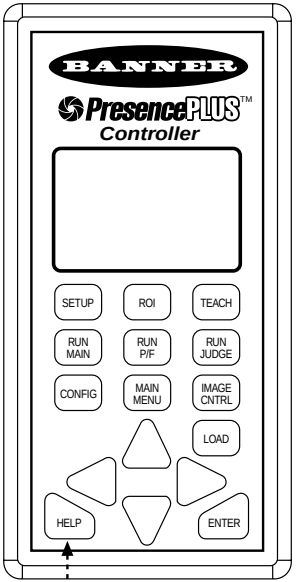
If the application does not require defining an ROI, masking, or teaching bad product, the QUICK START option provides a simple one-step SETUP, TEACH, and RUN sequence. The resulting judgment criteria may be manually adjusted.

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.

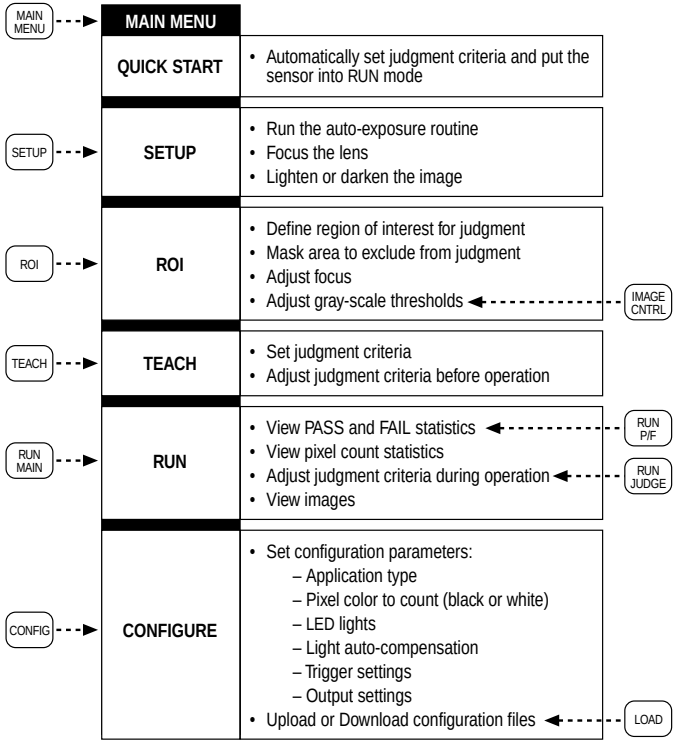
Up to four different sets of parameters may be uploaded from the sensor to the controller and saved as files. This feature allows parameters to be downloaded to the sensor when setting up different product runs or programming more than one sensor.

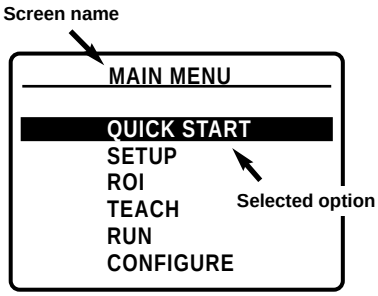
After the sensor has been programmed and configured, the controller is used to put the sensor into RUN mode. While the sensor is in operation, RUN screens may be used to monitor PASS/FAIL and pixel count statistics, view captured images, or adjust configuration settings and gray-scale thresholds.

Controller Keypad

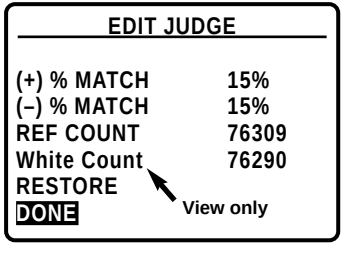


Display information about the selected option





Press **UP** and **DOWN** buttons to select an option. Press **ENTER** to execute the option.



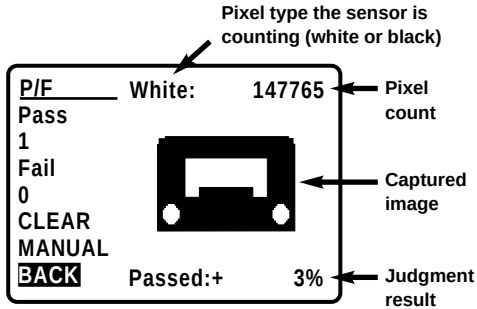
Options are displayed in **CAPITAL** letters, view-only information is displayed in **Upper and Lower Case** letters.

Working with Screens

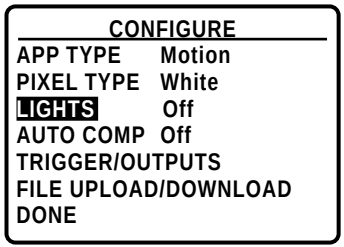
- The screen name is underlined at the top of each screen.
- In this manual, some screens are identified by a number. These numbers help show how screens are related. They do not appear on the screen and do not necessarily suggest the order that screens should be completed.
- Options are displayed in **CAPITAL** letters.
- View-only data, values, and message text are displayed in **Upper and Lower Case** letters.
- To select an option, press **UP** or **DOWN** buttons to highlight it.
- To execute a selected option, press **ENTER**.
- Changes are automatically saved when you go to another option or screen.
- Use arrow buttons to quickly navigate between options on a screen:
  - Press the **LEFT** button to select the first option.
  - Press the **RIGHT** button to select the last option.
  - Press the **UP** button from the first option to select the last option.
  - Press the **DOWN** button from the last option to select the first option.
- Press and hold an **UP**, **DOWN**, **LEFT**, or **RIGHT** button to allow the controller to continue the action until the button is released.
- To display information about the selected option, press the **HELP** button. To exit the Help screen, press the **HELP** button again.
- Whenever a selected option will take the sensor out of RUN mode or affect previously set information, the controller displays a confirmation prompt. To continue with the operation, select **YES**. To back out without changing anything, select **NO**.

- RUN mode and IMAGE CONTROL screens display the pixel type the sensor is counting (white or black), the pixel count, the captured image, and the judgment result.

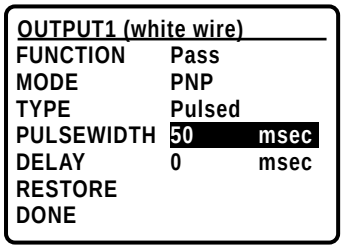
  The judgment result includes the percent above (+) or below (–) the Reference Count. For example, if the (+) %Match is 15%, a pixel count that is 3% above the Reference Count is displayed as **Passed: + 3%** because 3% is within 15%. A pixel count that is 25% above is displayed as **Failed: +25%** because 25% is not within 15%. A value of **0%** means that the count is within 1% of the Reference Count. See page 24 for more information about how judgment criteria is applied.
- To change a word value displayed next to an option, highlight the option and press **ENTER** to toggle between choices (see Example 1).
- To adjust a numerical value displayed next to an option, highlight the option and press **ENTER** to select its value. Press **UP** or **DOWN** buttons to edit the number. Press **ENTER** again to deselect the value (see Example 2).
- To adjust ROI or mask borders, press **UP**, **DOWN**, **LEFT**, or **RIGHT** buttons (see Example 3).



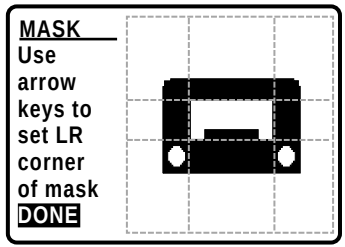
Monitoring data displayed on RUN mode and IMAGE CONTROL screens



Example 1: Changing word values



Example 2: Adjusting numerical values

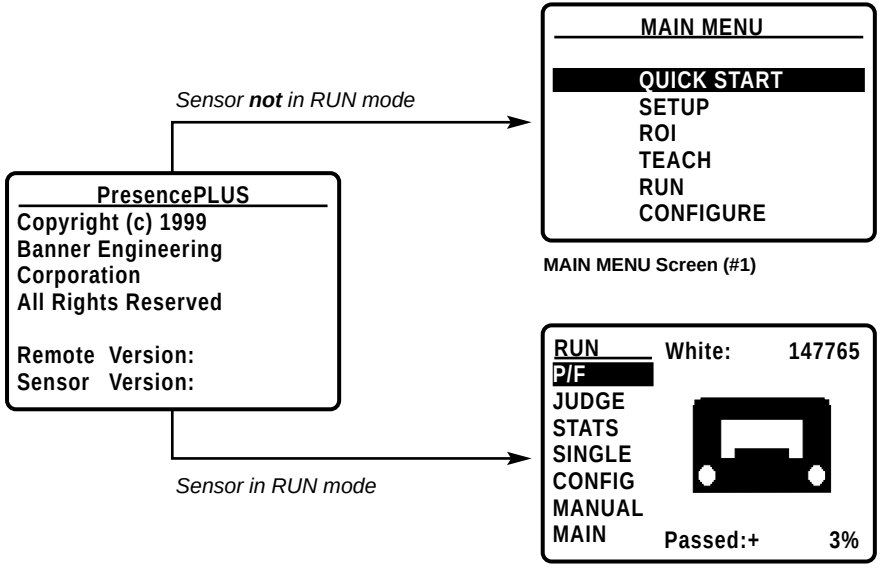


Example 3: Adjusting borders

Startup Screens

Upon connection to the sensor, the controller briefly displays version information on the PresencePLUS startup screen and then displays the MAIN MENU screen (#1).

If the sensor is in RUN mode, the controller displays the RUN screen (#5) upon connection.



MAIN MENU Screen (#1)

RUN Screen (#5)

MAIN MENU Overview

MAIN MENU Screen (#1)

This screen provides access to all programming functions. Although MAIN MENU options may be accessed in any order, the controller anticipates that they will be completed sequentially and highlights the next option in the menu each time the screen is re-entered.

NOTE: The sensor must be in RUN mode to operate. When programming is complete, select **RUN** on the MAIN MENU screen or press **RUN MAIN**, **RUN P/F**, or **RUN JUDGE** to put the sensor into RUN mode.

QUICK START

Provides a simple way to program and run the sensor if advanced features are not required (see page 10).

SETUP

Adjust where the image appears within the array, focus the lens, and lighten or darken the image (see page 11).

ROI

Define a Region of Interest (ROI) to include in judgments or mask an area to exclude (see page 12).

TEACH

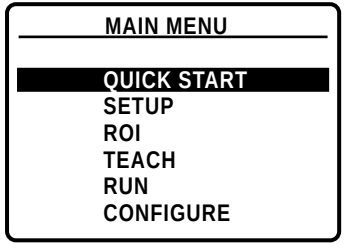
Set and edit judgment criteria (see page 18).

RUN

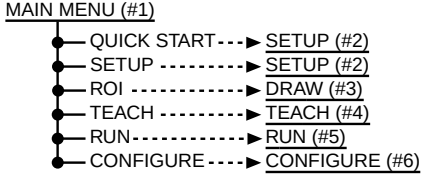
Put the sensor into RUN mode and display the RUN screen. The RUN screen provides access to all monitoring functions (see page 21).

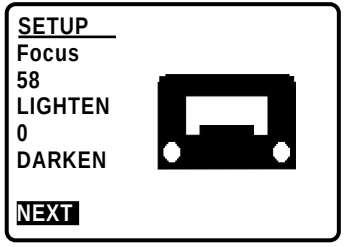
CONFIGURE

Set application type, pixel color to count, lighting options, and trigger/output options. Upload or download a configuration file (see page 26).



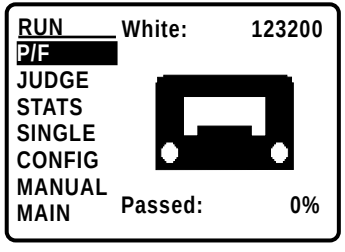
MAIN MENU Screen (#1)





SETUP Screen (#2)

Automatically gathers TEACH data, determines judgment criteria, and puts the sensor into RUN mode.



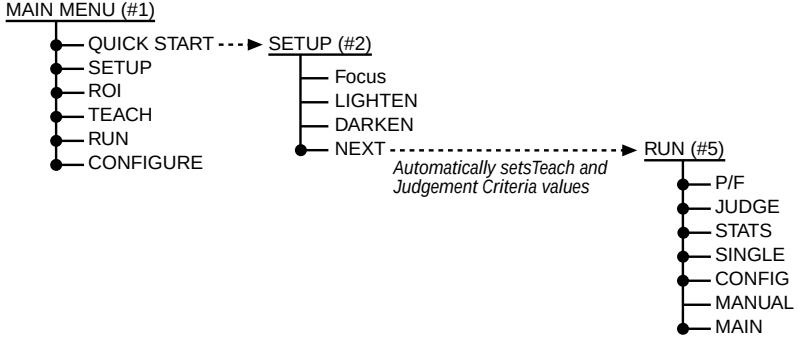
RUN Screen (#5)

Using the QUICK START Option

Use the QUICK START option as a simple, one-step way to program and run the sensor.

QUICK START may be used with any CONFIGURE settings and with a previously defined Region of Interest (ROI) or mask. Judgment criteria is based on five image captures and replaces any previously set TEACH settings. Judgment criteria may be manually adjusted (see page 23).

- ➡ On the MAIN MENU screen (#1), select **QUICK START** and press **ENTER** to display the SETUP screen (#2).
- ➡ Use the SETUP screen (as described on page 11) to adjust the image withing the array, adjust the focus, lighten or darken the image, or clear a previously defined ROI or mask.
- ➡ Select **NEXT** and press **ENTER**. The controller automatically captures five images, determines judgment criteria values, puts the sensor into RUN mode, and displays the RUN screen (#5) (see page 21).



Adjusting Image, Focusing, Auto-Exposure

SETUP Screen (#2)

After placing the target object within the sensor's field of view, use this screen to adjust where the image appears within the array, to focus the lens, and to lighten or darken the image.

While this screen is displayed, the controller continuously updates the image and runs the auto-exposure routine to set the optimal exposure time, sensor gain, and gray-scale thresholds. These values may be viewed and thresholds adjusted on the IMAGE CONTROL screen (#3.4) (see page 16).

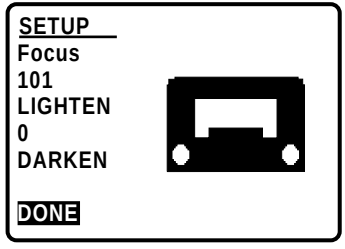
Use **LIGHTEN** and **DARKEN** options to adjust the lower gray scale threshold. Values between -7 and 7 represent 15 steps of gray between the darkest and lightest pixels in the image.

- ➡ To achieve optimal focus, turn the lens focus ring in small increments until the displayed **Focus** value is the highest possible number. Remove your hand from the lens after each adjustment. The value indicates the amount of contrast in the image. Higher numbers are achieved when sensing images with greater contrast between light and dark areas.
- ➡ To lighten the image, select **LIGHTEN**. Each time you press **ENTER**, the value is increased by 1 within a range of -7 to +7.
- ➡ To darken the image, select **DARKEN**. Each time you press **ENTER**, the value is decreased by 1 within a range of +7 to -7.

RESET

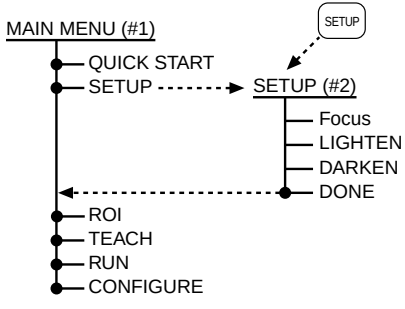
This option is displayed only if an ROI or mask has been previously defined.

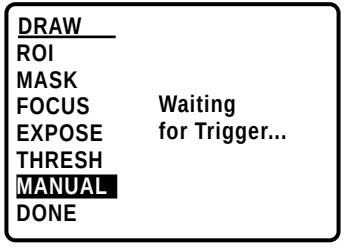
- ➡ To clear a previously drawn ROI or MASK, select **RESET** and press **ENTER**.
- ➡ To exit the screen, select **DONE** and press **ENTER**. If this screen was accessed from the **QUICK START** option, select **NEXT** and press **ENTER** to continue.



SETUP Screen (#2)

For more information about gray scale thresholds, see **Appendix B: Gray-Scale Thresholds** on page 33.





DRAW Screen (#3)

ROI Overview

DRAW Screen (#3)

Use this screen to define or remove Region of Interest (ROI) and mask areas. An ROI or mask reduces the amount of area included in judgments or omits an area that could adversely affect judgment.

ROI and Mask options are not available until a trigger is provided. If the application involves motion, use an external trigger.

OPTIONAL: After adding an ROI, use the **FOCUS** option to re-focus the lens and select **EXPOSE** to re-calculate and optimize the exposure time. Using the **THRESH** option to adjust gray-scale thresholds may help improve the image.

ROI

Draw an area to include in judgments.

MASK

Draw an area to exclude from judgment.

➡ To re-focus the lens after adding an ROI, select **FOCUS** and press **ENTER**.

➡ To re-calculate and optimize the exposure time after adding an ROI, select **EXPOSE** and press **ENTER**.

➡ To improve the image by adjusting gray-scale threshold values, select **THRESH** and press **ENTER**.

➡ To provide a trigger to the sensor, select **MANUAL** and press **ENTER** (or provide an external trigger).

➡ To exit the screen, select **DONE** and press **ENTER**.

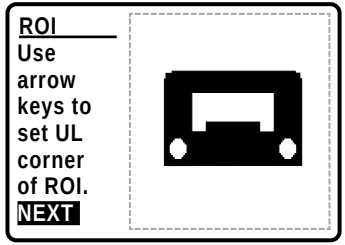
Drawing a Region of Interest (ROI)

ROI Screen #3.1

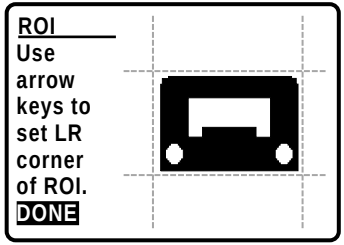
Use ROI screens to define an area within the pixel array to judge or to remove a previously defined ROI. The area inside the lines is included in judgments.

NOTE: To remove an ROI, move all lines to their maximum outermost position.

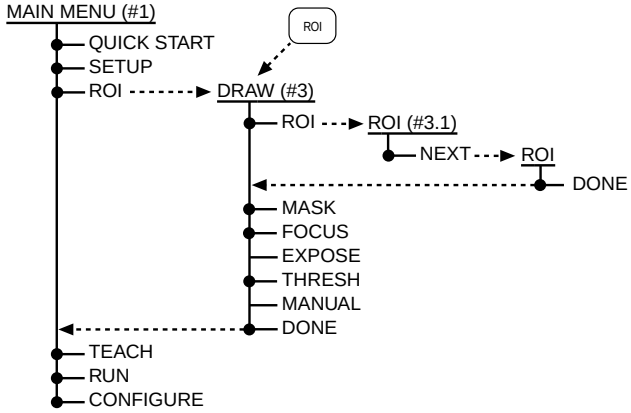
- ➡ On the DRAW screen (#3), provide a trigger to capture an image (see page 12).
- ➡ Select **ROI** and press **ENTER**.
- ➡ Press **UP**, **DOWN**, **LEFT**, and **RIGHT** buttons to move the top (upper) and left lines. Select **NEXT** to continue.
- ➡ Press **UP**, **DOWN**, **LEFT**, and **RIGHT** buttons to move the bottom (lower) and right lines.
- ➡ Select **DONE** to return to the DRAW screen.
- ➡ (Optional) Select **FOCUS** and press **ENTER** to re-focus the lens on the FOCUS screen (see page 15).
- ➡ (Optional) Select **EXPOSE** and press **ENTER** to re-calculate and optimize the exposure time.

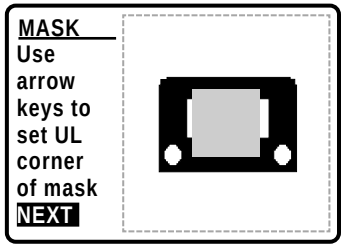


ROI Screen (Maximum pixel array area before adding an ROI))

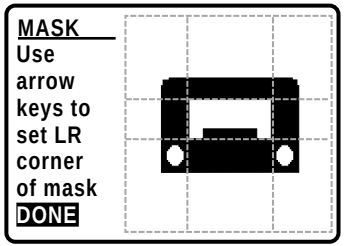


ROI Screen (ROI defined)

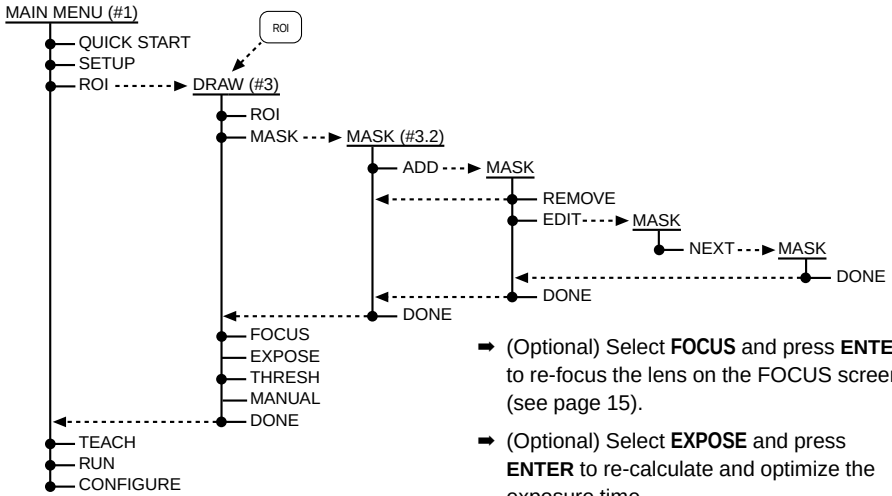




MASK Screen (Default mask size and location)



MASK Screen (Mask edited)



➡ (Optional) Select **FOCUS** and press **ENTER** to re-focus the lens on the FOCUS screen (see page 15).

➡ (Optional) Select **EXPOSE** and press **ENTER** to re-calculate and optimize the exposure time.

Drawing a Mask

MASK Screen (#3.2)

Use MASK screens to define an area within the region of interest (ROI) to exclude from judgment or to remove a previously drawn mask. The area covered by gray is excluded from judgments.

NOTE: Only the area of mask that is within the ROI will affect judgment results.

➡ On the DRAW screen (#3), provide a trigger to capture an image.

➡ Select **MASK** and press **ENTER**.

➡ To add a mask, select **ADD** and press **ENTER**. A mask area appears in the center of the image.

➡ To remove the mask, select **REMOVE** and press **ENTER**.

➡ To edit the size or position of the mask, select **EDIT** and press **ENTER**.

➡ Press **UP**, **DOWN**, **LEFT**, and **RIGHT** buttons to move the top (upper) and left lines. Select **NEXT** to continue.

➡ Press **UP**, **DOWN**, **LEFT**, and **RIGHT** buttons to move the bottom (lower) and right lines.

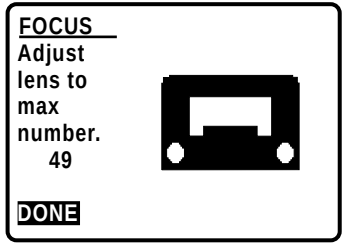
➡ To exit the screen, select **DONE** and press **ENTER**.

Adjusting Focus

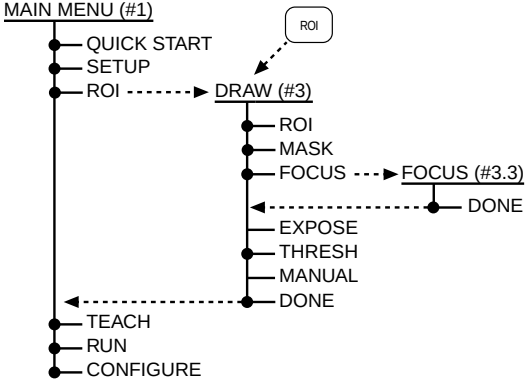
FOCUS Screen #3.3

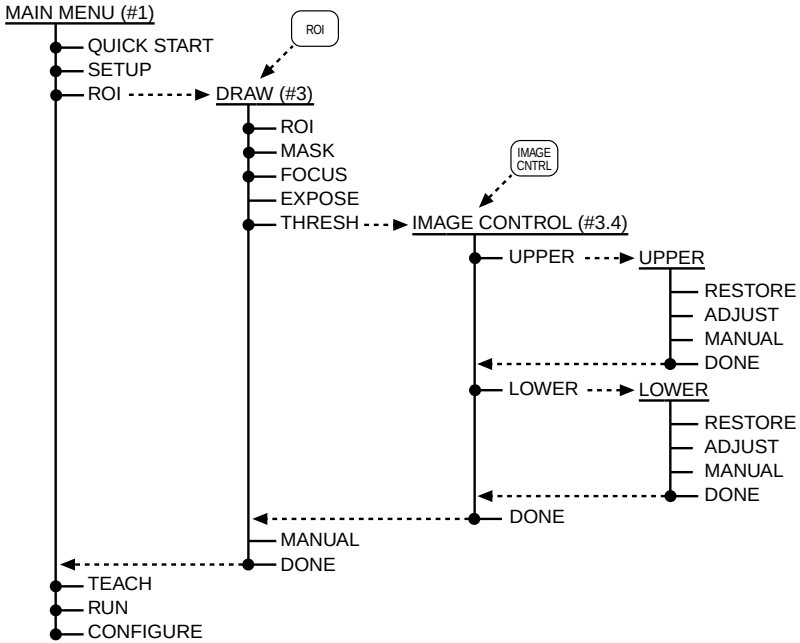
Use this screen to focus the sensor's lens after adding an ROI.

- ➡ To achieve optimal focus, turn the lens focus ring in small increments until the displayed value is the highest possible number. Remove your hand from the lens after each adjustment.
- ➡ Select **DONE** and press **ENTER** to return to the DRAW screen.
- ➡ (Optional) After returning to the Draw screen, select **EXPOSE** and press **ENTER** to run the auto-exposure routine.



FOCUS Screen (#3.3)





Adjusting Gray-Scale Thresholds

IMAGE CONTROL Screen (#3.4)

Use IMAGE CONTROL screens to view auto-exposure values and to adjust the upper and lower gray-scale threshold values.

These values are set during the auto-exposure routine on the SETUP screen and whenever the **EXPOSE** option is executed.

Gray-scale thresholds may be manually adjusted. Threshold values are specified as a number from 0 (black) to 255 (white). The upper value must be greater than the lower value.

➡ On the DRAW screen (#3), select **THRESH** and press **ENTER** to display the IMAGE CONTROL screen (#3.4).

➡ To exit the screen, select **DONE** and press **ENTER**.

UPPER and LOWER Screens

- ➡ On the IMAGE CONTROL screen (#3.4), select **UPPER** or **LOWER** and press **ENTER**.
- ➡ To change the value, select **ADJUST** and press **ENTER** to highlight the value. Press and hold down the **UP** or **DOWN** button until the desired valued is displayed. The threshold value is updated when the button is released. The image will be updated following the next trigger.
- ➡ When satisfied with the results, press the **DOWN** button to select **DONE** and press **ENTER** to exit the screen.
- ➡ To provide a trigger to the sensor, select manual and press ENTER (or provide an external trigger).
- ➡ To restore the value to the value present upon entering the screen, select **RESTORE** and press **ENTER**.

For more information about gray scale thresholds, see **Appendix B: Gray-Scale Thresholds** on page 33.

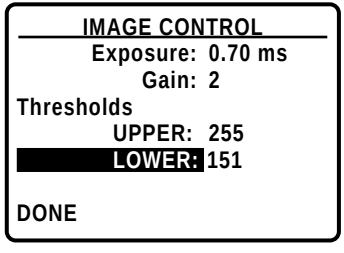
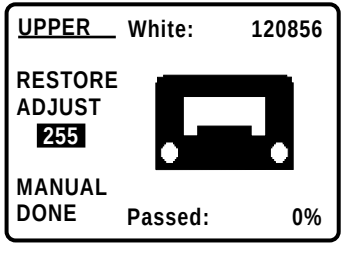
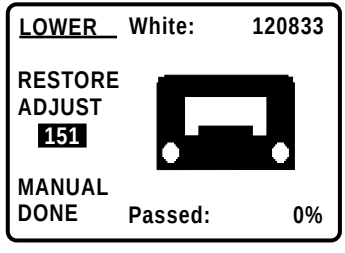


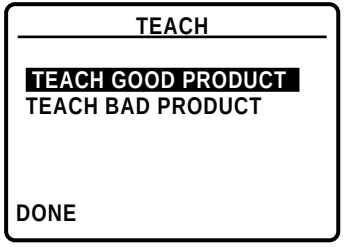
IMAGE CONTROL Screen (#3.4)



UPPER Screen



LOWER Screen



TEACH Screen (#4)

TEACH Overview

TEACH Screen (#4)

If not using the **QUICK START** option, use TEACH screens to set judgment criteria.

The controller uses the maximum, minimum, and average counts obtained from good and (optionally) bad examples to calculate acceptable ranges (%Match values). During subsequent operation, a pixel count must be within the %Match ranges to receive a PASS judgment.

NOTE: If the sensor is taught using the **QUICK START** option or only good examples, the %Match values are 15% above the maximum count and 15% below the minimum count. These values may be adjusted automatically by teaching bad examples or manually on the EDIT JUDGE screen (#4.2) (see page 20).

TEACH GOOD PRODUCT

Present examples of good product to obtain judgment criteria.

TEACH BAD PRODUCT

Present examples of bad product to obtain judgment criteria. This option is available only after teaching good product.

DONE

Exit the screen. This option is displayed only if judgment criteria has not been changed. Otherwise, you must select **NEXT** to continue to the EDIT JUDGE screen and then select **DONE** to exit TEACH screens.

NEXT

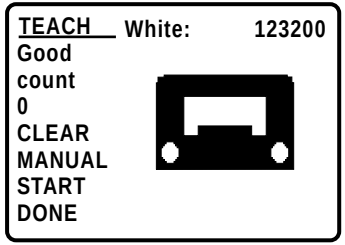
Continue to the EDIT JUDGE screen. This option is displayed only after teaching good product.

Setting Judgment Criteria

TEACH Screen (#4.1)

Use this screen to determine judgment criteria by presenting good and (optionally) bad product targets. The **White** (**Black**) count at the top of the screen is the pixel count result of the last captured image.

NOTE: The image is continuously updated on this screen to assist with the placement of the target object.



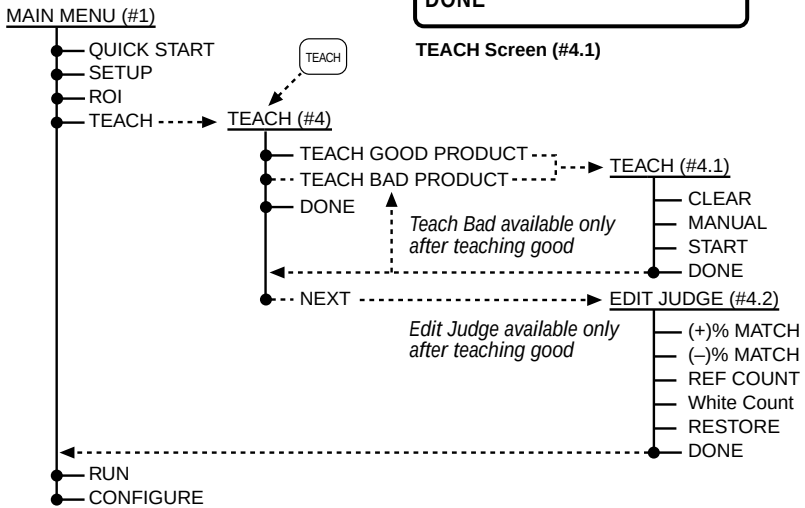
TEACH Screen (#4.1)

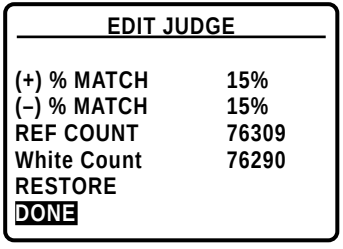
- ➡ On the TEACH screen (#4), select **TEACH GOOD PRODUCT** and press **ENTER**.
- ➡ To begin gathering teach data, select **START** and press **ENTER. START** changes to **STOP**.

  Upon receiving an external or manual trigger, the sensor captures an image. For each captured image, the controller gathers teach data, displays the image, and increments the count.

  To provide manual triggers, press the **UP** button to select **MANUAL** and press **ENTER** to initiate each trigger.

  To stop gathering teach data after the desired number of counts are displayed, select **STOP** and press **ENTER**. **STOP** changes to **START**.
- ➡ To clear teach data and start over, select **CLEAR** and press **ENTER**.
- ➡ To exit the screen, select **DONE** and press **ENTER**.
- ➡ If desired, select **TEACH BAD PRODUCT** and repeat the same procedure.





EDIT JUDGE Screen (#4.2)

For more information about how judgment criteria is calculated and applied to pixel counts during sensor operation, contact Banner's factory application engineers at the address or numbers listed on the back cover.

Editing Judgment Criteria

EDIT JUDGE Screen (#4.2)

Use this screen to view and edit judgment criteria (Reference Count and %Match values) and to view the pixel count result of the last trigger.

(+) % MATCH (Positive Percent Match)
The percent above the reference count the sensor will judge as PASS. The value is 15% or the percent obtained by teaching.

➡ To adjust, select **(+) % MATCH** and press **ENTER** to select the value. Press **UP** and **DOWN** buttons to change the value. Press **ENTER** to deselect the value.

(–) % MATCH (Negative Percent Match)
The percent below the reference count the sensor will judge as PASS. The value is 15% or the percent obtained by teaching.

➡ To adjust, select **(–) % MATCH** and press **ENTER** to select the value. Press **UP** and **DOWN** buttons to change the value. Press **ENTER** to deselect the value.

REF COUNT
The average of all taught good counts. This value is used to calculate the Pass High and Pass Low limits.

➡ To adjust, select **REF COUNT** and press **ENTER** to select the value. Press **UP** and **DOWN** buttons to change the value. Press **ENTER** to deselect the value.

White (Black) Count
Displays the pixel count result of the last captured image. The color is determined by the **PIXEL TYPE** option on the CONFIGURE screen (#6).

➡ To change all values back to what they were upon entering the screen, select **RESTORE** and press **ENTER**.

➡ To exit the screen, select **DONE** and press **ENTER**.

RUN Overview

RUN Screen (#5)

The RUN screen provides access to all monitoring functions and configuration settings that may be adjusted while the sensor is in RUN mode. Gray-scale thresholds may also be adjusted while the sensor is in RUN mode by pressing **IMAGE CONTROL** (see page 16).

NOTE: The sensor must be in RUN mode to operate. When programming is complete, select **RUN** on the MAIN MENU screen or press **RUN MAIN**, **RUN P/F**, or **RUN JUDGE** to put the sensor into RUN mode.

P/F
View or clear PASS and FAIL statistics (see page 22).

JUDGE
View or adjust judgment criteria values (see page 23).

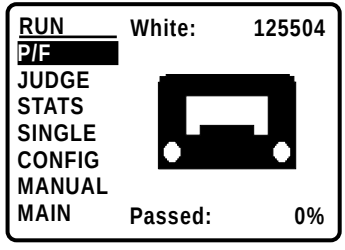
STATS
View or clear pixel count statistics (see page 24).

SINGLE
Display the next triggered, next failed, or next passed image (see page 25).

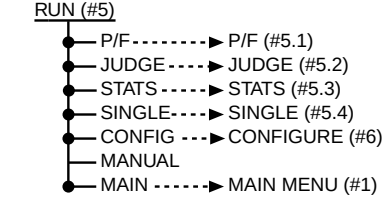
CONFIG
View or adjust configuration settings (see pages 26-30).

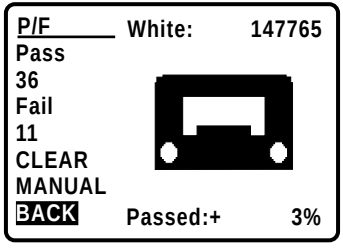
MAIN
Take the sensor out of RUN mode and display the MAIN MENU screen. The MAIN MENU screen provides access to all programming functions (see page 9).

➡ To provide a trigger to the sensor, select **MANUAL** and press **ENTER** (or provide an external trigger).

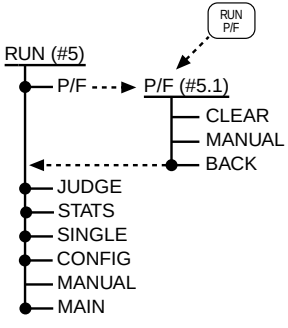


RUN Screen (#5)





P/F Screen (#5.1)



Viewing Pass/Fail Statistics

P/F Screen (#5.1)

Use this screen to view the number of PASS and FAIL judgments since the last reset.

Pass

Displays the number of counts that have passed judgment.

Fail

Displays the number of counts that have failed judgment.

➡ To reset all counts to zero, select **CLEAR** and press **ENTER**.

➡ To provide a trigger to the sensor, select **MANUAL** and press **ENTER** (or provide an external trigger).

➡ To exit the screen, select **BACK** and press **ENTER**.

Viewing/Editing Judgment Criteria

JUDGE Screen (#5.2)

Use this screen to view or edit judgment criteria during sensor operation.

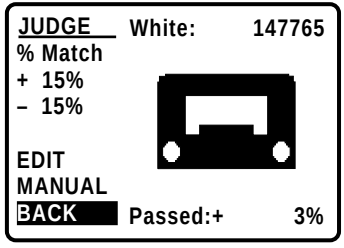
% Match

Displays the (+) %Match and (–) %Match settings.

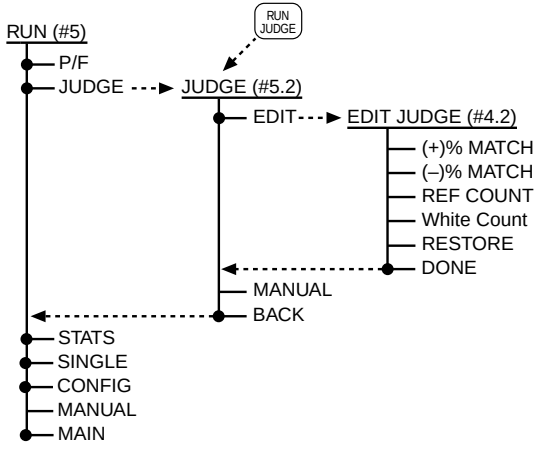
➡ To edit judgment criteria on the EDIT JUDGE screen (#4.2), select **EDIT** and press **ENTER** (see page 20).

➡ To provide a trigger to the sensor, select **MANUAL** and press **ENTER** (or provide an external trigger).

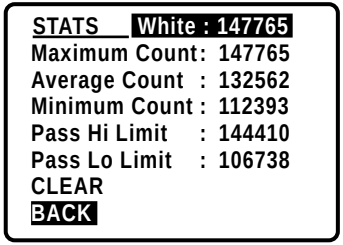
➡ To exit the screen, select **BACK** and press **ENTER**.



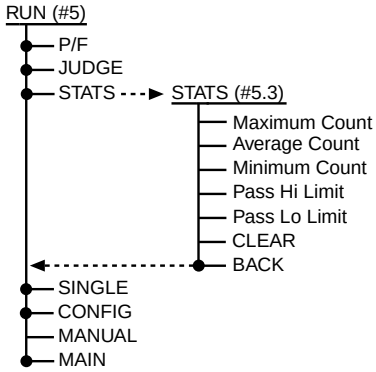
JUDGE Screen (#5.2)



For more information about how to set and adjust judgment criteria, see **Setting Judgment Criteria** on page 19 and **Editing Judgment Criteria** on page 20.



STATS Screen (#5.3)



Viewing Pixel Count Statistics

STATS Screen (#5.3)

Use this screen to view pixel count statistics since the last reset. The **White** (**Black**) count at the top of the screen is the pixel count result of the last captured image.

Maximum Count: The highest count obtained during operation.

Average Count: The average of all counts obtained during operation.

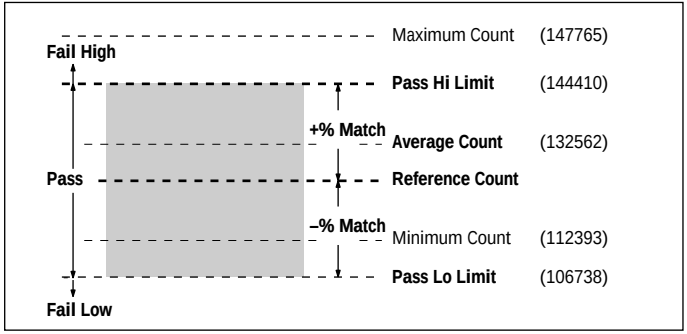
Minimum Count: The lowest count obtained during operation.

Pass Hi Limit: Reference Count + (Reference Count x (+) % Match).

Pass Lo Limit: Reference Count – (Reference Count x (–) % Match).

➡ To reset all counts to zero, select **CLEAR** and press **ENTER**.

➡ To exit the screen, select **BACK** and press **ENTER**.



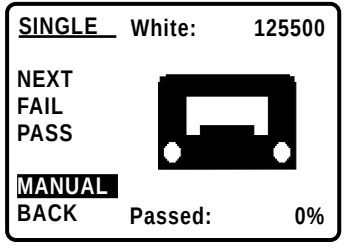
Graphical Example of Statistics

Viewing Images

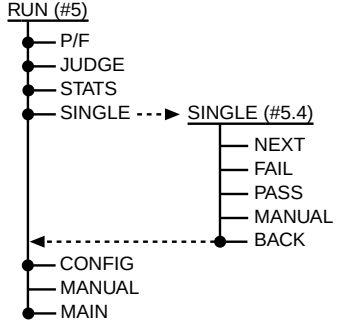
SINGLE Screen (#5.4)

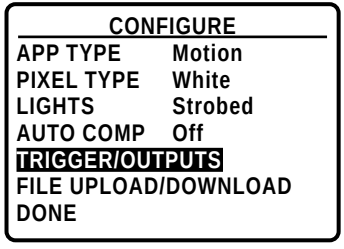
Use this screen to display selected images. The image remains on the screen until the next image is selected.

- To display the next triggered image, select **NEXT** and press **ENTER**.
- To display the next image that fails judgment criteria, select **FAIL** and press **ENTER**.
- To display the next image that passes judgment criteria, select **PASS** and press **ENTER**.
- To provide a trigger to the sensor, select **MANUAL** and press **ENTER** (or provide an external trigger). This option is not available until you select **NEXT**, **FAIL**, or **PASS**.
- To exit the screen, select **BACK** and press **ENTER**.



SINGLE Screen (#5.4)





CONFIGURE Screen (#6)

APP TYPE
Motion
PIXEL TYPE
White
LIGHTS
Strobed
AUTO COMP
On

CONFIGURE Screen Defaults

Configuring Application Type, Pixel Type, and Lighting

CONFIGURE Screen (#6)

Use CONFIGURE screens to set application type, pixel color to count, lighting options, and trigger/output options, to test output signals, and to upload or download a configuration file. To restore configuration defaults, download the **FACTORY DEFAULTS** file (see page 31).

APP TYPE

To optimize the auto-exposure time, select the type of sensing application: **Indexed** (the target stops for some period of time in the sensor's view) or **Motion** (the target is continuously moving past the sensor).

➡ To toggle between choices, select **APP TYPE** and press **ENTER**.

PIXEL TYPE

Select the pixel color that the sensor will count: **White** or **Black**. As a general rule, if the target is mostly white on a black background, choose white. If the target is mostly black on a white background, choose black.

➡ To toggle between choices, select **PIXEL TYPE** and press **ENTER**.

LIGHTS

Set the behavior of the LED light source (if attached): **Off** (no light) or **Strobed** (light flashes on and off only upon trigger).

➡ To toggle between choices, select **LIGHTS** and press **ENTER**.

AUTO COMP

Select **On** to enable the sensor to automatically compensate for small lighting variations over time (changes in ambient light or degradation in a light source). Select **Off** to disable this option.

➡ To toggle between choices, select **AUTO COMP** and press **ENTER**.

TRIGGER/OUTPUTS

Set input and output options.

FILE UPLOAD/DOWNLOAD

Upload or download a configuration file.

➡ To exit the screen, select **DONE** and press **ENTER**.

TRIGGER/OUTPUTS Screen (#6.1)

Use this screen to access trigger and output screens (see pages 28-30) and to test outputs.

TEST–Setup mode only

This option is available only when the sensor is not in RUN mode.

➡ Select **TEST–Setup mode only** and press **ENTER** to display the TEST OUTPUTS screen.

➡ Select the output to test and press **ENTER** to toggle between **Active** and **Inactive**.

Selecting **Active** emits an output signal as configured. Selecting **Inactive** stops the test signal.

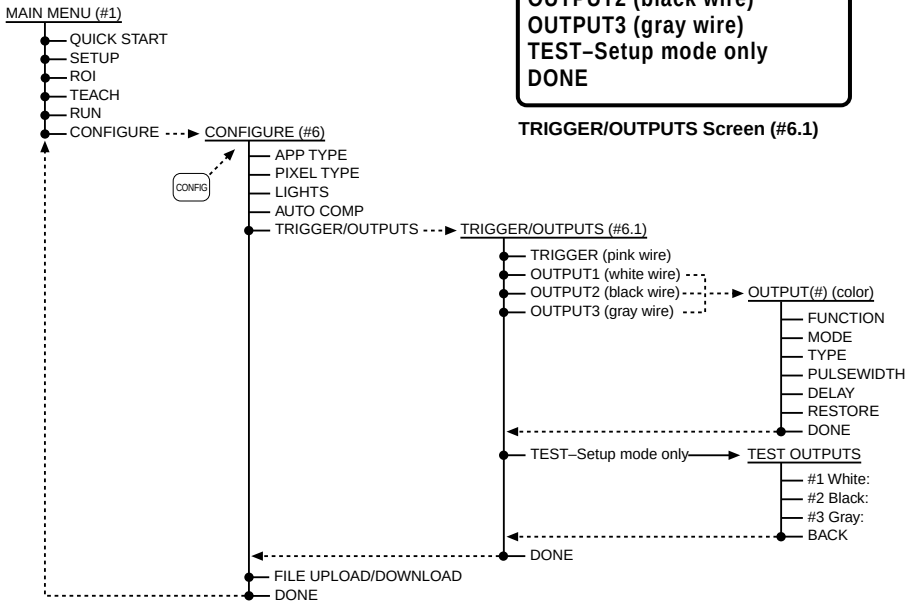
NOTE: Outputs configured as **Pulsed** do not pulse in test mode.

➡ To exit the screen, select **BACK** and press **ENTER**.

TRIGGER/OUTPUTS

TRIGGER (pink wire)
OUTPUT1 (white wire)
OUTPUT2 (black wire)
OUTPUT3 (gray wire)
TEST–Setup mode only
DONE

TRIGGER/OUTPUTS Screen (#6.1)



TEST OUTPUTS

Output:
#1 White: PNP Active
#2 Black: Off Inactive
#3 Gray : NPN Inactive

BACK

TEST OUTPUTS Screen

Configuring Triggers

TRIGGER Screen

Use this screen to configure the trigger input signal.

➡ On the TRIGGER/OUTPUTS screen (#6.1), select **TRIGGER** and press **ENTER**.

MODE

Select the type of input that the trigger circuitry inside the sensor should expect: **NPN** (current sinking) or **PNP** (current sourcing).

➡ To toggle between choices, select **MODE** and press **ENTER**.

DIVIDE

Set the sequence of valid triggers from 1-100. For example, 1=the sensor will consider each trigger valid, 2=every other trigger is valid, 5=every 5th trigger is valid.

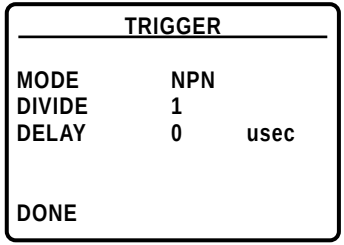
➡ Select **DIVIDE** and press **ENTER** to select the value. Press **UP** or **DOWN** buttons until your choice is displayed. Then press **ENTER** again to deselect the value.

DELAY

Set the time in microseconds (µs) from 0-25,000 from the instant the sensor receives the trigger to the instant the sensor captures the image.

➡ Select **DELAY** and press **ENTER** to display the DELAY screen. Select **ADJUST** and press **ENTER**. Press **UP** or **DOWN** buttons to adjust the value. Press **ENTER** to deselect the value. To reset the value to what it was upon entering the screen, select **RESTORE** and press **ENTER**. To exit the DELAY screen, select **DONE** and press **ENTER**.

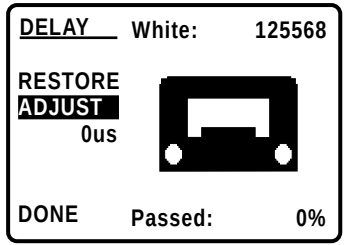
➡ To exit the TRIGGER screen, select **DONE** and press **ENTER** .



TRIGGER Screen

MODE
NPN
DIVIDE
1
DELAY
0 µsec

TRIGGER Screen Defaults



DELAY Screen

Configuring Output

OUTPUT Screen

Use this screen to configure and test output signals.

➡ On the TRIGGER/OUTPUTS screen (#6.1), select **OUTPUT1**, **OUTPUT2**, or **OUTPUT3** and press **ENTER**.

FUNCTION

Select the condition upon which the sensor will emit an output signal:

Pass: When judgment result is within taught limits.

Output Rdy: (Output Ready) Upon each valid trigger. Indicates that a judgment has been made and the output lines are valid.

Snsr Fail: (Sensor Fail) When the sensor detects a hardware problem.

Fail Low: When the count is less than the Pass Lo Limit (see page 24).

Fail High: When the count is greater than the Pass Hi Limit (see page 24).

Fail: When the judgment result is either Fail High or Fail Low.

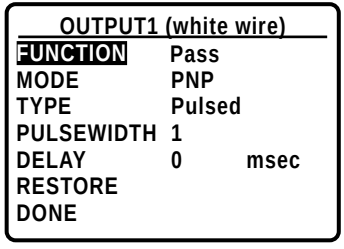
➡ To toggle between choices, select **FUNCTION** and press **ENTER**.

MODE

Select the type of circuitry inside the sensor that should drive the output signal: **NPN** (current sinking), **PNP** (current sourcing), or **Off** (inactive).

➡ To toggle between choices, select **MODE** and press **ENTER**.

(Continued on page 30)



OUTPUT Screen

FUNCTION
- Pass (Output1)
- Fail (Output2)
- Snsr Fail (Output3)

MODE
- Off

TYPE
- Latched

PULSEWIDTH
- 1 msec (If **TYPE** is set to Pulsed)

DELAY
- 0 msec

OUTPUT Screen Defaults

For more information about configuring output signals, see **Appendix A: Output Configuration** on page 32.

OUTPUT Screen (continued)

TYPE

Select the type of output signal: **Latched** (signal stays on until a judgment occurs that changes the condition and inactivates the output) or **Pulsed** (signal duration is determined by the user-defined **PULSEWIDTH** value).

➡ To toggle between choices, select **TYPE** and press **ENTER**.

PULSEWIDTH

If the selected **TYPE** is Latched, this option is not displayed.

If the selected **TYPE** is Pulsed, set the duration of the signal in milliseconds (msec) from 1-60,000 (60 seconds).

➡ To set the Pulse Width value, select **PULSEWIDTH** and press **ENTER**. Press **UP** or **DOWN** buttons to change the value. Press **ENTER** to deselect the value.

DELAY

Set the time in milliseconds (msec) from 0-60,000 (60 seconds) from the end of the sensor's 50-millisecond response time to the start of the output signal.

➡ To adjust, select **DELAY** and press **ENTER**. Press **UP** or **DOWN** buttons to change the value. Press **ENTER** to deselect the value.

➡ To reset values to what they were upon entering the screen, select **RESTORE** and press **ENTER.**

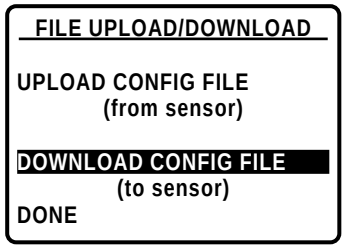
Uploading and Downloading Files

FILE UPLOAD/DOWNLOAD Screen (#6.2)

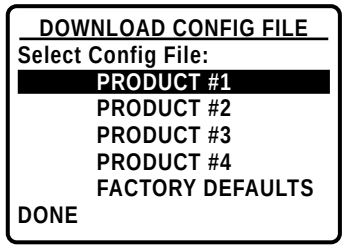
Use this screen to save all programmed settings from the sensor by uploading them to a file in the controller and to reset the sensor to previously programmed settings by downloading a file from the controller.

The controller stores up to four files plus a **FACTORY DEFAULTS** file which may be used to restore defaults. Uploading a file replaces the contents of the previous file. Uploading or downloading a file takes the sensor out of RUN mode.

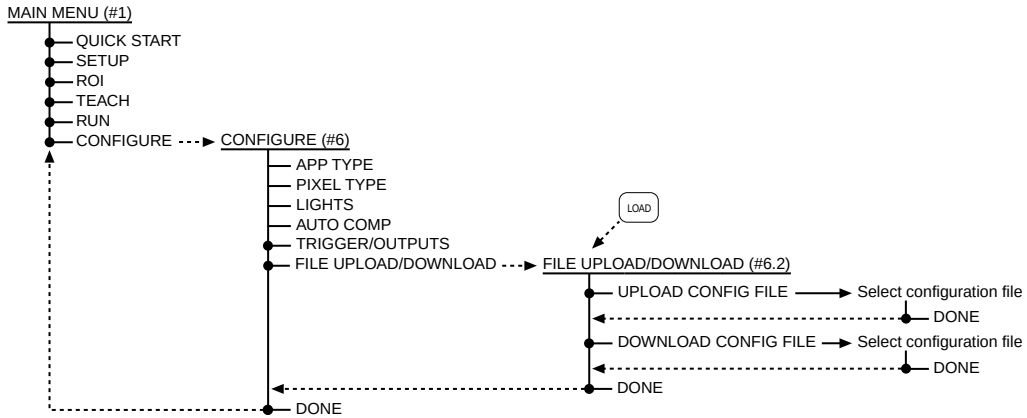
- ➡ To upload, select **UPLOAD CONFIG FILE** and press **ENTER** to display the UPLOAD CONFIG FILE screen. Select the file name and press **ENTER**. The controller saves current settings to the file and exits the screen when done.
- ➡ To download, select **DOWNLOAD CONFIG FILE** and press **ENTER** to display the DOWNLOAD CONFIG FILE screen. Select the file name and press **ENTER**. The controller downloads file information to the sensor and exits the screen when done.
- ➡ To exit the screen, select **DONE** and press **ENTER**.



FILE UPLOAD/DOWNLOAD Screen (#6.2)



DOWNLOAD CONFIG FILE Screen



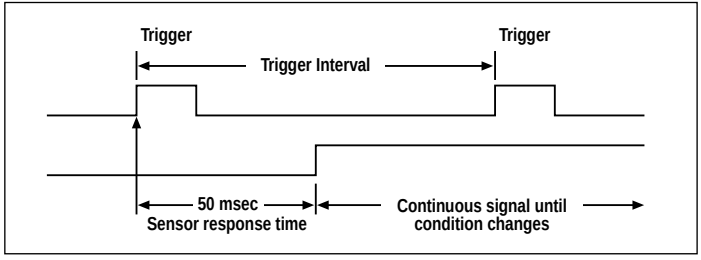


Figure 1: Latched Output

A latched output signal remains active until a judgment occurs that makes the output inactive.

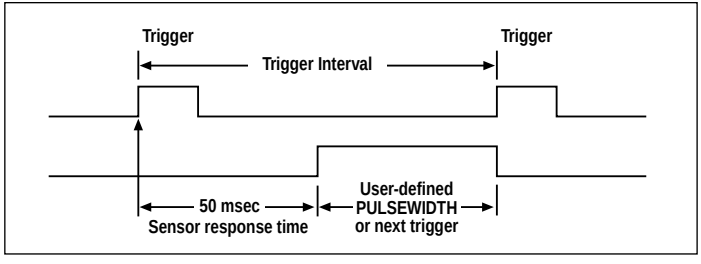


Figure 2: Pulsed Output

A pulsed output signal remains active for a user-defined duration or until the next valid trigger. If the pulse width is longer than the trigger interval, the pulse output will be turned off at the beginning of the next trigger, whether the pulse width has expired or not.

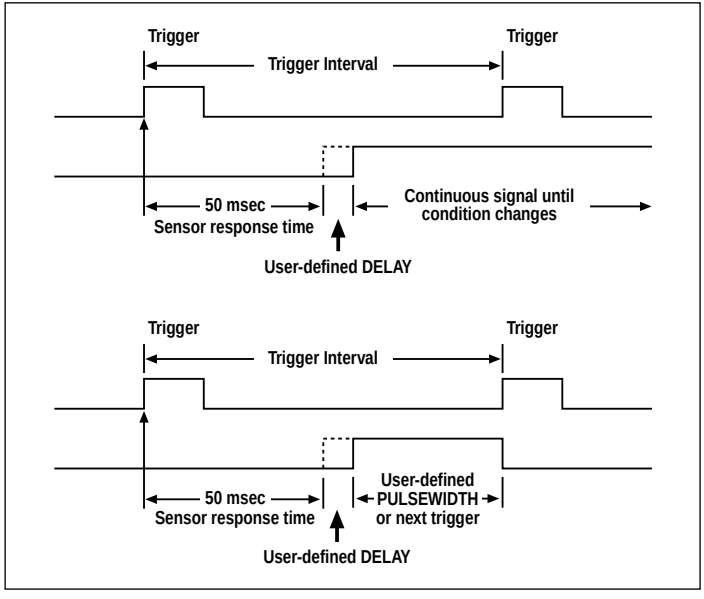


Figure 3: Output Delay for Latched and Pulsed Outputs

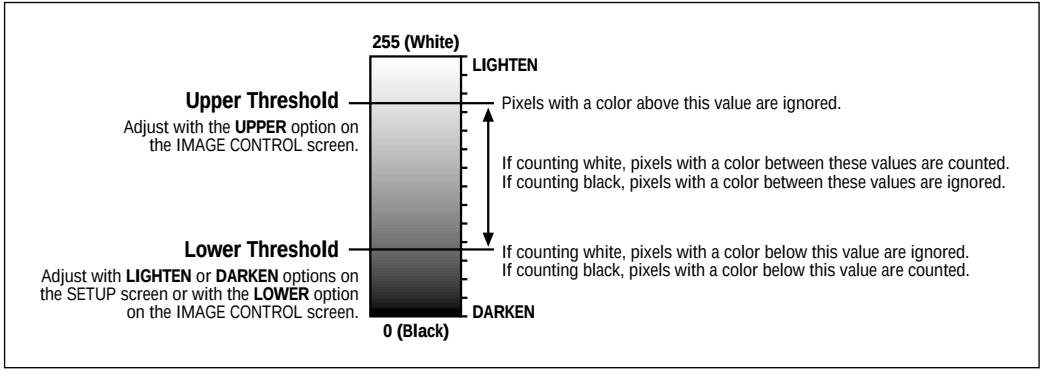
Output delay is the amount of time from the instant the sensor is ready to start the output signal to the instant it does. The sensor is ready to emit an output signal after the 50 msec sensor response time has elapsed. If system response plus delay is longer than the trigger interval, the output will never be activated because the delay timer is reset at the beginning of each trigger.

Gray Scale

A gray scale is a range of shades from pure white to pure black obtained by mixing white and black. The gray scale contains 256 values represented by numbers from 0 (black) to 255 (white). Each color in an image is sensed as a shade of gray between these two numbers.

Gray-Scale Thresholds

A gray-scale threshold is a dividing line that defines ranges within the gray scale.



Upper and Lower Gray-Scale Thresholds

The PresencePLUS sensor provides two adjustable thresholds. The lower threshold defines the division between “light” and “dark”. The upper threshold defines the limit above which pixels will be ignored.

After determining if a pixel is light or dark based on where its value falls in relation to the lower threshold, the sensor converts light pixels to white and dark pixels to black.

The sensor may be programmed to count either white or black pixels. If the sensor is counting white, pixels with values between the lower and upper thresholds are counted. Pixels with values above the upper threshold or below the lower threshold are ignored. If the sensor is counting black, only pixels with values below the lower threshold are counted.

Adjusting Gray-Scale Thresholds

During setup, the lower gray-scale threshold may be adjusted on the SETUP screen using **DARKEN** and **LIGHTEN** values from -7 to +7 (see page 11).

At any time, both the upper and lower thresholds may be adjusted on the IMAGE CONTROL screen to a value from 0 to 255. The upper must be greater than the lower (see page 16).

Model PRC1 Controller

Supply Voltage and Current
22 to 26V dc; 200 mA max. supplied through connection to the P1B65Q sensor

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Display
128 x 64 pixel LCD

Construction
Housing: Black ABS or polystyrene
Switches: Polyester membrane

Environmental Rating
IP 20, NEMA 1

Connections
6 loaded 4-pin modular jack for supplied coiled cord Cord extends to 4 m (12')

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

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

Contrast
The range of difference between white and black values.

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
The image area captured within the sensor's pixel array.

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) (see Appendix B on page 33).

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.

Latched output
When active, the output remains active until a condition occurs which makes the output inactive (see Figure 1 on page 32).

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

Output delay
The amount of time in milliseconds between the instant the sensor is ready to start the output signal to the instant it starts. The **DELAY** option adds a specified amount of time after the 50 msec default sensor response time has elapsed (see Figure 3 on page 32).

Output type
Refers to whether an output signal is continuous (Latched) or limited (Pulsed). See **Latched output** and **Pulsed output**.

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.

Pulsed output
When active, the output remains active for a user-defined duration or until the next valid trigger (see Figure 2 on page 32).

Pulse width
The duration of a pulsed output signal specified in milliseconds.

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.

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.

Valid trigger

A trigger that causes the sensor to capture an image. The sensor may be set to ignore a certain number of triggers (see the **DIVIDE** option on page 28).

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