

LADYBUG®2 SPECIFICATIONS

SPECIFICATION	DESCRIPTION	
Overview	360-degree spherical IEEE-1394b digital video camera system	
Imaging Sensor	Six (6) Sony ICX204AK 1/3" 1024x768 progressive scan CCDs	
A/D Converter	Six (6) Analog Devices AD9849 12-bit analog-to-digital converters	
Data Output	<i>Head Unit</i>	30FPS raw, uncompressed 8bpp (Y8) Bayer-tiled data
	<i>Compressor</i>	See <i>Image Formats</i> section below
Interfaces	<i>Head Unit</i>	1.2Gbps optical link for data transfer to <i>Compressor</i>
	<i>Compressor</i>	1.2Gbps optical link for data transfer from <i>Head</i> 800Mbps IEEE-1394b link for data transfer to PC
Voltage Requirements	8-30V, via external power supply (recommended) or IEEE-1394b interface	
Power consumption	<i>Head Unit</i>	Less than 6.5W
	<i>Compressor</i>	Less than 4.7W
Gain	Automatic/Manual Gain modes 0 to 26dB	
Shutter	Automatic/Manual Shutter modes 0.06ms to 34ms at 30FPS	
Gamma	Range TBD	
Signal To Noise Ratio	TBD	
Dimensions	<i>Head Unit</i>	90mm x 90mm x 110mm
	<i>Compressor</i>	39mm x 43mm x 10mm
Mass	<i>Head Unit</i>	920g
	<i>Compressor</i>	270g
Camera Specification	IIDC 1394-based Digital Camera Specification v1.31	
Emissions Compliance	FCC and CE Class A device	
Operating Temperature	Commercial grade electronics rated from 0° - 45°C	
Storage Temperature	-30° - 60°C	
Camera Upgrades	Firmware upgradeable in field via IEEE-1394b interface.	

OUTPUT IMAGE FORMATS

The *Ladybug2 Head Unit* is capable of streaming raw, uncompressed Bayer Tiled images at 30fps over the fiber-optic interface to the *Ladybug2 Compressor*. The *Compressor* is able to stream images to the host's local hard drive in the following formats:

COMPRESSION	DATA
None	Individual 1024x768 Y8 images (controlled by the PAN register)
None	One (1) 1024x4608 image (made up of 6 uncompressed images)
None	One (1) 512x9216 image (made up of 24 uncompressed images, representing 6 groups of R/G/G/B Bayer tiles)
JPEG	Six (6) JPEG compressed Bayer images
JPEG	One (1) 512x9216 image (made up of 24 JPEG compressed images, representing 6 groups of R/G/G/B Bayer tiles)

STATUS LED

LED Status	Fiber LED	1394b LED
Off	No communication between <i>Head</i> and <i>Compressor</i> over optical connection	No power
Solid green	<i>Head</i> sending images; communication between <i>Head</i> and <i>Compressor</i>	Transmitting images over 1394b
Solid half-red	<i>Head</i> sending images, but no communication between <i>Head</i> and <i>Compressor</i>	Not transmitting images over 1394b
Flashing half-red and full-red pulses	<i>Head</i> not sending images, but communication between <i>Head</i> and <i>Compressor</i>	Accessing <i>Ladybug2</i> registers
Flashing green / red	Firmware update in progress	

GENERAL FEATURES

- High Quality Imaging:** Six (6) closely-packed Sony 1024x768 CCDs placed within 20mm of each other help reduce parallax effects common with most omnidirectional cameras. High quality 2.4mm microlenses enable the system to collect video from more than 75% of the full sphere.
- High-Speed Data Rates:** The *Ladybug2 Head Unit* is capable of acquiring and streaming images to the *Ladybug2 Compressor Unit* at 30FPS. The *Compressor* can perform JPEG compression and stream data to the local hard drive at up to 80MB/sec via the IEEE-1394b interface.
- Independent Imaging Control:** The camera employs six 12-bit A/D converters that allow the gain, brightness, and white balance settings for all six CCDs to be controlled individually or slaved off one sensor.
- Onboard Calibration:** Accurate calibration parameters for lens distortions and camera misalignments stored on the *Head Unit*.
- Image Processing:** The *Ladybug SDK* provides a full C/C++ API and demo software for decompressing, stitching and blending image data in real-time or as a post-processing step.
- System Portability:** The *Ladybug2 Head Unit* can be powered directly via a wall wart or via a power link to the *Compressor*.
- Upgradeable Firmware:** The camera employs a design that allows in-field firmware upgrades via the IEEE-1394b interface.

CONTACTING POINT GREY RESEARCH

Email:

For all general questions about Point Grey Research please contact us at info@ptgrey.com.
For technical support (existing customers only) contact us at www.ptgrey.com/support/contact/.

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Knowledge Base:

Find answers to commonly asked questions in our knowledge base at www.ptgrey.com/support/kb/.

Downloads:

Users can download the latest manuals and software from www.ptgrey.com/support/downloads/.

Getting Started

LADYBUG®2 1394b Spherical Vision System

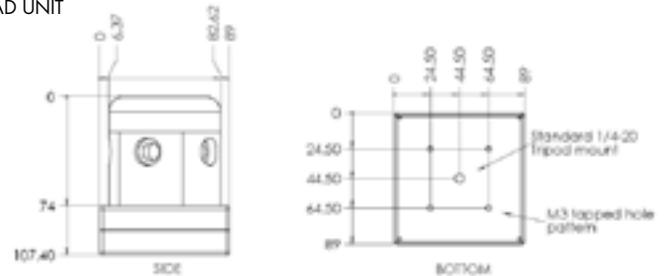
The following items are included with your *Ladybug2 Development Accessory Kit*

- *Ladybug2 Head Unit* and *Ladybug2 Compressor Unit*
- 4.5 meter, 9-pin to 9-pin, IEEE-1394b cable
- 4.5 meter, 6-pin to 9-pin, 1394a-to-1394b cable
- 4.5 meter, 4-pin to 9-pin, 1394a-to-1394b cable
- IEEE-1394b OHCI PCI Host Adapter 3 port-800Mbps card
- 24V 2.5A power supply with standard connector and wall wart
- 10 meter, 62.5/125um fiber optic cable
- 10 meter, 3-pin power link cable
- *Ladybug SDK* (C/C++ API and device drivers) CD
- *Ladybug2 Getting Started Manual*

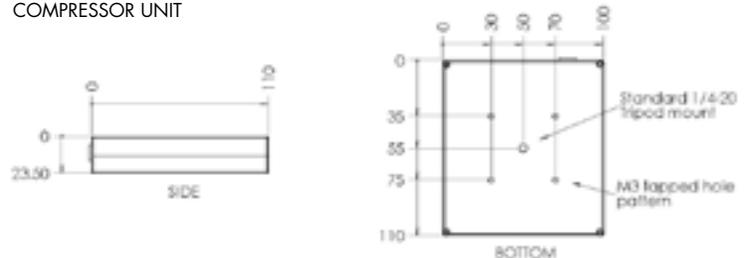


TECHNICAL DRAWINGS

HEAD UNIT

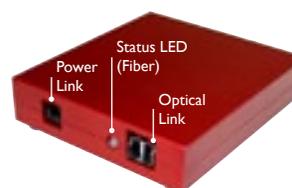


COMPRESSOR UNIT

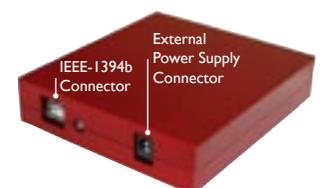


PHYSICAL DESCRIPTION

Compressor (to Head)



Compressor (to PC)



Head Unit



1 Installation

1. Recommended System Configuration

OS	CPU	RAM	VIDEO	PORTS
Windows XP SP1 or Vista	2Ghz or faster	1 GB	NVIDIA 128mb	IEEE-1394b

- Windows XP or Vista
- Point Grey FirePRO driver
- Intel Pentium 4 2Ghz+ processor or compatible processor
- 1 GB of RAM
- NVIDIA video card with 128 MB RAM
- IEEE-1394b PCI Express interface card
- Striped disk RAID array to store streaming data at more than 80MB/sec
- Microsoft Visual Studio 2005 (to compile and run example code)

2. Electrostatic Precautions and Camera Care

- Users who have purchased a bare board camera should:



- Either handle bare handed or use non-chargeable gloves, clothes or material. Also use conductive shoes.
- Install a conductive mat on the floor or working table to prevent the generation of static electricity.



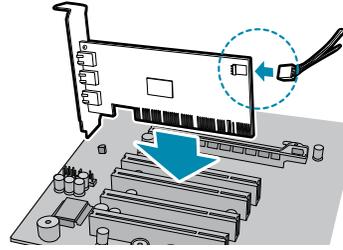
- When handling the camera unit, avoid touching the lenses. To clean the lenses, use a standard camera lens cleaning kit or a clean dry cotton cloth. Do not apply excessive force.

- To clean the imaging surface of your CCD, follow the steps outlined in www.ptgrey.com/support/kb/index.asp?a=4&q=66.
- Extended exposure to bright sunlight, rain, dusty environments, etc. may cause problems with the electronics and the optics of the system.
- Avoid excessive shaking, dropping or mishandling of the device.

2 Installation

3. Install the IEEE-1394b PCIe card (Desktop) or IEEE-1394b Express Card (Laptop)

- Turn computer off and place the IEEE-1394b PCI card in an open PCI slot.



- Connect the 4-pin connector on the card to the PC power supply.
- Turn the computer back on and log into Windows.
- In most cases, the Windows IEEE-1394 drivers will be automatically installed for the card, with no user input required. However, in some cases the **Found New Hardware Wizard** will appear. Follow the prompts given by the Wizard to install the card.
- Open Windows Device Manager by going to the **Control Panel > System > Hardware tab > Device Manager**. Ensure the PCI card is properly installed as an **IEEE 1394 Bus host controller**.

4. Install the Ladybug Software and Drivers



- Insert the Ladybug software CD-ROM. If the Installation Wizard does not automatically run, browse to your CD-ROM directory and run the **setup.exe** file.

- Follow the installation instructions to install the software.



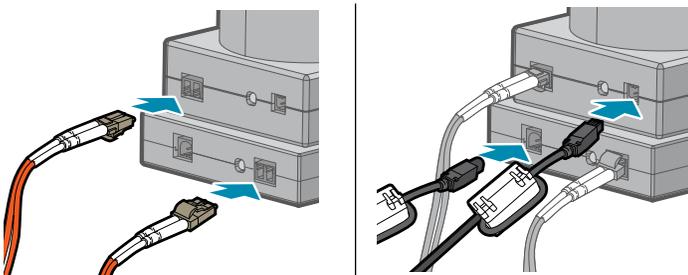
IMPORTANT NOTE for Windows XP and Vista Users

- A dialog will appear asking if you want to install Point Grey's FirePRO driver. If you are running Vista, XP SP2, or XP SP3, users must install and use the FirePRO driver to achieve S800 speeds. For more details, refer to the following Knowledge Base articles: <http://www.ptgrey.com/support/kb/index.asp?a=4&q=258> <http://www.ptgrey.com/support/kb/index.asp?a=4&q=171>

3 Installation

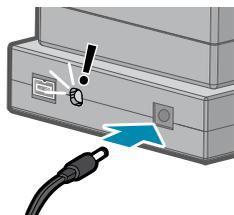
3. Connect the Head to the Compressor

- Remove the protection plugs from the ends of the orange fiber optics cable and plug cable into the Optical Link connectors of the *Head* and *Compressor*. NOTE: avoid tight bends in the cable, which can affect data transmission.
- Plug the 10m 3-pin power link cable into the Power Link connectors of the *Head* and *Compressor*.



4. Connect the External Power Supply to the Compressor

- Plug the 24V 2.5A external power supply into the *Compressor* External Power Supply Connector. The Status LEDs on the 1394b bus side of the *Compressor* and the *Head* should both turn on (see "Status LEDs" section above)

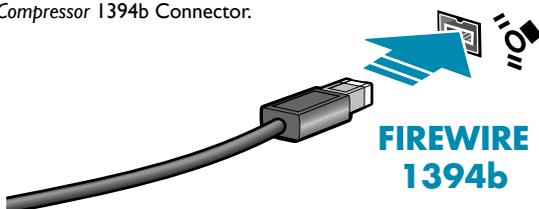


*Power Plug Type:

5.5 mm (OD) x 2.1 mm (ID), male, center-positive

5. Connect the 1394b PCI Card and Cable to the Compressor

- Plug the 4.5 meter, 9-pin to 9-pin, IEEE-1394b cable into the 1394b PCI card and the *Compressor* 1394b Connector.



- In most cases, the MS Windows "Found New Hardware Wizard" will appear and prompt you to install the driver. Proceed to Step 6.

4 Troubleshooting

- The Ladybug User Guide (**Programs > Point Grey Research > PGR Ladybug > Documentation**) provides detailed installation information. Our on-line **Knowledge Base** (<http://www.ptgrey.com/support/kb/>) also addresses the following problems:

- Article 21: Troublesome hardware configurations
- Article 91: PGR camera not recognized by system and not listed in Device Manager
- Article 258: Which Point Grey camera driver should I use?
- Article 171: Performance of 1394 devices may decrease after installing Windows XP SP2
- Article 188: Image data acquired by my camera is corrupt and displayed images are broken

5 Other References

- The Ladybug User Guide (**Programs > Point Grey Research > PGR Ladybug > Documentation**) provides other references.

- Ladybug SDK Help
- Ladybug3 Technical Reference

- Knowledge Base Articles:

- Article 91: PGR camera not recognized by system and not listed in Device Manager
- Article 171: Performance of 1394 devices may decrease after installing Windows XP SP2
- Article 188: Image data acquired by my camera is corrupt and displayed images are broken
- Article 21: Troublesome hardware configurations