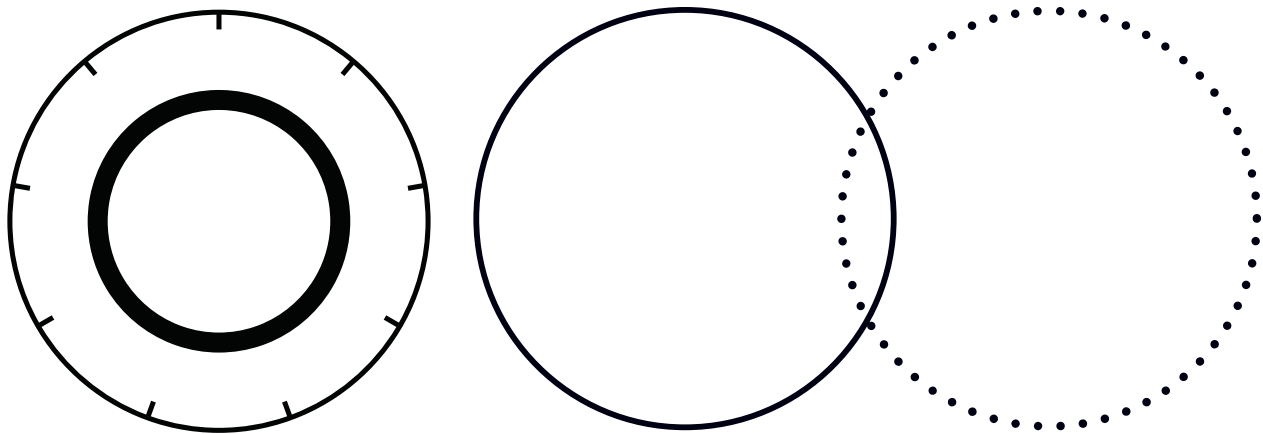


LaserCam-HR II

Operator's Manual



LaserCam-HR-II
Beam Diagnostics Digital CCD Camera
USB 2.0

Operator's Manual



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Should you experience any difficulties with your laser or need any technical information, please visit our website: www.Coherent.com. Additional support can be obtained by contacting our Technical Support Hotline at 1.800.367.7890 (1.408.764.4557 outside the U.S.), or e-mail Product.Support@Coherent.com. Telephone coverage is available around the clock (except U.S. holidays and company shutdowns).

If you call outside our office hours, your call will be taken by our answering system and will be returned when the office reopens.

If there are technical difficulties with your laser that cannot be resolved by support mechanisms outlined above, e-mail, or telephone Coherent Technical Support with a description of the problem and the corrective steps attempted. When communicating with our Technical Support Department via the web or telephone, the Support Engineer responding to your request will require the model and Laser Head serial number of your laser system.

Outside the US:

If you are located outside the U.S., visit our website for technical assistance or contact our local service representative. Representative phone numbers and addresses can be found on the Coherent website: www.Coherent.com.

Coherent provides telephone and web technical assistance as a service to its customers and assumes no liability thereby for any injury or damage that may occur contemporaneous with such services. These support services do not affect, under any circumstances, the terms of any warranty agreement between Coherent and the buyer. Operation of any Coherent laser with any of its interlocks defeated is always at the operator's own risk.

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1 Introduction

1.1 Preface

This manual contains user information for the LaserCam-HR II™ Beam Diagnostics Digital CCD camera.

1.2 Signal Words and Symbols in this Manual

This documentation may contain sections in which particular hazards are defined or special attention is drawn to particular conditions. These sections are indicated with signal words in accordance with ANSI Z-535.6 and safety symbols (pictorial hazard alerts) in accordance with ANSI Z-535.3 and ISO 7010.

1.2.1 Signal Words

Four signal words are used in this documentation: **DANGER**, **WARNING**, **CAUTION** and **NOTICE**.

The signal words **DANGER**, **WARNING** and **CAUTION** designate the degree or level of hazard when there is the risk of injury:

DANGER!

Indicates a hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING!

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION!

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

The signal word '**NOTICE**' is used when there is the risk of property damage:

NOTICE

Indicates information considered important, but not hazard-related.

Messages relating to hazards that could result in both personal injury and property damage are considered safety messages and not property damage messages.

1.2.2

Symbols

The signal words **DANGER**, **WARNING**, and **CAUTION** are always emphasized with a safety symbol that indicates a special hazard, regardless of the hazard level:



This symbol is intended to alert the operator to the presence of important operating and maintenance instructions.



This symbol is intended to alert the operator to the danger of exposure to hazardous visible and invisible laser radiation.



This symbol is intended to alert the operator to the presence of dangerous voltages within the product enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



This symbol is intended to alert the operator to the danger of Electro-Static Discharge (ESD) susceptibility.



This symbol is intended to alert the operator to the danger of crushing injury.



This symbol is intended to alert the operator to the danger of a lifting hazard.

1.3

Publication Updates

To view information that was added or changed since this publication went to print:

1. Connect to www.Coherent.com.
2. Type **LaserCam-HR II** in the Site Search box (top right of the screen).
3. Click the **LaserCam-HR II** link in the search results.
4. Click the **Literature** tab.

2 Safety and Compliance

This section describes requirements for safety and for compliance for persons setting up or operating the LaserCam-HR II camera.

2.1 General Safety Warnings and Cautions

Carefully review the following safety information to prevent personal injury or damage to this instrument or any sensor connected to it. This equipment has no user-serviceable parts. For service information, refer to “Contact Service” (p. 33).



WARNING!

Do not operate the camera if its panels are removed or any of the interior circuitry is exposed.



WARNING!

Do not operate the camera in wet or damp conditions, or in an explosive atmosphere.



NOTICE

Operate the camera only within the specified voltage range.



CAUTION!

Do not operate the camera if there are suspected failures. Refer damaged equipment to qualified Coherent service personnel.



WARNING!

Use of controls or adjustments or performance of procedures other than those specified in this manual can result in exposure to hazardous radiation.

2.2 Laser and Optical Safety

Laser light, because of its optical qualities, poses safety hazards not associated with light from conventional light sources. The safe use of lasers requires all operators, and everyone near the laser system, to be aware of the dangers involved. Users must be familiar with the instrument and the properties of coherent, intense beams of light.

At all times, make sure that all personnel who operate, maintain or service the laser are protected from accidental or unnecessary exposure to laser radiation exceeding the accessible emission limits defined in the laser safety standards.



WARNING!

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT!

The greatest concern when using a laser is eye safety. In addition to the main beam, there are often many smaller beams present at various angles near the laser system. Always wear appropriate laser safety eyewear for protection against the specific wavelengths and laser energy being generated.



CAUTION!

Laser safety eyewear protects the user from accidental exposure to laser radiation by blocking light at the laser wavelengths. However, laser safety eyewear may also prevent the operator from seeing the beam or the beam spot. Exercise extreme caution even while wearing safety glasses.

For safety information specific to the use of lasers, read and obey all respective documentation provided by the manufacturer of the laser system being used.

2.3 Electrical Safety

The LaserCam-HR II UVcamera does not have dangerous voltages.



NOTICE

The LaserCam-HR II UV camera is designed to be operated as assembled; there are no user-serviceable components in the device. **DO NOT** disassemble the enclosure. *The Warranty is void if the enclosure is disassembled!*

2.3.1

Electrostatic Discharge (ESD)



CAUTION!

Electrostatic charges as high as 4000 volts easily collect on the human body and equipment and can discharge without detection.

Although the electronics features have input protection, permanent damage can occur on devices subjected to high-energy electrostatic discharges. You must take correct ESD precautions to prevent damage or performance degradation.

The most common ESD damage occurs when handling a device during installation or use. Take the necessary measures to protect the system from ESD.

Dry air and carpet also create a higher potential for ESD. Remember to take precautions or shielding not only for operations, but for demonstrations or trade show exhibitions.

When mobile equipment (a cart or table) is used as an ESD-protected workstation, connect it to ESD ground that meets ANSI/ESD S4.2 required limits for an ESD-protected workstation ($<1 \times 10^9$ ohms).

2.3.2

Electrical Safety Precautions

Everyone must observe the electrical safety precautions when work is done with potentially hazardous electrical circuitry.



DANGER!

When working with electrical power systems, the rules for electrical safety must be strictly followed. Failure to do so could result in the exposure to lethal levels of electricity.



WARNING!

Normal operation of the camera should not require access to the power supply circuitry. Removing the power supply cover exposes the user to potential electrical hazards. Contact an authorized service representative before attempting to correct any problem with the power supply.

2.3.3

Safety Features and Compliance with Government Requirements

The following features are incorporated into the instrument to conform to government requirements:

European Union:

The European Community requirements for product safety are specified in the Low Voltage Directive (LVD) (published in 2014/35/EU). The Low Voltage Directive requires that lasers comply with the standard EN 61010-1/IEC 61010-1 "Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use" and IEC 60825-1 "Safety of Laser Products". Compliance of this laser with the European Union requirements is certified by the CE mark.

2.3.4

International Standards and Sources of Additional Information

Following are sources for information about electrical safety standards, as well as safety equipment and training.

Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use

IEC 61010-1 / EN 61010-1

International Electrotechnical Commission (IEC)

www.iec.ch

2.4 Compliance

This section describes compliance with various government requirements for safety, environmental regulations, and control law.

2.4.1 Environmental Compliance

2.4.1.1 Electromagnetic Compatibility

Compliance of this laser with the Electromagnetic Compatibility (EMC) requirements is certified by the CE mark and the UKCA mark.

Each application and installation is unique, and in some cases, the user may experience Electromagnetic Interference (EMI) noise being emitted from various electronic components. This laser may use high-frequency RF. While adequate countermeasures have been taken to suppress this emission to meet the requirements stated on the Declaration of Conformity, the user may wish to employ additional measures to suppress the EMI to reduce the emissions further. Standard methods of reducing the EMI are:

1. Use of shielded control cables grounded on both ends
2. Addition of appropriate ferrite beads to cables connected to the beam source.

2.4.1.2 RoHS Compliance

Coherent product(s) conform to all applicable requirements of the EU-RoHS Directive (2011/65/EU) and subsequent Amendment Directives including Directive (EU) 2015/863. Compliance Declarations are available upon request.

2.4.1.3 China RoHS Compliance

Coherent product(s) conform to all applicable requirements of Restriction of Hazardous Substances Regulation SJ/T 11364-2014 commonly referred to as China RoHS.

Hazardous substances (if applicable) in the LaserCam-HR II are listed in the material declaration table included with the equipment, REACH Compliance.

Coherent product(s) conform to all applicable requirements of the EU-REACH Regulation, (1907/2006). Compliance Declarations are available upon request.

The LaserCam-HR II UV camera is a green and environmentally friendly product with electronic and electrical components that can be recycled appropriately. This is identified by the Green logo shown in Figure 2-1. This label is attached on the underside of the camera.



Figure 2-1. China RoHS Green Label

Hazardous substances in the LaserCam-HR II are shown on the China RoHS Compliant Components table in Figure 2-1.

Figure 2-2. China-RoHS Compliant Components

部件名称 Part Name	有害物质 Hazardous Substances						
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)	
电缆装配 Cable Assembly	X	O	O	O	O	O	
本表格依据SJ/T 11364的规定编制							
O: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。 X: 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。							

2.4.1.4

Waste Electrical and Electronic Equipment (WEEE, 2002)

The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) is represented by a crossed-out garbage container label. The purpose of this directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection.

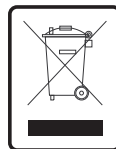


Figure 2-3. Waste Electrical and Electronic Equipment Label

2.4.2 Product Labels

Product labels that show the compliance symbols discussed in this section, and their placement, are shown in the example in Figure 2-4.



Figure 2-4. Product Labels and Placement

2.4.3 Export Control Laws Compliance

It is the policy of Coherent to comply strictly with U.S. export control laws.

Export and re-export of lasers manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations.

The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or re-export of certain articles. When there is uncertainty about the obligations imposed by U.S. law, clarification must be obtained from Coherent or an appropriate U.S. Government agency.

Products manufactured in the European Union, Singapore, Malaysia, Thailand: These commodities, technology, or software are subject to local export regulations and local laws. Diversion contrary to local law is prohibited. The use, sale, re-export, or re-transfer directly or indirectly in any prohibited activities are strictly prohibited.

2.4.4 Declaration of Conformity

Declaration of Conformity certificates are available upon request.

3 Description and Specifications

The LaserCam-HR II beam diagnostics cameras use laser-grade 1/2-inch and 2/3-inch CCD sensors. They are used for detection and analysis of laser beam profiles from ~150 micron to 4 mm in diameter (1/2-inch camera) and ~150 micron to 6 mm in diameter (2/3-inch camera).

The 1/2-inch model is a 12-bit camera with 4.6 micron pixel size. The 2/3-inch model is a 14-bit camera offering wider dynamic range with a 6.5 micron pixel size.

LaserCam-HR II characteristics include excellent signal-to-noise ratio and linear response for accurate beam dimension and uniformity measurements. They also have high overexposure protection for distortion-less measurements of saturated beam profiles.



Figure 3-1. USB Cable

Other features include:

- USB 2.0 digital interface
- Compact design minimizes space required in optical train
- Mountable in any orientation for maximum flexibility. Camera markings provide for X and Y alignments
- Uses a single interface cable for data and power
- A Low Distortion Face Plate (LDFP) that minimizes room light, protects the CCD array, and provides laser grade quality attenuation of 2500:1

- High sensitivity and dynamic range
- No lag, geometric distortion, or image burn-in
- Accepts C-mount optics, including all Coherent optical sampling, attenuation, and UV conversion accessories
- High resolution: 1280 x 1024 active picture elements (pixels)
- Requires only USB 2.0 connections
- CE compliant when used with a CE-compliant computer and cables

3.1 Parts and Accessories List

Table 3-1 shows the parts that can be ordered for the LaserCam-HR II system.

Table 3-1. Parts and Accessories List

Item	Part Number
LaserCam-HR II 1/2-inch USB Camera System (RoHS)	1282868
LaserCam-HR II 2/3-inch USB Camera System (RoHS)	1282870
Low Distortion Face Plate (LDFP)	1255961
Trigger In and Pass/Fail Output Cable (RoHS)	1120313
USB Cable, 3.0 meter (RoHS)	1114614
LaserCam-HR II Shipping Container	1073686
LaserCam-HR II CD (includes PDF User Manual)	1186807

3.2

Dimensions

Figure 3-2 shows the physical dimensions of the LaserCam-HR II camera.

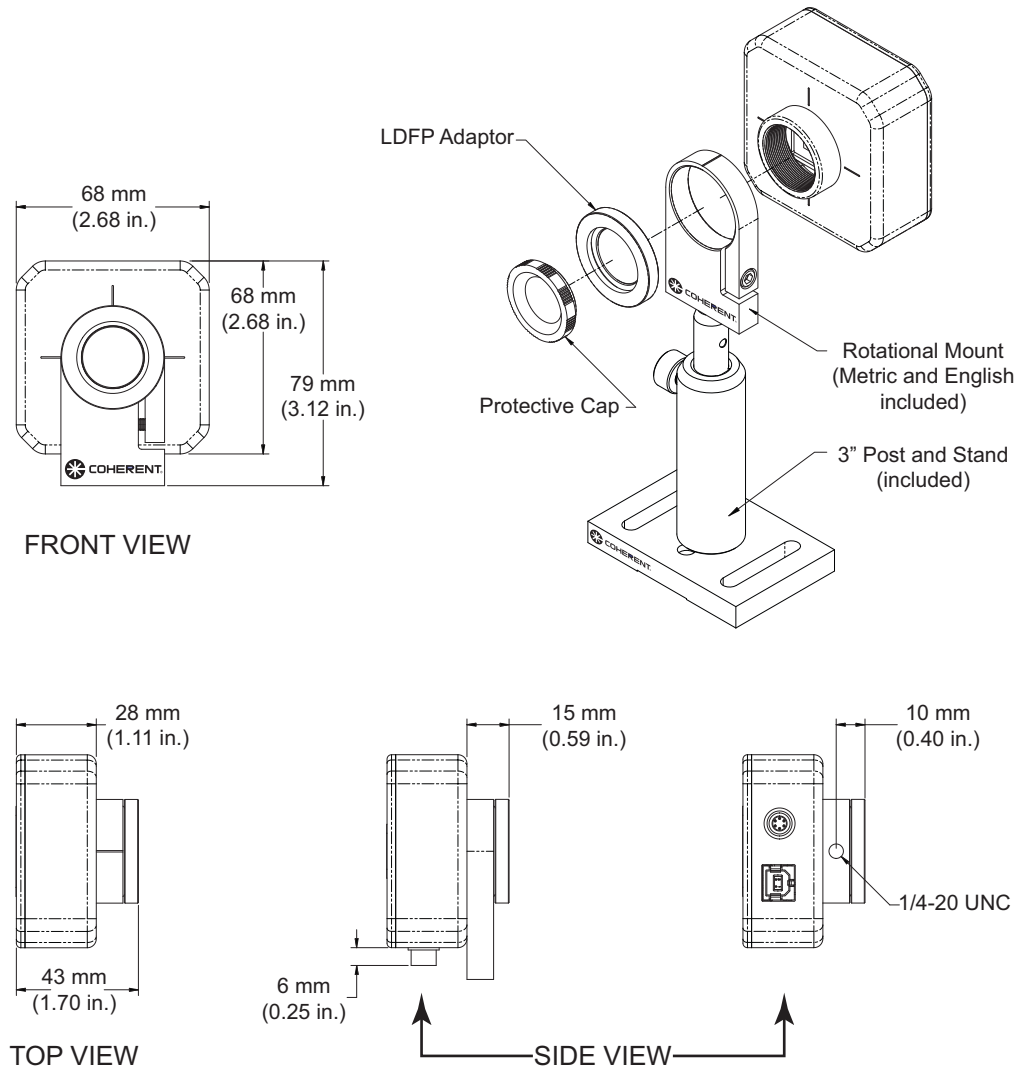


Figure 3-2. LaserCam-HR II Dimensions

3.3 Specifications

Table 3-2 shows specifications for the LaserCam-HR II.

Table 3-2. LaserCam-HR II Specifications (Sheet 1 of 2)

	LaserCam-HR II (1/2-inch)	LaserCam-HR II (2/3-inch)
Sensor Elements (pixels)	1280 x 1024	
Pixel Size (μm)	4.6 x 4.6	6.5 x 6.5
Sensor Active Area (mm) (H x V)	5.9 x 4.8	8.3 x 6.6
Camera Bit Depth	12-bit	14-bit
Spectral Range (nm) without LDFP with LDFP included with BIP-12F accessory	190 to 1100 ^a 400 to 1100 190 to 355	
Recommended Beam Diameter (mm)	0.15 to 4.0 ^b	0.2 to 6.0 ^b
Glassless Sensor	Low Distortion Face Plate is removable	
Low Distortion Face Plate	Laser-grade ND filter	
(LDFP, LDFP-UV)	OD = 2.5 at 632.8 nm	
Electrical Interface	USB 2.0	
Capture Modes	Continuous (CW), pulsed	
Variable Exposure Time	1 to 500 msec, default at 5 msec	
Pulsed Mode Trigger Methods	Trigger In (TTL)	
Trigger Delay (μs)	75	20
Maximum Pulse Trigger In Rate (Hz)	200 (without averaging adjacent pulses)	
Maximum Frame Rate (FPS) Live video, no calculations Capture with calculations	15 10	
Damage Threshold without LDFP	32 mJ/cm ² at 1064 nm	

Table 3-2. LaserCam-HR II Specifications (Sheet 2 of 2)

	LaserCam-HR II (1/2-inch)	LaserCam-HR II (2/3-inch)
CW Saturation with LDFP without LDFP with LDFP without LDFP	13 mW/cm ² at 633 nm 5 μ W/cm ² at 633 nm 70 mW/cm ² at 1064 nm 340 μ W/cm ² at 1064 nm	5 mW/cm ² at 633 nm 2 μ W/cm ² at 633 nm 25 mW/cm ² at 1064 nm 125 μ W/cm ² at 1064 nm
Pulsed Saturation with LDFP without LDFP	0.4 mJ/cm ² at 1064 nm 2 μ J/cm ² at 1064 nm	0.15 mJ/cm ² at 1064 nm 0.7 μ J/cm ² at 1064 nm
USB 2.0 Cable	10 ft. standard A/B cable (included)	
Trigger Connector	BNC receptacle (trigger cable included)	
Part Number	1282868	1282870

a. There is a risk of degradation in the 190 to 300 nm range due to DUV exposure. The optional BIP-12F UV-to- visible fluorescence converter can be used to prevent drift.

b. It is possible to measure smaller diameter beams, but resolution is reduced.

4 Installation and Setup

This section provides information about setup and installation.

4.1 Install Software

4.1.1 System Requirements

It is recommended that you use the most current and robust workstation possible. Support is provided on the following operating systems:

- Windows v10, v11 (32- and 64-bit)

In addition, the workstation must meet the following minimum requirements:

- CPU: 2.5 GHz or faster processor
- RAM: Minimum of 2 GB of RAM
- Available hard disk space: 10 GB
- USB 2.0 high-speed port
- Display: 1280 x 1024 screen resolution
- Microsoft .NET Framework 4.0 or higher. If no version (or an older version) is found on the workstation, then the installation program installs a version of Microsoft .NET Framework.

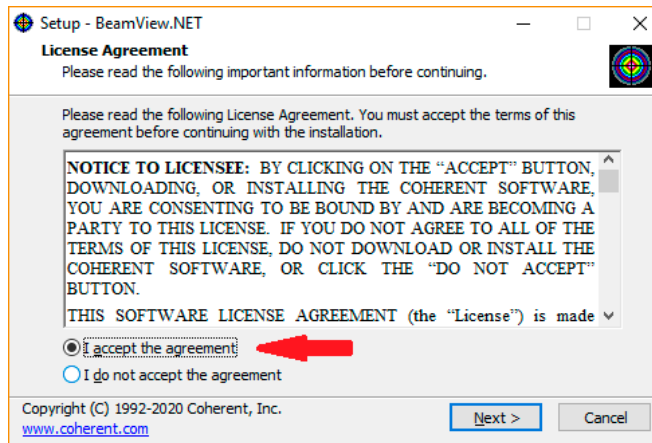
4.1.2 Installation Steps

Refer to the *BeamView.NET User Manual* (1416724) for complete software installation instructions.

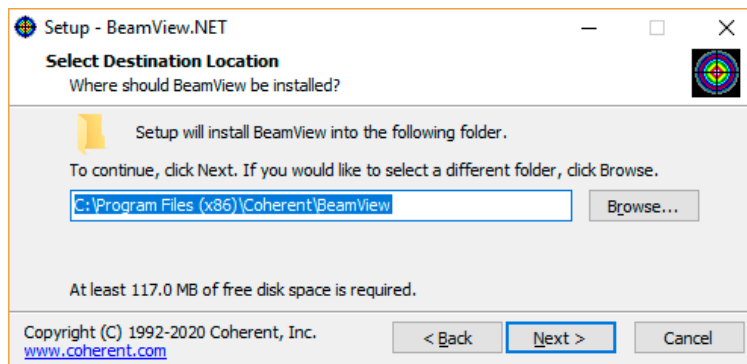
the Beamview.NET software and manual:

1. Connect to www.Coherent.com/resources/.
2. Type **BeamView.NET** in the Site Search box
3. Download the latest version of the BeamView.NET software, and the BeamView.NET User Manual.

4. Review the License Agreement, and then accept the terms of the Agreement.



5. Select a directory on the workstation to install the files.



6. Follow the prompts to set up shortcuts and locations.
7. Review settings and begin installation.
8. Install device drivers as needed, when prompted.
9. Finish the software installation and close the Installation Wizard.

4.2 Set up Cables

Set the LaserCam-HR II in position at the location where the beam will be measured. To protect the face plate from dust, keep the dust cap installed until ready to take measurements.

4.2.1 USB Cable

Connect the USB cable to the connector on the LaserCam-HR II camera (see Figure 4-1).

NOTICE

Do not connect the USB cable to the computer until instructed to do so.

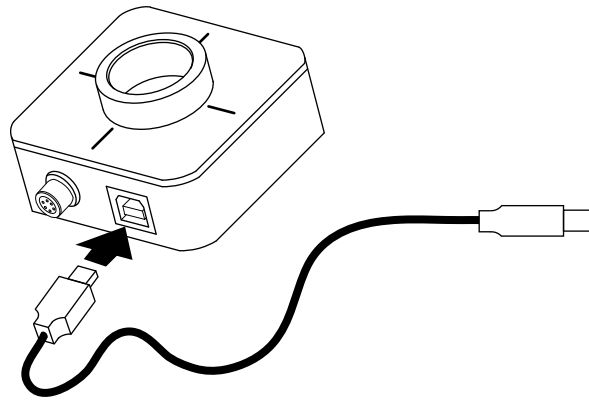


Figure 4-1. USB Cable

LaserCam-HR II will interface through the USB 2.0 connector of any compatible PC using Coherent BeamView Version 4.8.1 software.

Connection of the Trigger and Pass/Fail cable is described next.

4.2.2 Trigger Input and Pass/Fail Output Cable

For more information about the Trigger Input and Pass/Fail Output cable (1120313) shown in Figure 4-2, refer to the BeamView software Help file.

4.3 Put the Camera in a Mount

LaserCam-HR II can be mounted in any rotational position with a $\frac{1}{4}$ -20 or M6 threaded mounting post. Figure VII-1 (p. 29) shows the mounting post location. Alignment marks permit rotation of the camera and alignment with the vertical and horizontal orientation of the sensor. Note: The beam movement on the camera will not match the beam movement on the monitor for all positions between 0 and 90 degrees.

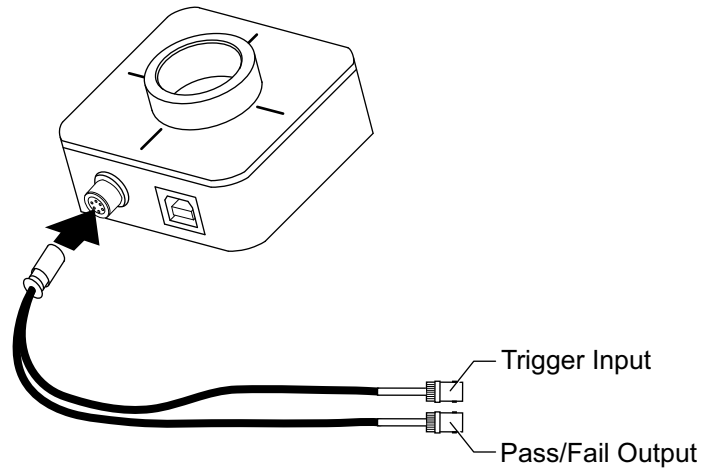


Figure 4-2. Trigger Input and Pass/Fail Output Cable

5 Operation

5.1 Pixel Spacing

Note the LaserCam-HR II pixel spacing values are shown in Table 5-1.

Table 5-1. Pixel Spacing for LaserCam-HR II

	Horizontal Spacing	Vertical Spacing
LaserCam-HR II 1/2-inch System	4.6 μm	4.6 μm
LaserCam-HR II 2/3-inch System	6.5 μm	6.5 μm

5.2 Power On

LaserCam-HR II has no ON/OFF switch. When power is given to the camera through the USB 2.0 connection, it begins to operate.

5.3 Warm-Up Time

The LaserCam-HR II does not require warm-up. However, if the camera is used to make high-accuracy measurements, it must warm-up for at least 15 minutes to insure best baseline (background) stability.

NOTICE

For best results, the background map must be taken after the camera warm-up period.

5.4 Maximum Power Levels

Care must be taken to observe and manage the power levels so that they are not too high.

CAUTION!

Damage can happen at power levels more than 10,000 times the saturation power density, or 32 mJ/cm² at 1064 nm.

5.5 Saturation

The LaserCam-HR II pixel saturation values are shown in Table 5-2.

Table 5-2. Saturation

Wavelength	On Array	On LDFP
633 nm (CW)	16.0 $\mu\text{W}/\text{cm}^2$	40.0 mW/cm ²
1064 nm (CW)	320.0 $\mu\text{W}/\text{cm}^2$	800.0 mW/cm ²
1064 nm (Pulse)	3.2 $\mu\text{J}/\text{cm}^2$	8.0 mJ/cm ²

Table 5-3. LaserCam-HR II Saturation Levels

	LaserCam-HR II (1/2-inch)	LaserCam-HR II (2/3-inch)
CW Saturation	13 mW/cm ² (with LDFP) at 633 nm	5 mW/cm ² (with LDFP) at 633 nm
	5 $\mu\text{W}/\text{cm}^2$ (without LDFP) at 633 nm	2 $\mu\text{W}/\text{cm}^2$ (without LDFP) at 633 nm
	70 mW/cm ² (with LDFP) at 1064 nm	25 mW/cm ² (with LDFP) at 1064 nm
	340 $\mu\text{W}/\text{cm}^2$ (without LDFP) at 1064 nm	125 $\mu\text{W}/\text{cm}^2$ (without LDFP) at 1064 nm
Pulsed Saturation	0.4 mJ/cm ² (with LDFP) at 1064 nm	0.15 mJ/cm ² (with LDFP) at 1064 nm
	2 $\mu\text{J}/\text{cm}^2$ (without LDFP) at 1064 nm	0.7 $\mu\text{J}/\text{cm}^2$ (without LDFP) at 1064 nm

5.6 Trigger

The LaserCam-HR II trigger lets the beam diagnostic system interface with pulsed lasers and transient optical events, including single-shot lasers.

5.6.1 Trigger In

Trigger In uses the BNC connector labeled 'IN' on the LaserCam-HR II Trigger and Pass/Fail cable. This 5 VDC, TTL input—available on the rising or falling edge—causes the camera to immediately reset and begin integrating light. The Trigger In delay is 75 μ s (1/2-inch camera) and 20 μ s (2/3-inch camera). This is the time it takes for the camera to start integrating light once the trigger signal occurs. The LaserCam-HR II can sample laser pulse repetition rates to a maximum of 200 Hz without averaging adjacent pulses.

5.6.2 Trigger Out

Coherent suggests that an external pulse generator be used if the laser under test does not supply a “sync-out” signal. Connect the pulse generator to the Trigger In connector. A delayed trigger should be applied to the Enable or Trigger input connector of the laser. Keep in mind that integration begins 75 μ s (for the 1/2-inch camera) and 20 μ s (for the 2/3-inch camera) after the rising edge of the camera trigger (Trigger In), so users must delay the laser enable pulse by 75 μ s (for the 1/2-inch camera) or 20 μ s (for the 2/3-inch camera), minus any delay in the laser firing circuit.

NOTICE

To avoid missed pulses due to jitter, add additional trigger delay beyond the listed trigger delay values. For low rep. rate lasers—such as 10 Hz lasers—delay the trigger enough to place the laser pulse in the middle of the integration window.

5.7 Low Distortion Face Plate (LDFP)

The Low Distortion Face Plate provides a protective window for the camera array that also acts as a background attenuator with 0.04% to 0.05% typical. The LDFP is made of laser grade filter glass that minimizes interference fringes—refer to 'Manage Fringes' (p. 27)—and does not distort the beam image. The LDFP limits room light, instrumentation lights, and

flash lamp light from reaching the camera sensor. These lights cause a background level that may not be effectively subtracted by the Background Subtraction Wizard.

5.8 Examine and Clean Contamination

5.8.1 Examine for Contamination

If low intensity spots or small circles are seen in the camera video then dust may be present on the CCD sensor or on the Low Distortion Face Plate—see Figure 5-1 (p. 26). Dust on the LDFP filter glass can cause distortion in the form of small circular diffraction rings, or can cause low-intensity spots if present on the sensor array. Observe the defects with a flashlight or a small light illuminating the camera. If the defect moves when the illumination angle is changed, then the dust is on the LDFP. Otherwise it is dust on the sensor array.

Use clean air at low pressure, or methanol and lens tissue to clean the LDFP filter glass. Take all necessary precautions to insure that nothing comes in contact with the sensor surface.

5.8.2 Clean the Sensor

Avoid unnecessary exposure of the sensor to dust and dirt. If the surface of the sensor has to be cleaned, *never* use any kind of cloth, tissue, or brush, and strictly avoid the use of any kind of cleaning fluid. Only use clean, dry, micro-filtered low-pressure air to gently blow away particles from the surface of the sensor. Contact Coherent Customer Service if the sensor requires additional cleaning—refer to 'Contact Service' (p. 33) for contact information.

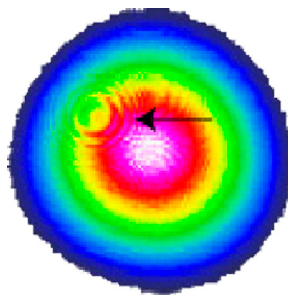


Figure 5-1. Dust on Filter Glass

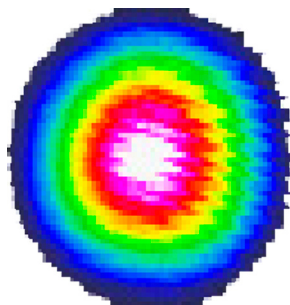


Figure 5-2. Filter Glass after Cleaning



CAUTION!

DO NOT touch the sensor. This will cause irreversible damage.



NOTICE

Always cover the sensor with a dust cap when not in use.

5.9

Manage Fringes

If the LDFP filter glass is installed in the camera, fringes can appear in the video (see Figure 5-3). The fringe pattern is caused by a second reflection off the sensor and LDFP superimposing back on the original beam image. Correct this condition by loosening the C-mount setscrew and rotating the LDFP housing until the fringes are no longer present. Slightly turning the camera with respect to the laser beam can also decrease this effect.

5.10

Get the Most from the LaserCam-HR II System

The LaserCam-HR II has been carefully designed to provide accurate measurements of the spatial and intensity characteristics of laser beams. Significant attention has been paid to every aspect of the instrument that impacts data accuracy. The following items help users get the best performance from your LaserCam-HR II:

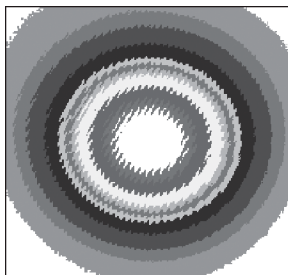


Figure 5-3. Fringes

- System tray—Turn off everything that is non-essential to the running of the computer. This action will help assure the fastest frame update rate possible.
- Resolution—Select 640 x 512 x 8 resolution to get the highest update rates.
- RAM—A minimum of 512 MB is required. 1 GB is recommended. More RAM is typically better.
- Processor speed—A minimum of 3.3 GHz is recommended. Faster clock speeds give higher frame update rates. The faster the processor speed, the better.
- Keep all optics clean—Dirty LDFP, beam sampling, and attenuation optics will distort the beam under test. It is important that users regularly check these optical surfaces for dust, fingerprints, and other contamination. Follow standard coated optical surfaces cleaning techniques. Refer to 'Clean the Sensor' (p. 26).
- Use the Inclusion command to reduce the size and amount of data that is processed. The Inclusion command provides control of the sensor area where calculations are performed. Reducing this area can increase frame update rates and is especially effective with small spot sizes.



NOTICE

Cleaning the sensor surface voids the warranty and can possibly damage the camera.

It is recommended that the LDFP always be left in place and that the dust cap is used to protect the LDFP when the instrument is not in use.

- Read the user documentation—The LaserCam-HR II is a complex piece of optical test equipment. Many functions are included in the

system that may not be obvious to a casual or first-time user. Review the *LaserCam-HR II User Manual* (this manual) and the Beam-View-USB Help (accessed by clicking the Help button in the Beam-View software) to learn about these useful functions. Many calculations and functions that can at first appear to require post-processing or exporting of the data to another application are included in the instrument. The user documentation explains all of the functions in an easy-to-use format.



CAUTION!

Observe standard Laser Safety procedures—this must be done to avoid eye injury. Refer to 'Laser and Optical Safety' (p. 6).

I **Warranty**

I.1 **Limited Warranty**

Coherent, Inc. (the “Company”) warrants its laser beam diagnostic products (“Products”) to the original purchaser (the “Customer”) that the product is free from defects in materials and workmanship and complies with all specifications, active at the time of purchase, for a as specified in the sales agreement.

Coherent, Inc. will, at its option, repair or replace any product or component found to be defective during the warranty period. This warranty applies only to the original purchaser and is not transferable.

Refer to the sales agreement for full warranty details and for warranty limitations.

I.2 **Warranty Limitations**

The foregoing warranties shall not apply, and Coherent reserves the right to refuse warranty service, should malfunction or failure result from:

- Damage caused by improper installation, handling or use.
- Laser damage (including sensor elements damaged beyond repair).
- Failure to follow recommended maintenance procedures.
- Unauthorized product modification or repair.
- Operation outside the environmental specifications of the product.

Coherent assumes no liability for Customer-supplied material returned with Products for warranty service or recalibration.

II Service and Support

To view general information about service and support, as well as a list of contact names, telephone numbers, and addresses worldwide, visit our website: www.Coherent.com.

II.1 Contact Product Support

Coherent provides telephone and web-based technical assistance as a service to its customers and assumes no liability for any injury or damage that may occur with such services.

Please be prepared to provide the following information to the Customer Support Engineer who responds to your request:

- Model or part number of the unit
- Serial number of the unit
- A description of the problem
- Any corrective steps that were attempted

Under no circumstances do these support services affect the terms of any warranty agreement between Coherent and the buyer. Operation of any Coherent laser with any of its interlocks (or safety features) defeated is always at the operator's own risk.

II.2 Contact Service

In order to obtain service under this warranty, Customer must notify the Company of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Company shall, in its sole discretion, determine whether to perform warranty service at the Customer's facility, at the Company's facility or at an authorized repair station.

If Customer is directed by the Company to ship the product to the Company or a repair station, Customer shall package the product (to protect from damage during shipping) and ship it to the address specified by the Company, shipping prepaid. The Company shall pay the cost of shipping the Product back to the Customer in conjunction with product failures within the first twelve months of time of sale.

A Returned Material Authorization number (RMA) assigned by the Company must be included on the outside of all shipping packages and containers. Items returned without an RMA number are subject to return to the sender.

For the latest Customer Service information, connect to www.Coherent.com.

Detailed instructions on how to prepare a product for shipping are shown under 'Product Shipment Instructions' (p. 34).

Table II-1. Coherent Service Centers

Location	Phone	E-mail
USA	1.800.343.4912	LSMservice@Coherent.com
Europe	+49-6071-968-0	customer.support@Coherent.com
International	503.454.5700	customer.support@Coherent.com

II.3 Product Shipment Instructions

To prepare the product for shipping to Coherent:

1. Contact Coherent Customer Service—refer to Table II-1, 'Coherent Service Centers,' on page 34—for a Return Material Authorization number.
2. Attach a tag to the product that includes:
 - The Returned Material Authorization number (RMA)
 - The name of the person to contact about any issues with the product, or other contact name. at the Customer site.
 - Both the billing address and shipping address for the Customer.
 - The name, model, and part number of the product.
 - The product serial number.
3. Wrap the product with polyethylene sheeting or equivalent material.
4. If the original packing material and carton are not available, do the following:
 - Get a corrugated cardboard shipping carton with inside dimensions that are at least 6 in. (15 cm) taller, wider, and deeper than the product.

- The shipping carton must be made of cardboard with a minimum of 375 lb. (170 kg) test strength.
 - Make sure that the instrument is cushioned in the shipping carton with packing material or urethane foam on all sides between the carton and the product. Allow at least 3 in. (7.5 cm) on all sides, as well as the top and bottom.
5. Make a seal on the shipping carton with shipping tape or an industrial stapler.
 6. Put the RMA number received from Coherent Customer Service on the outside of all shipping labels and containers.
 7. Ship the product to:
Coherent, Inc. Laser Measurement and Control
27650 SW 95th Ave.
Wilsonville, OR 97070
Attn: RMA # *(add RMA number received from Coherent Service)*



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INNOVATIONS THAT RESONATE

