GAMMA SCIENTIFIC
Light Measurement Solutions


# Image Processing Assembly

9925 Carroll Canyon Road San Diego, CA 92131 | 858-279-8034 | contact@gamma-sci.com | www.gamma-sci.com

GAMMA SCIENTIFIC
Light Measurement Solutions

# Image Processing Assembly


The Gamma Scientific Image Processing Assembly (GS-IPA) is a precise angular position and luminance measurement combination designed to measure Head Up Display (HUD) and direct view Multi-Function Displays (MFDs) with a built in touch screen graphical user interface.

The calibrated mechanical component of the Transport utilizes two motor/disc assemblies on the horizontal and vertical axes to control the pitch (altitudinal) and yaw (azimuthal) angles of the thermally stabilized CCD sensor imaging photometer as it is oriented to view and measure angular position as well as luminance of symbology on HUD, CRT or LCD display images.

The motor drive assemblies in the pitch and yaw axis motion have integral high precision absolute angular encoders that allow automatic operation where an internally stored test macro can be loaded, executed and move the Imaging Photometer in a pre-programmed test pattern that typically over-samples the display image in all areas of interest.

The Image Acquisition System (IAS) portion of the instrument consists of a high-resolution temperature controlled CCD sensor coupled to an adjustable focus optical system that allows focusing from 0.8 meters (30 inches) to infinity, allowing measurements of both HUDs and MFDs.

The precise control of the angular position afforded by the motor drives, absolute angular encoders, and the CCD sensor within the IAS allows the GS-IPA to function as an automated theodolite.

In addition, the detector has been tested to have zero defective pixels, tested and corrected for photometric linearity, and each pixel of the detector is calibrated using an ISO/IEC 17025 accredited laboratory standard of spectral radiance to provide low uncertainty display luminance measurement results.

## About Gamma Scientific

Since 1961 Gamma Scientific has produced LED, display and light measurement test solutions for production and R&D environments. Gamma Scientific instruments are trusted by leading global organizations that require high-speed, precision measurements and custom configurations for the most challenging environments. Gamma Scientific also operates a NVLAP accredited laboratory that performs LM-79/LM-80 LED testing and is ISO 17025 compliant. NVLAP Lab Code 200823-0.

To view the complete line of test and measurement solutions from Gamma Scientific, please visit our website at www.gamma-sci.com.

Gamma Scientific
9925 Carroll Canyon Road
San Diego, CA 92131
858-279-8034
contact@gamma-sci.com
www.gamma-sci.com

GAMMA SCIENTIFIC
Light Measurement Solutions

# Image Processing Assembly

The central square of the CCD sensing area can be set from 0.01 degrees to 2 degrees in size to define the luminance measure aperture. The GS-IPA can be considered an "imaging micro-photometer" as well as an automated theodolite.

The CCD sensor sits in the IAS's internal focus transport, which has two inches of travel and enables both manual and optional auto focus capabilities. The auto focus feature of the IAS can be important if the display image being tested is not actually at infinite focus. Most image characteristics are best quantified with the IAS automatically focused on the actual image.

The built in Auto Collimation capability of the IAS assures that precise setting of infinite focus can be set and verified as well as allowing existing HUD holding fixture alignment tooling to be used, greatly reducing the cost of deployment of the GS-IPA to replace existing theodolite based HUD testing solutions.

The IAS is equipped with a photometric filter and additional attenuation to provide a luminance dynamic range of 10,000 footlamberts (34,260 Candelas/$m^2$) to 0.1 footlamberts (0.34 Candelas/$m^2$) utilizing the internal 16 bit analog to digital converter and automatic exposure time determination that provides linearity corrected values. The calibrated values are valid over the full range of focus of the IAS, including the addition of supplemental lenses.

## About Gamma Scientific

Since 1961 Gamma Scientific has produced LED, display and light measurement test solutions for production and R&D environments. Gamma Scientific instruments are trusted by leading global organizations that require high-speed, precision measurements and custom configurations for the most challenging environments. Gamma Scientific also operates a NVLAP accredited laboratory that performs LM-79/LM-80 LED testing and is ISO 17025 compliant. NVLAP Lab Code 200823-0.

To view the complete line of test and measurement solutions from Gamma Scientific, please visit our website at www.gamma-sci.com.

Gamma Scientific
9925 Carroll Canyon Road
San Diego, CA 92131
858-279-8034
contact@gamma-sci.com
www.gamma-sci.com

GAMMA SCIENTIFIC
Light Measurement Solutions

# Specifications

| Image Processing Assembly Specifications | |
|---|---|
| **Image Sensor** | |
| Default Luminance Aperture | Square; 0.01° - 2° |
| Luminance Range | 0.1 to 12000 footlamberts (1/pi*cd/ft²) |
| | 0.1 to 41112 cd/m² |
| Angular Subtense/Pixel | 0.001734°; 0.10405 arc min; 6.243 arc sec |
| Image Sensor Size | 2750H x 2200V pixels |
| Pixel Size | 4.54 micrometers |
| Image Field of View | 4° |
| Focus Range | 80 cm (30 inches) to infinity |
| Luminance Uncertainty* | 200 to 3500 footlamberts (1/pi*cd/ft²) +/-5% |
| | 58 to 1021 cd/m²+/-5% |
| | 3500 to 12000 footlamberts (1/pi*cd/ft²) +/-7% |
| | 1021 to 41112 cd/m² +/-7% |
| Luminance Repeatability* | 3500 to 12000 footlamberts (1/pi*cd/ft²) +/-2% |
| | 1021 to 41112 cd/m² +/-2% |
| **Angular Positioning** | |
| Measurement Accuracy, Azimuth & Elevation | < 4.5° = +/-0.1mRad (+/-21 arc sec) |
| Measurement Accuracy, Azimuth & Elevation | < 10° = +/-0.2mRad (+/- 45 arc sec) |
| Measurement Accuracy, Azimuth & Elevation | < 15° = +/-0.3mRad(+/- 63 arc sec) |
| Measurement Accuracy, Azimuth & Elevation | > 15° = +/-0.020mRad/deg (+/-4.2 arc sec/deg) |
| Movement Range | ±15° elevation ±30° azimuth |
| Maximum Angular Speed | 10 deg/sec |
| Optical Centerline Height | 23.65 cm (9.31 inches) |
| | 33.3 cm (13.12 inches) with F-16 IAIS platform |
| **Control Interface** | |
| Hardware Verification | Less than one minute |
| Boot Time | Less than one minute |
| AC Power Input | Universal power supply; 100-240V, 50-60Hz |
| Communication Interfaces | (2) RS232; (2) 1Gbs Ethernet; (4) USB |
| **Physical Dimensions** | |
| H x W x D Without Display Attached | 39.4 x 25.4 x 27.9 cm (15.5 x 10 x 11 inches) |
| H x W x D With Display Attached | 39.4 x 25.4 x 41.9 cm (15.5 x 10 x 16.5 inches) |
| H x W x D With Display and Platform Attached | 49.3 x 25.4 x 44.5 cm (19.4 x 10 x 17.5 inches) |
| Total Weight | 17.28 kg (38.10 lb) |
| Display with Mount Weight | 5.95 lb |
| Power Supply Weight | .80 kg (1.75 lb) |

*Illuminant A source over the focus range without supplemental lens uncertainty coverage factor 2

GAMMA SCIENTIFIC
Light Measurement Solutions

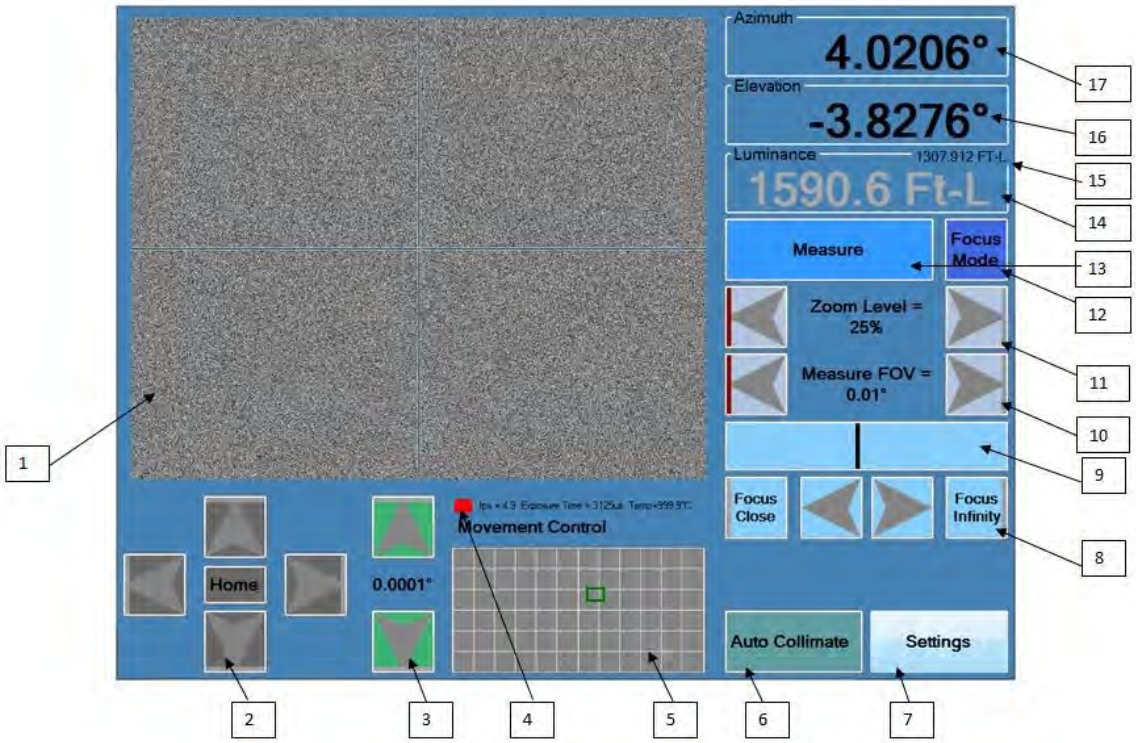
# Environmental Specifications

| Image Processing Assembly Environmental Specifications | |
|---|---|
| **Temperature** | |
| Ambient Temperature | 5° C to 40° C |
| Non-Operating Temperature | -20° C to 65° C |
| | |
| **Humidity** | |
| Ambient Relative Humidity (non-condensing) | 5% to 95% |
| | |
| **Altitude** | |
| Operating | 0 to 6,000 feet |
| Non-Operating | 0 to 20,000 feet |
| | |
| **Vibration Levels** | |
| Frequency Range | Double Amplitude |
| 5 to 15 Hz | 0.06 inch |
| 15 to 25 Hz | 0.04 inch |
| 25 to 55 Hz | 0.02 inch |
| | |
| **Shock** | |
| Operating | None |

*Standard Operating Range for Gamma Scientific Instruments- Temperature: Minimum: 0°C (32°F) - Maximum: 35° C (95°F); Relative Humidity (Non-Condensing): Minimum: 20% - Maximum 70%
**The information contained in this data sheet is based on Gamma Scientific's internal evaluation and is subject to change at any time without notice.
***Revised on April 9, 2015

GAMMA SCIENTIFIC
Light Measurement Solutions

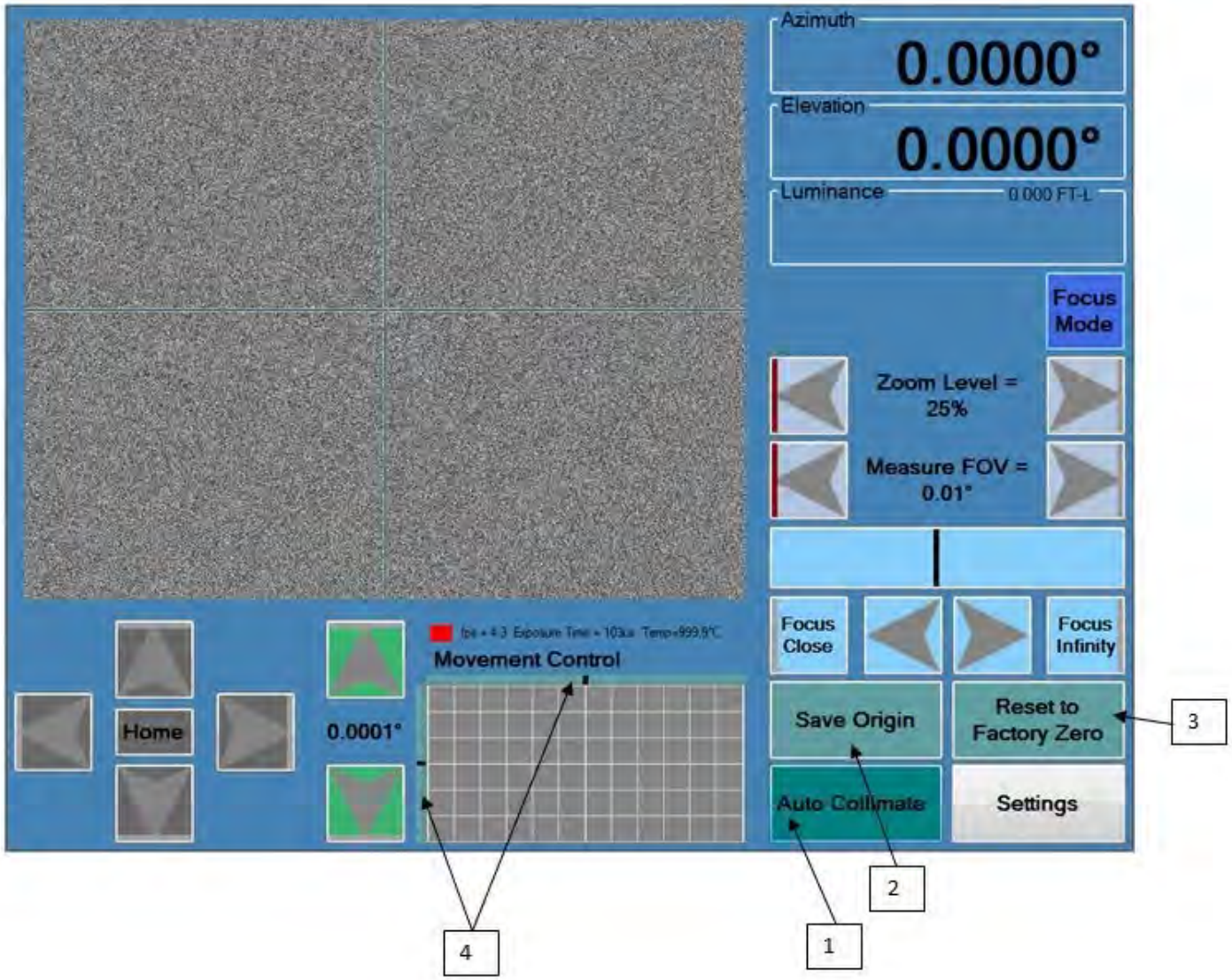
# Normal Operation Mode




1. **Image Display**- The image is shown here. Tap in this area to position the image.
2. **Motor Movement Buttons**- Tap these to move the azimuth or elevation motors by the amount shown between the motor resolution buttons.
3. **Motor Resolution Buttons**- Tap these to control how much the motor movement buttons move the motors.
4. **Status Indicator**- Shows frame rate, exposure time and temperature information. A green indicator indicates system is ready.
5. **Total Range of Motion Indicator Panel**- Tap here to move the motors to the corresponding position. The green box represents the current position.
6. **Auto Collimate Button**- Press this button to initiate the autocollimation process. See the autocollimation page for details.
7. **Settings Button**- press to configure the instrument.
8. **Focus Infinity Button**- tap to move the focus to the default infinity setting. Tap the **Focus Close Button** to focus at the closest possible distance. The arrow buttons move the focus mechanism in between the two extremes.
9. **Focus Range Indicator**- represents the approximate position of the focus mechanism, with the closest position all the way to the left, and infinity all the way to the right. Tapping on the indicator will move the focus to the corresponding position.
10. **FOV Arrow Buttons**- to change the size of the area that is used for measurement data.
11. **Zoom Level Buttons**- to adjust the digital zoom of the instrument.
12. **Focus Mode Button**- to increase the frame rate by reducing exposure time. In this mode, measurements cannot be taken and the image will appear grainier due to higher gain settings that compensate for the reduced exposure time.
13. **Measure Button**- press to take an instantaneous measurement.
14. **Luminance Value-** is displayed here after a measurement is initiated. The reading will initially be black, and then change to grey to indicate that the value may not apply to current conditions.
15. **Instantaneous Approximate Luminance**- is continuously updated and displayed here. This value should not be used for official measurements, but can be used for focusing and preparing the instrument for a measurement.
16. **Elevation Angle**- is shown here. Tap the reading to change the display from decimal degrees (XXX.XXXX°) to degrees/minutes/seconds (XXX°.YY′.ZZ.Z″)
17. **Azimuth Angle**- is shown here. Tap the reading to change the display from decimal degrees to degrees/minutes/seconds.

GAMMA SCIENTIFIC
Light Measurement Solutions

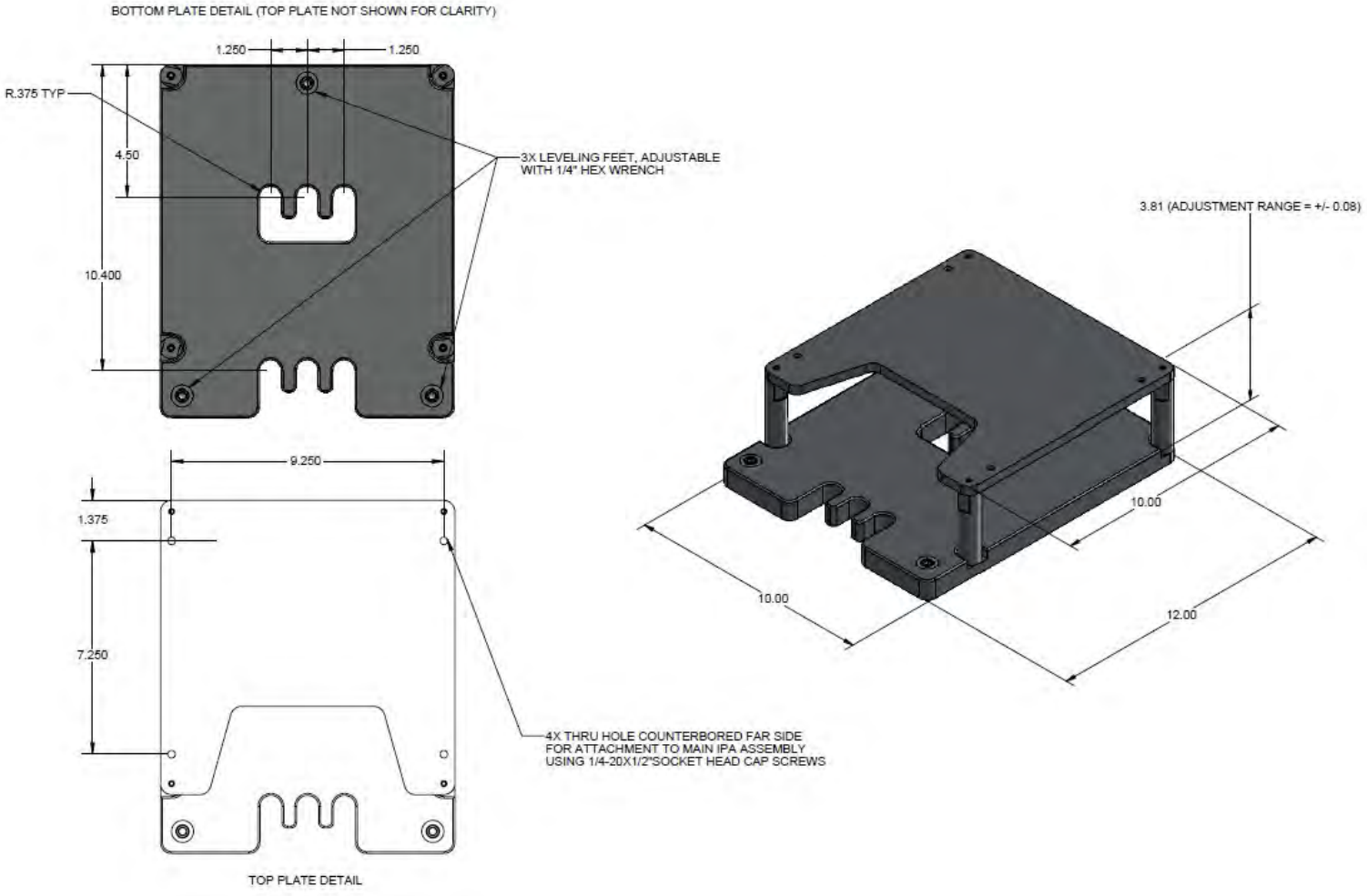
# Autocollimation Mode




1. **Auto Collimation Button**- will turn to dark green while in autocollimation mode. Tap the button to exit this mode.
2. **Save Origin Button**- tap to set the current position to 0.0000°, 0.0000°.
3. **Reset to Factory Zero Button**- tap to set the instrument to its factory zero position. This is recommended before a new autocollimation process, in order to maximize the range of adjustment possible for the next auto collimation.
4. **Autocollimation Limit Indicators** show where the current autocollimation position is relative to the maximum allowed range. Resetting the autocollimation to factory zero will center these indicators.

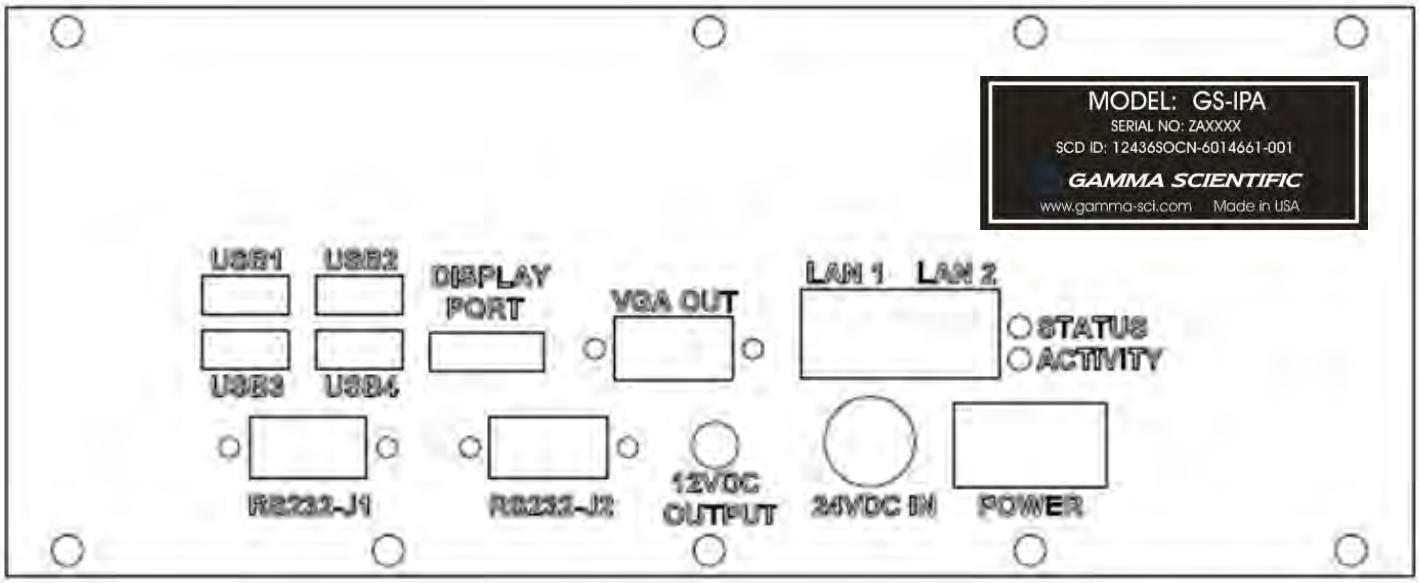
GAMMA SCIENTIFIC
Light Measurement Solutions

# Bottom Plate Detail



GAMMA SCIENTIFIC
Light Measurement Solutions

# ID Markings




MODEL: GS-IPA
SERIAL NO: ZAXXXX
SCD ID: 12436SOCN-6014661-001
GAMMA SCIENTIFIC
www.gamma-sci.com Made in USA

MODEL: 44115
DESCRIPTION: MONITOR ASSEMBLY, GS-IPA
SCD ID: 12436SOCN-6014661-002
GAMMA SCIENTIFIC
www.gamma-sci.com Made in USA

MODEL: 44208
DESCRIPTION: SUPPLEMENTAL LENS, GS-IPA
SCD ID: 12436SOCN-6014661-008
GAMMA SCIENTIFIC
www.gamma-sci.com Made in USA

GAMMA SCIENTIFIC
Light Measurement Solutions

# View of Computer Panel Ports