

Preinstallation Manual
Astrella Ultrafast Amplifier
Laser System



COHERENT®
5100 Patrick Henry Drive
Santa Clara, CA 95054

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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.

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.

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.

Preface

This document contains user information for the Astrella modelocked Ti:Sapphire laser.



NOTICE!

Read this Operator's Manual carefully before operating the system for the first time. Special attention should be given to the material in Section One: Laser Safety.



WARNING!

Use of controls or adjustments or performance of procedures other than those specified in this Operator's Manual may result in hazardous radiation exposure.



WARNING!

Use of the system in a manner other than that described herein may impair the protection provided by the system.

U.S. 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 should be obtained from Coherent or an appropriate U.S. Government agency.

SECTION ONE: LASER SAFETY



NOTICE!

This user information is in compliance with section 1040.10 of the CDRH Performance Standards for Laser Products from the Health and Safety Act of 1968.



NOTICE!

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

This laser safety section must be thoroughly reviewed prior to operation of the Astrella laser system. Safety instructions presented throughout this manual must be followed carefully.

Hazards

Hazards associated with lasers generally fall into the following categories:

- Exposure to laser radiation that may damage the eyes or skin
- Electrical hazards generated in the laser power supply or associated circuits
- Chemical hazards resulting from contact of the laser beam with volatile or flammable substances, or released as a result of laser material processing

The above list is not intended to be exhaustive. Anyone operating the laser must consider the interaction of the laser system with its specific working environment to identify any potential hazards.

Optical Safety

Laser light, because of its special qualities, poses safety hazards not associated with light from conventional 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.

The safety precautions listed below are to be read and observed by anyone working with or near the laser. At all times, ensure 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 listed in 'Performance Standards for Laser Products,' *United States Code of Federal Regulations*, 21CFR1040 10(d).



WARNING!

Direct eye contact with the output beam from the laser will cause serious damage and possible blindness.

The greatest concern when using a laser is eye safety. In addition to the main beam, there are often secondary beams present at various angles near the laser system. These beams are formed by specular reflections of the main beam at polished surfaces such as lenses or beam splitters. While weaker than the main beam, such beams may still carry sufficient intensity to cause eye damage.

Laser beams are powerful enough to burn skin, clothing or paint even at some distance. They can ignite volatile substances such as alcohol, gasoline, ether and other solvents, and can damage light-sensitive elements in video cameras, photomultipliers and photodiodes. The user is advised to follow the precautions below.

Recommended Precautions and Guidelines

1. Observe all safety precautions in the preinstallation and/or Operator's Manuals.
2. All personnel should wear laser safety glasses rated to protect against the specific wavelengths being generated. Protective eye wear vendors are listed in the *Laser Focus World*, *Lasers and Optronics*, and *Photonics Spectra* buyer's guides. Consult the ANSI, ACGIH, or OSHA standards listed at the end of this section for guidance.
3. Avoid wearing watches, jewelry, or other objects that may reflect or scatter the laser beam.
4. Stay aware of the laser beam path, particularly when external optics are used to steer the beam.
5. Provide enclosures for beam paths whenever possible.
6. Use appropriate energy-absorbing targets for beam blocking.
7. Block the beam before applying tools such as Allen wrenches or ball drivers to external optics.

8. Limit access to the laser to qualified users who are familiar with laser safety practices. When not in use, lasers should be shut down completely and made off-limits to unauthorized personnel.
9. Use the laser in an enclosed room. Laser light may remain collimated over long distances and therefore presents a potential hazard if not confined. It is good practice to operate the laser in a room with controlled access.
10. Post warning signs in the area of the laser beam to alert those present.
11. Exercise extreme caution when using solvents in the area of the laser.
12. Never look directly into the laser light source or at scattered laser light from any reflective surface. Never sight down the beam.
13. Set up the laser so that the beam height is either well below or well above eye level.
14. Avoid direct exposure to the laser light. Laser beams can easily cause flesh burns or ignite clothing.
15. Advise all those working with or near the laser of these precautions.

***NOTICE!***

Laser safety glasses protect the user from eye damage by blocking light at the laser wavelengths. However, this also prevents the operator from seeing the beam. Use extreme caution even while wearing safety glasses.

Electrical Safety

The Astrella uses AC and DC voltages in the laser head and controller. All units are designed to be operated with protective covers in place. Certain procedures in this manual require removal of the protective covers. These procedures shall be used by a qualified trained service personnel. Safety information contained in the procedures must be strictly observed by anyone using the procedures.

The Astrella controller should be connected to the AC input using a certified 3 conductor power cord, < 10 ft length, rated for at least 10 A operation, with a 16 AWG conductor. The power cord provided in the ship kit is rated for 1625 W.

**DANGER!**

Normal operation of the Astrella does not require access to dangerous electrical voltage. Removing the Pockels cell covers will expose the user to electrical hazards. These covers are labeled with the electrical hazard symbol shown to the left.

Recommended Precautions and Guidelines

The following precautions must be observed by anyone working with potentially hazardous electrical circuitry:

1. Disconnect main power lines before working on any electrical equipment when it is not necessary for the equipment to be operating.
2. Do not short or ground the power supply output. Protection against possible hazards requires proper connection of the ground (earth) terminal on the power cable, and an adequate external ground. Check these connections at the time of installation, and periodically thereafter.
3. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment, and who is competent to administer first aid.
4. When possible, keep one hand away from the equipment to reduce the danger of current flowing through the body if a live circuit is touched accidentally.
5. Always use approved, insulated tools.
6. Special measurement techniques are required for this system. A technician who has a complete understanding of the system operation and associated electronics must select ground references.

Component Lasers

The Astrella system incorporates a Coherent Revolution™ and Coherent Vitara laser as components, or other compatible lasers. The beams from these lasers are hazardous. Refer to the Revolution, Vitara, or other respective Operator's Manual for additional safety information.

Designated Use

The Astrella system has been built in accordance with state-of-the-art standards and recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or of third parties or cause damage to other material property.

The laser system shall only be used within its designated use and the instructions set out in this manual, and only by safety conscious persons who are fully aware of the risks involved in operating the laser system. Any functional disorders, especially those affecting the safety of the laser system, should therefore be rectified immediately.

The Astrella system is a mode-locked ultrafast laser amplifier designed for use in scientific applications and environments. Using the laser system for purposes other than those mentioned above is considered contrary to its designated use. The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user.

Operating the laser system within the limits of its designated use also involves observing the instructions set out in this manual and complying with the inspection and maintenance directives.

Maximum Accessible Radiation Level

The Astrella produces visible and invisible radiation over a wavelength range of 700 to 900 nm, with a maximum energy of 15 mJ per < 40 fs pulse [CFR 1040.10 (h)(2)/ EN 60825-1/ IEC 608225-1, Clause 6]. Refer to the pump and seed laser Operator's Manuals for maximum radiation levels from these lasers.

Safety Features and Compliance with Government Requirements

The following features are incorporated into the instrument to conform to several government requirements. The applicable United States Government requirements are contained in 21 CFR, Subchapter J, part 1040 administered by the Center for Devices and Radiological Health (CDRH). The European Community requirements for product safety are specified in the Low Voltage Directive (LVD) (published in 73/23/EEC and amended in 93/68/EEC). 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 EN 60825-1/IEC 60825-1 "Safety of Laser Products". Compliance of this laser with the LVD requirements is certified by the CE mark.



NOTICE!

Use of the system in a manner other than that described herein may impair the protection provided by the system.

Laser Classification

Governmental standards and requirements specify that the laser must be classified according to the output power or energy and the laser wavelength. The Astrella is classified as Class IV based on 21 CFR, Subchapter J, part 1040, section 1040.10 (d). According to the European Community standards, Astrella lasers are classified as Class 4 based on EN 60825-1/IEC 60825-1, clause 9. In this manual, the classification will be referred to as Class 4.

Protective Housing

The laser head is enclosed in a protective housing that prevents human access to radiation in excess of the limits of Class I radiation as specified in the 21CFR, Part 1040 Section 1040.10 (f)(1) and Table 1-A/EN 60825-1/IEC 60825-1 clause 4.2 except for the output beam, which is Class 4.

Safety Interlocks

The system incorporates multiple safety interlocks which activate when the top cover(s) of the laser head is removed. An interlock fault initiation will terminate the pump laser by activating a shutter mechanism as well as removing power from the infrared diodes in the pump laser power supply. While active, the interlock defeats are directly visible by anyone near the laser. It is not possible to replace the laser cover while the interlocks are active.

The laser interlocks should be defeated only for the purpose of maintenance and service by trained personnel. Extreme caution must always be observed when operating the laser with its covers removed [CFR 1040.10 (f)(2)/ EN 60825-1/IEC 608225-1, Clause 4.3].

Operating Controls

The laser controls are positioned so that the operator is not exposed to laser emission while manipulating the controls [CFR 1040.10(f)(7)/EN 60825-1/IEC 60825-1, clause 4.8].

Display Screen

The display screen on the operating computer may be viewed without exposing the operator to laser emission [CFR 1040.10(f)(8)/EN 60825-1/IEC 60825-1, clause 4.9].

Location of Safety Labels

Refer to Figure 1-1 for the location of all safety labels. These include warning labels indicating removable or displaceable protective housings, apertures through which laser radiation is emitted, and labels of certification and identification [CFR 1040.10(g), CFR 1040.2, and CFR 1010.3/ EN 60825-1/IEC 60825-1, Clause 5].

Electromagnetic Compatibility

The European requirements for Electromagnetic Compliance (EMC) are specified in the EMC Directive (published in 89/336/EEC).

Conformance to the EMC requirements is achieved through compliance with the harmonized standard EN61326-1.

Compliance of this laser with the EMC requirements is certified by the CE mark.

Environmental Compliance

RoHS Compliance

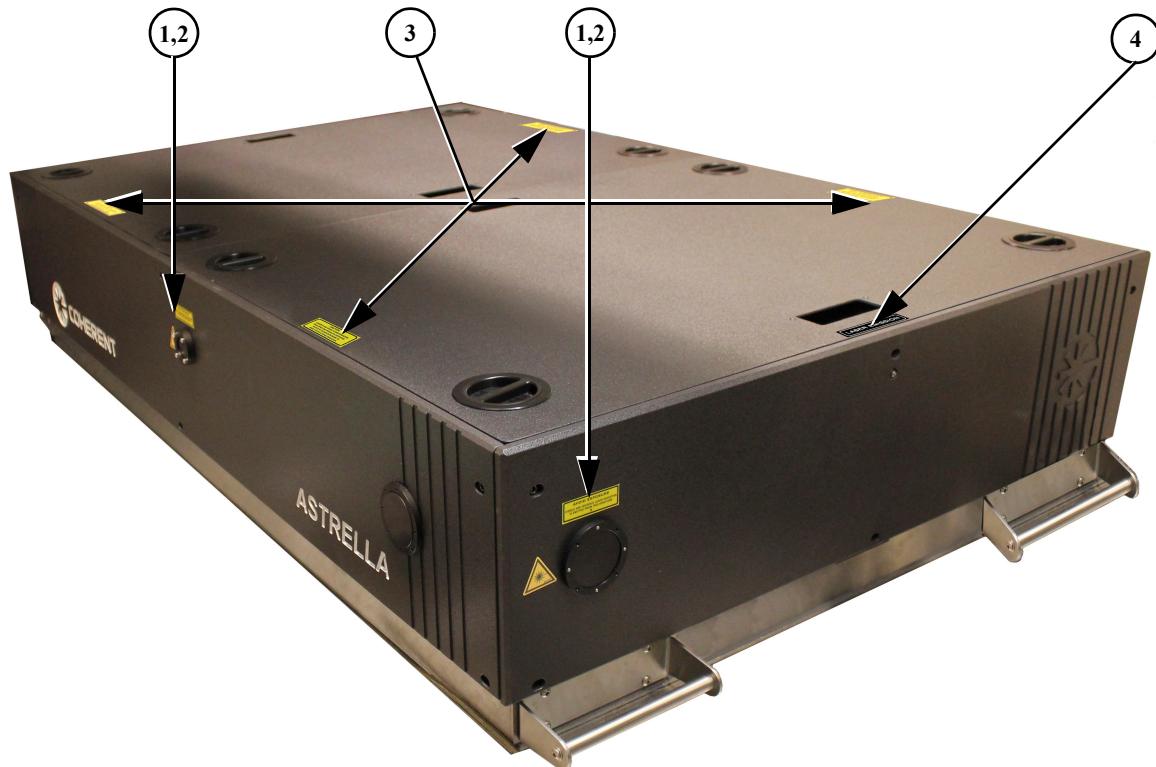
The RoHS directive restricts the use of certain hazardous substances in electrical and electronic equipment. All components of the Astrella system are RoHS compliant.

China-RoHS Compliance

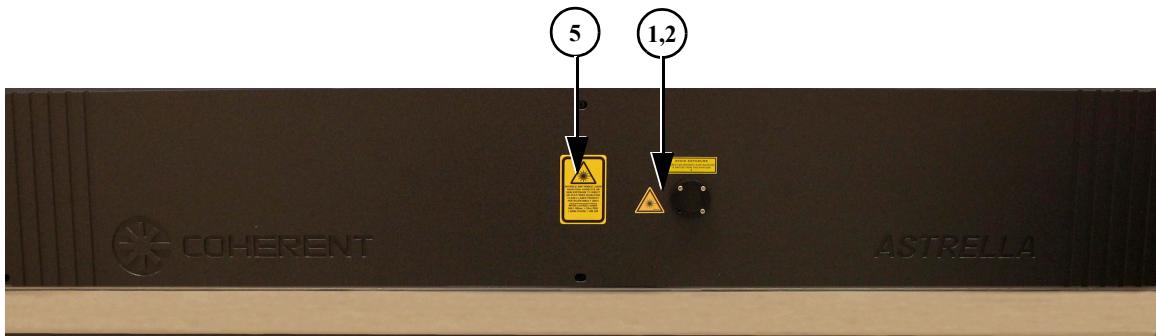
The China-RoHS directive restricts the use of certain hazardous substances in electrical and electronic equipment. Refer to the figures below for product components that are China-RoHS compliant.

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 and is part of the China-RoHS label. The purpose of this directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection.

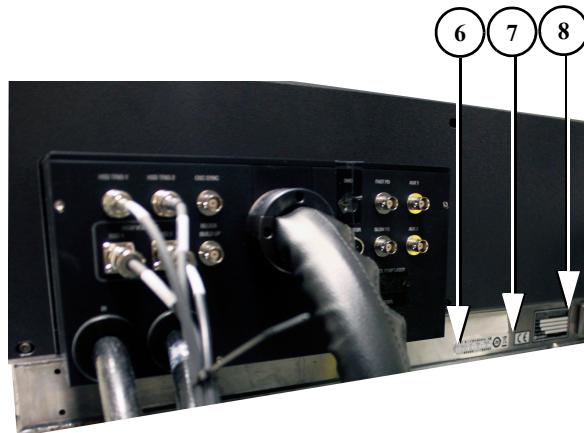


ASTRELLA OPTICAL BENCH ASSEMBLY, LEFT-CORNER VIEW

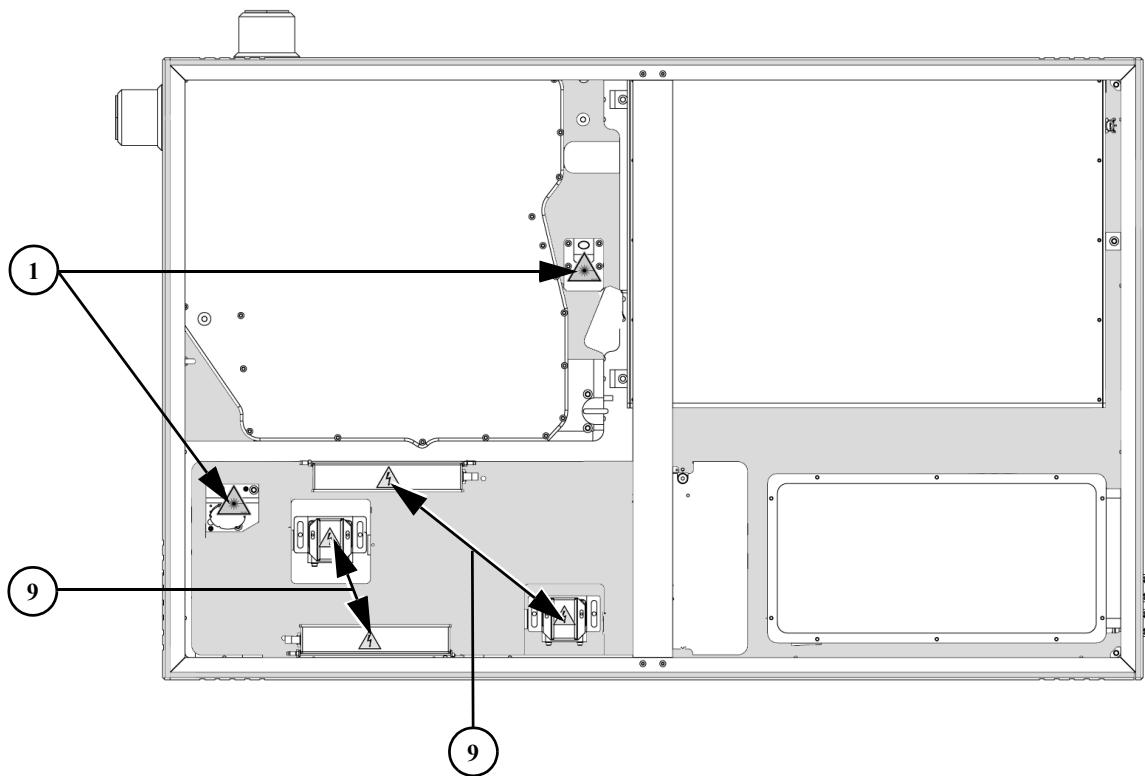


ASTRELLA OPTICAL BENCH ASSEMBLY, RIGHT VIEW

Figure 1-1. Astrella HE+ Safety Labels (Sheet 1 of 4)



ASTRELLA OPTICAL BENCH ASSEMBLY, REAR PANEL



ASTRELLA W/ TOP-COVERS REMOVED



1. HAZARDOUS RADIATION EXPOSURE WARNING LABEL

Figure 1-1. Astrella HE+ Safety Labels (Sheet 2 of 4)



2. EXIT APERTURE WARNING LABEL



3. HEAD COVER WARNING LABEL



4. LASER EMISSION POSSIBLE INDICATOR LABEL



5. MAXIMUM RADIATION LABEL

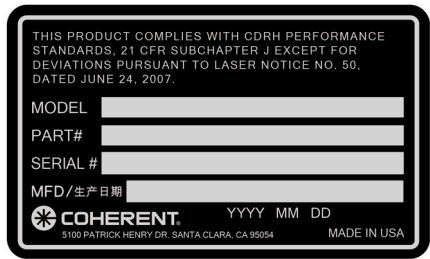
LABEL# 1127166AC	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6 ⁺	多溴联苯 PBB	多溴二苯醚 PBDE		
	X	O	O	O	O	O		
	O= 小于最高浓度值 X= 大于最高浓度值							

6. CHINA ROHS LABEL, LASER HEAD

Figure 1-1. Astrella HE+ Safety Labels (Sheet 3 of 4)



7. CE LABEL



8. SERIAL NUMBER LABEL



9. UNPLUG POWER CORD ELECTRICAL WARNING LABEL

Figure 1-1. Astrella HE+ Safety Labels (Sheet 4 of 4)

Sources of Additional Information

The following are sources for additional information on laser safety standards and safety equipment and training.

Laser Safety Standards

Safe Use of Lasers (Z136.1)
American National Standards Institute (ANSI)
1430 Broadway
New York, NY 10018
Tel: (212) 354-3300

A Guide for Control of Laser Hazards
American Conference of Governmental and Industrial Hygienists (ACGIH)
6500 Glenway Avenue, Bldg. D-7
Cincinnati, OH 45211
Tel: (513) 661-7881

Occupational Safety and Health Administration (OSHA)
U.S. Department of Labor
200 Constitution Avenue N.W.
Washington, DC 20210

Laser Safety Guide
Laser Institute of America
12424 Research Parkway, Suite 130
Orlando, FL 32826
Tel: (407) 380-1553

Equipment and Training

Laser Focus Buyer's Guide
Laser Focus World
One Technology Park Drive
P.O. Box 989
Westford, MA 01886-9938
Tel: (508) 692-0700

Lasers and Optronics Buyer's Guide
Lasers and Optronics
301 Gibraltar Dr.
P.O. Box 650
Morris Plains, NJ 07950-0650
Tel: (210) 292-5100

Photonics Spectra Buyer's Guide
Photonics Spectra
Berkshire Common
Pittsfield, MA 01202-4949
Tel: (413) 499-0514

SECTION TWO: DESCRIPTION AND DIMENSIONS

Astrella Amplifier Laser System

The Astrella is an all-in-one ultrafast oscillator and regenerative amplifier laser system. Solid-state laser technology is incorporated into a compact optical enclosure, providing reliable operation over thousands of hours.

The Astrella laser system consists of six primary components:

- Astrella optical bench assembly
- Synchronization & delay generator (SDG)
- Vitara power supply
- Revolution power supply
- Closed-loop water chiller
- Laptop computer with control software



Figure 2-1. Astrella Optical Bench Assembly

Astrella Optical Bench Assembly

The Astrella optical bench assembly comprises of four modules (See Figure 3-2 on page 3-7 for block diagram layout):

- Vitara seed laser
- Revolution pump laser
- Regenerative amplifier (RA)
- Stretcher/Compressor

The Coherent Vitara™ serves as the seed laser for the Astrella system. This module includes a modelocked Ti:Sapphire oscillator cavity pumped by the Coherent Verdi™ G-Series, a continuous-wave diode-pumped green laser.

The Revolution is a diode-pumped second-harmonic Q-switched laser. Operating at 527 nm and a single-kHz repetition rate, it provides the pump power to the amplifier module. The Vitara and Revolution are described in detail in their respective Operator's Manuals.

The regenerative amplifier is based on the Coherent Legend Elite™ platform. Designed in a compact, enclosed module with active cooling, the amplifier exhibits excellent stability and reduced sensitivity to environmental temperature changes. Included in this design is the Coherent Synchronization and Delay Generator (SDG™).

The stretcher and compressor are sealed and thermally stable for optimum pulse width stability and reliability with no feedback or moving parts required.

Synchronization and Delay Generator (SDG)

The SDG controls the precise timing of the regenerative amplifier's Pockels cells. It contains a high-speed power supply for the Pockels cells as well as a bandwidth detector (BWD) circuit, which serves as an interlock to protect the laser from operation at narrow bandwidth.

Power Supplies

The Astrella system includes two individual power supplies for the Vitara and Revolution modules. Refer to the Vitara and Revolution Operator's Manuals for additional information.

Water Chiller

The closed-loop water chiller dissipates the heat generated by the system and stabilizes the Vitara, Revolution, and amplifier cavity. The temperature is optimized in the factory and is typically ~21 °C. Refer to the chiller operator's manual for further details.

Laptop Computer

The system is shipped with a laptop computer with Windows-based control software for the Vitara, Revolution, and SDG already installed.

These components may be controlled remotely through RS-232 serial connections on the Vitara power supply, Revolution power supply, and SDG rear panel. Multiple serial-to-USB adapters are used for simultaneous control from one computer.

Specifications

The Customer Data Sheet shipped with each Astrella provides a detailed description of system performance. Specifications for all Coherent products can be found at www.Coherent.com.

Dimensions and Weight

Figure 2-2 gives the dimensions of the optical bench assembly. Refer to the respective Operator's Manuals for the dimensions of other components.

Table 2-1. Summary of Dimensions & Weight

SYSTEM COMPONENT	LENGTH	WIDTH	HEIGHT	WEIGHT
Astrella Amplifier	124.97 cm 49.2 in.	79.25 cm 31.2 in.	26.19 cm 6.28 in.	249 kg 550 lbs.
Vitara-S: Controller	36.3 cm 14.3 in.	23.4 cm 9.2 in.	13.7 cm 5.4 in.	3.4 kg 7.5 lbs.
Vitara-S: Power Supply	36.1 cm 14.2 in.	22.9 cm 9.0 in.	16.0 cm 6.3 in.	6 kg 13.2 lbs.
Revolution Power Supply	43.68 cm 33.56 in.	48.26 cm 19.0 in.	13.25 cm 5.22 in.	40 kg 88 lbs.
Synchronization & Delay Generator	48.26 cm 19.00 in.	30.48 cm 12.0 in.	9.73 cm 3.83 in.	2.2 kg 4.9 lbs.
Chiller	27.7 cm 10.9 in.	20.3 cm 8.0 in.	38.6 cm 15.2 in.	8.8 kg 19.4 lbs.

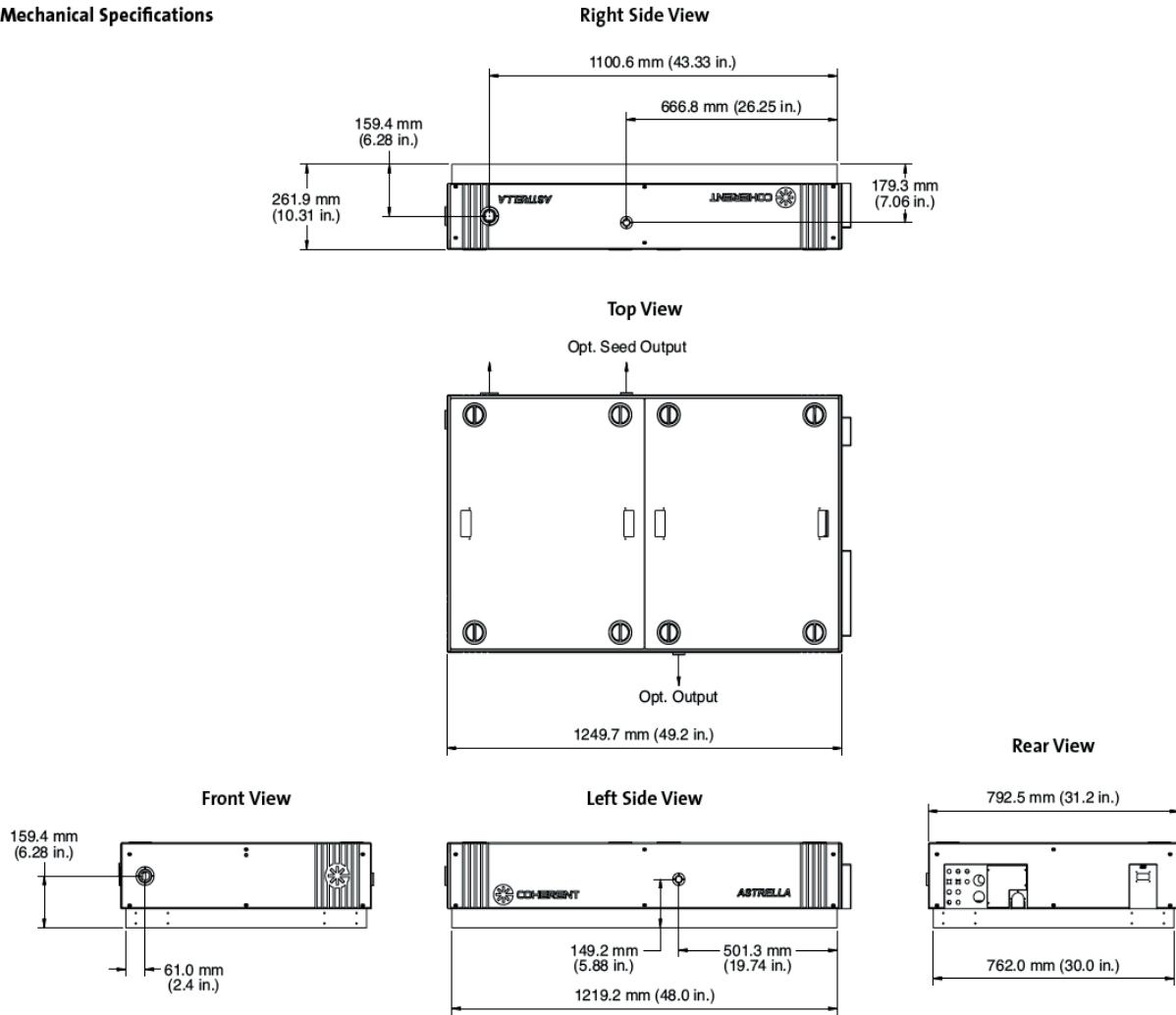
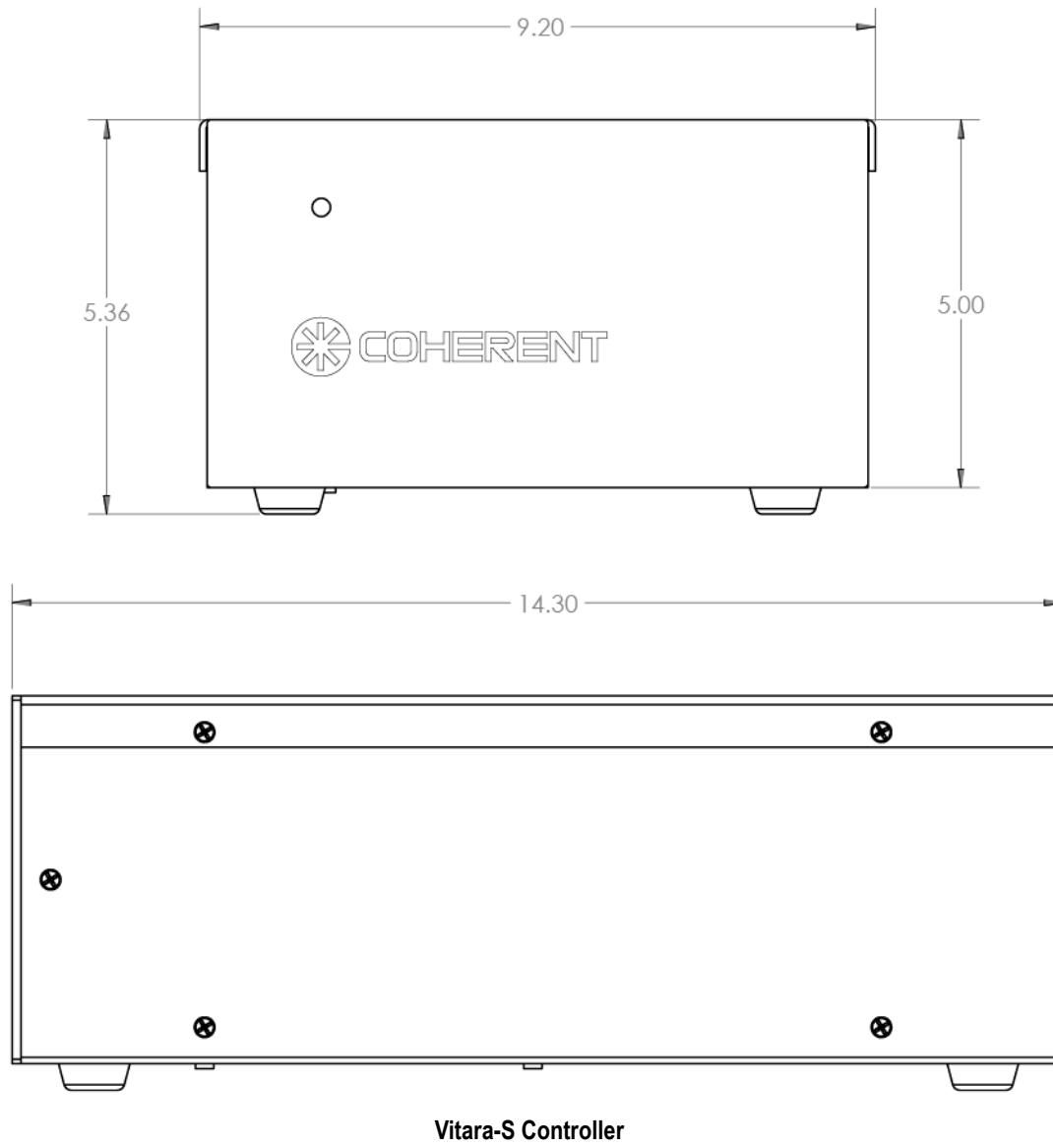
Mechanical Specifications**Astrella Optical Bench Assembly**

Figure 2-2. Astrella Optical Bench Assembly & External Component Dimensions



Vitara-S Controller

Figure 2-2. Astrella Optical Bench Assembly & External Component Dimensions (Continued)

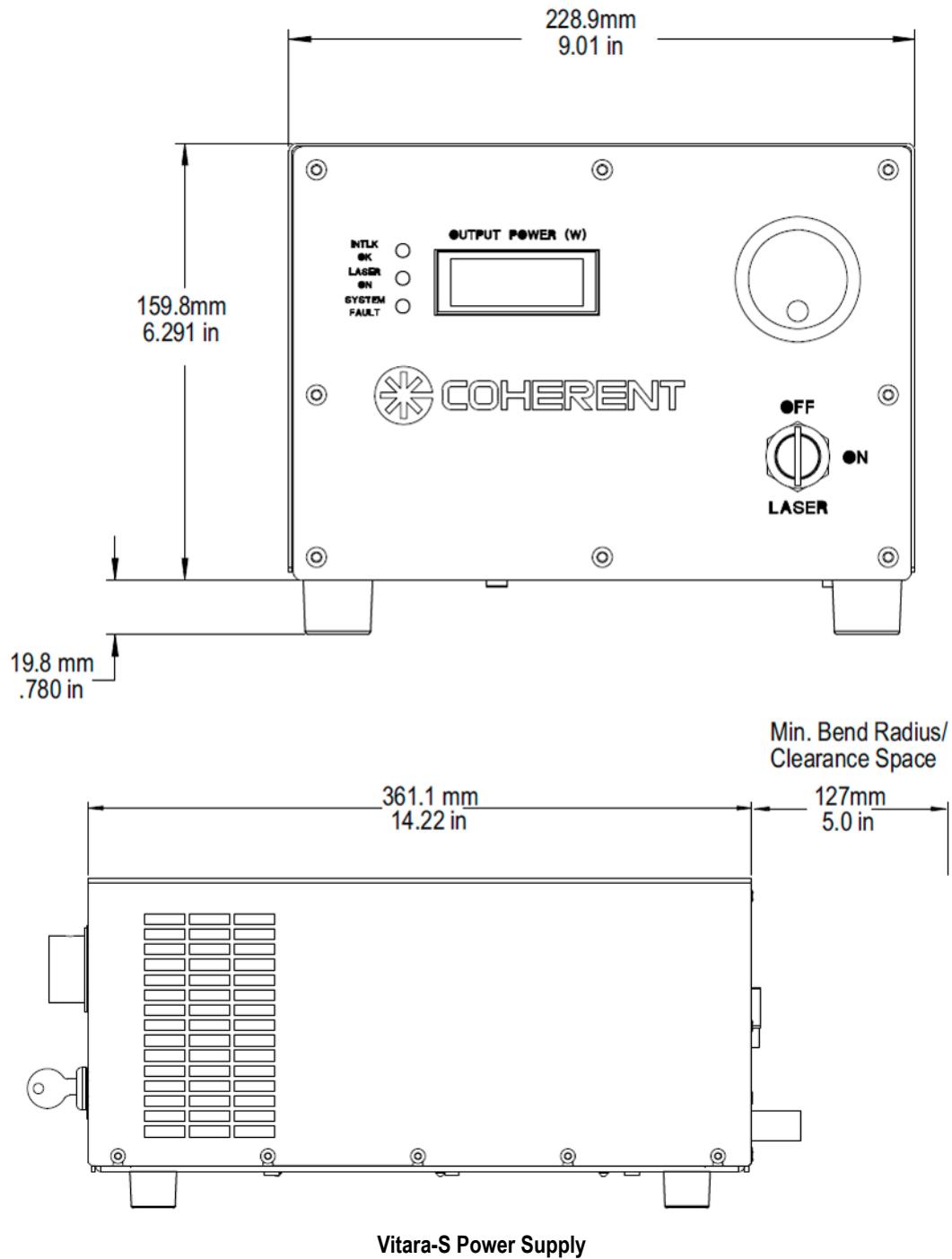
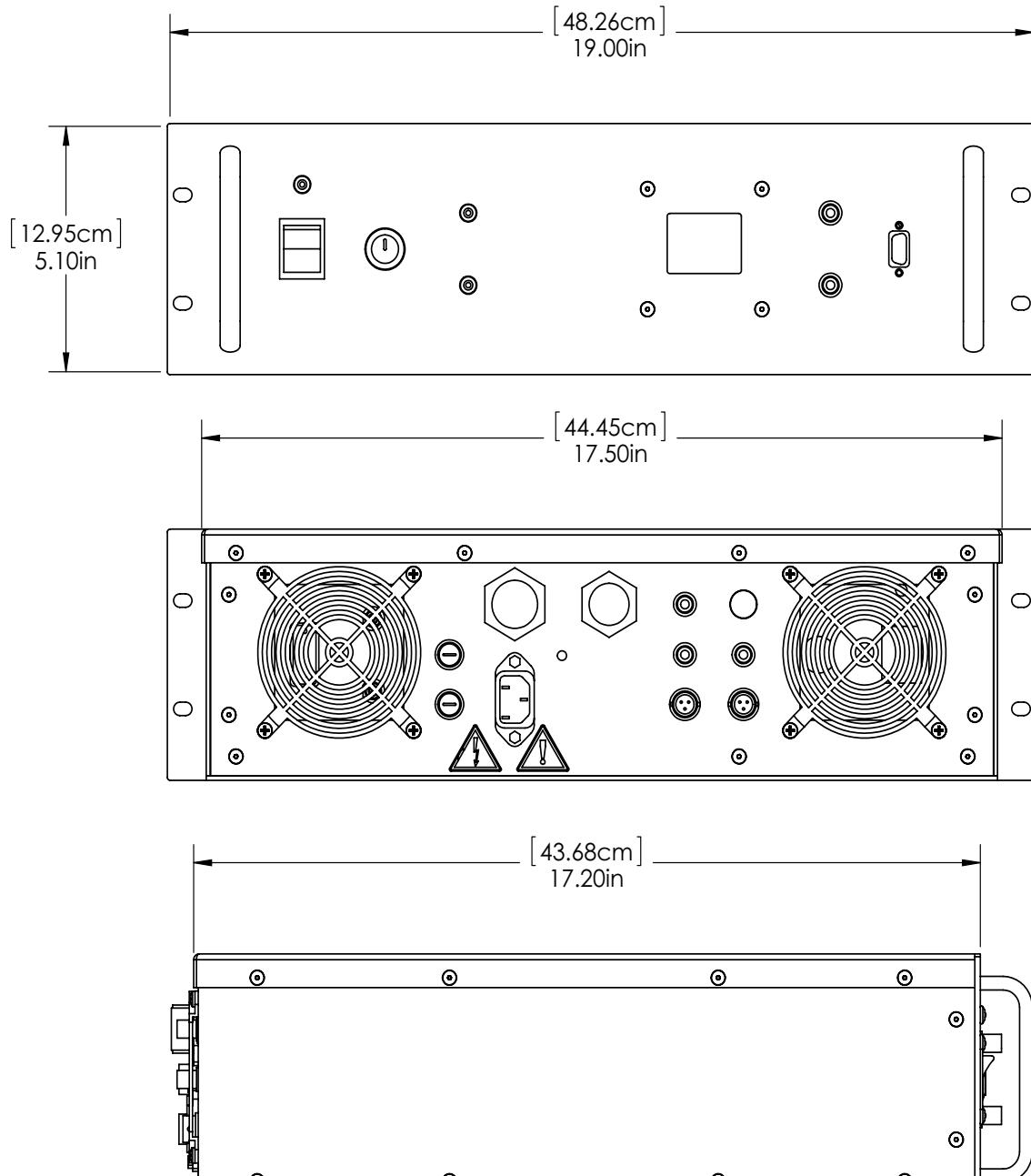


Figure 2-2. Astrella Optical Bench Assembly & External Component Dimensions (Continued)



Revolution Power Supply

Figure 2-2. Astrella Optical Bench Assembly & External Component Dimensions (Continued)

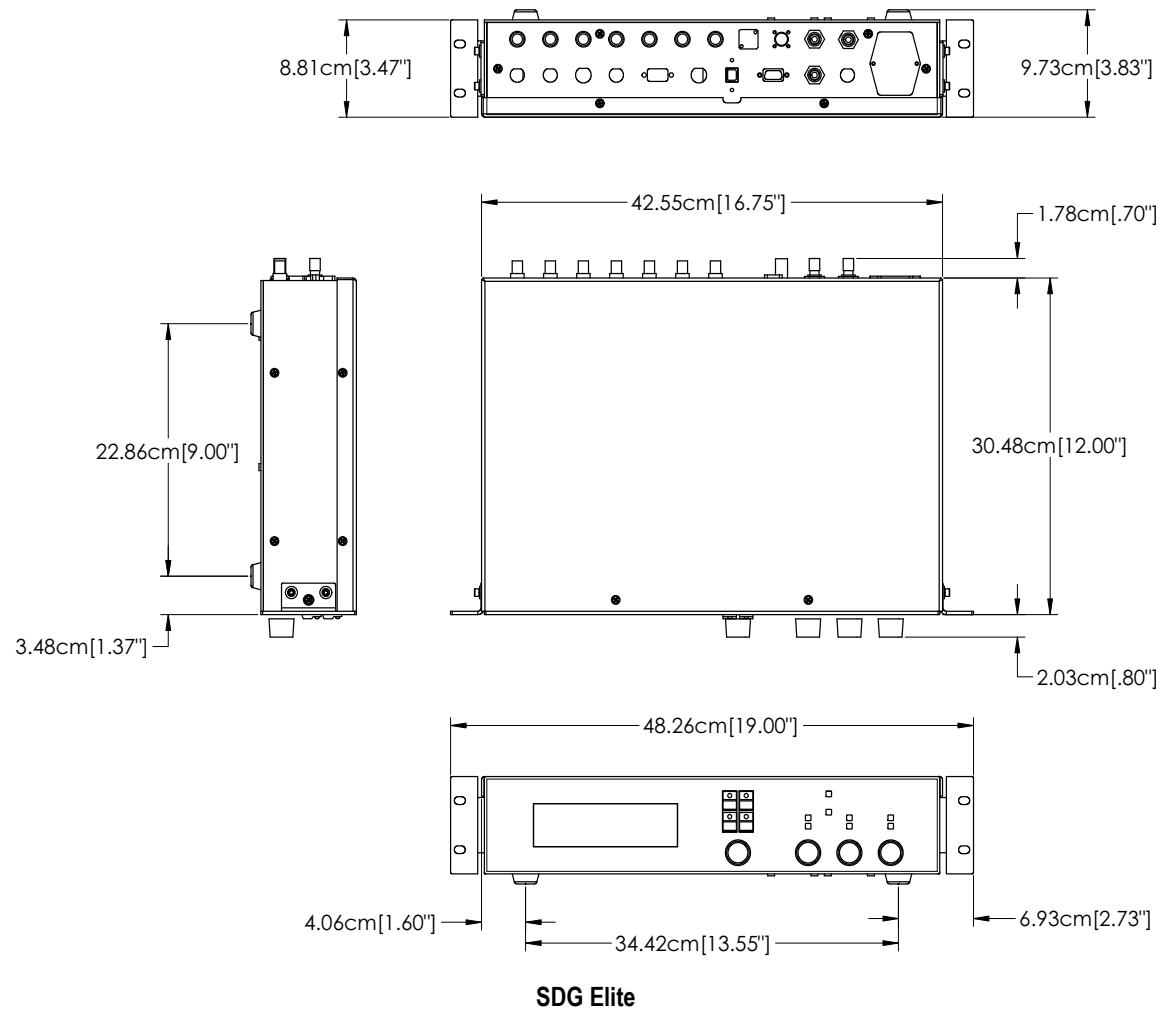


Figure 2-2. Astrella Optical Bench Assembly & External Component Dimensions (Continued)

SECTION THREE: INSTALLATION

Installation must be performed by a Coherent Field Service Engineer or an authorized representative. Any damage incurred while a Field Service Engineer is not present is not covered under warranty. The customer may, however, unpack and locate the laser in the laboratory where it will be used.

Read this section thoroughly before installation, with particular attention given to the information in Section One: Laser Safety.



NOTICE!

Do not attempt to install the laser without a qualified member of Coherent service or an authorized representative present. Unauthorized installation will void the warranty.

Receiving and Inspection

Inspect shipping containers for signs of rough handling or damage, and immediately report any damage to the shipping carrier and to Coherent.



NOTICE!

The Astrella must be installed by authorized Coherent personnel.



CAUTION!

The Astrella is heavy and equipped with brackets and eye-bolts to be lifted with a mechanical-lift. A rigging team is recommended to place the laser onto an optical table. See Figure 3-1.



CAUTION!

The Astrella is heavy. Avoid placing hands or fingers under the laser while it is suspended or moving.

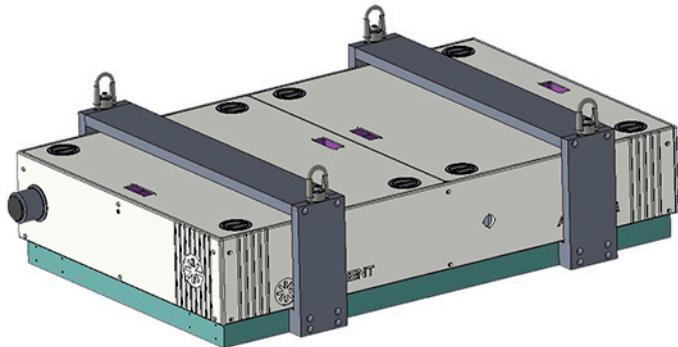


Figure 3-1. Astrella with Mounting Brackets for Mechanical Lift

Vitara and Revolution Lasers

Refer to the Vitara and Revolution Operator's Manuals for additional installation information.

Control Computer



NOTICE!

The Astrella was manufactured and tested using the computer and control software that shipped with the laser. Coherent does not support the use of other computers or software to control the Astrella; doing so voids the warranty and may cause damage to the laser.

Installation Requirements

Before installing the Astrella, use following checklist as shown in Table 3-1.

Location

The Astrella must rest on an optical table. Coherent recommends that the Astrella be located in a laboratory environment; that is, in a

Table 3-1. Pre-installation Checklist

ACTIVITY & EQUIPMENT	GENERAL REQUIREMENTS	REFERENCE(S)
Laser Environment	<input type="checkbox"/> Laser area layout planned according to system dimensions. <input type="checkbox"/> No strong air currents directed at the laser. <input type="checkbox"/> No thermal gradients across the length or height of the laser. <input type="checkbox"/> Temperature fluctuations < 2° C.	“Location” on page 3-2 & “Environmental Requirements” on page 3-4
Receive and Inspect	<input type="checkbox"/> Area is clean and large enough to uncrate the laser, power supplies and chiller.	“Receiving and Inspection” on page 3-1
Utility Requirements	<input type="checkbox"/> Seed Laser <input type="checkbox"/> Pump Laser <input type="checkbox"/> Synchronization & Delay Generator (SDG) <input type="checkbox"/> Laptop Computer <input type="checkbox"/> Chiller, Pump Laser	“Astrella Utility Requirements” on page 3-5
Chiller	<input type="checkbox"/> Pump Laser: Premixed Optishield (1.1 gallons, 4.16 liters). <input type="checkbox"/> Seed Laser: Steamed Distilled Water with 10% Isopropyl Alcohol (15 Ounces, 444 ml).	“Chiller Fluid Requirements” on page 3-6
Laser Safety	<input type="checkbox"/> Laser Safety Officer (LSO) identified (recommended). <input type="checkbox"/> Laser Personnel Safety Training completed. <input type="checkbox"/> Laser controlled area established. <input type="checkbox"/> Personal protective equipment (Laser safety eye wear) available. <input type="checkbox"/> External interlock system well thought out (optional)	“Section One: Laser Safety” on page 1-1
Lab Equipment and Cleaning Material	See “Laboratory Equipment Requirements” on page 6.	“Laboratory Equipment Requirements” on page 3-6

room free of dust, drafts, and which does not exhibit large temperature fluctuations. Although the Astrella is designed to be insensitive to environment temperature, Coherent recommends that the temperature be controlled within $\pm 2^{\circ}\text{C}$ throughout the day for optimal system performance.

The Astrella requires a minimum table space of about 4 x 3 ft. (1.2 x 0.90 m). It is the responsibility of the customer to determine the best location for the Astrella. The Astrella must be placed in a position that allows easy access for service-related activities.

Environmental Requirements

Table 3-2. Operation Temperature, Humidity & Stability Guideline

OPERATIONAL TEMPERATURE	TEMPERATURE STABILITY	HUMIDITY	HUMIDITY STABILITY
22° C ± 2° (71.6° F ± 2°)	± 1° C	45 ± 10 %	± 5 %

Utility Requirements

Table 3-3 lists electrical requirements for and the amount of heat dissipated by a complete Astrella system.

Table 3-3. Astrella Utility Requirements

COMPONENT ¹	OPERATING VOLTAGE	MAX POWER	FUSE RATING 110V/220V	HEAT DISSIPATION
Seed Laser, Vitara-S: Vitara controller Vitara power supply	100-240 VAC, 50-60 Hz 100-240 VAC, 50-60 Hz	100 VA 750 VA	1 A / 0.5 A 8 A / 4 A	550 W 1000 W
Pump Laser, Revolution: Power supply Chiller	220VAC ($\pm 10\%$), 50-60 Hz 220VAC ($\pm 10\%$), 50-60 Hz	1500 VA	15 A / 10 A 12 A	550 W 1000 W
SDG Elite	100-240 VAC, 50-60 Hz	200 VA	1 A / 0.5 A	50 W
Compressor remote control	negligible	negligible	negligible	negligible
Computer			2 A / 1 A	negligible

¹Refer to the respective operator's manual for full details. Some products are not compatible with 110 V operation.

Table 3-4. Astrella Cable & Hose Lengths

MODEL	AC POWER CORD LENGTH	UMBILICAL/WATER LINE LENGTH
Revolution Power Supply	3 m (10 ft.)	3 m (10 ft.)
Revolution Chiller	2.4 m (8 ft.)	3 m (10 ft.)
Vitara-S Power Supply Vitara-S Controller	3 m (10 ft.)	3 m (10 ft.)
SDG Elite	3 m (10 ft.)	N/A



NOTICE!

Consult with the factory for any hoses or cables longer than the standard length. Damage may occur for unauthorized changes.

Chiller Fluid Requirements

The chiller is a closed loop system that requires premixed Optishield only.

Laboratory Equipment Requirements

The following equipment is required for installation and daily operation of the Astrella:

- Safety glasses rated to protect against wavelengths of 525 to 535 nm, and 700 to 900 nm
- Power meter with 10 W capacity (45 W for entire Revolution beam)
- A spectrometer with a spectral window of 700 to 900 nm
- 300 MHz or better oscilloscope and BNC cable
- IR viewer
- Optic cleaning supplies (lens tissue, hemostats, ultra-pure acetone and methanol, eyedropper)
- Latex or nitrile gloves or finger cots

Cable Connections

Figures 3-1 shows the rear panel of the Astrella optical bench assembly. Refer to the Vitara and Revolution Operators Manuals for figures pertaining to these components. Also reference “Section Four: Controls and Indicators” on page 4-1 for more Astrella and SDG Elite connection details.

Make the following cable connections:

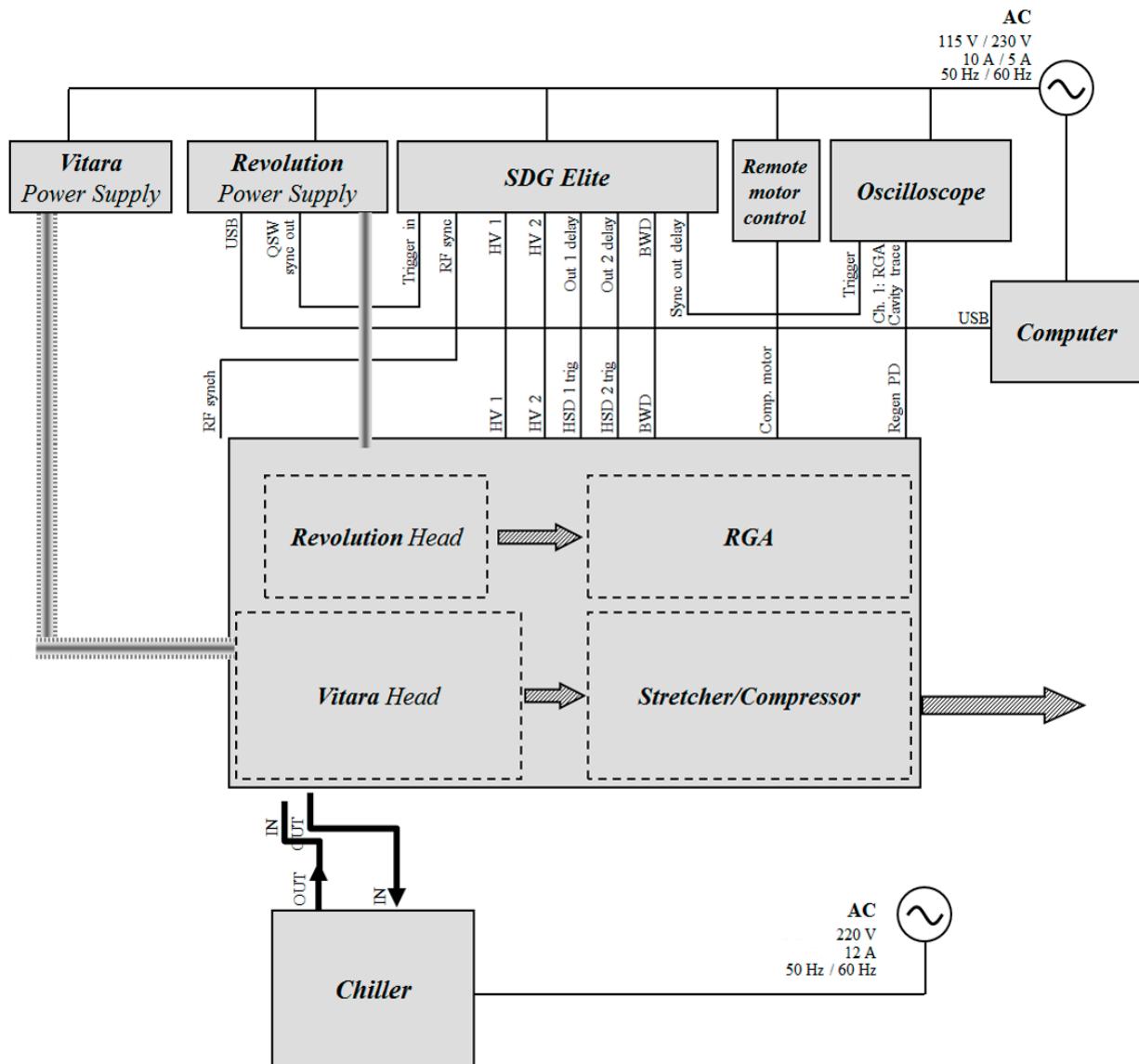


Figure 3-2. Astrella Block Diagram & Layout

Astrella Rear Panel Connections

Standard BNC connections

1. "HSD Trig 1" on the Astrella rear panel, to "Out 1 Delay ns" on the SDG front panel.
2. "HSD Trig 2" on the Astrella rear panel, to "Out 2 Delay ns" on the SDG front panel.
3. "Osc Sync" on the Astrella rear panel to "RF Sync" on the SDG rear panel.
4. "Regen Build-Up" on the Astrella rear panel to the channel input of an oscilloscope. Use a time base of 100 or 200 ns per



Figure 3-3. Astrella Optical Bench Assembly Rear Panel Connections

division to monitor the RA intra-cavity buildup (pulse train) during system operation.

5. “Sync out Delay ns” on the SDG front panel, to the trigger input of an oscilloscope. Trigger the scope from this signal.
6. “Aux 1” and “Aux 2” are not used.

High Voltage BNC connections



WARNING!

Verify the SDG main power switch is OFF before contacting the High Voltage (HV) connectors on the SDG rear panel.

1. “High Voltage HSD 1” on the Astrella rear panel to “High Voltage H.V. 1” on the SDG rear panel.
2. “High Voltage HSD 2” on the Astrella rear panel to “High Voltage H.V. 2” on the SDG rear panel.

Remaining Cables

1. Connect the three-pin cable assembly from the compressor stage remote control to “COMP. MOTOR” on the Astrella rear panel.

2. Connect the four-socket cable assembly to “BWD” on the Astrella rear panel, and to “BWD” on the SDG rear panel.

Vitara and Revolution Umbilical Cables

Large umbilical cables connect from the Astrella rear panel to the Vitara and Revolution power supplies. Do not disconnect or disassemble these cables.

Revolution Power Supply Connections

1. “Q-SW Sync Out” on the Revolution power supply rear panel, to “Trigger In” on the SDG rear panel.
2. “USB” on the Revolution power supply front panel, to a USB port on the computer.

Chiller Connections

1. Connect the chiller output water hose to the IN connector on the Astrella optical bench assembly.
2. Connect the chiller return water hose to the OUT connector on the Astrella optical bench assembly.
3. Fill the reservoir with fluid.

Vitara and SDG Computer Connections (Optional)

The Vitara power supply and SDG feature RS-232 serial ports for remote control over these components. USB-to-Serial adapters may be used to simultaneously connect the Vitara, Revolution, and SDG to the computer.

Control software is shipped with the system. See the “Readme” file for additional information about software features and operation.

Power Connections

Connect the following equipment to facility power:

- Vitara power supply
- Revolution power supply
- SDG
- Chiller
- Computer

Grating Installation

The Astrella is shipped with covered stretcher and compressor gratings. The grating covers will be removed by Coherent field service engineers or representatives.

External Interlock

An external interlock connector is provided on the SDG rear panel. When the toggle switch is in the ENABLE position (up), the system will not operate with this circuit open. In the event of an interlock fault during normal operation, the Pockels cells are disabled which terminates Astrella output. This circuit may be disabled by toggling the switch down.

Alternatively, the interlock connector may be wired to an external circuit such as a door switch. Many types of switches may be used, but the switch should have its contacts closed when it is safe to operate the laser and open when it is not safe.

The Vitara and Revolution power supplies are also equipped with interlock connectors, as described in their respective Operator's Manuals. The system is shipped with interlock defeats installed over these connectors.

SDG Toggle Switches

1. The BWD toggle switch on the SDG rear panel should be set to ON (up position).
2. If an external interlock is connected, set the INTERLOCK toggle switch to ENABLE (up position). If no external interlock circuit is connected, set it to the down position.

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