iVu Plus TG and Color Gen2 Image Sensors

more sensors, more solutions

Quick Start Guide

Introduction

This guide is designed to help you set up and install the iVu Plus TG and Color Gen2 Image Sensors. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at *www.bannerengineering.com*. Search for p/n 179042 to view the Instruction Manual. Use of this document assumes familiarity with pertinent industry standards and practices.

The iVu includes integrated Help.

Program, modify and view inspections through the integrated touch screen, remote touch screen or Vision Manager PC software. Vision Manager is not required to configure or run the iVu.

Connect to the iVu using Vision Manager PC Software to control the device remotely. After connecting to the device, the interface displays on the **Sensor** tab. Use the interface in the same manner as the iVu display.

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.

Features and Indicators



Figure 1. Features

1. Power LED
   - Green: Ready/Power
   - Red (blinking or steady): Error
2. Pass/Fail LED
   - Green (steady): Pass
   - Green (blinking): Error
   - Red: Fail
3. Ethernet I/O LED
   - Green: Connected
   - Off: Disconnected
4. Focusing Window
5. Focusing Window Locking Clip
6. Integrated Display (integrated display models only)

Note: Integrated display models: The touchscreen display has a plastic cover to protect the display. Remove this cover when configuring the device. When the display is not in use, keep the display covered to protect it.

Installation Instructions

Mount the iVu

The iVu requires a bracket for mounting. Brackets are available from Banner Engineering. See *www.bannerengineering.com*. The brackets allow the iVu to be mounted either perpendicular to the part or at an adjustable angle.

1. Position the iVu on the bracket.
2. Thread three M4 x 4 mm screws (supplied) through the bracket into the mounting holes in the bottom of the iVu.

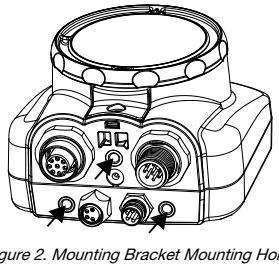


Figure 2. Mounting Bracket Mounting Holes

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3. Tighten all three screws.
4. Mount the iVu and bracket to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
5. Check the iVu alignment.
6. Tighten the mounting screws to secure the iVu and the bracket in the aligned position.

Cable Connections

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

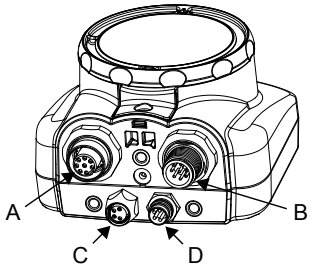


Figure 3. iVu Cable Connections—Micro Video Lens Model

A Remote Display Connector (remote display models only)
B Power and I/O Cable Connector
C USB Connector
D Ethernet Connector

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

Table 1: Power I/O Connections

Pin #	Wire Color	Description	Direction
1	White	Output 1	Output
2	Brown	10 V dc to 30 V dc	Input
3	Green	Output 2	Output
4	Yellow	Strobe Out (5 V 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	Output 3	Output
10	Light Blue	RS-232 TX	Output
11	Black	RS-232 Signal Ground	Output
12	Violet	RS-232 Rx	Input

Install the Software

PC Requirements

Operating System
Microsoft® Windows® operating system version 7, 8, or 10[1]
System Type
32-bit, 64-bit
Hard Drive Space
80 MB (plus up to 280 MB for Microsoft .NET 4.5, if not already installed)
Memory (RAM)
512 MB minimum, 1 GB+ recommended
Processor
1 GHz minimum, 2 GHz+ recommended
Screen Resolution
1024 × 768 full color minimum, 1650 × 1050 full color recommended
Third-Party Software
Microsoft .NET 4.5, PDF Viewer (such as Adobe Acrobat)
USB Port
USB 3.0, recommended if a USB to Ethernet adapter used to communicate with the sensor

Important: Administrative rights are required to install the Vision Manager software.

1. Download the latest version of the software from *www.bannerengineering.com*.
2. Navigate to and open the downloaded file.
3. Click **Next** to begin the installation process.
4. Confirm the software destination and availability for users and click **Next**.
5. Click **Install** to install the software.
6. Depending on your system settings, a popup window may appear prompting to allow Vision Manager to make changes to your computer. Click **Yes**.
7. Click **Close** to exit the installer.

Connect to the Sensor

These instructions use Windows® operating system version 7, 8, or 10.[2]

[1] Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries.
[2] Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

1. Confirm the network connections.
   a) Click the **Start** button, then on the **Start** menu, click **Control Panel**.
   b) In **Control Panel**, click **Network and Internet**, then click **Network and Sharing Center**, and then click **Change adapter settings**.
   c) Right-click on the connection that you want to change, then click **Properties**.
   If you are prompted for an administrator password or confirmation, enter the password or provide confirmation.
   d) In the connection properties, click **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties**.
   e) In the **Internet Protocol (TCP/IPv4) Properties**, select **Use the following IP address**.
   f) Make sure that the IP address is 192.168.0.2, and the subnet mask is 255.255.255.0.
2. Open Vision Manager from the desktop or the **Start** menu.
   The **Sensor Neighborhood** tab displays and lists the available sensors.
3. From **Sensor Neighborhood**, click to connect to the desired sensor.
   The status changes from **Available** to **Connected** and the **Sensor** screen displays. Click to disconnect from the sensor.
4. If the desired sensor is not listed, verify that:
   - The network adapter connected to the sensor has the same subnet mask as the sensor (for example, 192.168.0.xxx); view the subnet mask in the Network Adapters list at **Home** > **Sensor Neighborhood** > **Network Adapters**
   - The Ethernet cable is the correct type
   - The TCP/IPv4 settings are correct

   Or, manually enter the sensor's IP address.

Note: The sensor's IP address and subnet mask are also available from the sensor display.

Active Sensors Tab

Use the **Active Sensors** tab in **Sensor Neighborhood** to connect to an active sensor. Available options vary depending on the type of sensor to which Vision Manager is connected.

Navigate: **Home** > **Sensor Neighborhood** > **Active Sensors**.

This tab includes sensor information such as sensor status, sensor name, IP address, MAC address, and model number. Sensors can also be added to Favorites.

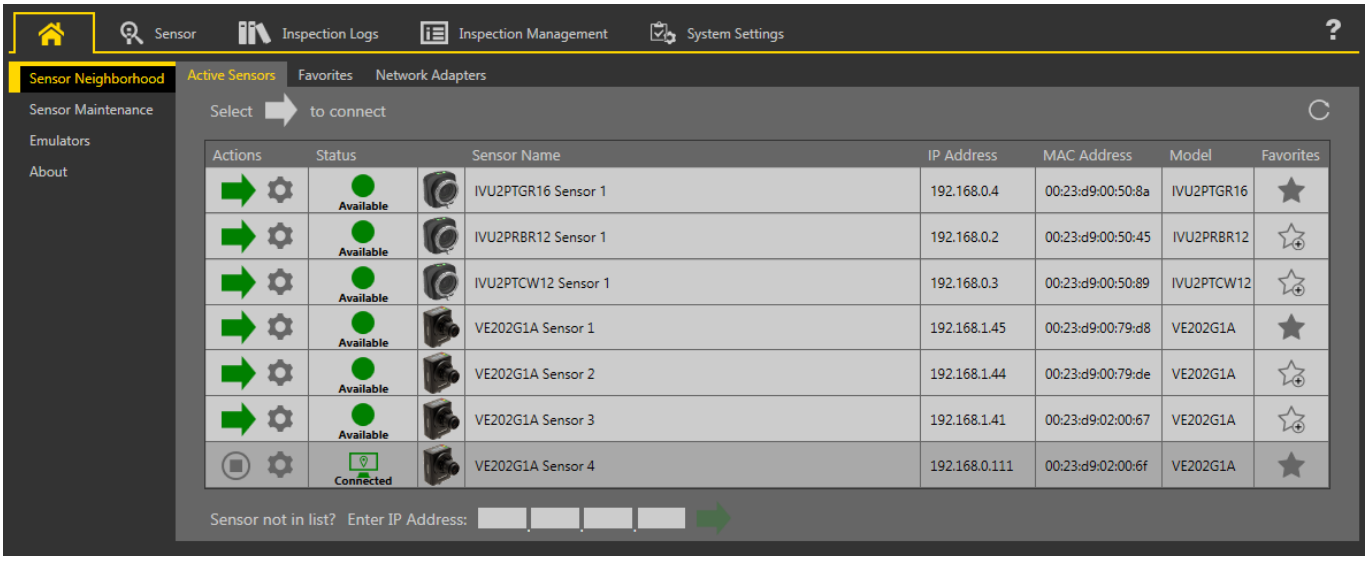


Figure 4. Active Sensors Tab

To connect to a sensor, click next to the desired sensor. To disconnect from a sensor, click .

To view or change sensor Status, MAC Address, Sensor Name, IP Address, Subnet Mask, and Gateway, click .

To add the sensor to a Favorites Group, click . The icon changes to .

To manually connect to a sensor with a known IP address, enter the IP address in the **Enter IP Address** field and click .

Demo Mode

The first time the iVu is powered up, it starts in Demo Mode. You can choose whether to stay in Demo Mode or exit to Live Mode. Demo Mode uses stored images and inspection parameters that demonstrate how the iVu is set up, without having to worry about focus, lighting, or triggers. In this mode, practice making adjustments while working with the different sensor types and observing how the adjustments affect the results. To exit Demo Mode, go to **Main Menu** > **System** > **Mode** and select **Exit Demo Mode**. Upon exit, the iVu restarts in the normal operating mode with the default settings.

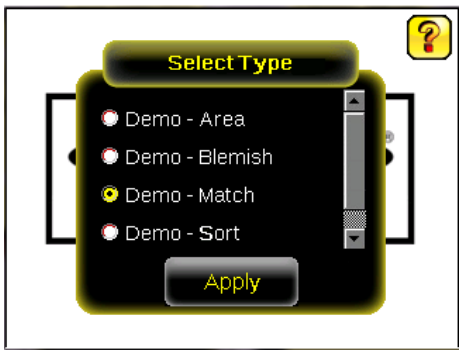


*Figure 5. **Select Type** Screen*

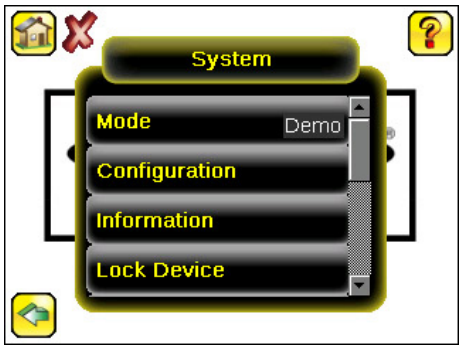


*Figure 6. **System** Menu*

Note: Switch between Live Mode and Demo Mode any time by going to **Main Menu** > **System** > **Mode**.

Device Home Screen

Use the **Home** screen on the iVu display to monitor inspections and to configure the iVu. Typically, the part being inspected is centered on the screen with the feature of interest bounded by the Region of Interest (ROI), a rectangle as shown below. The ROI can be rotated and resized, and is highlighted when selected for adjustment.

In following figure, there are two ROI because it is a multi sensor inspection. The green annotations indicate the object passes, and the red annotations indicate a failure. This sample inspection failed as shown by the red X next to the **Display mode** button.

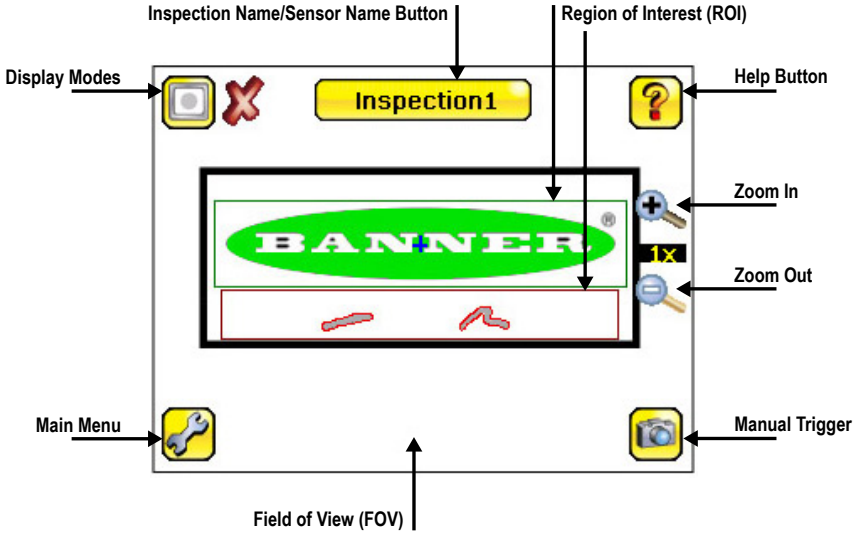


*Figure 7. **Home** Screen*

Device Main Menu

The Main Menu has four sections:

- **Inspection**—Modify inspection settings
- **Imager**—Run the Auto Exposure routine and adjust functions such as exposure, gain, and strobe
- **Logs**—Configure and view System and Inspection Logs
- **System**—Select the mode and manage the device

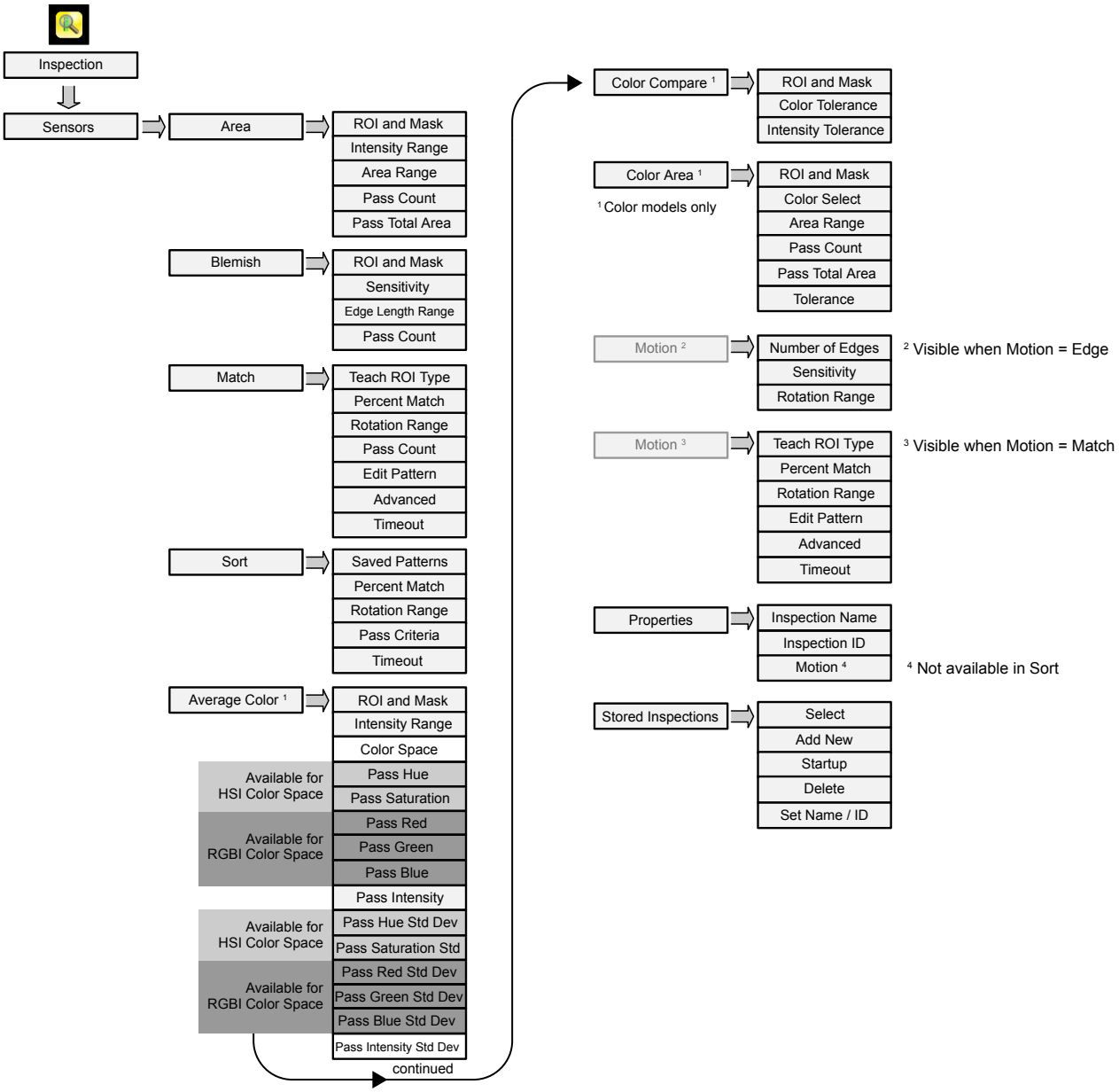


Figure 8. Menu Map - Part 1

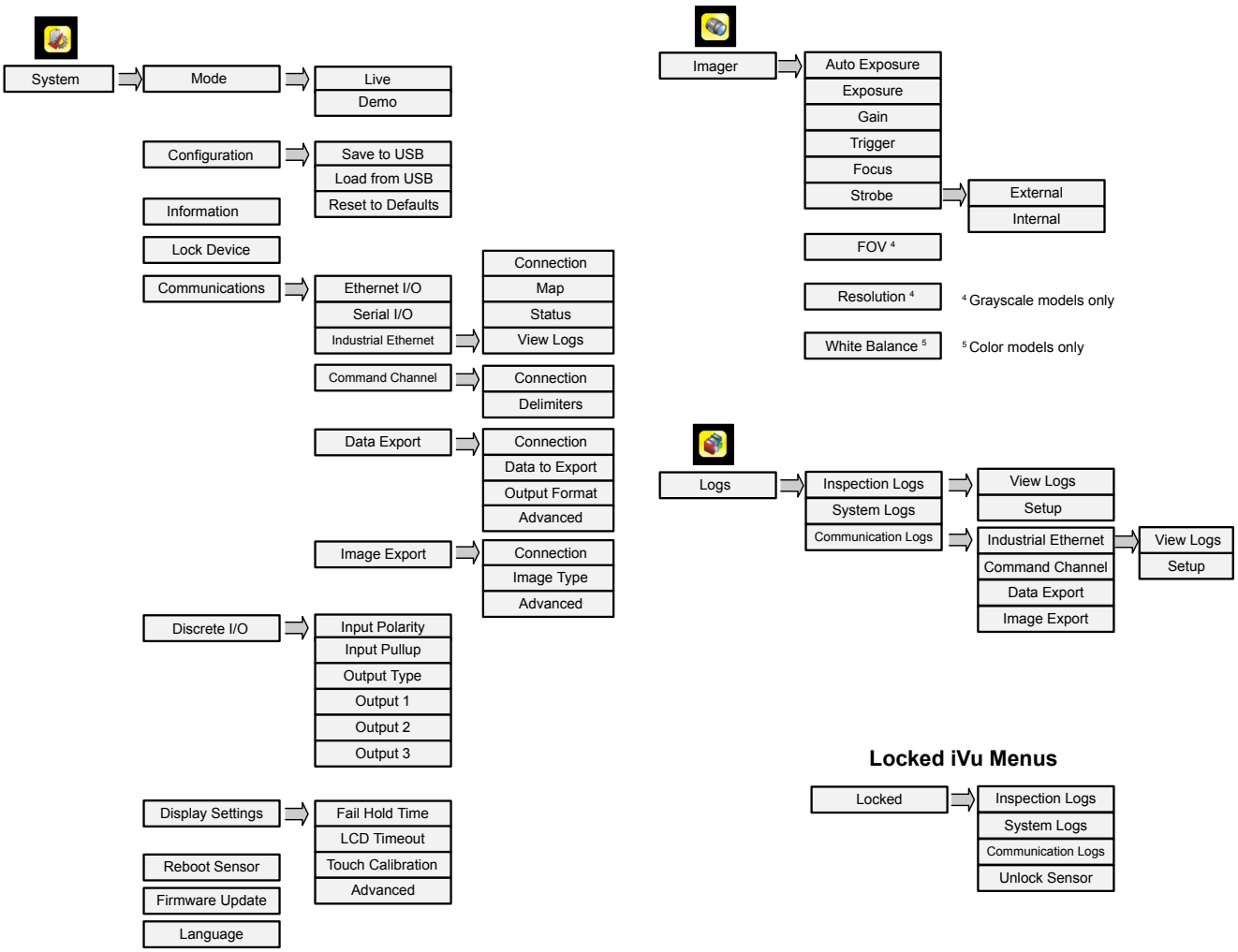


Figure 9. Menu Map - Part 2

Icon Reference

Action Icons

Icon	Description
	The **Main Menu** icon is on the bottom-left corner of the display on the **Home** screen. Click this icon to access sub-menus that are used to set up the iVu.
	The **Inspection** menu icon is located on the **Main Menu**. Click this icon to access parameters that need to be set for the current and all stored inspections.
	The **Imager** menu icon is located on the **Main Menu**. Click this icon to adjust parameters that affect the characteristics of the captured image.
	The **System** menu icon is located on the **Main Menu**. Click this icon to manage the device.
	The **Logs menu** icon is located on the **Main Menu**. Click this icon to set up, view, and save Inspection, Communications, and System Logs.
	The **Home Screen** icon is in the upper-left corner of the display when viewing menus and parameter screens in the **Main Menu**. Click this icon to quickly return to the **Home** screen.
	The **Display Annotations** icon is one of three icons in the upper-left corner of the display while monitoring inspections on the **Home** screen. Click this icon to highlight features that the sensor finds.
	The **Hide Annotations** icon is one of three icons in the upper-left corner of the display while monitoring inspections on the **Home** screen. Click this icon to disable highlighting.
	The **Show Statistics** icon is one of three icons in the upper-left corner of the display while monitoring inspections. Click this icon to show inspection results and input parameters.

Icon	Description
	The **Go Back** icon is located on the lower-left of the display while working in the **Main Menu**. Click this icon to return to the previous screen or menu.
	The **Manual Trigger** icon is located on the lower-right of the display on the **Home** screen. Click this icon to manually capture a new image.
	The **Intensity Selector** is located on the left of the of the **Intensity Range** screen. Click this icon to select the shade of one of the objects of interest. The **Color Selector** is located on the left side of the **Color** screen for the Color Area sensor. Click this icon to select the color of one of the objects of interest. (Color models only.)
	The **Add Mask** icon is on the left side of the display when masking is enabled. Click this icon to add a mask to the currently selected sensor.
	The **Delete Mask** icon is on the left side of the display when a mask is selected. Click this icon to delete a mask from the currently selected sensor.
	The **Circular Mask** icon is on the left side of the display when a mask is selected. Click this icon to cycle through and select a circular, elliptical, or rectangular-shaped mask.
	The **Elliptical Mask** icon is on the left side of the display when a mask is selected. Click this icon to cycle through and select a circular, elliptical, or rectangular-shaped mask.
	The **Rectangular Mask** icon is on the left side of the display when a mask is selected. Click this icon to cycle through and select a circular, elliptical, or rectangular-shaped mask.
	The **Eraser** icon is located on the left side of the screen when a Match tool is in **Edit Pattern** mode. Click this icon to enable erasing pixels from a taught pattern.
	The **Draw** icon is located on the left side of the screen when a Match tool is in **Edit Pattern** mode. Click this icon to enable restoring removed pixels to a taught pattern.

Display Icons

Icon	Description
	The **Inspection Passed** icon is located in the upper-left of the display. This icon indicates that the last inspection passed the test conditions.
	One of the possible **Inspection Failed** icons located in the upper-left of the display. This icon indicates that the last inspection failed.

Acquiring a Good Image

The iVu 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 iVu.
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**

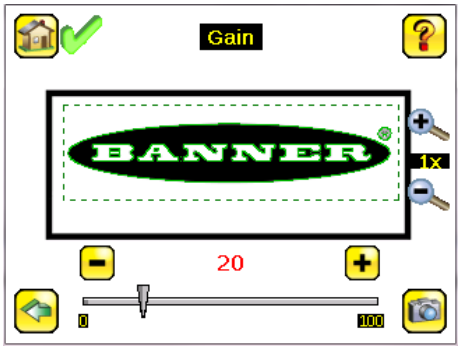


*Figure 10. **Gain** Screen*

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

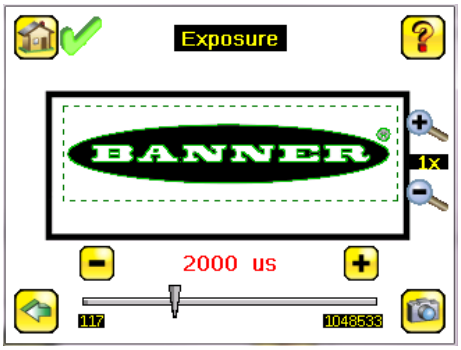


*Figure 11. **Exposure** Screen*

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

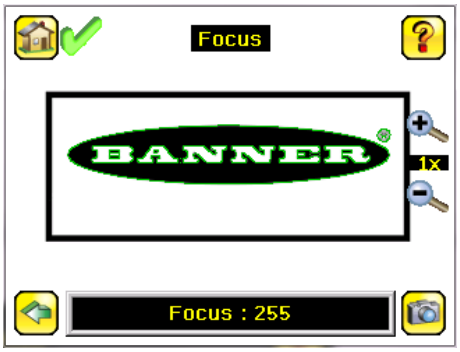


*Figure 12. **Focus** Screen*

5. If you have an iVu color model, perform the white balance procedure to adjust the intensities of the color in the image so that the colors most closely match the actual objects.
   a. Go to **Imager** > **White Balance**.
   b. Move and adjust the white balance Region of Interest (ROI) to surround a white or gray object in the Field of View (FOV). If there is none, place a piece of white paper in front of the iVu to use for the white balance procedure.
   c. Click **Start**. The device moves through a series of triggers. If the sensor is not set to automatically trigger, you must manually click .

Adjust the Focus on a Micro Video Lens Model

1. Use the supplied 1/16 inch hex key to loosen the focusing window locking screw (**D**), then adjust focus on the iVu 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.



Figure 13. Adjust the Focus

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



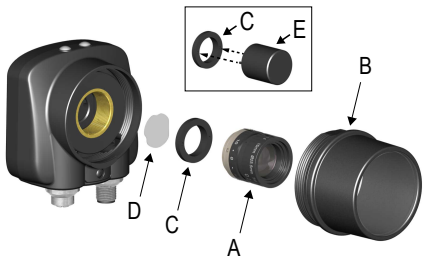
A	Lens
B	Focusing Window
C	Locking Clip
D	Locking Screw
E	Filter Cap
F	Filter

Figure 14. Micro Video Lens Model Components

Note: The filter cap (E) and filter (F) are optional. Filter kits are available separately.

Adjust the Focus on a C-Mount Lens Model

1. Remove the lens enclosure.
2. Adjust the 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.



A C-Mount Lens
B Lens Enclosure
C Retainer Ring
D Filter
E Filter Retainer Ring Tool

Figure 15. C-Mount Lens Model Components

Note: The retainer ring (C) and filter (D) are optional. Filter kits are available separately.

Add a New Inspection

Note: The iVu supports multiple inspections that facilitate storing and controlling up to 30 inspections of different sensor types.

To add a new stored inspection:

1. Go to **Main Menu** > **Inspection** > **Stored Inspections** and click **Add New**.

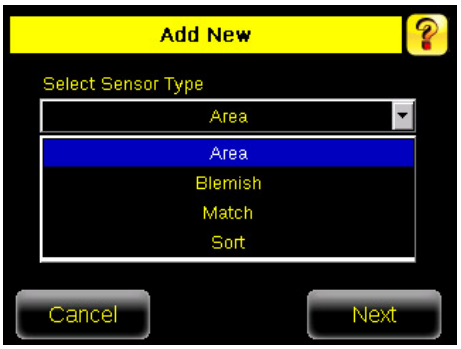


*Figure 16. **Add New** Screen (TG models shown)*

2. Select the Sensor Type for the new inspection, and click **Next**.

Sensor Type	Description
Area Sensor	Use an Area sensor to ensure that a feature, or multiple features, are present on a part. When setting up the iVu 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 verifies that each part or package includes the specified number of features.
Blemish Sensor	Use a Blemish sensor to find flaws on a part (for example, scratches on a disc), or to make sure that a feature exists on a part. Although verifying whether a feature is present on a part is more commonly an Area sensor application, a Blemish sensor may be a better option when dealing with variable materials or uneven lighting.
Match Sensor	Use a Match sensor to verify that a pattern, shape, or part in any orientation matches a reference pattern. Teach the reference pattern 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. If there is more than one of the identified pattern, set the number of expected matches.
Sort Sensor	Use a Sort sensor to recognize and sort up to ten different patterns within the same inspection. Teach each reference pattern during setup. Store reference patterns in one of ten pattern memory locations. A reference pattern might include alphanumeric characters, logos, or any other shapes. The pass criteria can be set for any or all of the patterns.
Average Color (iVu Color models only)	Use an Average Color sensor to visually inspect a part by analyzing all colors in the Region of Interest (ROI) and reducing them to a single set of color values, the average of the combined colors in the ROI. The Average Color sensor is used to report which color, on average, is being seen by the sensor.
Color Compare (iVu Color models only)	Use a Color Compare sensor to verify that a part's color matches a reference color. The Color Compare sensor looks for a statistical match for both the specific hue(s) and relative abundance of colors seen within the ROI.
Color Area (iVu Color models only)	Use a Color Area sensor to separate same color blobs, or Binary Large Objects, from the larger scene and to analyze parts with color variations that cannot accurately be detected by gray scale sensors. Use an Color Area sensor to ensure that a specific color feature, or multiple features, are present on a part. 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 verifies that each part or package includes the correct color and specified number of features.

3. Click the yellow arrow to enter a custom inspection name, if desired.



*Figure 17. **New Inspection** Screen*

4. Click **Done**. The newly created inspection will now be the currently running inspection.

Trigger

Main Menu > **Imager** > **Trigger**

A trigger is a signal that tells the iVu to capture an image and inspect it.

Five trigger options are available:

- **External Trigger**—inspections are triggered in response to an electrical signal on the Trigger input line
- **Internal Trigger** (default)—triggers are based on timed intervals. Select a trigger interval between 10 and 10000 milliseconds

Note: If the interval is less than the inspection time, missed triggers will occur.

- **Free Run**—the iVu automatically runs continuous inspections
- **Industrial Ethernet Only**— only Trigger commands from the Industrial Ethernet communications channel are accepted.
- **Command**—the command channel triggers the iVu from a remote device

Change the Running Inspection

To change the currently running inspection:

1. From the **Home** screen, click **[Inspection name]** in the top center of the screen to display all of the stored inspections.

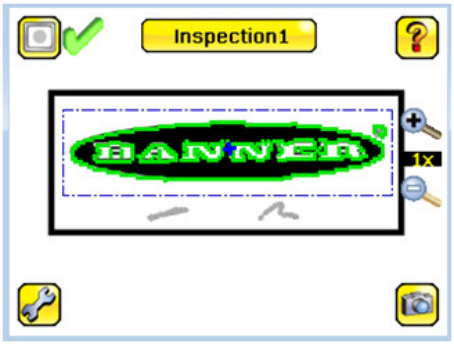


*Figure 18. **Home** Screen*

2. Select the desired inspection and click **Start Running**.

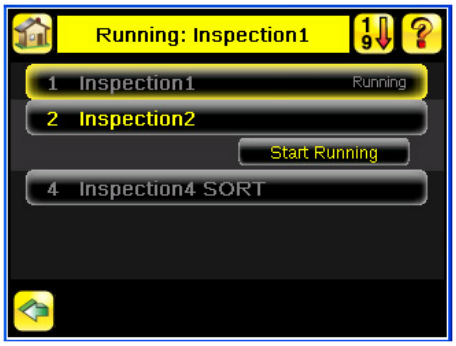


*Figure 19. **Running [Inspection Name]** Screen*

iVu Plus Communication Summary of Ethernet and Serial

The iVu communicates with other devices via Ethernet or a UART serial communications port (RS-232). To establish an Ethernet connection to the iVu, configure the external device with the correct IP address and TCP port. To use the serial communications connection, configure the port settings for baud rate, data bits, parity, and stop bits on the iVu to match the settings of the external device.

Communication Channels

The iVu supports up to four communications channels. To access the channels, go to **Main Menu** > **System** > **Communications**.

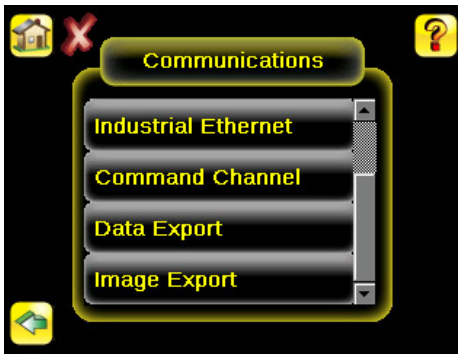


*Figure 20. **Communications** Menu*

- Command Channel—A bi-directional communication protocol that currently supports ASCII and enables other devices to remotely control the iVu and access device information and inspection results
- Industrial Ethernet—A bi-directional communication channel that allows the user to control the device and access device results using Ethernet/IP™[3], Modbus/TCP, PCCC, or PROFINET®[4] protocol
- Data Export—Used to export selected inspection data to a remote device
- Image Export—Used to export inspection images to a remote device

Data export and command channel can be configured for either Ethernet or Serial I/O, but not both. Image export is only available over Ethernet. The following table summarizes valid communication channel configuration options.

Command Channels	Scenario #1		Scenario #2		Scenario #3	
	Ethernet	Serial I/O	Ethernet	Serial I/O	Ethernet	Serial I/O
Command Channel	Yes	No	No	Yes	Yes	No
Industrial Ethernet	Yes	No	Yes	No	Yes	No
Data Export	Yes	No	Yes	No	No	Yes
Image Export	Yes	No	Yes	No	Yes	No

Specifications

Power Connection
12-pin M12/Euro-style male connector; accessory cable required for operation

USB 2.0 Host
4-pin M8/Pico female connector; optional USB cable required for operation of USB flash drive

Ethernet Connection
4-pin M8/Pico male connector

Remote Display Connection
8-pin M12/Euro-style female connector; accessory cable required for remote display

Power Requirements
Voltage: 10 V dc to 30 V dc
Current: 1 A maximum (exclusive of I/O load)

Output Configuration
NPN or PNP, software selectable

Demo Mode
Full tool functionality on canned images

Sensor Lock
Optional password protection

Integrated Ring Light
Models with red, blue, green, infrared, white, ultraviolet or no integrated ring light

Output Rating
150 mA

External Strobe Output
+ 5 V dc

Acquisition
60 fps (frames per second) maximum, with full FOV

Exposure Time
0.1 ms to 1.049 s

Imager
1/3 inch CMOS 752 × 480 pixels; color or grayscale, depending on model
Adjustable Field of View (FOV), grayscale models only

Lens Mount
Micro Video Lens models: M12 × 1 mm thread; micro video lens 4.3 mm, 6 mm, 8 mm, 12 mm, 16 mm, 25 mm
C-Mount models: Standard C-mount (1 inch-32 UN)

Construction
Black PBT sensor housing; die cast zinc back cover; acrylic window
Integrated Display **Weight:** 0.36 kg (0.80 lbs)
Remote Display **Weight:** 0.41 kg (0.90 lbs)

Vibration and Mechanical Shock
Meets IEC 60068-2-6 requirements (Vibration: 10 Hz to 55 Hz, 0.5 mm amplitude, 5 minutes sweep, 30 minutes dwell)
Meets IEC 60068-2-27 requirements (Shock: 30G 11 ms duration, half sine wave)

Environmental Rating
IEC IP67, micro video lens models only

Operating Conditions
Integrated Display **Stable Ambient Temperature:** 0 °C to +45 °C (+32 °F to +113 °F)
Remote Display **Stable Ambient Temperature:** 0 °C to +40 °C (+32 °F to +104 °F)

Certifications

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FCC Part 15 and CAN ICES-3 (A)/NMB-3(A)

This device complies with part 15 of the FCC Rules and CAN ICES-3 (A)/NMB-3(A). Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules and CAN ICES-3 (A)/NMB-3(A). These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the manufacturer.

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