iVu Series Image Sensor

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BANNER ®

Contents

1 Product Support and Maintenance

This section provides general Banner resources and specific documentation for installers and operators of this iVu TG Vision Sensor.

⚠️ **WARNING: Not To Be Used for Personnel Protection**

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

1.1 Product Support

Banner provides the following resources for quickly setting up and operating the sensor.

Documentation

Online Help

When setting up or monitoring inspections using the iVu sensor's integrated display, you can get online help on any screen by clicking the Help icon in the upper-right of the screen.

PDF Documentation

The iVu Series Image Sensor documentation is available in a convenient printable format (PDF) on the installation CD or on the *Banner Web site* (http://www.bannerengineering.com)

Banner Website

The most current iVu Series sensor information is available on the Banner website:

www.bannerengineering.com

Warranty Service

The iVu Image Sensor is designed for reliability. Do not open the housing; it contains no field-replaceable components. If repair is necessary, do not attempt to repair the sensor yourself; return the unit to the factory. Should it become necessary to return a sensor to the factory, please do the following:

1. Contact the Banner Factory Application Engineering group at the address or numbers listed below. They will attempt to troubleshoot the system from your description of the problem. If they conclude that a component is defective, they will issue an RMA (Return Merchandise Authorization) number for your paperwork and give you the proper shipping address.
2. Pack the sensor carefully. Damage which occurs during return shipping is not covered by warranty.

Factory Support

Call, e-mail, fax, or write your local Banner representative or a Banner Applications Engineer for support. Applications Engineers are available from 8:00 A.M. to 5:00 P.M. Central Time, Monday through Friday, excluding holidays.

Phone	Local: 763.544.3164
	Toll Free: 1.888.3.SENSOR (1.888.373.6767)
Fax	763.544.3213
E-mail	sensors@bannerengineering.com
Address	Banner Engineering Corp.
	9714 10th Avenue North, Minneapolis, MN 55441 USA

To help Banner better assist you, be ready to provide the following information:

- iVu firmware version (to find the version number, click **Main Menu** > **System** > **Sensor Information**
- Sensor Model Number and Date Code, which are found on the bottom of the sensor.
- Exact wording of any messages that appeared on your screen
- A description of what you were doing and what happened
- A description of how you tried to solve the problem
- Error Codes (see *LED Indicator Troubleshooting* on page 59)

1.2 Maintenance

Maintenance tasks include keeping the hardware free of dust and dirt and possibly updating the iVu firmware as new versions become available.

Cleaning the Sensor

Regularly remove any dust or dirt from the Sensor using a soft cloth. If needed, slightly dampen the cloth with a weak solution of neutral detergent. Avoid getting dirt on the imager (the area behind the lens). If the imager is dirty, use anti-static compressed air to blow off the dust.

Updating the iVu Firmware

The current version of iVu firmware is available for download from the Banner website. See the Banner Website for the firmware download link.

2 Overview of the Sensor

The iVu TG Image Sensor is used to monitor parts for type, size, orientation, shape, and location. No external PC is required to configure the sensor. Instead, the sensor has a color touch screen display (either integrated with the sensor or available as a remote display) that you can use to set up and monitor inspections. The following are features of the iVu sensor:

- Totally self-contained image sensor; no PC required
- No PC required to configure, change or monitor
- Easy configuration: install/connect iVu, select sensor type, acquire image, set inspection parameters
- Advanced capabilities: menu-driven tools guide you as you set up your inspection
- Intuitive interface and sophisticated features make powerful inspection capabilities simple
- On-board language-selectable, intuitive GUI (English, French, German, Italian, Spanish, Japanese, Traditional and Simplified Chinese)
- Easy configuration: install/connect iVu, acquire image, set inspection parameters
- 68,5 mm touch-screen LCD display (320 x240 pixels)
- Robust IP67 housing with integrated lighting (red, blue, green or infrared)
- M12 connector with 10 to 30 VDC for power supply and PNP or NPN output
- External trigger input, remote TEACH input and external strobe output available
- USB port for upload and download of inspections and log files
- Software emulator for PC available to evaluate inspections offline based on bitmap images
- Compact, rugged housing available with or without a variety of integrated ring lights- red, blue, green, and infrared

2.1 Typical iVu Applications

2.1.1 Label Inspection

A manufacturer packages a number of products in similar packaging and needs a cost-effective way to ensure that only like products are packaged together. Additionally, they want to verify that all the products have labels.

To verify each product, an iVu Series sensor is configured for a Match inspection. An image of a good product package is captured. When the inspection is running, if the sensor detects a package with a different or missing label, the sensor sends a fail output to the line, and the product is rejected.

2.1.2 Blister Pack Inspection

Because of tightened federal regulations that make the quality of pharmaceutical packaging increasingly critical, when tablets are inserted into a blister pack, manufacturers need to verify that all the blisters in a pack have been filled with unbroken tablets.

To verify each blister in the pack, use an iVu Series sensor configured for an Area inspection. The sensor inspects each blister pack to make sure that each blister contains an unbroken tablet.

2.1.3 Vial Stopper Inspection
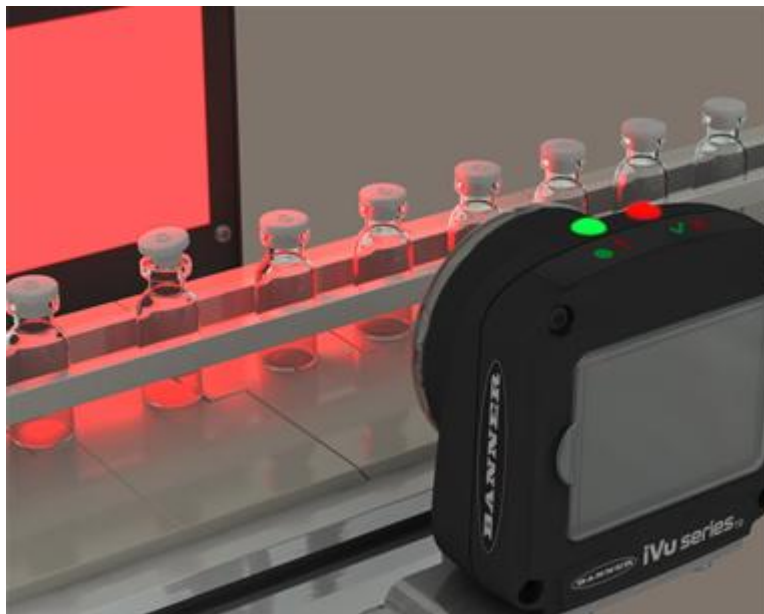
In the pharmaceutical industry where vials are filled with tablets in a high-speed application, as soon as each vial is filled, a stopper must be properly inserted into the vial.

To ensure that a stopper is properly inserted as each vial leaves the filling station, an iVu Series sensor—set up for an Area application and motion parameters enabled—verifies that the vial has a stopper inserted into its neck and that the stopper is positioned correctly to provide a proper seal on the glass vial. If the stopper is missing or incorrectly positioned, then the sensor sends a fail output to the line.

2.2 Installing the Sensor

2.2.1 Installing and Connecting the Sensor

The iVu TG sensor requires a bracket for mounting. Three brackets are available from Banner. The brackets allow the sensor to be mounted either perpendicular to the part or at an adjustable angle.

| Available iVu Brackets		
SMBIVURAL	**SMBIVURAR**	**SMBIVUU**

Thread three M4 x 4mm screws through the bracket into the mounting holes in the bottom of the sensor. Tighten all three screws.

Installing Filters on the iVu Series Sensor

✍ **NOTE:** Failure to follow these instructions can cause damage to your iVu Series sensor.

To install a filter on the iVu Series sensor with Micro Lens, use the illustration as a guide and follow the steps listed below.

A	Lens
B	Focusing Window
C	Locking Clip
D	Locking Screw
E	Filter Cap
F	Filter
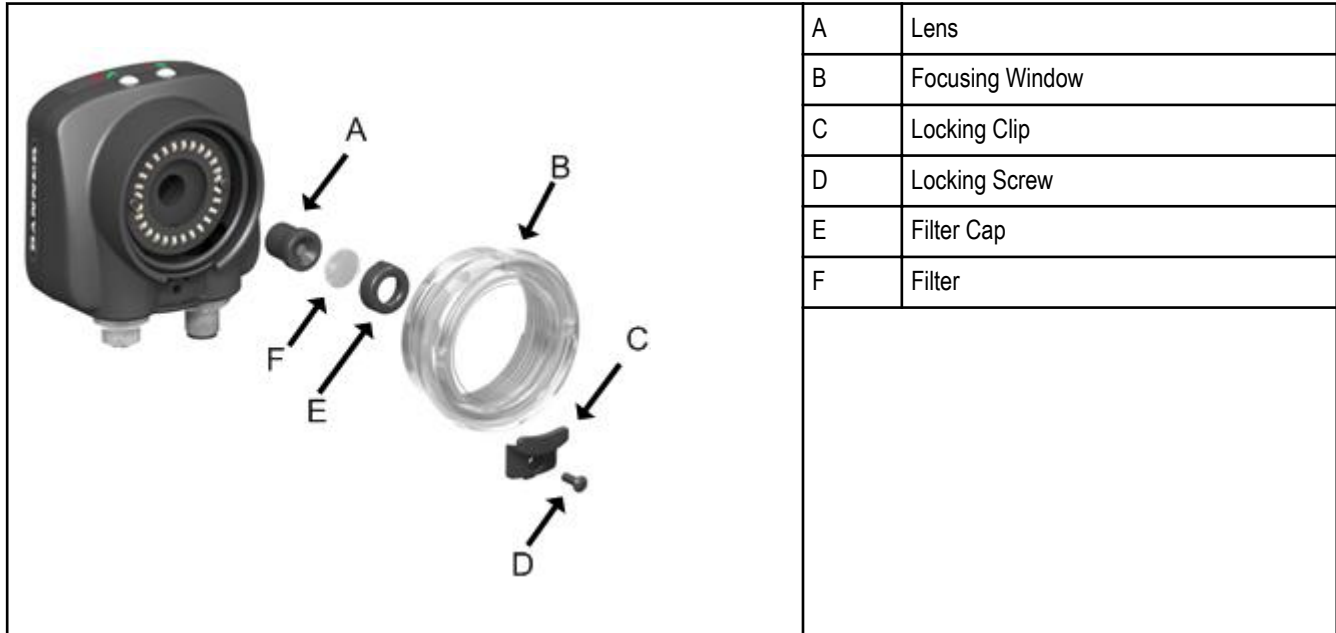
1. Use the 1/16" hex key to remove the Focusing Window locking screw (D).

✍ **NOTE:** The Locking Clip (C) inserts in a groove near the top of the Focusing Window (B). When removing the window, the Locking Clip will be loose. Be careful not to lose the clip while removing the window.

2. Unscrew the Focusing Window by turning it clockwise approximately 5 complete turns or until the Focusing Window disengages from the light/lens assembly.

✍ **NOTE:** The light/lens assembly may include an integrated ring light or a blank disk if an integrated ring light is not used. Be careful that the light/lens assembly does not pull out when removing the Focusing Window. Give a slight tug on the Focusing Window when you think you've unscrewed it far enough. If the lens assembly moves with the window, continue to rotate the window clockwise until the lens assembly does not move.

3. Set the Focusing Window aside. Be careful not to get any debris on the window's O-ring.
4. Once the is installed, place the Focusing Window back into the housing while inserting the Locking Clip into the groove as shown below.
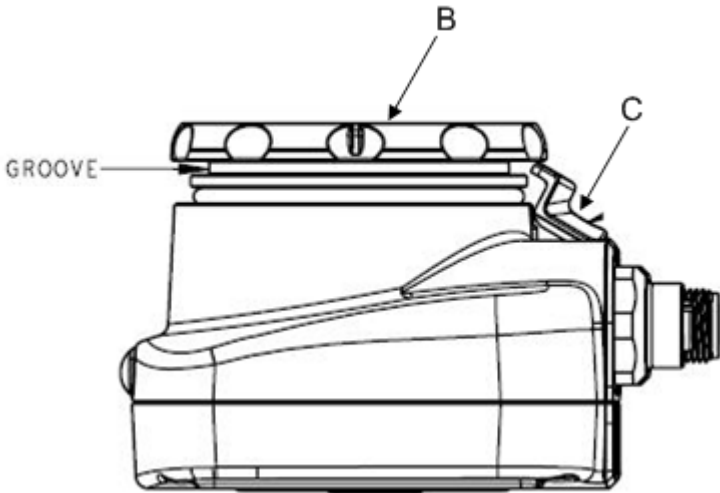
5. Press the Focusing Window onto the housing to make sure that it seats correctly (that is, there is no gap between the window and housing. Rotate the window counter-clockwise at least two turns.
6. Replace the locking tab screw but do not tighten until you have set up and focused the sensor again.

To install a filter on the iVu Series sensor with C-Mount Lens, use the illustration as a guide and follow the steps listed below.

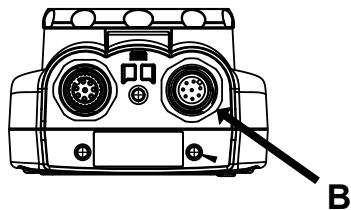| C-Mount Models		
	A	C-Mount Lens
	B	Lens Enclosure
	C	Retainer Ring (optional)
	D	Filter (optional)
	E	Filter Retainer Ring Tool
	NOTE: Filter Kits are available separately.	

1. Remove the Lens Enclosure and Lens.
2. Install filter behind the retainer ring. Make sure it is fully seated.
3. Using the provided retainer ring tool, thread the retainer ring into the sensor until it firmly seats the filter.
4. Replace the Lens and Lens Enclosure on the camera.

⚠️ **CAUTION: Avoid the damage that electrostatic discharget (ESD) can cause to the sensor.** Always use a proven method for preventing electrostatic discharge when installing a lens or attaching a cable.

2.2.2 Cable Connections for iVu TG with Integrated Display

The power and I/O cable for the iVu TG sensor is available in 2, 5, 9, and 15 m (6, 15, 30, 50') lengths. The connector on the sensor is shown below (**B**).
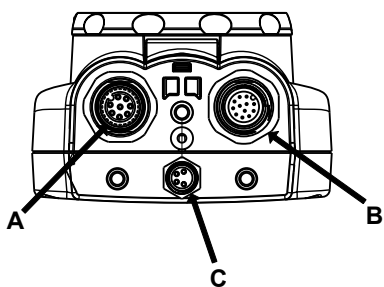
Power I/O Connections			
Pin #	Wire Color	Description	Direction
2	Brown	10-30V dc	Input
7	Blue	Common (Signal Ground)	Input
6	Pink	External Trigger	Input
5	Gray	Remote Teach	Input
1	White	Output 1	Output
8	Red	Ready	Output
4	Yellow	Strobe Out (5V dc only)	Output
3	Green	Output 2	Output
9	Orange	Not used	N/A
10	Light Blue	Not used	N/A
11	Black	Not used	N/A
12	Violet	Not used	N/A

NOTE: Microlens model shown, C-Mount model connections are identical.

2.2.3 Cable Connections for the iVu TG with a Remote Display

The cable connections on the iVu sensor are shown below, and power I/O connections (**B**) are defined in the **Power I/O Connections** table below.

A	Remote Display Connector
B	Power I/O Connector
C	USB Connector

NOTE: Microlens model shown, C-Mount model connections are identical.

Power I/O Connections			
Pin #	Wire Color	Description	Direction
2	Brown	10-30V dc	Input
7	Blue	Common (Signal Ground)	Input
6	Pink	External Trigger	Input
5	Gray	Remote Teach	Input
1	White	Output 1	Output
8	Red	Ready	Output
4	Yellow	Strobe Out (5V dc only)	Output
3	Green	Output 2	Output
9	Orange	Not used	N/A
10	Light Blue	Not used	N/A
11	Black	Not used	N/A
12	Violet	Not used	N/A

2.2.4 iVu Trigger, Remote Teach, and I/O Waveforms

The iVu has two input signals—Trigger and Remote Teach. The default setting is to detect the Trigger or Remote Teach input on the low to high transition. This setting can be changed in the **Main Menu** > **System** > **Discrete I/O** > **Input Polarity** screen on the sensor.

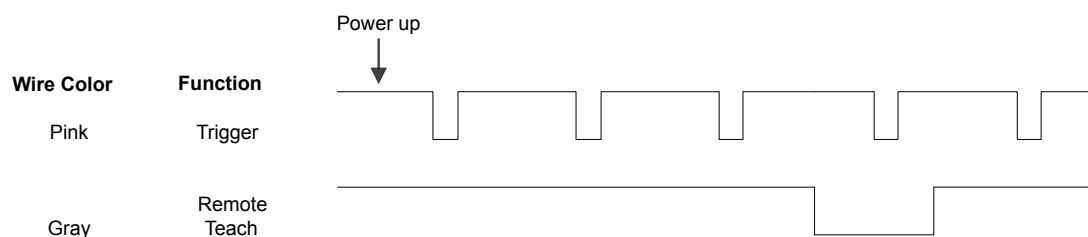### iVu Low-to-High Trigger and Remote Teach Input Waveforms

The iVu Trigger and Remote Teach input waveforms are shown below.
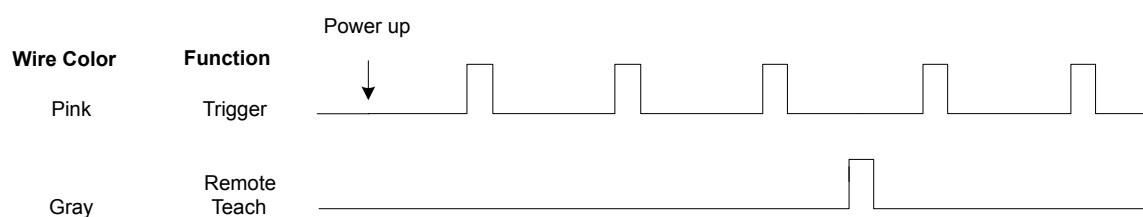
The sensor triggers from low to high, and Remote Teach behaves electrically like trigger (see above).

iVu High-to-Low Trigger and Remote Teach Input Waveforms

The iVu High-to-Low Trigger and Remote Teach input waveforms are shown below.
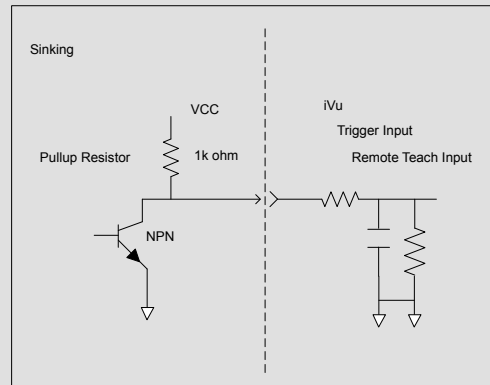
The sensor triggers from high to low, and Remote Teach behaves electrically like trigger.

> **NOTE:** If the device used to trigger or remote teach the iVu TG is a sinking device (that is, NPN), then there are two options regarding the use of a pull-up resistor:
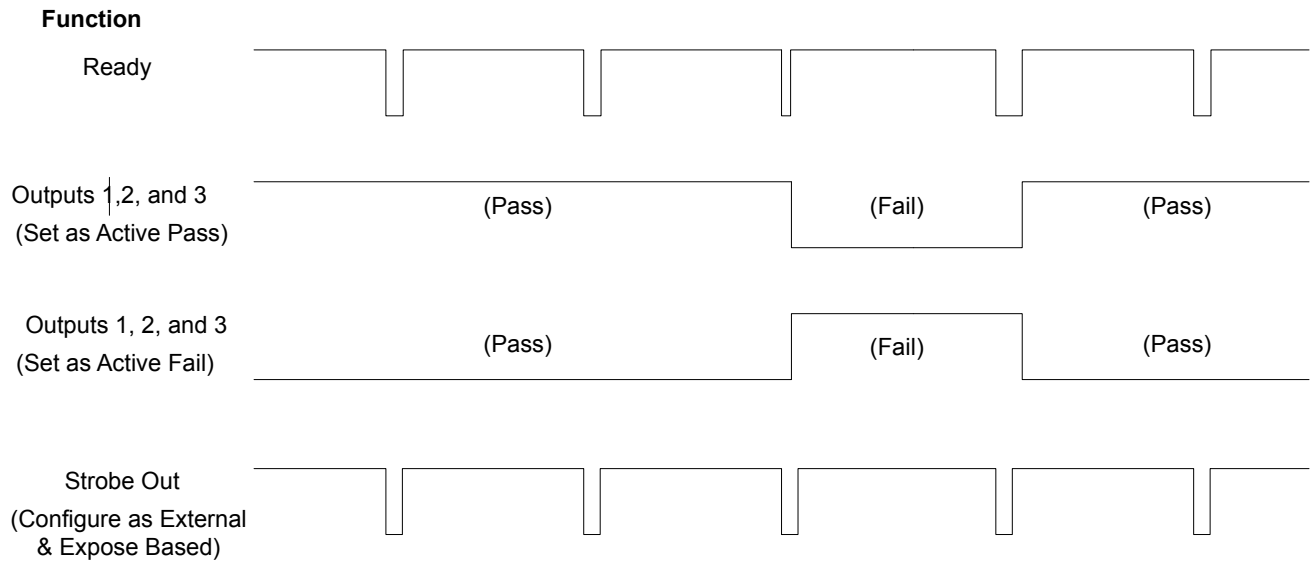>
> **Option 1:** Put a pull-up resistor, rated approximately 1k ohm, between the sensor's positive (+) voltage and the sensor's input as shown below.
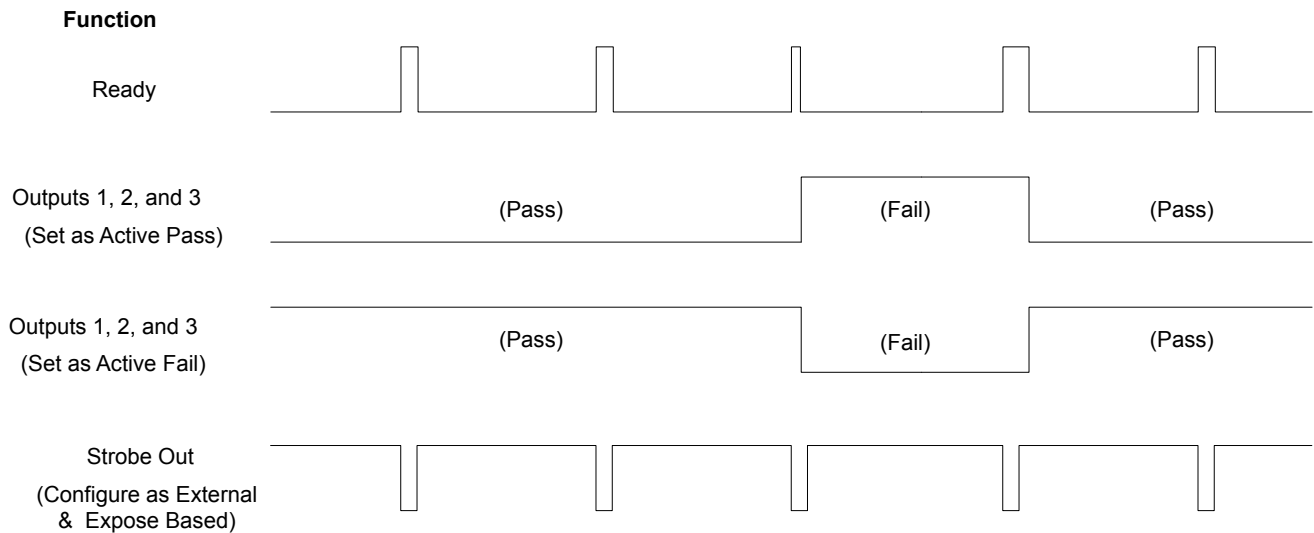>
>
>
> **Option 2:** Enable the Input Pullup in the iVu TG software (**Main Menu > System > Discrete I/O > Input Pullup**).

iVu Output Waveforms

PNP Outputs

Function

Ready

Outputs 1,2, and 3
(Set as Active Pass)

(Pass)   (Fail)   (Pass)

Outputs 1, 2, and 3
(Set as Active Fail)

(Pass)   (Fail)   (Pass)

Strobe Out
(Configure as External
& Expose Based)

NPN Outputs

Function

Ready

Outputs 1, 2, and 3
(Set as Active Pass)

(Pass)   (Fail)   (Pass)

Outputs 1, 2, and 3
(Set as Active Fail)

(Pass)   (Fail)   (Pass)

Strobe Out
(Configure as External
& Expose Based)

2.3 Major Features

2.3.1 Demo Mode

The first time you power up the iVu TG sensor, it starts in Demo Mode. Demo Mode uses stored images and inspection parameters that demonstrate how the sensor is set up without having to worry about focus, lighting, or triggers. In this mode, you can learn how to make adjustments working with the three sensor types while observing how the adjustments affect the sensor results. When you exit Demo Mode, the sensor reboots into its normal operating mode with default settings.
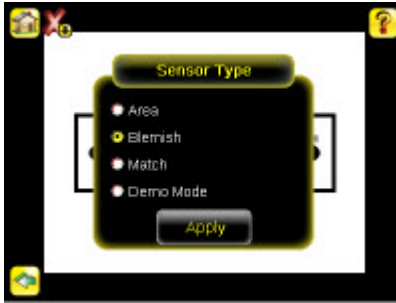
✎ **NOTE:** You may return to Demo Mode any time by going to **Main Menu** > **System** > **Sensor Type** and selecting Demo Mode.

2.3.2 Sensor Types

The iVu TG sensor includes three Sensor Types:

Area Sensor

An Area type sensor is used to ensure that a feature, or some features, are present on a part. When setting up the sensor for an Area inspection, a feature, such as a drilled hole, is identified as well as the size (area) expected. If there is more than one of the identified features on a part, the number expected can be set as well. During the inspection, the sensor will verify that each part or package includes the specified number of features. Some example applications include:

- Inspections that check for drilled holes on a part
- Inspections that check for correctly stamped parts
- Inspections that ensure proper packaging (for example, check that a packing slip exists in or on a box; test whether a vial is properly capped)
- Inspections of blister packs

Blemish Sensor

A Blemish type sensor can be used to find flaws on a part (for example, scratches on a disc), or it can be used to make sure a feature exists on a part. Although verifying a feature is present on a part is more commonly an application for an Area sensor, a Blemish sensor may be a better option when dealing with variable materials or uneven lighting. Some example applications include:

- Inspections that check for scratches on a part, and reject parts where the scratches are too numerous or larger than acceptable
- Inspections that check for the presence of some label or marking on a part that may vary in color

Match Sensor

A Match type sensor is used to verify that a pattern, shape, or part in any orientation matches a reference pattern. The reference pattern is taught during setup. A reference pattern might include alphanumeric characters, logos, or any other shapes. During an inspection, the sensor checks that each part or package being inspected matches the reference pattern. Additionally, if there is more than one of the identified pattern, the number expected can be set.

Some example applications include:

- Date/Lot code inspections
- Label inspections
- Part etching inspections
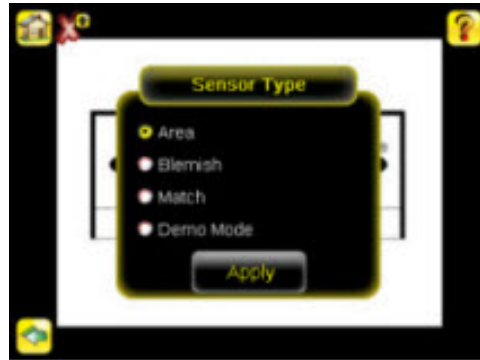- Part orientation inspections

• Part shape inspections

Selecting a Sensor Type

When you exit Demo Mode, the sensor reboots with a single inspection with a Match sensor type by default. To change the Sensor Type:

1. Go to **Main Menu** > **System** > **Sensor Type**

   This displays the **Sensor Type** menu options.

2. Select either **Area** , **Blemish**, or **Match**.

3. Click the **Home Screen** icon in the upper-left corner of the screen to return to the Home screen.

2.3.3 Trigger Modes

The iVu TG has three trigger modes that determine how the sensor captures and processes images:

• External
• Internal
• Free Run

3 Main Menu Reference

3.1 Main Menu Icons

	Main Menu icon — used to access the Main Menu
	Inspection icon — provides access to parameters that need to be set for an inspection. Parameters are dependent on Sensor Type.
	Imager icon — lists parameters that affect the characteristics of the captured image.
	System icon — used to manage the sensor.
	Logs icon — used to set up, view, and save Inspection and System Logs.

3.2 System Menu

The System menuicon is on the Main Menu, and is used to manage the sensor. The System menu provides for selecting Sensor Type, updating sensor firmware, backing up and restoring sensor Configuration and other general system-level operations.

 Main Menu > System
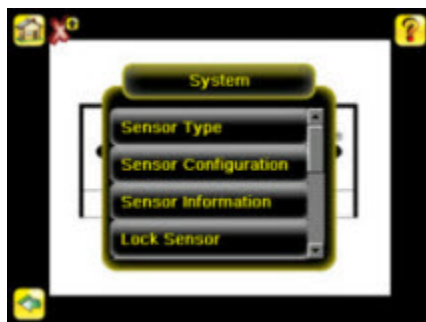
3.2.1 Sensor Type

The Sensor Type menu allows you to select one of the following as a Sensor Type:

- An Area sensor that detects if a particular feature (or features) is present
- A Blemish sensor that either detects flaws, or determines if a particular feature (or features) is present when conditions are not optimal for using an Area sensor
- A Match sensor that determines whether a part or label matches some reference part or label

NOTE: The first time you start up the sensor, it starts in Demo Mode. Demo Mode uses canned images to demonstrate how the sensor operates as a Match, Area, and Blemish sensor. If in Demo Mode, Sensor Type will have an option to exit Demo Mode. If in normal running mode, there is an option to enter Demo Mode.

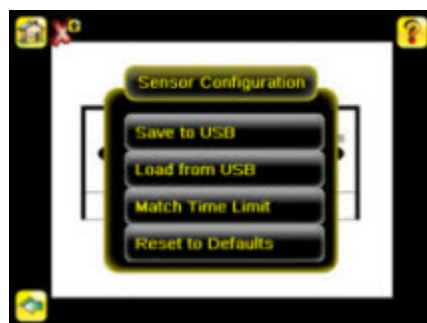**Main Menu > System > Sensor Type**
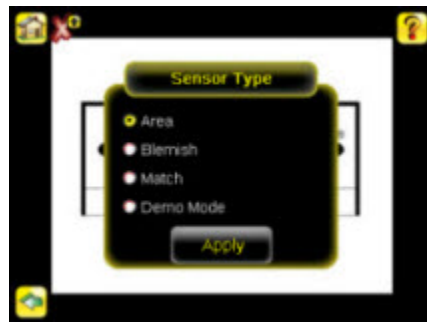
3.2.2 Sensor Configuration

The Sensor Configuration menu provides for:

- Saving sensor Configuration to the USB drive
- Restoring sensor Configuration from the USB drive
- Resetting the sensor to defaults
- Updating sensor firmware
- Setting Pass/Fail Output

Main Menu > System > Sensor Configuration

Save to USB

The Save to USB screen provides for saving sensor Configuration to a USB flash drive. The saved configuration information can be used as a backup or as a way to clone configuration information for other sensors.

> **NOTE:** On the Emulator, this option is **Save Configuration.**

Main Menu > System > Sensor Configuration > Save to USB

Load from USB

The Load from USB screen provides for restoring sensor Configuration from a USB drive.

> **NOTE:** On the Emulator, this option is **Load Configuration.**

Main Menu > System > Sensor Configuration > Load from USB

Match Time Limit

When the sensor is configured as a Match sensor, this screen provides for adjusting the amount of time allotted for the sensor to determine if a pattern is good. This is essentially a timeout value. If set too high, the sensor can miss triggers while trying to match a bad pattern.

> **NOTE:** This menu option is only available when the Sensor Type selected is Match.

Main Menu > System > Sensor Configuration > Match Time Limit
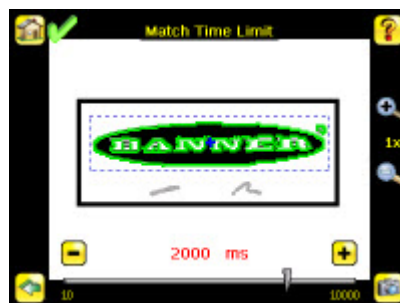
Reset to Defaults

Resets all sensor configuration to factory defaults.

Main Menu > System > Sensor Configuration > Reset to Defaults
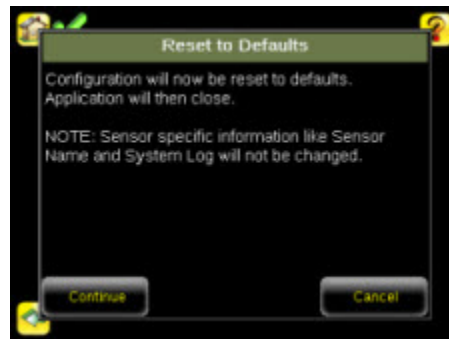
3.2.3 Sensor Information

The Sensor Information screen displays the following sensor information:

- Serial Number
- Firmware Version
- Boot Number
- Up Timer
- Hour Count
- Model Number
- Sensor Name

Main Menu > System > Sensor Information

Click the right-arrow next to the Sensor Name field to display a software keyboard that allows you to change the Sensor Name.

3.2.4 Lock Sensor

This option provides for locking the sensor to prevent accidental modification of settings. When locked, the sensor only provides access to pass/fail statistics, as well as the abi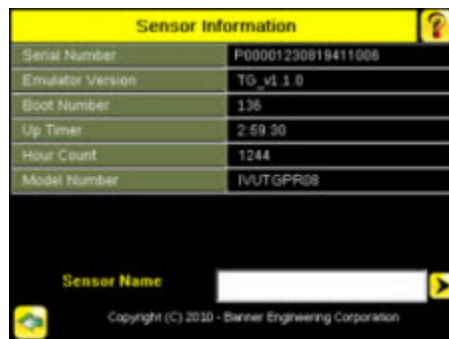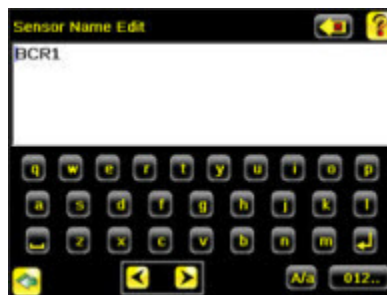lity to view logs and to save them to a USB device. A lock icon in the upper left corner of the sensor display indicates that the sensor is locked. Note that the sensor can be locked with or without a password. If a password is not used, unlock the sensor by clicking on the Unlock Device menu. When a password is used, it must be 4 digits entered using the software keypad. If the password is lost, use the Password Reset Utility software provided in the CD to obtain a Reset Key.

> ✏ **NOTE:** This menu option is not available on the Emulator.

Main Menu > System > Lock Sensor

3.2.5 Motion

Motion settings involve selecting the number of edges to locate, adjusting sensitivity, and selecting whether or not rotation is enabled. Motion settings are only available for Area or Blemish sensor types.
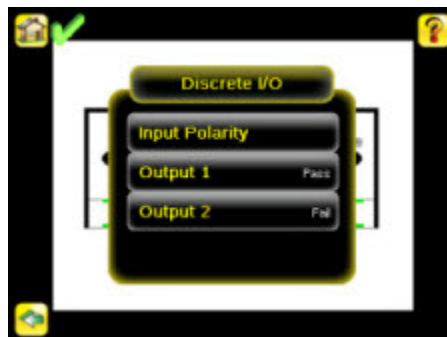
Main Menu > System > Motion

3.2.6 Discrete I/O

The Discrete I/O options are used to adjust iVu input and output settings.

**Main Menu > System > Sensor Configuration > Discrete I/O**

Input Polarity

The iVu has two input signals—Trigger and Remote Teach. The operation of these signals is dependent on the Input Polarity setting. Low To High—The Trigger and Remote Teach are detected on a low to high transition of the signal. High To Low—The Trigger and Remote Teach are detected on a high to low transition of the signal.

The default setting for a PNP sensor is Low To High, and for an NPN sensor it is High To Low. The user can change the setting on the Input Polarity screen.

Main Menu > System > Sensor Configuration > Input Polarity
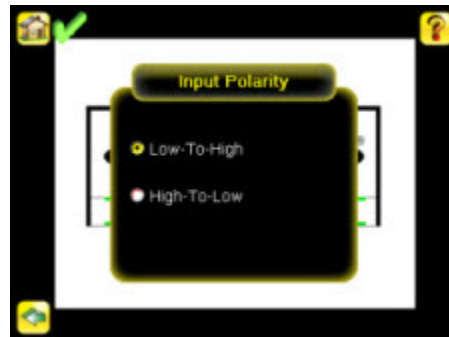
Output 1

Output 1 can be configured for Pass, Fail, Missed Trigger, or System Error.

- A Missed Trigger condition occurs when a trigger is received while the sensor is busy inspecting the previous image. This output signal will be set to active state. This signal will be reset upon resetting the 'History' on the statistics page.
- A System Error condition occurs when a fatal error is detected on the sensor. This output signal will be set to active state. This signal can be reset upon resetting the 'History' on the statistics page, or executing a 'ClearSystemError' command through command channel.

The default setting is Pass and Latched for Output 1. If Pulsed is selected, the default Pulse width is 50 ms.

NOTE: For Latched the signal is active until the results of an inspection cause a change in the signal output.

Main Menu > System > Sensor Configuration > Discrete I/O > Output 1
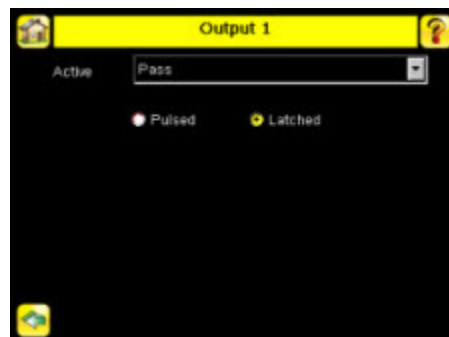
Output 2

Output 2, can be configured for Pass or Fail.

The default setting is Fail and Latched for Output 2. If Pulsed is selected, the default Pulse width is 50 ms.

📝 **NOTE:** For Latched the signal is active until the results of an inspection cause a change in the signal output.

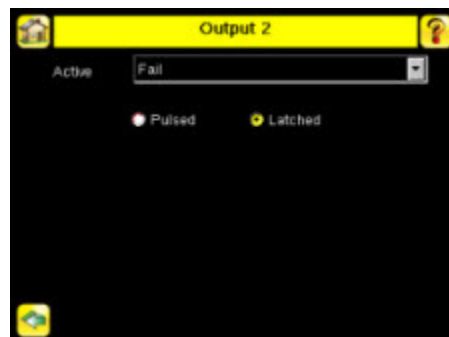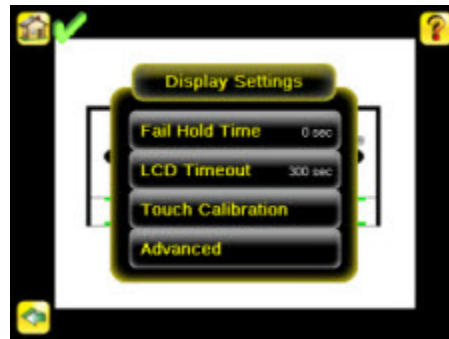**Main Menu > System > Sensor Configuration > Discrete I/O > Output 2**

3.2.7 Display Settings

The Display Settings menu is for setting the LCD Timeout, the Fail Hold Time, and doing a Touch Screen Calibration.

Main Menu > System > Display Settings

Fail Hold Time

The Fail Hold Time determines how long a failed image is displayed on the LCD so that you can see what failed. The sensor will continue to process any triggers and the inspection will continue normally. This time delay is just for the screen. You can set this parameter from 0 to 3600 seconds using the slider at the bottom of the screen.

Main Menu > System > Display Settings > Fail Hold Time

LCD Timeout

The LCD screen dims after a user-selectable period when it is not being used. Use the arrow keys or slide the bar at the bottom of the screen to set the LCD screen time out.

> **NOTE:** This screen is not available on the Emulator.

Main Menu > System > Display Settings > LCD Timeout

Touch Calibration

Touchscreen Calibration may be necessary if the software does not correctly respond when an icon on the screen is pressed. The calibration routine aligns the touch screen's coordinates to the display behind it. Be sure to follow the prompts on the screen when executing the Touchscreen Calibration function.

NOTE: This screen is not available on the Emulator.

Main Menu > System > Display Settings > Touch Calibration

Advanced

Enabling Optimize Display Response helps to make the display more responsive when the sensor is busy (either inspection times are long and/or no idle time exists between inspections). Disable this feature if Missed Triggers occur due to touchscreen presses. With this setting disabled, the display may become sluggish when the sensor is busy.

Main Menu > System > Display Settings > Advanced

3.2.8 Reboot Sensor

The Reboot Sensor screen allows you to force a reboot of the sensor.

NOTE: This option is not available on the Emulator.

Main Menu > System > Reboot Sensor

3.2.9 Firmware Update

The Firmware Update screen is used to load the latest sensor firmware. The Firmware Update screen lists the firmware versions it finds in the BANNER\FIRMWARE folder on the USB drive. When you receive a firmware update from Banner Engineering, be sure to put it in the BANNER\FIRMWARE folder on the USB drive.
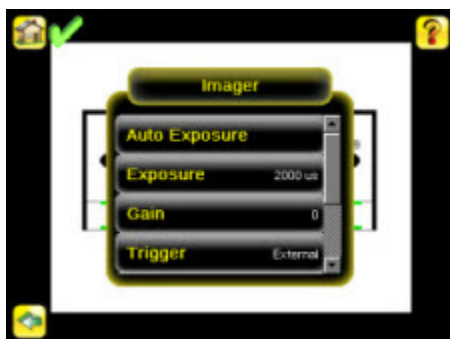
NOTE: The **Firmware Update** menu is not available on the Emulator.

Main Menu > System > Firmware Update

3.3 Imager Menu

The Imager menu icon is on the Main Menu, and lists parameters that affect the characteristics of the captured image.

Main Menu > Imager

3.3.1 Auto Exposure

Auto Exposure optimizes the exposure time and gain for the current inspection.

> ✎ **NOTE:** The Auto Exposure option is not available on the Emulator.

Main Menu > Imager > Auto Exposure

3.3.2 Exposure

Exposure is the amount of time the sensor allows light to energize the imager. Increasing the exposure time by moving the slider to the right allows more light to energize the imager, which brightens the image.
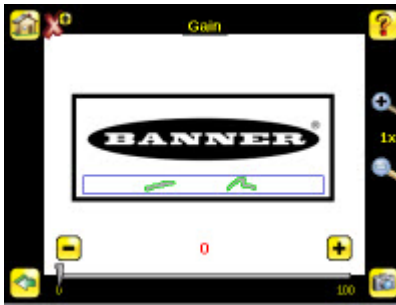
Main Menu > Imager > Exposure

3.3.3 Gain

Gain is an electronic boost to the image signal. Increasing Gain by using the right arrow key or moving the slider to the right increases image brightness without increasing exposure time. Note that Gain brightens both the light pixels and dark pixels and may reduce the image quality.

Main Menu > Imager > Gain

3.3.4 Trigger

A Trigger is a signal that makes the sensor capture an image and inspect it. Use the radio buttons to select either External Trigger, Internal Trigger or Free Run.

> ✎ **NOTE:** The default is Internal Trigger.

• If Internal Trigger is selected, triggers are based on timed intervals, and you need to select a trigger interval between 10 and 10000 milliseconds.

> ✎ **NOTE:** If the interval is less than the inspection time, then missed triggers will occur.

• If External Trigger is selected, inspections are triggered in response to an electrical signal on the Trigger input line.
• If Free Run is selected, the sensor automatically runs continuous inspections.

Main Menu > Imager > Trigger
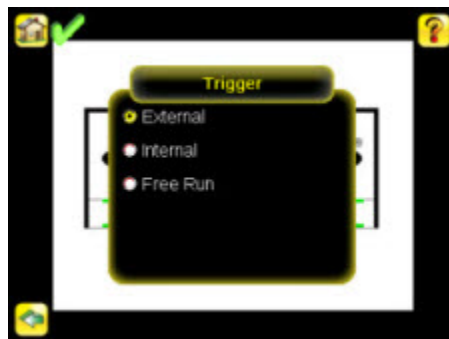
3.3.5 Focus

The Focus Number displayed at the bottom of this screen is used to fine-tune image focus. Loosen the lock on the lens cover, turn the focus ring on the sensor until the Focus Number peaks (or the image appears sharp), then lock the focus ring.

> ✎ **NOTE:** For the Focus Number to work, the sensor must be triggering and the images must be similar over time.

Main Menu > Imager > Focus

3.3.6 Strobe

The Internal Strobe configures the operation of the integrated ring light. The External Strobe configures the operation of an external light.

Main Menu > Imager > Strobe
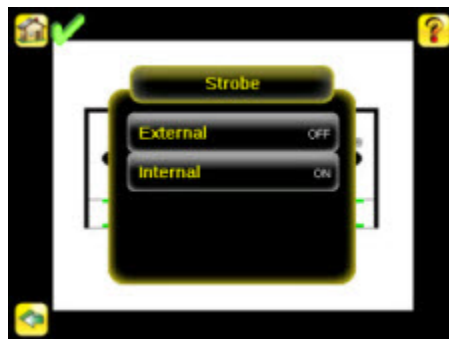
External

The External Strobe is a 5V output that can be used for an external light. Setting options are Always ON, Always OFF, or Exposure Based. If Exposure Based is selected, then the external light is on during the time the sensor is capturing an image.
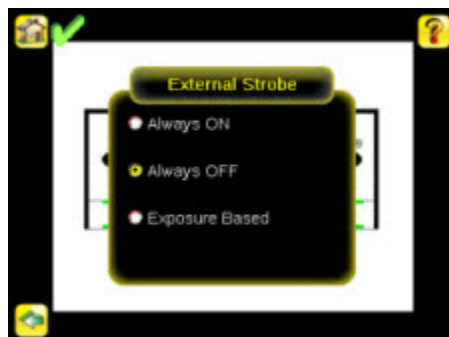
Main Menu > Imager > Strobe > External

Internal

The Internal Strobe setting configures the operation of the integrated ring light. Setting options are Always ON, Always OFF, or Exposure Based. If Exposure Based is selected, then the ring light is on during the time the sensor is capturing an image.

Main Menu > Imager > Strobe > Internal
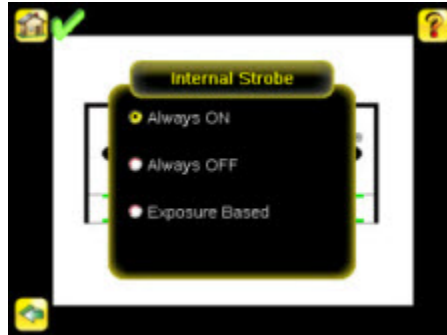
3.3.7 FOV

The field of view (FOV) is the area that the sensor can see at a given working distance. The working distance is the distance from the sensor's lens cover to the part being inspected. By default, the sensor uses the entire FOV in its operation. The effective FOV can be reduced in order to speed up the processing time of an inspection, or to decrease background noise.

Main Menu > Imager > FOV
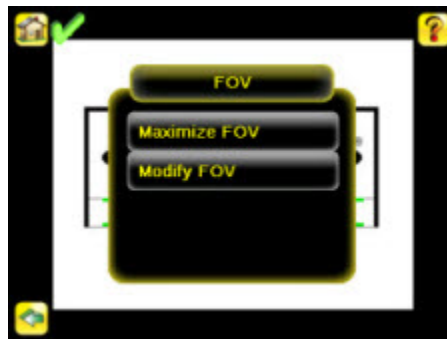
Maximize FOV

If the FOV has been modified and you want to get back to the default quickly, click the **Maximize FOV** menu option to restore the FOV to the entire sensor display.

Main Menu > Imager > FOV > Maximize FOV

Modify FOV

Use this option to reduce the size of the FOV.

Main Menu > Imager > FOV > Modify FOV
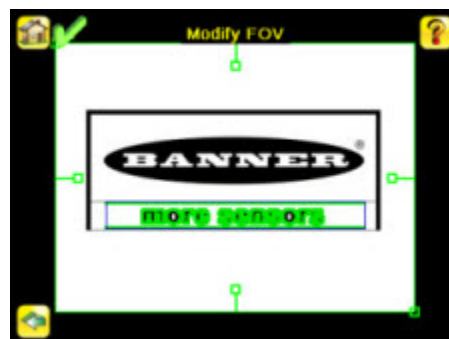
3.4 Inspection Menu

The Inspection menu icon is located on the the Main Menu, and provides access to parameters that need to be set for an inspection.

Main Menu > Inspection

3.4.1 Match

When the sensor is configured as a Match sensor, set the ROI Type, Percent Match, Rotation Range, and Pass Count for the inspection.

Main Menu > Inspection > Match
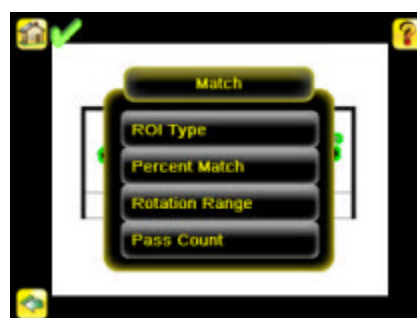
ROI Type (Match)

The Region of Interest (ROI) is the user-defined area on the screen that the sensor will analyze. The ROI Type can be rectangular, elliptical, or circular. From the menu at the bottom of the ROI Type screen, select the ROI Type to use for the inspection. Adjust the ROI as appropriate for your inspection. An ROI can be as large as the entire Field of View (FOV).

Inspection > Match > ROI Type
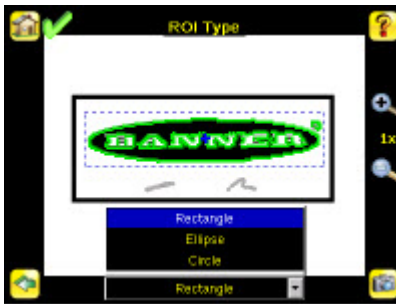
Percent Match

he Percent Match setting adjusts for how closely the inspected part or label matches the reference part or label. The Percent Match scale is from 0 to 100 where 0 is the most tolerant and 100 is the least tolerant. Move the slider to the left or to the right.

**Main Menu > Inspection > Match > Percent Match**
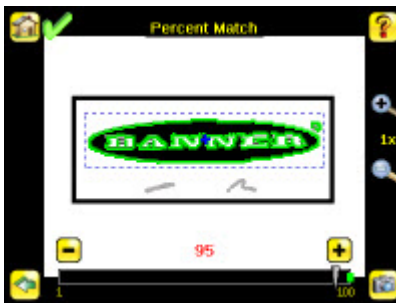
Rotation Range

The Rotation Range sets the expected rotation of parts or labels during an inspection. For example, a value of 45 means that the part may rotate 45 degrees in either direction from the reference part and still pass. Move the slider from 0 to 180 degrees.

> **NOTE:** The smaller the rotation range, the faster the inspection will run.

Main Menu > Inspection > Match > Rotation Range
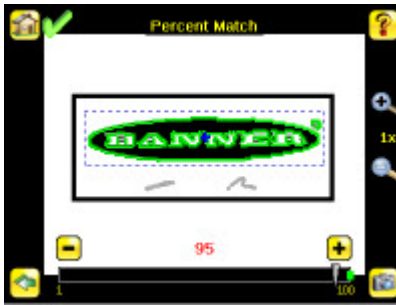
Pass Count (Match)

The Minimum Pass Count is the minimum number of parts, labels, or features expected to fall within the specified criteria; the Maximum Pass Count is the maximum number expected to fall within the specified criteria. These settings are used to determine the pass or fail result of the inspection.

Main Menu > Inspection > Match > Pass Count
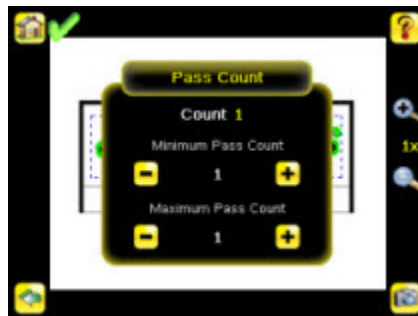
3.4.2 Area

When configured as an Area sensor, the sensor is used to ensure that one or more features of interest are present on a part. To configure as an Area sensor, set three parameters:

• Intensity Range (range of gray scale values) of a feature of interest
• Area Range, or size, of a feature of interest
• Pass Count

Main Menu > Inspection > Area
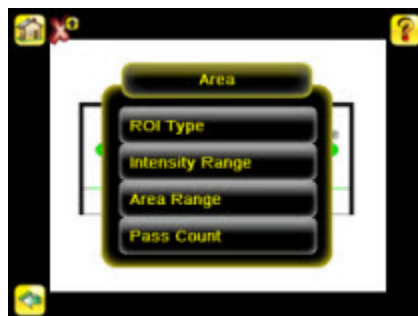
ROI Type (Area)

The Region of Interest (ROI) is the user-defined area on the screen that the sensor will analyze. The ROI Type can be rectangular, elliptical, or circular. From the menu at the bottom of the ROI Type screen, select the ROI Type to use for the inspection. Adjust the ROI as appropriate for your inspection. An ROI can be as large as the entire Field of View (FOV).

Inspection > Area > ROI Type
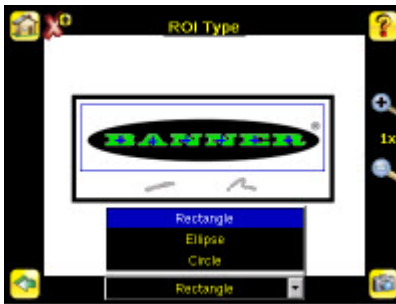
Intensity Range

Intensity Range is the range of gray scale values the sensor should look for. To set the Intensity Range, use the eye dropper on the left of the screen to select the target feature, then use the slider bar at the bottom of the display to fine tune the selection. As the slider bar is moved, green highlighted areas indicate objects the sensor finds. Note that objects that are colored yellow are found, but filtered out. This is because the objects fall outside of the Area Range. See Area Range to adjust this setting.

Main Menu > Inspection > Area > Intensity Range

Area Range

The Area Range is used to set the size limits of a feature of interest. Use the slider bar at the bottom of the display to select the range. Areas are measured by counting pixels. For example, a rectangular feature that is 100 pixels wide by 200 pixels tall will have an area of roughly 20,000 pixels.

Main Menu > Inspection > Area > Area Range
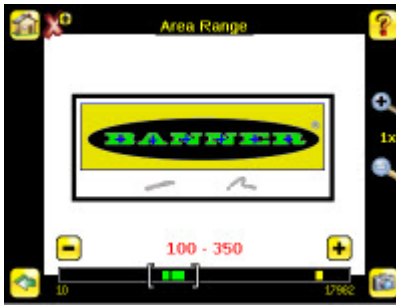
Pass Count (Area)

The Minimum Pass Count is the minimum number of parts, labels, or features expected to fall within the specified criteria; the Maximum Pass Count is the maximum number expected to fall within the specified criteria. These settings are used to determine the pass or fail result of the inspection.

Main Menu > Inspection > Area > Pass Count

3.4.3 Blemish

When configured as a Blemish sensor, it can be used to find flaws on a part (for example, scratches on a disc), or it can be used to make sure the a feature exists on a part. Although verifying a feature is present on a part is more commonly an application for a sensor configured as an Area sensor, a Blemish sensor may be a better option when dealing with variable materials or uneven lighting. Some sample applications include:

* Inspections that check for scratches on a part, and reject parts where the scratches are too numerous or larger than acceptable
* Inspections that check for the presence of some label or marking on a part that may vary in color

Main Menu > Inspection > Blemish
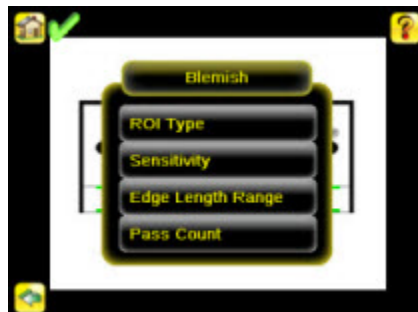
ROI Type (Blemish)

The Region of Interest (ROI) is the user-defined area on the screen that the sensor will analyze. The ROI Type can be rectangular, elliptical, or circular. From the menu at the bottom of the ROI Type screen, select the ROI Type to use for the inspection. Adjust the ROI as appropriate for your inspection. An ROI can be as large as the entire Field of View (FOV).

Inspection > Blemish > ROI Type

Sensitivity

Sensitivity is used to fine-tune how sensitive the sensor is to finding blemish or other edges within the ROI. The Sensitivity value helps account for light variations that might affect how well the sensor detects edges. The Sensitivity scale is from 0 to 100 where 0 means least sensitive and 100 means most sensitive. If set near 0, the sensor will only find very sharp edges with strong contrast. If set near 100, the sensor will find very dim or blurry edges, and may be unstable.

Inspection > Blemish > Sensitivity
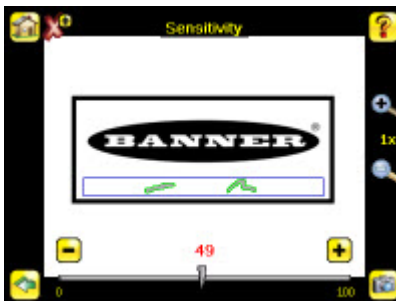
Edge Length Range

The sensor counts all the edge pixels it detects in the ROI. The bar at the bottom of the Edge Length Range screen shows all the different contiguous edge segments found. Edge segments within the two brackets [ ] are highlighted in green and those outside the brackets are ignored and colored yellow. You can move each bracket to add or remove more of the edge segments from consideration.

Inspection > Blemish > Edge Length Range
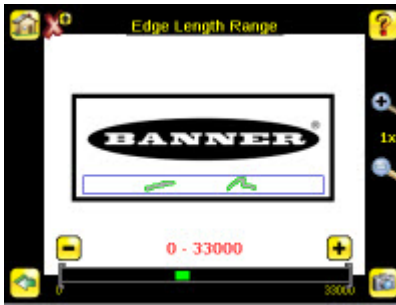
The range bar at the bottom of the screen provides a zoomed view of the range so that you can fine-tune the range. Click on the bar and drag up to bring up the zoomed view as shown below.
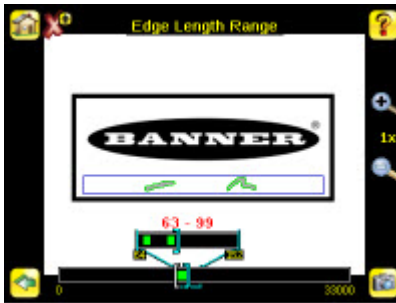
Pass Count (Blemish)

The sensor aggregates all the edge pixels that fall within the Edge Length Range and indicates the value with a small colored bar at the bottom of the Pass Count page. If within the range brackets, the bar is green, otherwise it is yellow. The brackets can be used to set a tolerance for pass/fail.

Main Menu > Inspection > Blemish > Pass Count
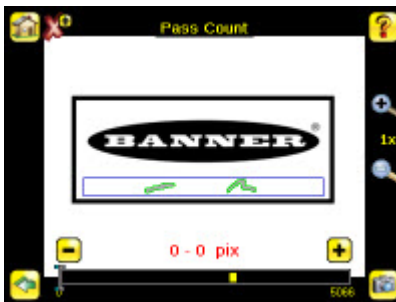
3.4.4 Motion Parameters (Optionally Available for Area and Blemish)

Motion settings involve selecting the number of edges to locate, adjusting sensitivity, and selecting whether or not rotation is enabled.

Main Menu > Inspection > Motion
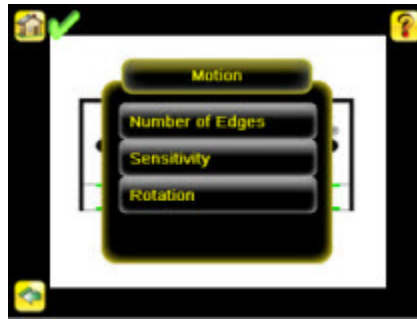
Number of Edges

On the Number of Edges screen, use the radio buttons to select One Edge or Two Edges. If One Edge is selected, motion is tracked in one direction (by default, horizontally); if Two Edges is selected, motion can be tracked horizontally and vertically.

Main Menu > Inspection > Motion > Number of Edges
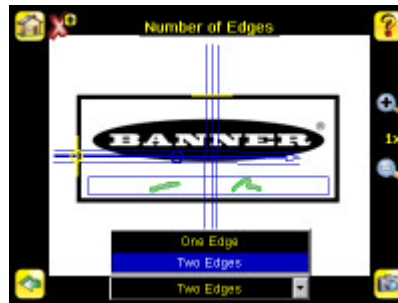
Sensitivity

Sensitivity is used to fine-tune how sensitive the sensor is to finding a reference edge. The Sensitivity value helps account for light variations that might affect how well the sensor detects edges on inspected parts. The Sensitivity scale is from 0 to 100 where 0 means least sensitive and 100 means most sensitive. If set near 0, the sensor will only find very sharp edges with strong contrast. If set near 100, the sensor will find very dim or blurry edges, and may be unstable due to noise within the image.

**Main Menu > Inspection > Motion > Sensitivity**
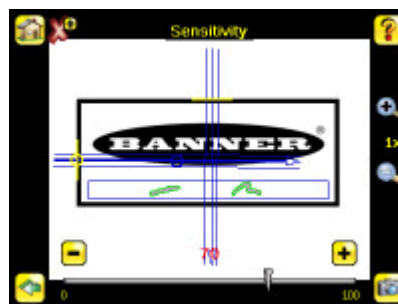
Rotation

Rotation can be Enabled or Disabled. Select Enabled if the part can be expected to rotated during the inspection.

Main Menu > Inspection > Motion > Rotation
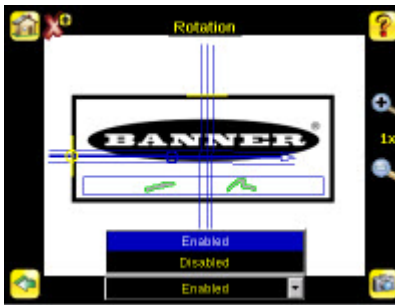
3.5 Logs Menu

The Logs menu icon is on the Main Menu, and is used to set up, view, and save Inspection and System Logs.

Main Menu > Logs
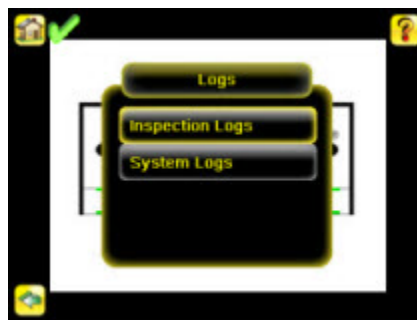
3.5.1 Inspection Logs

This menu provides for configuring and viewing Inspection Logs. Inspection Logs are stored inspection records that include a captured image, the parameters used to inspect it, and the results of that inspection. Up to ten Inspection Logs can be held in memory on the sensor. The next ten overwrite the previous. Inspection Logs can be saved to the USB drive so that the logs can be imported to the emulator.

Main Menu > Logs > Inspection Logs
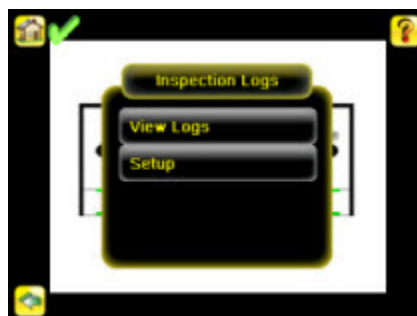
View Logs

Inspection Logs appear as a strip of film. You can select a frame to view a specific image. Use the icon in the lower right of the screen to save the logs to the USB drive. Logs saved to the USB drive can be imported into the emulator. Click the Clear button to clear Inspection Logs.

Main Menu > Logs > Inspection Logs > View Logs
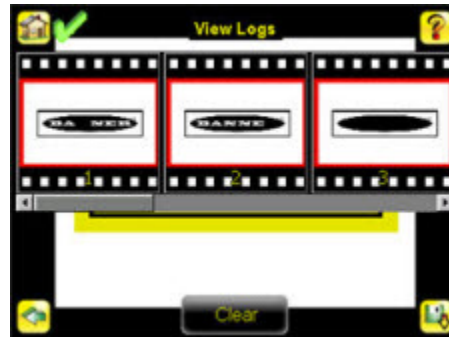
The View Inspection Log screen is used to debug an inspection, and shows one inspection in read-only mode. Click the upper-left icon to cycle through views. When in Statistics view, the table title has arrows to switch between Inputs and Results of the Inspection.

Use the left and right arrow keys at the bottom of the screen to navigate through the all stored Inspection Logs.

Setup

Use the radio buttons to Disable Logging, or to log Passed Inspections, Failed Inspections, or All Inspections.

Main Menu > Logs > Inspection Logs > Setup
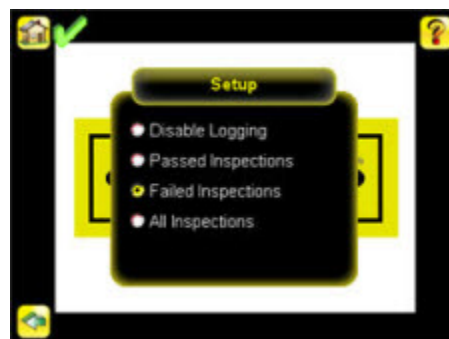
3.5.2 System Logs

The System Log contains configuration change information, other notifications, and any errors or warnings that may be encountered.

- Click the icon in the upper left corner of the screen to show/hide the time column.
- Click Clear Log button at the bottom of the screen to clear the System Log.
- Click the icon at the lower-right of the screen to save the System Log to the USB drive.

> **NOTE:** System log will not log changes while in Demo mode. Additionally, the Emulator does not log changes.

Main Menu > Logs > System Logs

4 Setting up for an Inspection

In order to set up for an inspection, you need to:

1. Select a Sensor Type.
2. Acquire a good image.
3. Set parameters depending on the Sensor Type.

4.1 Selecting a Sensor Type

When you exit Demo Mode, the sensor reboots with a single inspection with a Match sensor type by default. To change the Sensor Type:

1. Go to **Main Menu** > **System** > **Sensor Type**

   This displays the **Sensor Type** menu options.
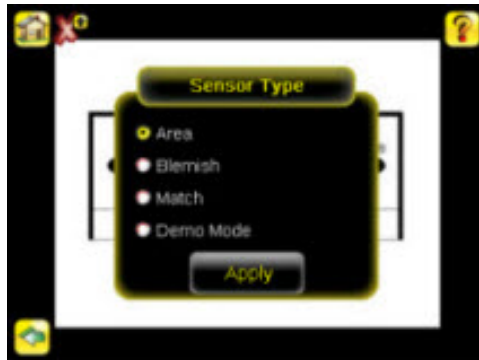
2. Select either **Area** , **Blemish**, or **Match**.

3. Click the **Home Screen** icon in the upper-left corner of the screen to return to the Home screen.

4.2 Acquiring a Good Image

The iVu Series sensor needs to capture a good image of each part to ensure that it correctly passes good parts and fails bad parts.

1. Go to **Main Menu** > **Imager** > **Auto Exposure** to run the **Auto Exposure** routine.
2. Check the lighting.

   • Make sure that the lighting is constant and consistent (unchanging over time, no shadows or hot spots).
   • Capture the shape and form of the target object with lighting that optimizes its contrast and separates it from the background. Depending on the target, this may mean the integral ring light is not the best choice and other Banner lights should be considered.
   • Adjust the mounting angle to provide the clearest image of the part features you are monitoring. The mounting bracket lets you easily position and adjust the sensor on your line.

3. If needed, go to **Main Menu** > **Imager** > **Auto Exposure** to run the **Auto Exposure** routine a second time or adjust **Gain** and **Exposure** manually:

   • **Main Menu** > **Imager** > **Gain**

- **Main Menu** > **Imager** > **Exposure**

4. Go to **Main Menu** > **Imager** > **Focus** to adjust the focus while monitoring the **Focus Number**:

For Micro-lens Models Only:

1. Use the supplied 1/16" hex key to loosen the Focusing Window locking screw (**D**), then adjust focus on the iVu Series sensor using the clear Focusing Window (**B**).

2. Adjust focus while monitoring the focus number. To ensure the best image, adjust the focus until the Focus Number peaks.

> 📝 **NOTE:** Turning the Focusing Window counter-clockwise focuses on closer objects, while turning the Focusing Window clockwise focuses on more distant objects.

3. Once the best image has been acquired, lock the focusing window.

Micro-Lens Models

A	Lens
B	Focusing Window
C	Locking Clip
D	Locking Screw
E	Filter Cap (optional)
F	Filter (optional)

NOTE: Filter Kits are available separately.

For C-Mount Models Only:

1. Remove the Lens Enclosure
2. Adjust focus while monitoring the focus number. To ensure the best image, adjust the focus until the Focus Number peaks.
3. Replace the Lens Enclosure on the camera.
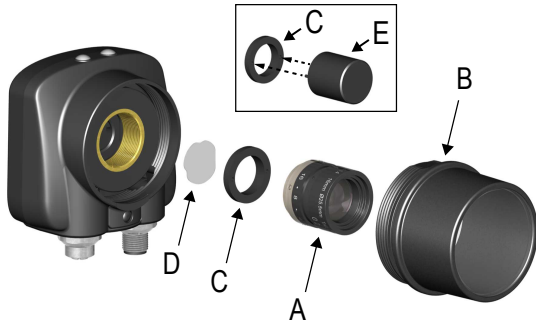
C-Mount Models		
	A	C-Mount Lens
	B	Lens Enclosure
	C	Retainer Ring (optional)
	D	Filter (optional)
	E	Filter Retainer Ring Tool
	NOTE: Filter Kits are available separately.	

4.3 Configuring an Area Sensor

This section describes how to configure an Area sensor using the Demo application as a reference.

> **NOTE:** By default, the **Trigger** is set to **Internal**, and will continuously trigger based on a time interval setting. This may make it more difficult to make adjustments while setting up the sensor. The best practice is as follows:
>
> • Go to the **Main Menu** > **Imager** > **Trigger** menu and select **External**.
>
>
>
> • Make sure there is no external trigger input.
> • Use the **Trigger** icon in the lower-right of the screen to manually trigger the sensor to capture an image as you set up and test.
> • Capture images of a range of samples to set up from the "worst" good part to the "best" bad part.

Start the setup with a good part. Normally, each part to be tested will be centered in the Field of View (FOV).

1. Adjust the Region of Interest (ROI).The ROI is a blue-dotted box as shown below.

2. Click Anywhere within the ROI to select it. When selected, the ROI is red with resize and rotational icons in the corners.
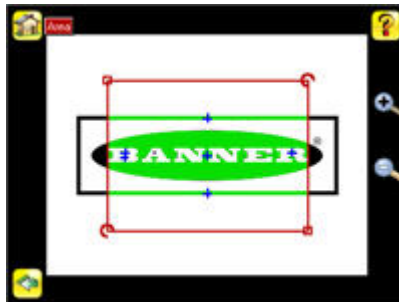
3. Resize and move the ROI so that the feature of interest. Resize the ROI so that it surrounds just the feature of interest. In the Demo example, the feature of interest is the Banner logo as shown below.

NOTE: When running an Area inspection, the sensor will only find objects within the ROI.

4. Click anywhere outside the ROI to deselect it.
5. Set inspection parameters.

   • Adjust the **Intensity Range** parameter. Intensity Range is the range of gray scale values the sensor should look for. To set the Intensity Range, use the eye dropper on the left of the screen to select the target feature, then use the slider bar at the bottom of the display to fine tune the selection. As the slider bar is moved, green highlighted areas indicate objects the sensor finds. Note that objects that are colored yellow are found, but filtered out. This is because the objects fall outside of the Area Range. See Area Range to adjust this setting.

      1. Go to **Main Menu** > **Inspection** , and click the **Intensity Range** option.

2. Click on the eye-dropper icon on the left of the screen, and then click anywhere in one of the white letters. Now any white area will be highlighted in green. Use the slider bar at the bottom of the display to fine tune the selection. As the slider bar is moved, green highlighted areas indicate objects the sensor finds and counts. The objects colored yellow are found, but filtered out (that is, not counted) because the objects fall outside of the Area Range.

• Adjust the **Area Range**. The Area Range is used to set the size limits of a feature of interest. Use the slider bar at the bottom of the display to select the range. Areas are measured by counting pixels. For example, a rectangular feature that is 100 pixels wide by 200 pixels tall will have an area of roughly 20,000 pixels.

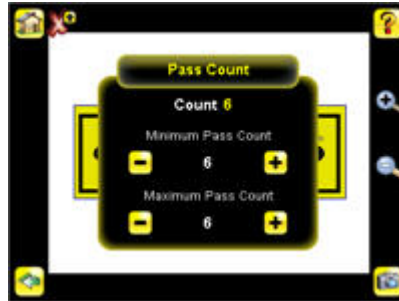1. Go to **Main Menu** > **Inspection** , and click the **Area Range** option.

2. Move the slider at the bottom of the screen to the to the desired area range. In the Demo example, the Area Range is adjusted so that each letter is identified as a found object (indicated by the green highlight and the blue +).

- Set the **Pass Count** parameter. The Minimum Pass Count is the minimum number of parts, labels, or features expected to fall within the specified criteria; the Maximum Pass Count is the maximum number expected to fall within the specified criteria. These settings are used to determine the pass or fail result of the inspection.

1. Go to **Main Menu** > **Inspection** , and click the **Pass Count** option.

2. Set the **Minimum Pass Count** and **Maximum Pass Count** as appropriate. In the Demo, both are set to 6, since the inspection should find six letters.

6. Test the complete range of good and bad samples to make sure that the sensor accepts good parts and rejects bad.
7. To complete the Area application setup, set triggering as appropriate for your application.

> ✎ **NOTE:** Remote Teach does not work with the Area Sensor type.

4.4 Configuring a Blemish Sensor

This section describes how to configure a Blemish sensor using the Demo application as a reference. The Demo application shows how the sensor, when configured as a Blemish tool, can accept or reject parts based on the range of edge pixels the sensor detects in the ROI.

Start the setup with a good part. Normally, each part to be tested will be centered in the Field of View (FOV).

1. Adjust the Region of Interest (ROI).The ROI, when selected, is a red box as shown below.

Resize the ROI so that the feature of interest. Resize the ROI so that it surrounds just the feature of interest. In the Blemish Demo example, the feature of interest includes the two irregular shapes below the Banner logo.

2. Click anywhere outside the ROI to deselect it.
3. Set inspection parameters.

- Adjust the **Sensitivity** parameter. Sensitivity is used to fine-tune how sensitive the sensor is to finding blemish or other edges within the ROI. The Sensitivity value helps account for light variations that might affect how well the sensor detects edges. The Sensitivity scale is from 0 to 100 where 0 means least sensitive and 100 means most sensitive. If set near 0, the sensor will

only find very sharp edges with strong contrast. If set near 100, the sensor will find very dim or blurry edges, and may be unstable.

1. Go to **Main Menu** > **Inspection** , and click the **Sensitivity** option.
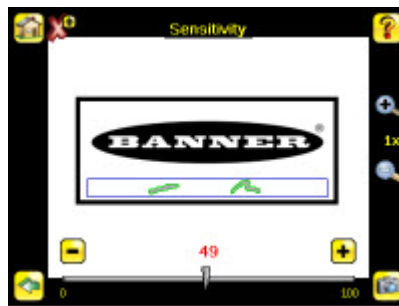
2. Use the slider on the bottom of the screen to adjust the sensitivity watching as the sensor detects more or fewer edges.
3. Click the Trigger button on the bottom-right of the screen to see how the sensor detects edges on other images, and adjust if necessary.

• Adjust the **Edge Length Range**. The sensor counts all the edge pixels it detects in the ROI. The bar at the bottom of the Edge Length Range screen shows all the different contiguous edge segments found. Edge segments within the two brackets [ ] are highlighted in green and those outside the brackets are ignored and colored yellow. You can move each bracket to add or remove more of the edge segments from consideration.

1. Go to **Main Menu** > **Inspection** , and click the **Edge Length Range** option.
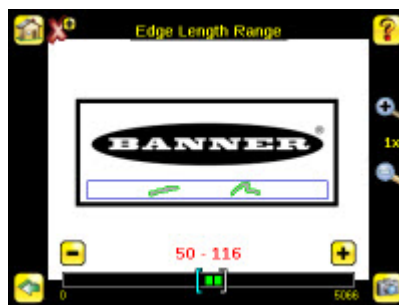
2. Move the slider at the bottom of the screen to the to the desired Edge Length Range. You can zoom in to refine the range.
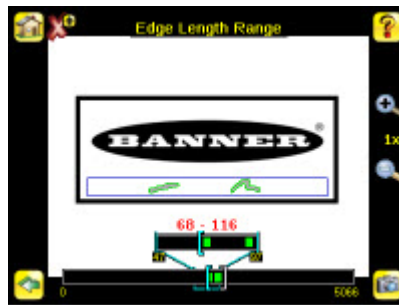
- Set the **Pass Count** parameter. The sensor aggregates all the edge pixels that fall within the Edge Length Range and indicates the value with a small colored bar at the bottom of the page. If within the range brackets, the bar is green, otherwise it is yellow.

  1. Go to **Main Menu** > **Inspection** , and click the **Pass Count** option.
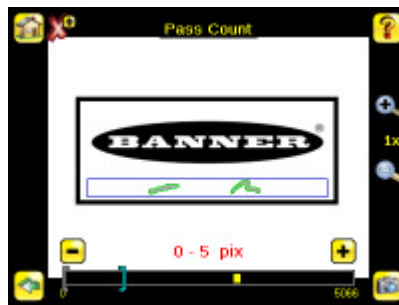
  2. Use the brackets to set a tolerance for the pass/fail.
4. Test the complete range of good and bad samples to make sure that the sensor accepts good parts and rejects bad.
5. To complete the Blemish application setup, set triggering as appropriate for your application.

NOTE: Remote Teach does not work with the Blemish Sensor type.

4.5 Configuring a Match Sensor

This section describes how to configure a Match sensor using the Demo application as a reference

NOTE: By default, the **Trigger** is set to **Internal**, and will continuously trigger based on a time interval setting. This may make it more difficult to make adjustments while setting up the sensor. The best practice is as follows:

- Go to the **Main Menu** > **Imager** > **Trigger** menu and select **External**.
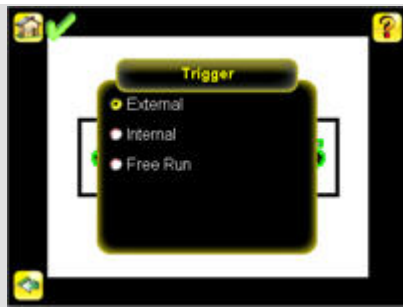
- Make sure there is no external trigger input.
- Use the **Trigger** icon in the lower-right of the screen to manually trigger the sensor to capture an image as you set up and test.
- Capture images of a range of samples to set up from the "worst" good part to the "best" bad part.

Start the setup with a good part. Normally, each part to be tested will be centered in the Field of View (FOV).

1. Teach the sensor a good reference part.

   a. Adjust the Region of Interest (ROI).The ROI is a blue-dotted box as shown below.

   b. Click Anywhere within the ROI to select it. When selected, the ROI is red with resize and rotational icons in the corners.
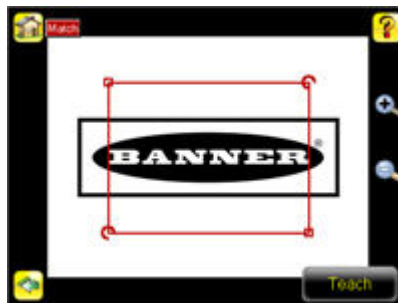
   c. Resize and move the ROI so that the feature of interest. Resize the ROI so that it surrounds just the feature of interest. In the Demo example, the feature of interest is the Banner logo as shown below.

> ✎ **NOTE:** When running a Match inspection, the sensor will look for any possible patterns to match anywhere within the Field of View.

    d. Click the **Teach** icon to teach the sensor this good reference part. With **Annotations Enabled**, the screen will highlight in green the pattern found.

2. Set inspection parameters.
  - Adjust the **Percent Match** parameter. The Percent Match setting adjusts for how closely the inspected part or label matches the reference part or label. The Percent Match scale is from 0 to 100 where 0 is the most tolerant and 100 is the least tolerant. Move the slider to the left or to the right.

> ✎ **NOTE:** When running a Match inspection with annotations enabled, the sensor will highlight in green any pattern matches that meet or exceed the value specified for **Percent Match**. Patterns that are below the specified value for **Percent Match** (down to approximately 20%), or out of the **Rotation Range** (see below), will be colored yellow

    1. Using a "bad" part, click the **Manual Trigger** icon in the lower-right of the screen to capture an image. For this example, one of the stored images is missing the letter "N," yet the sensor initially sees this as a "good" label.

    2. Go to **Main Menu > Inspection** , and click the **Percent Match** option.

3. On the adjustment at the bottom of the screen, adjust the slider and click the **Manual Trigger** button. When adjusted correctly, the annotations should turn yellow, and the icon in the upper-right of the screen should indicate fail.

• Adjust the **Rotation Range**. The Rotation Range sets the expected rotation of parts or labels during an inspection. For example, a value of 45 means that the part may rotate 45 degrees in either direction from the reference part and still pass. Move the slider from 0 to 180 degrees. Note that the smaller the rotation range, the faster the inspection will run. To set the **Rotation Range**:

1. Go to **Main Menu** > **Inspection** , and click the **Rotation Range** option.
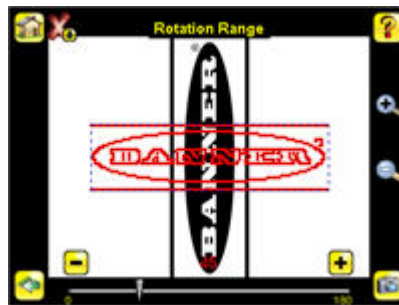
2. Move the slider at the bottom of the screen to the desired rotation. If you are verifying that a label is correctly applied to a container; that is, on straight, you will want to set a small rotation. If you want to make sure that the correct label is present no matter how the part is oriented in the Field of View, then the rotation range will be set to its maximum (180°, which is the setting for the Demo).
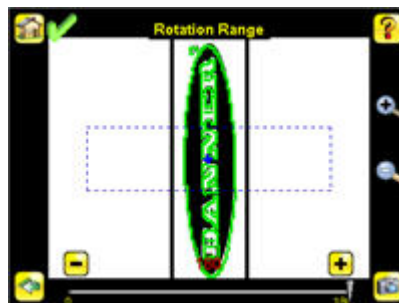
• Set the **Pass Count** parameter. The Minimum Pass Count is the minimum number of parts, labels, or features expected to fall within the specified criteria; the Maximum Pass Count is the maximum number expected to fall within the specified criteria. These settings are used to determine the pass or fail result of the inspection.

1. Go to **Main Menu** > **Inspection** , and click the **Pass Count** option.
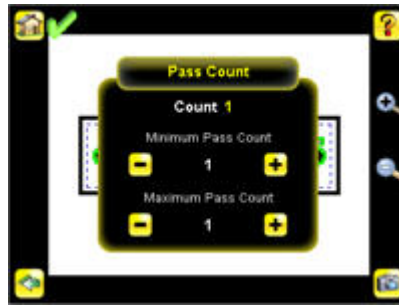
2. Set the **Minimum Pass Count** and **Maximum Pass Count** as appropriate. In the Demo, both are set to 1.
3. Test the complete range of good and bad samples to make sure that the sensor accepts good parts and rejects bad.
4. To complete the Match application setup, set triggering as appropriate for your application.

4.5.1 Remote Teach

The Remote Teach function is a method of remotely updating inspection parameters while the iVu sensor is running. Remote Teach is only available when the iVu is configured as a Match sensor. The sequence of events for executing a Remote Teach as follows:

1. With the sensor Ready, pulse the Remote Teach line.
2. The sensor recognizes that the Remote Teach line has been pulsed and waits for the next valid trigger.
3. At the next valid trigger, Ready goes inactive (the Green Ready LED shuts OFF), and the sensor acquires a new image.
4. The sensor learns the new pattern and performs the analysis.

5 Debugging Inspections

5.1 How to Round-Trip Debug Using the Emulator

The iVu Emulator is a Windows application that allows you to operate in a Windows environment exactly as you would on the sensor itself. In general, the Emulator is an inspection debugging tool: you can import stored inspections and configuration from an iVu sensor, then modify its parameters on the emulator, and restore the updated configuration back to the sensor. When you install the iVu Emulator, by default, it is installed in the following folder:

C:\Program Files\Banner Engineering\iVu Series

You can run the Emulator from this folder, but you will need to move files between the USB drive and PC. To avoid moving files, you can copy the Emulator executable to the USB drive, and run the Emulator directly from the USB drive.

This "how-to" describes the procedures for doing round-trip debugging either using the iVu Emulator installed on a PC or using it directly from the USB Thumb Drive

> **NOTE:** This document refers to saving configuration and inspection logs in folders based on the sensor name. If you have not yet named the sensor, then folders will be named using the first 8-characters of the sensor serial number.

5.1.1 How to Debug Using the Emulator from a PC

1. Plug a USB Thumb Drive into the sensor.
2. Save Inspection Logs to the Thumb Drive.

    a. On the **Main Menu** > **Inspection Logs** > **View Logs** screen, click the Save icon to save the inspection logs.
    b. When prompted, select Yes to save sensor configuration along with the Inspection Logs. The location of these files on the USB Thumb Drive will be displayed after the operation is completed. The Inspection Logs are saved in <USB>:\BANNER\<SENSOR_NAME>\InspLog and the sensor configuration is saved in <USB>:\BANNER\<SENSOR_NAME>. For example, if the sensor name is **myName**:

       • Configuration File (CONFIG.CFG) path: <USB>:\BANNER\myName
       • Inspection Logs path: <USB>:\BANNER\myName\InspLog

    > **NOTE:** If the sensor has no name, then the folder is the first 8-characters of the serial number.

3. Remove the USB drive from the sensor and insert it into an available USB port on a Windows PC that has the iVu Emulator installed.

    > **Important:** Make sure the iVu Emulator is **NOT** running before going to the next step.

4. Copy the Sensor Configuration from the USB Thumb Drive to the folder where the Emulator is installed on the PC. For example, if the sensor name is myName and the iVu Emulator is installed in the default location on the PC, copy the file <USB>:\BANNER\myName\CONFIG.CFG to C:\Program Files\Banner Engineering\iVu Series.
5. Copy the Inspection Logs from the USB Thumb Drive (for example, <USB>:\BANNER\myName\InspLog) to the InspLog folder on the PC (for example, C:\Program Files\Banner Engineering\iVu Series\InspLogs).
6. Start the emulator.
7. Set the Trigger option to Internal—

    a. Go to **Main Menu** > **Imager** > **Trigger** , and select Internal.

    b. Set the Trigger Interval as desired.

      The iVu Emulator will run with the saved configuration from Step 6 using the saved Inspection Logs from Step 7 as images.

8. Make the desired adjustments.

9. Close the iVu Emulator program. All configuration changes will be saved to the CONFIG.CFG file.

10. Copy the sensor configuration (that is, CONFIG.CFG) from the PC working directory to the USB Thumb Drive (for example <USB>: \BANNER\myName\CONFIG.CFG).

11. Remove the USB Thumb Drive from the PC, and connect to the sensor.

12. Restore the configuration to the sensor.

    a. Go to **Main Menu** > **System** > **Sensor Configuration** > **Load from USB** .

    b. Select the Configuration to restore.

    c. Click the Load button to start the restore sensor configuration.

      You will need to reboot the sensor when the restore is complete.

5.1.2 How to Debug Using the Emulator from the USB Flash Drive

1. Plug a USB Thumb Drive into the sensor.

2. Save Inspection Logs to the sensor.

    a. On the **Main Menu** > **Inspection Logs** > **View Logs** screen, click the Save icon to save the inspection logs.

    b. When prompted, select Yes to save sensor configuration along with the Inspection Logs. The location of these files on the USB Thumb Drive will be displayed after the operation is completed—the Inspection Logs are saved in <USB>:\BANNER \<SENSOR_NAME>\InspLog and the sensor configuration is saved in <USB>:\BANNER\<SENSOR_NAME>. For example, if the sensor name is **myName**:

      • Configuration File (CONFIG.CFG) path: <USB>:\BANNER\myName

      • Inspection Logs path: <USB>:\BANNER\myName\InspLog

> **NOTE:** If the sensor has no name, the folder name is the first 8-characters of the serial number.

3. Remove the USB drive from the sensor and insert it into an available USB port on a Windows PC that has the iVu Emulator installed.

4. Copy the iVuEmulator.exe program file to the USB Thumb Drive in the same location as the CONFIG.CFG file (for example, <USB>:\BANNER\myName).

5. Launch the <USB>:\BANNER\myName\iVuEmulator.exe program.

6. Set the Trigger option to Internal—

    a. Go to **Main Menu** > **Imager** > **Trigger** , and select Internal.

    b. Set the Trigger Interval as desired.

      The iVu Emulator will run with the saved configuration using the saved Inspection Logs as images.

7. Make the desired adjustments.

8. Close the iVu Emulator program. All configuration changes will be saved to the CONFIG.CFG file.

9. Remove the USB Thumb Drive from the PC, and connect to the sensor.

10. Restore the configuration to the sensor.

    a. Go to **Main Menu** > **System** > **Sensor Configuration** > **Load from USB** .

    b. Select the Configuration to restore.

    c. Click the Load button to start the restore sensor configuration.

      You will need to reboot the sensor when the restore is complete.

6 iVu Series: Updating the Sensor

6.1 Update Process

Banner Engineering may release new versions of the sensor firmware in the future. New firmware releases can be downloaded from Banner's website or can be obtained by ordering the latest Product CD. The following steps will guide you through the process of updating the iVu firmware.

Step 1: Copy firmware of desired product to USB Thumb Drive.

1. Launch the iVu Series software

From Product CD:

- Place the latest Product CD into your CD ROM drive. The iVu Series Software will automatically start.
- If your computer is not set for Auto-Play, you may start the iVu Series Software by browsing to the CD drive from My Computer screen and double-clicking on 'iVuSeries.exe'.

From Banner Website:

- Visit Banner's Website: *http://www.bannerengineering.com*
- Browse to Vision Products page and select the iVu product you are using.
- Click on the **Software** tab to view software releases.
- Determine which version you want to download (Current Version recommended, for example "iVu Series Software Version 2010R4").
- Click on the circular **Download** button. This will initiate the download process. Depending on your browser settings, you may be asked to confirm or provide a location to save the file. Choose to download on yoru desktop. Note the file name.
- Double-click the file to start extracting the files and run the iVu Series Software.

2. Select the product you are using and browse to **Firmware Update** page.

3. Click on 'Run Firmware Update Wizard' and program will start.

4. Follow on-screen instructions. Clicking on 'Copy firmware to USB' will copy the selected firmware to the USB Thumb Drive.

Step 2: Install firmware on iVu

1. Remove the USB Thumb Drive from the PC, and plug it into the sensor.

2. On the sensor, select System -> Firmware Update. The name of the firmware file you copied on the USB Thumb Drive will be displayed.

3. Choose correct file and click on the 'Load' button.

4. Follow the steps on the screen to update the firmware.

6.2 How to Set or Modify a Sensor Name

You can set a Sensor Name for your iVu Series sensor or modify an existing name on the sensor using the software keypad. You can also change the sensor name this using the iVu Emulator as described below.

> **NOTE:** If you are in a language other than English, you cannot modify the sensor name using the software keypad. Use the procedure described below.

> **NOTE:** If you have not set the sensor previously, then folders will be named using the first 8-characters of the sensor serial number.

1. Plug a USB Thumb Drive into the sensor.
2. Save Sensor Configuration to the USB Thumb Drive (**Main Menu** > **System** > **Sensor Configuration** > **Save to USB**). The locaton of these files on the USB Thumb Drive will be displayed after the operation is complete—the sensor configuration is saved in <USB>:\BANNER\<SENSOR_NAME>. For example, if the sensor name is **myName**:, the path will be <USB>:\BANNER\my-Name).
3. Remove the USB drive from the sensor and insert it into an available USB drive on a Windows PC.
4. If running the Emulator from the USB, launch the iVuEmulator.exe program. If running the Emulator installed on a PC, make sure the Emulator is not running, and copy the Sensor Configuration from the USB Thumb Drive to the folder where the Emulator is installed on the PC. For example, if the sensor name is myName and the iVu Emulator is installed in the default location on the PC, copy the file <USB>:\BANNER\myName\CONFIG.CFG to C:\Program Files\Banner Engineering\iVu Series.
5. Launch the iVuEmulator.exe program.
6. Go to the Sensor Information screen (**Main Menu** > **System** > **Sensor Information**).
7. Click the white box next to the Sensor Name label, and enter the desired Sensor Name.
8. Click the Back button on the lower-left corner of the screen to save the Sensor Name.
9. Close the Emulator program and the Sensor Name will be saved to the CONFIG.CFG file.
10. If running the Emulator on the PC, copy the CONFIG.CFG file back to the original folder on the USB drive—<USB>:\BANNER\<SENSOR_NAME> (for example <USB>:\BANNER\myName).

> **NOTE:** The sensor will look in the original folder (for example, myName) for the CONFIG.CFG file.

11. Remove the USB Thumb Drive from the PC, and connect to the sensor.
12. Restore the configuration to the sensor.

    a. Go to **Main Menu** > **System** > **Sensor Configuration** > **Load from USB** .
    b. Select the Configuration to restore.
    c. Click the Load button to start the restore sensor configuration.

> **NOTE:** Once the new sensor name is restored in the sensor, all files saved to USB will now reside in the folder corresponding to the new sensor name.

You will need to reboot the sensor when the restore is complete.

> **NOTE:** If a Sensor Configuration from one sensor is loaded onto another sensor, the Sensor Name from the Sensor Configuration will not be stored in the sensor.

6.3 How to Reset the Sensor Password

If you forget the password for your sensor, you can remove the current password using a reset key that is generated by the **Password Reset Utility**, which is located on the Product CD. The following steps will guide you through the specific steps to reset the password:

1. On your iVu Series sensor, click the **Forgot?** button located on the bottom of the **Enter Current Password** screen.
2. Write down the 6-digit **Device Key**.
3. On a Windows PC, insert the iVu product CD into the CD ROM drive.
4. From the product CD menu (started upon inserting the CD), launch the **Password Reset Utility**.
5. Enter the **Device Key** into the text box in the Utility—identified as **Step 1** in the **Password Reset Utility**.

6. Click the **Generate Reset Key** button.
7. Write down the four-digit **Password Reset Key**—identified as **Step 2** in the **Password Reset Utility**.
8. On the iVu Series sensor, check the **Next** button on the **Password Reset** screen.
9. Enter the 4-digit reset key on the **Enter Reset Key** screen.
10. Click **Apply**.

The password is now cleared.

6.4 How to Use Bitmap Image Files with the iVu Emulator

You can use bitmap (.bmp) image files with the iVu Emulator for developing and simulating iVu inspections. The iVu Emulator only accepts image files in .bmp format. If you have other image file formats, use an image viewer/editor program, such as PhotoShop, Gimp, or Paint, to convert the files to 8-bit grayscale .bmp format.

> **NOTE:** Images smaller than 640 X 480 will be black-filled starting in the upper-right. Images larger than 640 X 480 will be cropped starting in the upper-left.

1. Copy the .bmp files into the InspLog folder in the iVu Emulator install folder.

   For example, copy .bmp files into the C:\Program Files\Banner Engineering\iVu Series\InsLog folder.

   > **NOTE:** Remove any existing .bmp or Log files in that folder to avoid confusion because the Emulator automatically runs all .bmp/Log files sequentially according to filename.

2. Launch the iVu Emulator program.
3. Select Internal Trigger on the Trigger Selection screen (**Main Menu** > **Image** > **Trigger**) and select Internal.
4. Set the Trigger Interval as desired.

The iVu Emulator will be running using the .bmp files from Step 1.

> **NOTE:** Banner does not recommend setting up inspections using these 8-bit grayscale images because you will always end up modifying the configuration after loading it on the sensor on the line. A better choice would be to set up the inspection on the emulator using Inspection Logs from the sensor.

7 LED Indicator Troubleshooting

In normal operation, the Power LED is steady green, and the Pass/Fail is green or red depending on the triggered inspection. The Ethernet I/O LED will be lit or off depeding on connection status.

-

	1	Power LED	Green: Power Red: Error
	2	Pass/Fail LED	Green: Pass Red: Fail
	3	Ethernet I/O LED	Green: Connected No Light: Disconnected

The iVu also indicates abnormal conditions as described below.

7.1 Errors

Problem Indicator	Solution
The Pass/Fail LED is blinking green a number of times, separated by an LED red blink, and the sensor repeats this pattern over and over. This indicates that no inspections are occurring.	Reboot the sensor.
The Power LED is lit steady red. These type of errors are reported in the System log and appear highlighted in red.	Do the following: 1. Look in the System Log to see the error. 2. Clear the LED; that is, go to the **Main Menu** > **Logs** > **System Logs** and press the Clear System Error button at the bottom of the screen (a sensor reboot is not required). 3. If the error occurs again, you can try rebooting the sensor to see if that fixes the problem. If the problem persists, contact Banner customer support.

7.2 Warnings

Warnings are atypical conditions that the sensor detects and fixes. Warning are highlighted in yellow in the System Log, and can typically be ignored.

8 Sensor Specifications

Power Connection

12 8-pin Euro-style (M12) male connector; accessory cable required for operation (see *iVu Series: Power Cable — Required*)

USB 2.0 Host

8-pin Euro-style (M12) 4-pin Pico (M8) female connector; optional USB cable required for operation of USB Thumb Drive (see *iVu Series: USB Cable — Optional*)

Power Requirements

Voltage: 10 - 30V dc

Current: 800 mA maximum (exclusive of I/O load)

Output Configuration

NPN or PNP determined by model

Tools

Match, Area, Area with Motion

Demo Mode

Full tool functionality on canned images

Sensor Lock

Optional password protection

External Strobe Output

+ 5V dc

Integrated Ring Light

Red, IR, Green, Blue, White

Output Rating

150 mA

Display

68.5 mm (2.7") LCD Color Integrated Display 320 X 240 pixels

Remote Display Connection

8-pin Euro-style (M12) female connector; accessory cable required for remote display.

Acquisition

100 fps (frames per second) max.

Exposure Time

0.1 ms to 1.049 s

Imager

1/3 inch CMOS 752 X 480 pixels; adjustable Field of View (FOV)

Lens Mount

Micro Lens models: M12 X 1 mm thread; micro video lens 4.3, 6, 8, 12, 16, 25 mm

C-Mount models: Standard C-mount (1 inch-32 UN)

Construction

Black Valox™ sensor housing; acrylic window

Weight: Approximately .295 kg (10.4 oz.)

Environmental Rating

IP67

Operating Conditions

Stable Ambient Temperature: 0° to + 50° C (+32° to + 122° F)

Relative Humidity: 95%, max. relative, non-condensing

Certifications

$C\epsilon$

8.1 Models

NPN Models						
Ring Light Options	**Micro Lens Options**					**C-Mount Lens Options**
	4.3 mm	**8 mm**	**12 mm**	**16 mm**	**25 mm**	
None	IVUTGNX04	IVUTGNX08	IVUTGNX12	IVUTGNX16	IVUTGNX25	IVUTGNXC
Red	IVUTGNR04	IVUTGNR08	IVUTGNR12	IVUTGNR16	IVUTGNR25	N/A

NPN Models						
Ring Light Options	**Micro Lens Options**					**C-Mount Lens Options**
	4.3 mm	**8 mm**	**12 mm**	**16 mm**	**25 mm**	
Blue	IVUTGNB04	IVUTGNB08	IVUTGNB12	IVUTGNB16	IVUTGNB25	N/A
Green	IVUTGNG04	IVUTGNG08	IVUTGNG12	IVUTGNG16	IVUTGNG25	N/A
IR	IVUTGNI04	IVUTGNI08	IVUTGNI12	IVUTGNI16	IVUTGNI25	N/A
White	IVUTGNW04	IVUTGNW08	IVUTGNW12	IVUTGNW16	IVUTGNW25	N/A

PNP Models						
Ring Light Options	**Micro Lens Options**					**C-Mount Lens Options**
	4.3 mm	**8 mm**	**12 mm**	**16 mm**	**25 mm**	
None	IVUTGPX04	IVUTGPX08	IVUTGPX12	IVUTGPX16	IVUTGPX25	IVUTGPXC
Red	IVUTGPR04	IVUTGPR08	IVUTGPR12	IVUTGPR16	IVUTGPR25	N/A
Blue	IVUTGPB04	IVUTGPB08	IVUTGPB12	IVUTGPB16	IVUTGPB25	N/A
Green	IVUTGPG04	IVUTGPG08	IVUTGPG12	IVUTGPG16	IVUTGPG25	N/A
IR	IVUTGPI04	IVUTGPI08	IVUTGPI12	IVUTGPI16	IVUTGPI25	N/A
White	IVUTGPW04	IVUTGPW08	IVUTGPW12	IVUTGPW16	IVUTGPW25	N/A

NPN Models						
Ring Light Options	**Micro Lens Options**					**C-Mount Lens Options**
	4.3 mm	**8 mm**	**12 mm**	**16 mm**	**25 mm**	
None	IVURGNX04	IVURGNX08	IVURGNX12	IVURGNX16	IVURGNX25	IVURGNXC
Red	IVURGNR04	IVURGNR08	IVURGNR12	IVURGNR16	IVURGNR25	N/A
Blue	IVURGNB04	IVURGNB08	IVURGNB12	IVURGNB16	IVURGNB25	N/A
Green	IVURGNG04	IVURGNG08	IVURGNG12	IVURGNG16	IVURGNG25	N/A
IR	IVURGNI04	IVURGNI08	IVURGNI12	IVURGNI16	IVURGNI25	N/A
White	IVURGNW04	IVURGNW08	IVURGNW12	IVURGNW16	IVURGNW25	N/A

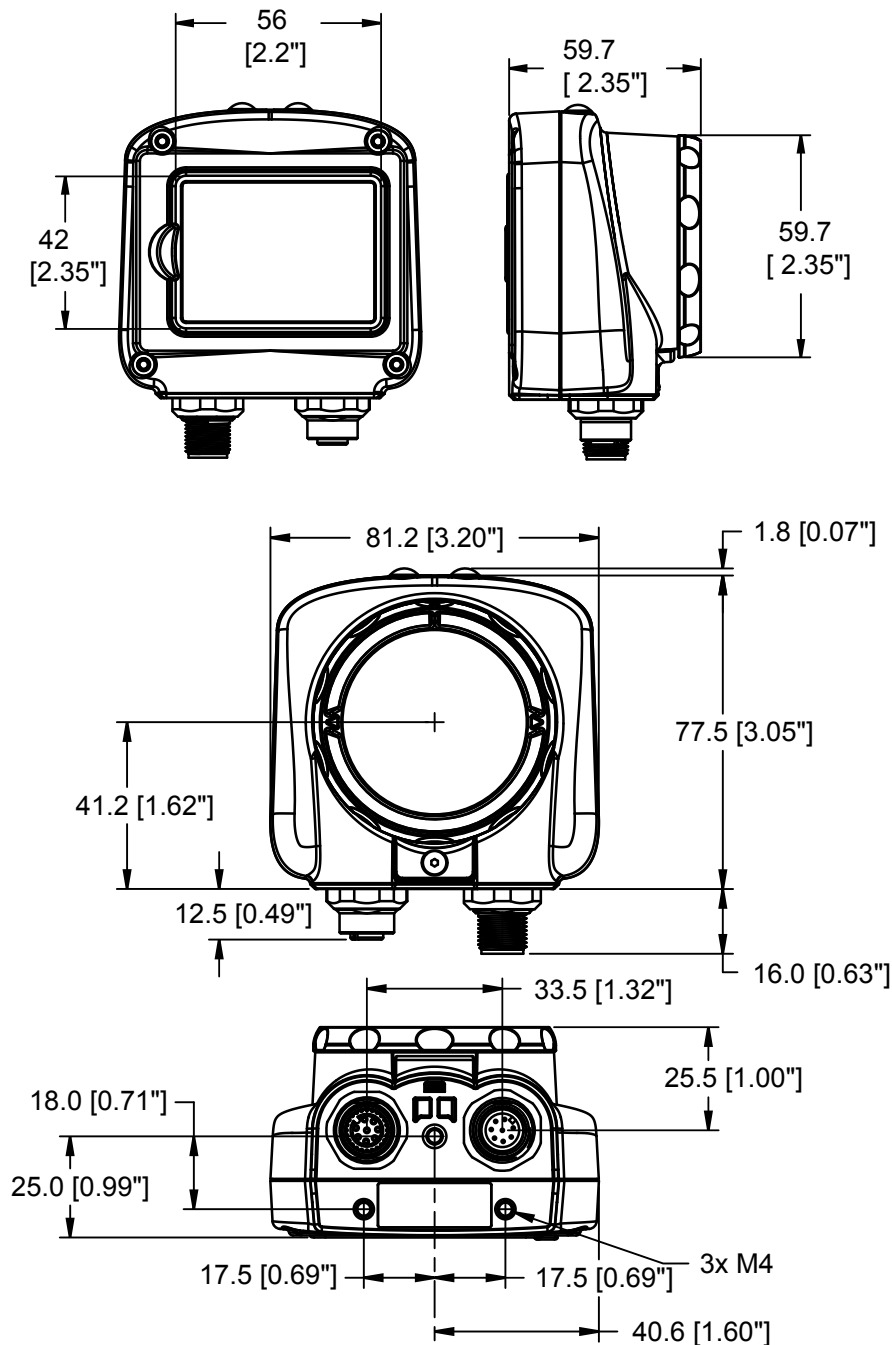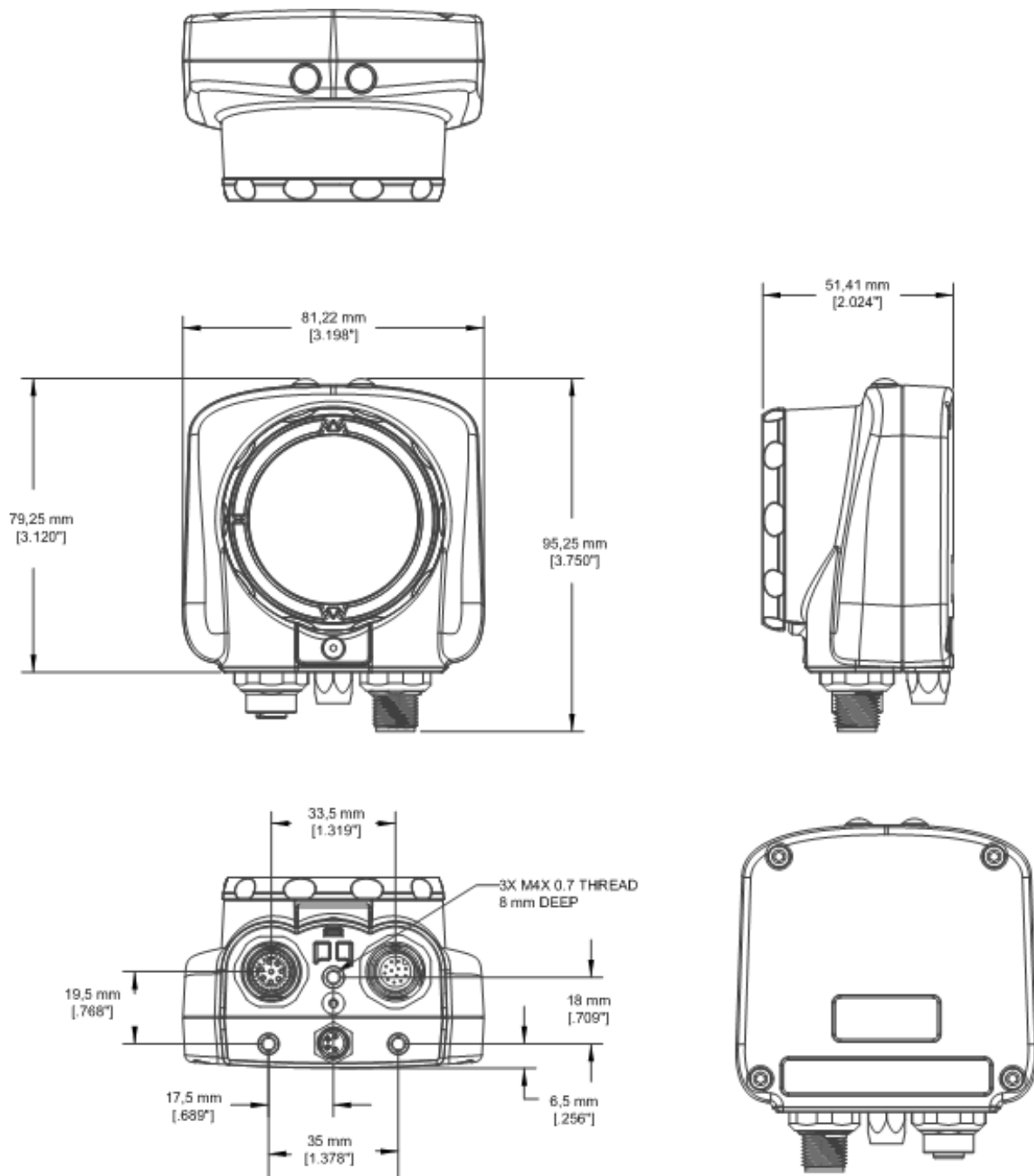| PNP Models						
Ring Light Options	**Micro Lens Options**					**C-Mount Lens Options**
	4.3 mm	**8 mm**	**12 mm**	**16 mm**	**25 mm**	
None	IVURGPX04	IVURGPX08	IVURGPX12	IVURGPX16	IVURGPX25	IVUTGPXC
Red	IVURGPR04	IVURGPR08	IVURGPR12	IVURGPR16	IVURGPR25	N/A
Blue	IVURGPB04	IVURGPB08	IVURGPB12	IVURGPB16	IVURGPB25	N/A
Green	IVURGPG04	IVURGPG08	IVURGPG12	IVURGPG16	IVURGPG25	N/A
IR	IVURGPI04	IVURGPI08	IVURGPI12	IVURGPI16	IVURGPI25	N/A
White	IVURGPW04	IVURGPW08	IVURGPW12	IVURGPW16	IVURGPW25	N/A

⚠️ **WARNING: Not To Be Used for Personnel Protection**

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
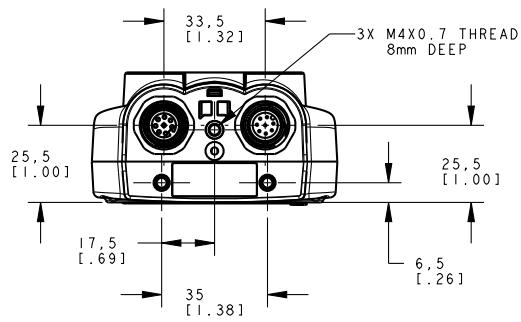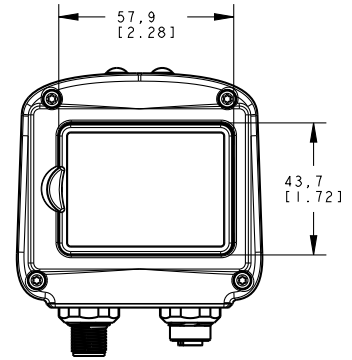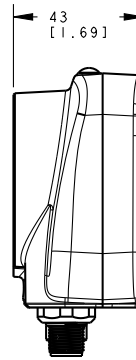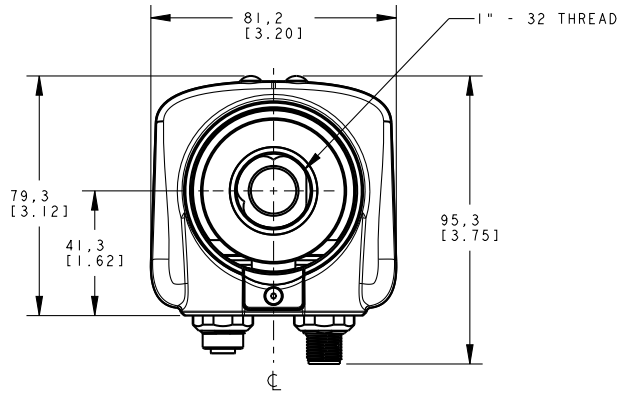
8.2 Dimensions

Micro Lens Dimensions

C-Mount Lens Dimensions

81,2 [3.20]
I" - 32 THREAD
79,3 [3.12]
41,3 [1.62]
95,3 [3.75]
¢

43 [1.69]

57,9 [2.28]
43,7 [1.72]

33,5 [1.32]
3X M4X0.7 THREAD 8mm DEEP
25,5 [1.00]
25,5 [1.00]
17,5 [.69]
6,5 [.26]
35 [1.38]

C-Mount Lens Covers
51,3
60
52,9
33

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