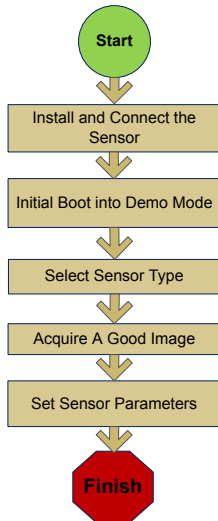


## Quick Start Guide

### Introduction

The iVu TG Image Sensor is used to monitor labels, parts, and packaging for type, size, orientation, shape, and location. The sensor has an integrated or remote color touch screen display making installation, setup and configuration easy without requiring a PC.



#### Quick Start Overview

This guide is designed to provide the necessary information to get the iVu TG sensor up and running quickly. It provides an overview of the sensor and illustrates how to set up the sensor to inspect a label, part, or packaging. The flow chart to the left provides an overview of the process.

#### Related Information

The following documentation is available on the Product CD:

- *iVu TG with Integrated Display* (datasheet; P/N 143370)
- *iVu TG for use with Remote Display* (datasheet; P/N 149160)
- *iVu TG Sensor Reference* (P/N 143371)
- *iVu TG Instruction Manual* (P/N 143372)

In addition, the sensor includes integrated Help.



#### WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device 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.



#### CAUTION: Electrostatic Discharge

Avoid the damage that electrostatic discharge (ESD) can cause to the Sensor.

Always use a proven method for preventing electrostatic discharge when installing a lens or attaching a cable.

## 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.

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

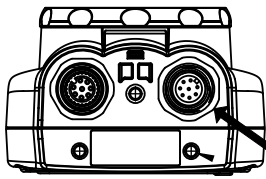


Table 1: iVu Brackets

SMBI VURAL	SMBI VURAR	SMBI VUU
		

### 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 ft) lengths. The connector on the sensor is shown below (B).



**B**

B Power I/O Connector

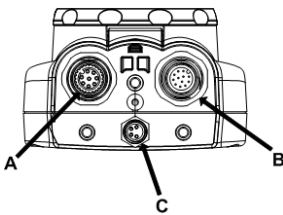


NOTE: Micro video lens model shown. C-Mount model connections are identical.

Power I/O Connections			
Pin #	Wire Color	Description	Direction
1	White	Output 1	Output
2	Brown	10-30V dc	Input
3	Green	Output 2	Output
4	Yellow	Strobe Out (5V dc only)	Output
5	Gray	Remote Teach	Input
6	Pink	External Trigger	Input
7	Blue	Common (Signal Ground)	Input
8	Red	Ready	Output

### Cable Connections for the iVu TG with a Remote Display

The cable connections on the iVu TG sensor are shown below, and power I/O connections (B) are defined in [Table 2](#) on page 3.



A Remote Display Connector

B Power I/O Connector

C USB Connector



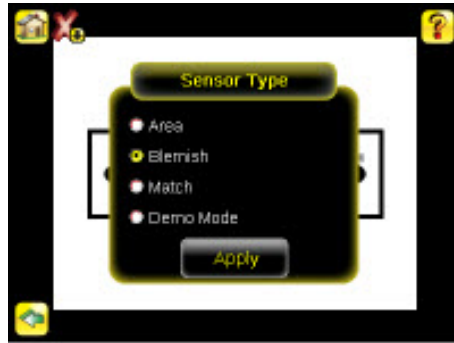
NOTE: Micro video lens model shown. C-Mount model connections are identical.

Table 2: Power I/O Connections

Pin #	Wire Color	Description	Direction
1	White	Output 1	Output
2	Brown	10-30V dc	Input
3	Green	Output 2	Output
4	Yellow	Strobe Out (5V dc only)	Output
5	Gray	Remote Teach	Input
6	Pink	External Trigger	Input
7	Blue	Common (Signal Ground)	Input
8	Red	Ready	Output
9	Orange	Not used	N/A
10	Light Blue	RS-232 TX	Output
11	Black	RS-232 Signal Ground	Output
12	Violet	RS-232 Rx	Input

## 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 while working with the different sensor types and 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.

## Sensor Types

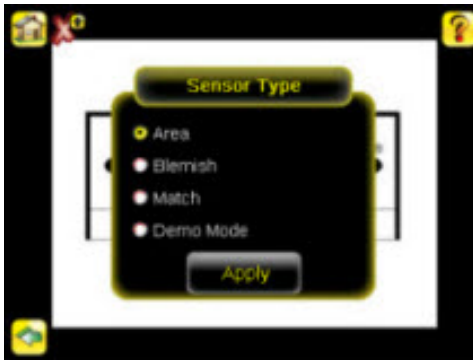
The iVu TG sensor includes three Sensor Types:

### 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 or (for Plus models to add) 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 Apply.

## 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



- Go to Main Menu > Imager > Focus to adjust the focus while monitoring the Focus Number:



For Micro Video Lens Models Only:

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

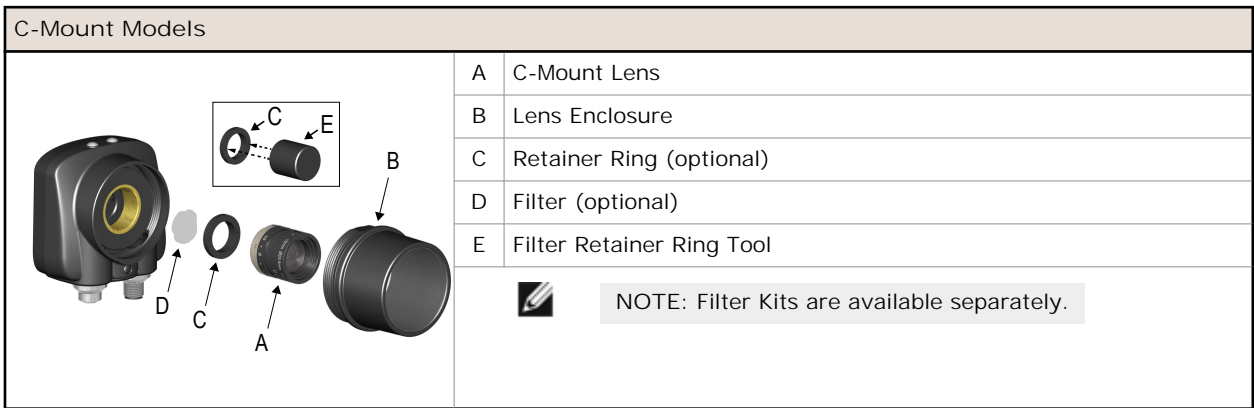


- After the best image has been acquired, lock the focusing window.

Micro Video 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:

- Remove the Lens Enclosure.
- Adjust focus while monitoring the focus number. To ensure the best image, adjust the focus until the Focus Number peaks.
- Replace the Lens Enclosure on the camera.



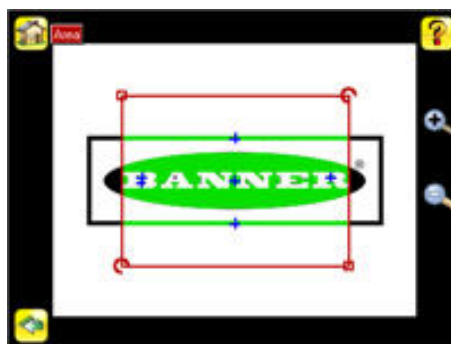
## Configuring an Area Sensor

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

To adjust the Region of Interest (ROI), follow the steps listed here. The ROI is a blue-dotted box as shown below.



1. Click anywhere within the ROI to select it. When selected, the ROI has resize and rotational icons in the corners..



2. Resize and move the ROI to surround the feature of interest. In the Demo example, the feature of interest is the Banner logo as shown here. It is still red because the parameters need to be set.



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

3. Click the sensor name button to go to open the Area sensor parameters menu.
4. Set sensor parameters.
  - Adjust the Intensity Range. This is the range of grayscale values the sensor should look for. 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 screen to fine tune the selection to set the intensity range.
    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.



NOTE: To get to the other parameters click the back arrow, then click inside the ROI, and then click the sensor name button.

- 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 has 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 +).

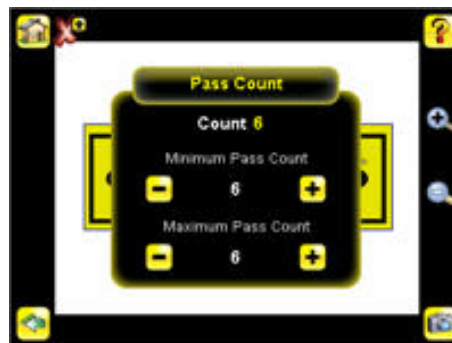


- Set the Pass Count parameter. The Minimum Pass Count is the minimum number of parts, labels, or features expected to fall within the specified criteria; the Maximum Pass Count is the maximum number expected to fall within the specified criteria. These settings are used to determine the pass or fail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



NOTE: Start with the Maximum Pass Count—the Minimum will not allow it to be more than the maximum.

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.
5. Test the complete range of good and bad samples to make sure that the sensor accepts good parts and rejects bad. The green check in the upper left corner indicates the inspection passed.
6. To complete the Area application setup, set triggering as appropriate for the application.





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

## Configuring a Blemish Sensor

The Demo application shows how the sensor, when configured as a Blemish sensor, 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). 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. Adjust the parameters of the sensor by clicking inside the ROI then click the sensor name button.
  - 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.

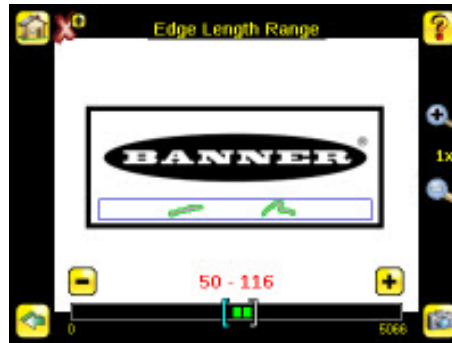


2. Use the slider on the bottom of the screen to adjust the sensitivity watching as the sensor detects more or fewer edges.
3. Click the Trigger button on the bottom-right of the screen to see how the sensor detects edges on other images, and adjust if necessary.

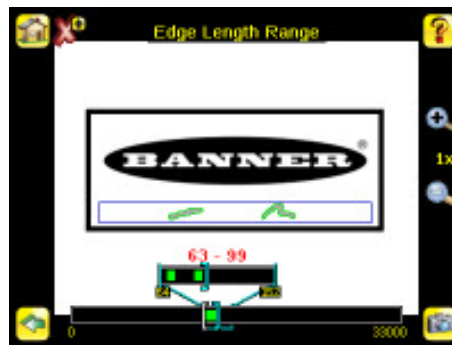


- Adjust the Edge Length Range. The sensor counts all the edge pixels it detects in the ROI. The bar at the bottom of the Edge Length Range screen shows all the different contiguous edge segments found. Edge segments within the two brackets [ ] are highlighted in green and those outside the brackets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

- Go to Main Menu > Inspection , and click the Edge Length Range option.

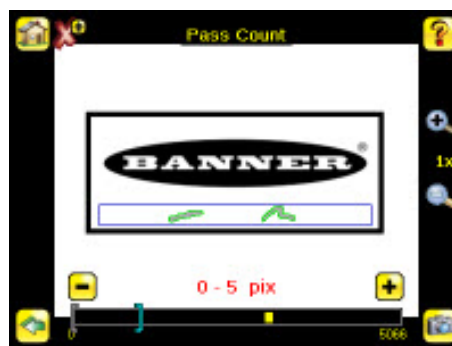


- Move the slider at the bottom of the screen to the to the desired Edge Length Range. You can zoom in to refine the range.



- Adjust 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.

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



- Use the brackets to set a tolerance for the pass/fail.
- Test the complete range of good and bad samples to make sure that the sensor accepts good parts and rejects bad parts.
- To complete the Blemish application setup, set triggering as appropriate for the application.



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

## Configuring a Match Sensor

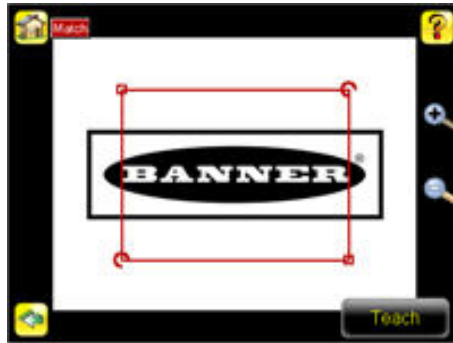
Start the setup with a good part. Normally, each part to be tested will be centered in the Field of View (FOV).

Teach the sensor a good reference part.

1. Adjust the Region of Interest (ROI). The ROI is a dotted box as shown. The color of the box depends on the inspection parameters (red for fail, green for pass).



2. Click Anywhere within the ROI to select it. When selected, the ROI is bolded with resize and rotational icons in the corners.



3. Resize the ROI so that it surrounds just the feature of interest. In the Demo example, the feature of interest is the Banner logo.



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



5. Set sensor 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.

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



- 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.

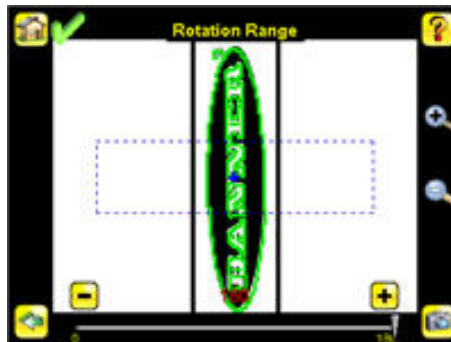


- Adjust the Rotation Range. The Rotation Range sets the expected rotation of parts or labels during an inspection. For example, a value of 45 means that the part may rotate 45 degrees in either direction from the reference part and still pass. Move the slider from 0 to 180 degrees. Note that the smaller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

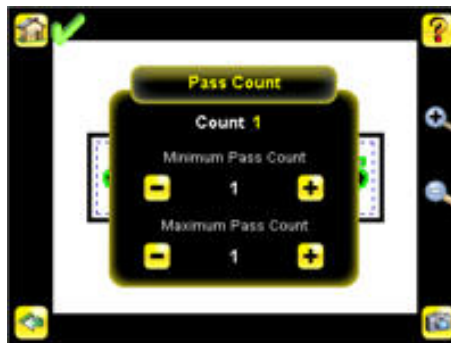


2. Move the slider at the bottom of the screen to the desired rotation. If you are verifying that a label is correctly applied to a container; that is, on straight, you will want to set a small rotation. If you want to make sure that the correct label is present no matter how the part is oriented in 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.
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 Match application setup, set triggering as appropriate for the application.

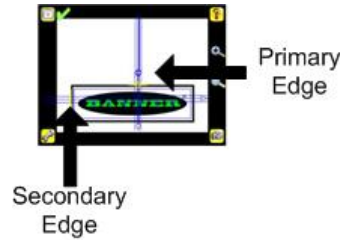


NOTE: When running a Match inspection, the sensor will look for any possible patterns to match anywhere within the Field of View.

## Adjusting for Motion

When the sensor is configured as an Area or Blemish sensor, it can automatically adjust for motion of inspected parts in the field of view. Motion parameter settings are enabled by going to Main Menu > Sensor > Motion . With Motion enabled, a new menu is available in the Main Menu > Inspection to set the following parameters:

- The Number of Edges parameter determines whether motion is tracked using One Edge or Two Edges. If One Edge is selected, motion is tracked in one direction; if Two Edges is selected, motion can be tracked horizontally and vertically. One edge is the primary edge and the second edge moves and rotates in relation to this primary edge. The primary edge is identified by a small O as shown below.



- Sensitivity is used to fine-tune how accurately the sensor detects edges. 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.
- Rotation can be Enabled or Disabled. Select Enabled if the part can be expected to rotate during the inspection.

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